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Issues Paper
On
Data Governance for Development:
From Asymmetry to Equitable Stewardship

Unedited Draft

Prepared by the UNCTAD Secretariat¹

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I. Introduction

At its twenty-ninth session held in April 2026, the United Nations Commission on Science and Technology for Development (CSTD) selected “Data Governance for Development: From Asymmetry to Equitable Stewardship” as the priority theme for the 2026-2027 intersessional period. To contribute to a better understanding of this theme and to assist the Commission in its deliberations at its thirtieth session, the Commission secretariat has prepared this issue paper based on relevant literature and inputs contributed by Commission members and international organizations.

As data become a strategic resource for innovation and sustainable development, new forms of global asymmetry are emerging, reflected in significant disparities in access to data, digital infrastructure and governance capacities. Although developing countries generate growing volumes of data, they often face challenges in capturing their social and economic value. Such value for the most part remains concentrated in technologically advanced economies and among large technology companies. At the same time, inequalities are embedded throughout the data lifecycle—from data generation and collection to access, use and value creation—both between and within countries. These inequalities are reinforced by biases and underrepresentation in datasets, including gender data gaps, geographic disparities affecting rural and remote communities, and linguistic and cultural biases, which can manifest in different ways across sectors of the economy. Such challenges have profound implications for equitable and interoperable data governance, inclusive innovation and efforts to reduce inequalities, as recognized in the Global Digital Compact (GDC) and Sustainable Development Goals (SDGs) 9 and 10.

In this regard, this paper examines the structural asymmetries that shape countries’ capacities to collect, generate, access, process and govern data, as well as their ability to derive value from data. It also assesses the implications of such disparities on development, with particular attention to developing countries and explores policy approaches and governance strategies that can promote equitable, interoperable and trusted data governance at both national and international levels, ensuring that data contribute to shared prosperity and sustainable development.

The remainder of the paper is organized as follows. Section II analyses structural asymmetries across the global data value chain. Section III reviews national strategies, regulatory frameworks and institutional arrangements that countries are adopting to advance equitable, interoperable and trusted data governance. Section IV explores the role of multilateral frameworks in fostering inclusive digital cooperation, including through trusted cross-border data flows, data sharing mechanisms and interoperability. Section V concludes and presents recommendations for the consideration of Member States and the international community. In the annex, the paper includes a set of suggested questions to facilitate discussions at the CSTD Intersessional Panel to be held on 6 November 2026.

II. Structural asymmetries and challenges in data governance

Countries often face gaps in infrastructure and computing capacity, human skills and institutional capacity, as well as legal and regulatory frameworks.² These disparities can create asymmetries in countries' ability to generate, collect, access, process, govern and derive value from data. Importantly, these disparities can constrain participation in the global data value chain and limit countries' ability to capture the economic and broader developmental benefits generated from data (Bu, 2026).³ Such constraints are particularly significant for developing countries, including Least Developed Countries (LDCs), Landlocked Developing Countries (LLDCs) and Small Island Developing States (SIDS).

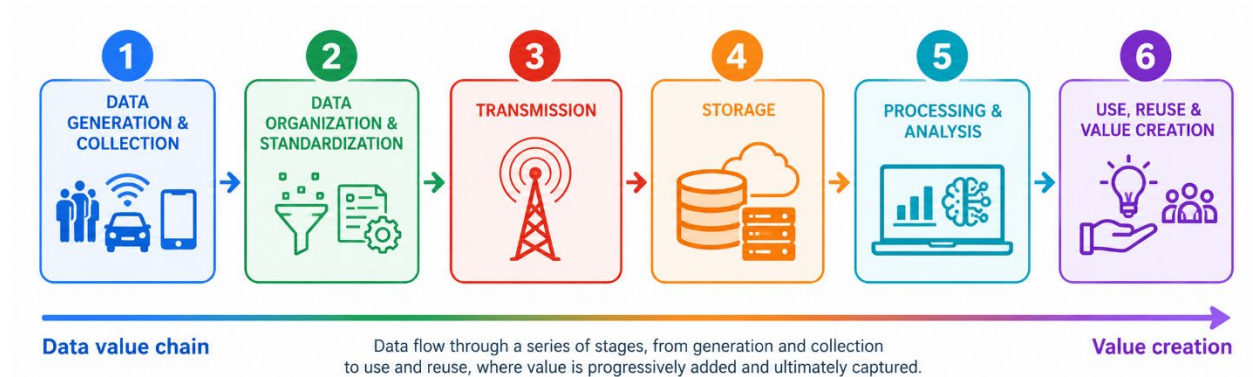
Understanding these asymmetries requires considering how value is created along the data value chain. While the data lifecycle describes the stages through which data are managed and transformed over time, from generation and collection to reuse and destruction, the data value chain focuses on the processes through which data are transformed into social and economic value, encompassing the capabilities, activities and relationships that add value at each stage and enable value to be captured (Curry, 2016; Shah et al., 2021).

The value of data increases as they are collected and organized in line with pre-established standards, transmitted, stored and subsequently processed and analyzed for use in commercial activities, public services, policymaking and other social and economic objectives (UNCTAD, 2021). Figure 1 presents the six stages of the data value chain, showing how data move from generation and collection through transmission, storage, processing and analysis towards their eventual use and value creation.

² Contributions from the Governments of Brazil, Burkina Faso, China, Iran, the Philippines, Poland, Saudi Arabia, Switzerland and the United Kingdom.

³ These disparities are also reflected in countries' differing capacities to use, adopt and adapt frontier technologies. UNCTAD's Frontier Technology Readiness Index provides a comprehensive assessment of countries' preparedness for frontier technologies, covering five dimensions: ICT deployment, skills, research and development, industrial capacity and access to finance. The Index reveals a substantial readiness gap between developed and developing countries, with the largest disparities observed in the R&D and industry subindices (UNCTAD, 2025).

Figure 1. Stages of the Data Value Chain



Source: UNCTAD.

Participation at one stage does not necessarily mean that a country can participate equally across the entire value chain. Developing countries, for example, may generate growing volumes of data through expanding digital activity while facing constraints in turning those data into economic and developmental gains. Such value may accrue disproportionately to economies and firms with greater access to more advanced digital infrastructure, technological capabilities, computing resources, skills and capital. A country's or firm's primary position within the value chain influences the degree of control it exercises over data and the amount of value it is able to capture (UNCTAD, 2021).

The data value chain framework recognizes that these stages are interdependent. Value does not necessarily increase in a simple linear manner across these stages but can accumulate, multiply or be redistributed as data move through the value chain, with processing and reuse generally creating substantially greater value than the initial generation of data. At the same time, value creation at later stages depends on the quality and accessibility established at earlier stages. Feedback loops operate across the value chain: new uses may generate demand for additional data, reveal gaps or biases in existing datasets and lead to improvements in collection, generation and governance. The distribution of value depends not only on who generates or owns data, but also on who possesses the infrastructure, technologies, skills, intellectual property, market access and institutional capabilities required to transform and reuse them. Box 1 illustrates some of these asymmetries and their implications for development.

Box 1. Asymmetries in the data lifecycle and their impact on development

Who is represented in the data? Asymmetries can enter the data lifecycle before information is collected, processed, and used. For instance, WHO notes that mobile populations and people in remote or fragile settings may be missed by censuses, civil registration and health records. Certain forms of unpaid and informal labour, including childcare and care for elderly relatives, have historically been less visible in formal economic statistics. Some marginalized population may hesitate to provide sensitive information for fear of discrimination, surveillance or immigration enforcement.

Digital data produces similar gaps in data representation. Where women and girls, Indigenous Peoples or people in LDCs have less access to the Internet and digital services, data generated through online activities may underrepresent their circumstances and experiences. In health care, a lack of diverse training data can limit the reliability of medical AI tools, including those used to diagnose skin cancer in people with darker skin tones.

What are the consequences of data asymmetries? If people are absent from records, their needs may be underestimated when governments set priorities, determine eligibility and allocate resources. In UNESCO's consultations, policymakers identified exclusion from social protection registries, gaps in rural health insurance eligibility and poorly targeted digital ID programmes where information about vulnerable groups was incomplete or inaccurate.

ESCWA likewise reports that limited data on refugees, internally displaced and stateless people reduce their visibility in national planning and resource allocation. People without birth registration may be missing from official records while also facing barriers to education, health care and social protection.

Sometimes data may be available but remain difficult to use. In Pretoria, South Africa, data scientists reported that government documents were often available only as PDFs, making information difficult to extract and analyze for public policy.

Asymmetries can arise at different stages of the data lifecycle, from who is recorded and how accurately, to whether data can be accessed, processed and used, and can ultimately shape the distribution of public services and development opportunities.

Source: Contributions from ESCWA, ITU, ODET, UNESCO, UNU-CPR and WHO.

Against this background, the data value chain is used as the analytical framework for this chapter, supported by relevant evidence and trends, to illustrate where structural asymmetries arise and how they affect countries' ability to derive value from data, with particular attention to developing countries, including LDCs, LLDCs and SIDS.

A. Asymmetries in data generation and collection

At the beginning of the data value chain, data are generated as a by-product or deliberate output of economic, social, scientific and administrative activities. Generation creates underlying data resources, but the potential value of data depends on their relevance, quality, granularity and representativeness. Collection creates additional value by bringing data together from different sources and improving their quality through validation, cleaning, classification and structuring.

Increasingly, data are generated and collected through digital transactions, online interactions, administrative systems and machine-generated processes. Differences in productive structures can introduce a bias in both the quantity of data generated and their potential value. Economic activities that are more formalized and digitalized tend to generate larger and more systematic data footprints. Advanced economies may consequently produce more readily usable data through formal businesses and digital services, while activities that are more prevalent in many developing countries, such as small-scale agriculture and informal businesses, are less frequently recorded. These structural differences can create asymmetries in the availability and usability of data and, in turn, reinforce differences in countries' ability to derive social and economic value from them.

Beyond differences in how much data are generated, the way in which data are collected also matters. Data can be collected actively, where data are directly provided by individuals, businesses, and governments, but data can also be collected passively, where data are generated from actors without their direct involvement. The completion of an online form is a form of active data collection, while the collection of heart rate or sleeping pattern data is a form of passive data collection (Slade et al., 2025).

Passive data collection from various devices and sensors help support productivity and efficiency, but hardware can malfunction and users may not fully understand the full extent of the data being collected. In the case of both active and passive data collection, users of this hardware often lack the bargaining power to negotiate the terms of data collection. For instance, payment systems illustrate how individuals and small businesses may generate valuable data while having limited control over their use and bearing higher proportional transaction costs than large market actors.⁴

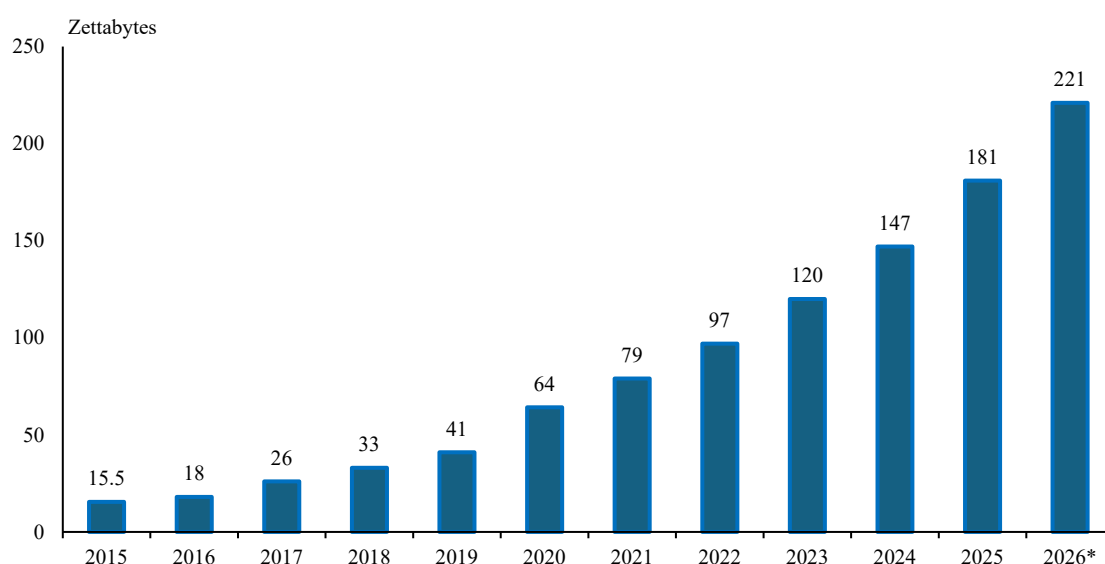
Standards and common data formats play an important role in the generation and collection stage. When data are collected using consistent definitions, classifications, metadata and technical formats, they are more likely to be comparable, reusable and interoperable at later stages of the data value chain, thereby enhancing spill-over effects. By contrast, where digital systems are fragmented, standards are weak or institutional capacity for data collection is limited, data may be

⁴ Contributions from the Government of Switzerland.

incomplete, inconsistent or difficult to combine across sources, reducing their usefulness for subsequent analysis and policymaking.⁵

Despite these differences in the conditions under which data are generated and collected, the overall volume of data has expanded rapidly as economic and social activities become increasingly digitalized. As shown in Figure 2, the global volume of data created, captured, copied and consumed increased from 15.5 zettabytes in 2015 to a projected 221 zettabytes in 2026, representing a fourteenfold increase over eleven years.

Figure 2. Global volume of data created, captured, copied and consumed, 2015-2026



Source: Statista, 2026.

Note: * is a projected figure.

This growth has been accelerated by the rapid shift towards online activities through use of digital technologies during the COVID-19 pandemic and, more recently, by the expansion of Artificial Intelligence (AI). Indeed, data generation and collection are core to the development of several rapidly emerging digital technologies, including AI, blockchain, Internet of Things (IoT), cloud computing and other Internet-based services (UNCTAD, 2021).

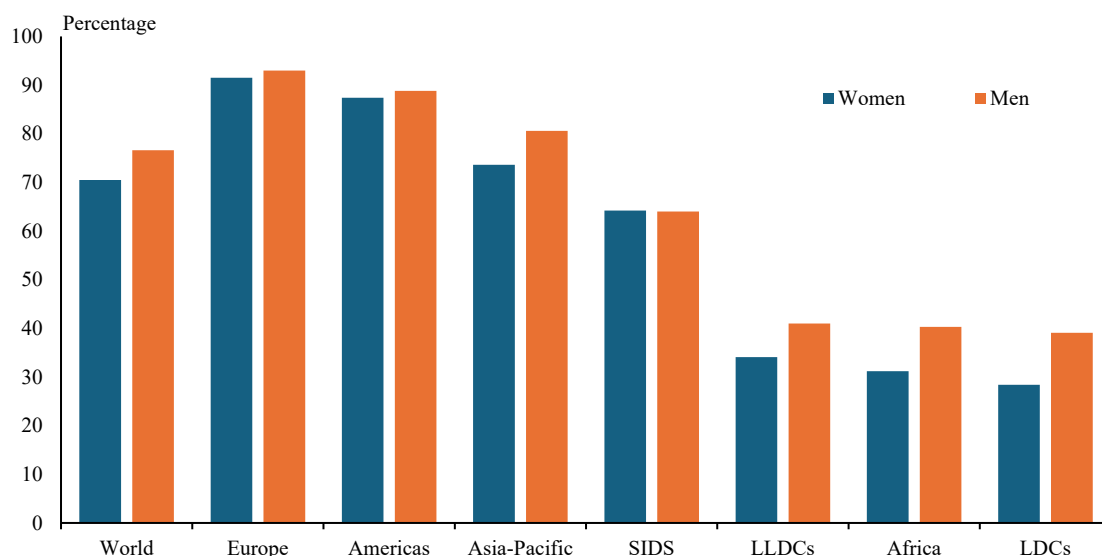
The ability to generate data is uneven across countries and population groups. Differences in the degree of Internet penetration, uptake of digital technologies, market access, socio-cultural norms and availability of local intermediaries and infrastructure for technology companies all contribute to this uneven participation.

⁵ Contributions from the Governments of the Philippines, Poland and Saudi Arabia.

While comparable data on the volume of data generated by region remain limited, Internet use can provide an indication of the extent to which individuals participate in digital activities through which data are generated. In 2025, statistics from ITU show approximately 6 billion people, or 74 per cent of the global population, were online. However, the share of Internet user remained considerably lower in Africa, at 36 per cent, and in LDCs, at 34 per cent, compared with more than 90 per cent in Europe (ITU, 2025a).

The gender disparities are also evident within countries and regions. As shown in Figure 3, globally, 71 per cent of women used the Internet in 2025, compared with 77 per cent of men. The gender gap was particularly pronounced in LDCs, where only 28 per cent of women were online compared with 39 per cent of men. By contrast, SIDS recorded equal Internet-use rates for women and men, at 64 per cent, although overall Internet use remained below the global average.

Figure 3. Share of women and men using the Internet, 2025



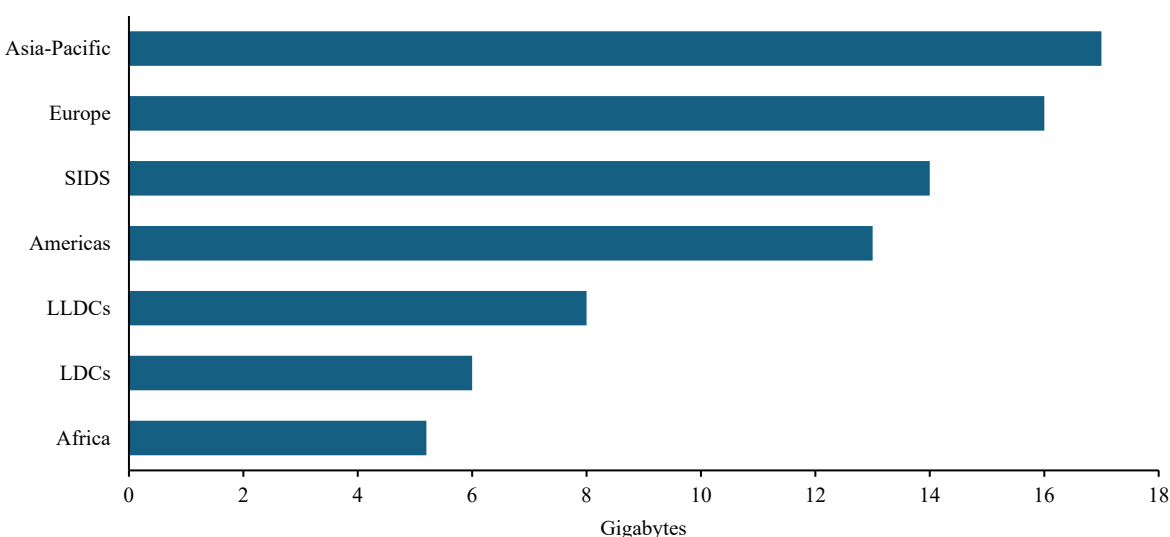
Source: ITU, 2025a.

Connectivity, however, captures only one dimension of participation in the data economy. Sex-disaggregated data for the intensity of digital participation, data processing capacity and value capture remain limited. Existing indicators can therefore describe who is connected, but provide much less information on who generates, governs or benefits from data within countries. Addressing this measurement gap is important for understanding inequalities embedded in the data lifecycle. Gender pay gaps, digital literacy, online safety, socio-cultural norms, including household and care responsibilities, and inadequate digital infrastructure have all been identified as factors contributing to the gender digital divide (Singh et al., 2025; Hilbert, 2011).

Given that mobile broadband is the primary means of Internet access in many developing countries, mobile data traffic provides a useful indication of the intensity of digital participation (World Bank, 2026; ITU, 2025b). Users in Africa, LDCs and LLDCs, in particular, exchange substantially lower volumes of mobile data than users in other regions. In agriculture, for instance, there are disparities between farmers in their access to digital technologies, with one study noting that only 13 per cent of smallholders in sub-Saharan Africa registered for digital agriculture services.

Figure 4 illustrates these disparities. Average monthly mobile broadband traffic in Africa in 2025 was only 5 GB per subscription, around one third of the global average of 15 GB. Traffic was higher in Asia-Pacific and Europe, at 17 GB and 16 GB per subscription, respectively. Similar disparities are observed across special country groupings, with average traffic of 6 GB per subscription in LDCs and 8 GB in LLDCs, compared with 14 GB in SIDS.

Figure 4. Average monthly mobile broadband traffic, 2025



Source: ITU, 2025c.

These differences suggest that the expansion of data generation is uneven. Although it represents only the first stage of the data value chain, asymmetries at this point shape the scale and composition of states' data resources, creating unequal starting conditions for subsequent value creation.

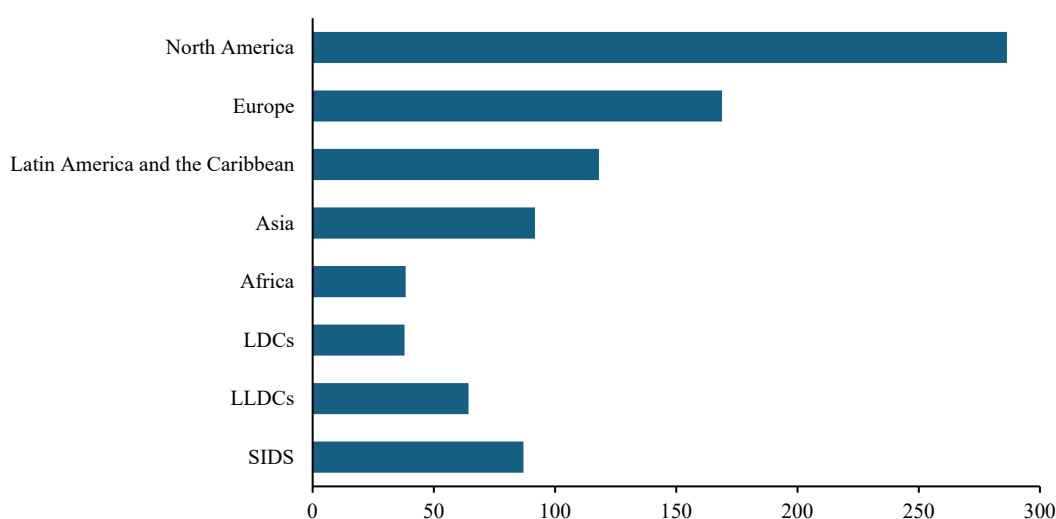
B. Uneven infrastructure for data transmission and storage

Following data collection, the next stage involves data transmission, through which data move across digital infrastructure, such as telecommunications networks, submarine cables, satellites and Internet exchange points (IXPs). Transmission enables data to move across systems,

organizations and borders, expanding the range of actors and applications that can access and use them. Interoperable systems, reliable connectivity and appropriate governance arrangements can increase the usability and potential reach of data.

This stage is closely linked to the infrastructure capacity required to support interoperability and movement of data, including cross-border data flows. For instance, Internet speeds have increased substantially over the past two decades, supported by the expansion of fibre-optic networks, submarine cable connectivity, mobile telecommunications infrastructure and satellite technologies. However, significant regional disparities remain. As shown in Figure 5, median download speeds reached about 286 Mbps in North America and 169 Mbps in Europe, compared with only around 38 Mbps in Africa and LDCs. These differences can constrain the speed and scale at which data are transmitted and accessed, reinforcing asymmetries along the data value chain.

Figure 5. Median download speeds per region and country groups, mid-2026



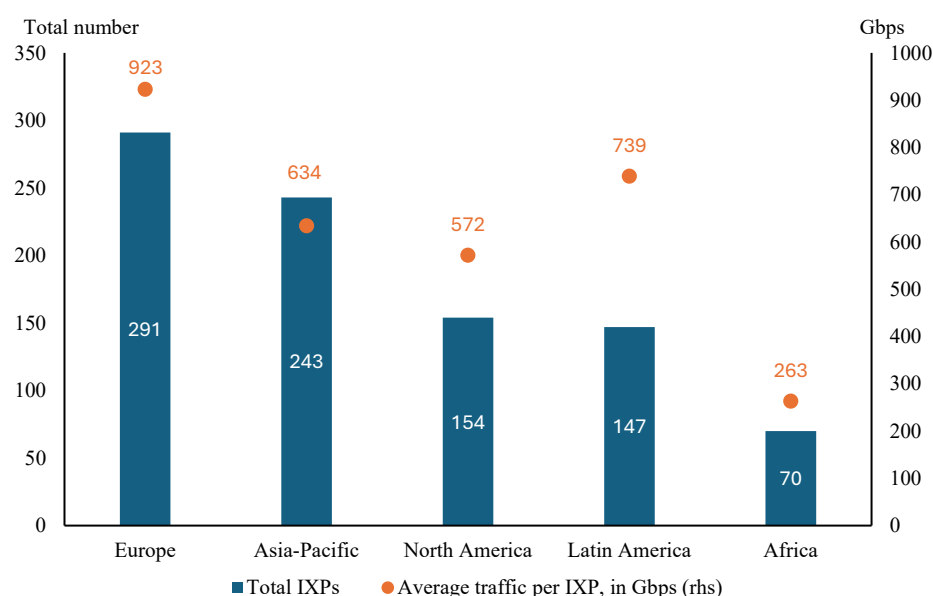
Source: UNCTAD calculations based on speedtest.net

Additional information on data transmission can be obtained by examining IXPs. These are physical locations where Internet service providers and other networks interconnect and exchange traffic, constituting a crucial component of middle-mile digital connectivity. In this sense, IXPs also illustrate an important aspect of interoperability at the infrastructure level, as they enable otherwise separate networks to connect and exchange data efficiently.

Figure 6 shows significant regional disparities in number of IXP and traffic. Europe stands out as the most mature and developed region, with many long-established IXPs handling high traffic

volumes. North America and Asia-Pacific also host major exchange points with substantial traffic and participation, including important hubs such as Frankfurt, Toronto and the Qianhai New-Type Internet Exchange (UNCTAD, 2025). By contrast, Africa remains significantly behind in both number of IXPs and traffic volumes, indicating more limited interconnection capacity across much of the region.⁶ The African Telecommunications Union (2025) attributes the relatively small number of IXPs across much of the African continent to inconsistent funding, a lack of trained network engineers, outdated technical infrastructure, an absence of broadband and peering policies and clear legal frameworks for IXPs.

Figure 6. Internet exchange point number and traffic, mid-2026



Source: UNCTAD calculations based on data from Packet Clearing House.

Notes: Gbps, gigabits per second; IXP, Internet exchange point.

Another important indicator of data transmission is the network of submarine cables. It is estimated that about 99 per cent of international data traffic is carried through submarine cables. Compared with other channels, such as satellites, submarine cables can transmit much larger volumes of data at considerably lower cost (UNCTAD, 2021).

ITU data show that, at the interregional level, the densest submarine cable connections are concentrated along the northern transatlantic and transpacific routes, linking the United States with

⁶ Data for Africa excludes South Africa because it has almost as many members (about 1,300) as all of the other Internet exchange points in the rest of Africa combined, which distorts the regional figure.

Europe and Asia, respectively (ITU, 2026).⁷ Within regions, the densest networks are found in Europe, East Asia and South Asia. By contrast, Africa and Latin America have lower densities of both intercontinental and intraregional connections, leaving some areas comparatively underserved. While in recent years large multinational technology companies have laid privately owned submarine cables across the coast of Africa, the connection of landlocked countries to submarine cables through coastal countries has been relatively slow and uneven (Simione and Li, 2021).

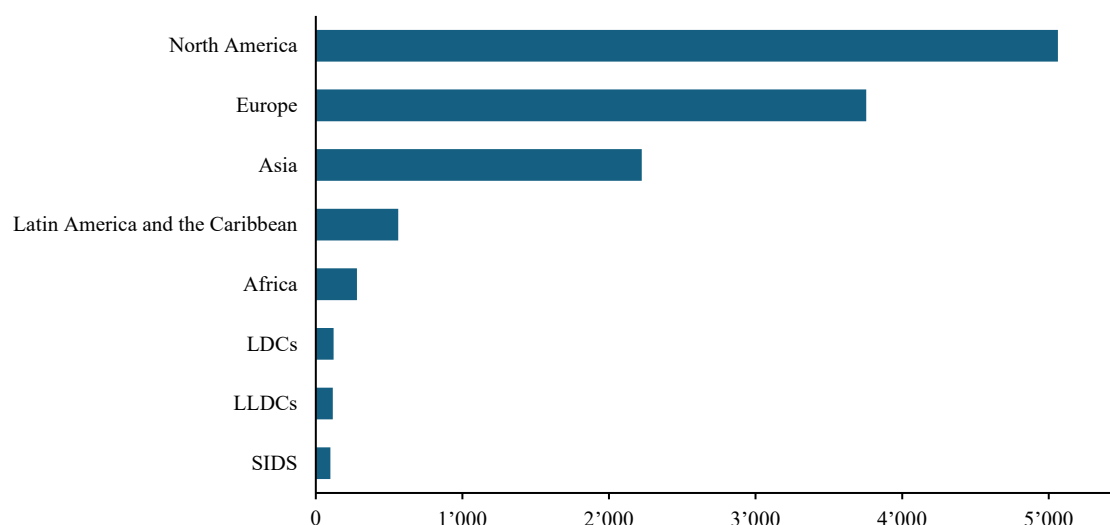
At the data storage stage, data are preserved in data centres, cloud infrastructure and other storage systems to remain available for future use. Storage contributes value by maintaining the reliability, accessibility and scalability of data over time. Effective storage requires not only physical or cloud infrastructure but also systems and rules for data management, security, documentation, metadata and access control. These capabilities determine whether data remain reliable, discoverable and usable over time.

Significant disparities are evident in the availability and geographical distribution of physical infrastructure. Data centres are highly concentrated in a small number of regions, shaping where data can be stored, processed and accessed efficiently.⁸ As shown in Figure 7, North America and Europe together account for about 72 per cent of the world's data centres, while Asia accounts for around 18 per cent, with a large share concentrated in China, Japan and the Republic of Korea. By contrast, the shares of Latin America and the Caribbean and Africa remain relatively small. The disparity is even more pronounced for LDCs, LLDCs and SIDS, each of which accounts for around 1 per cent or less of the global total.

⁷ The ITU Interactive Terrestrial Transmission Map provides information on national backbone connectivity, including optical fibre networks, microwave links and satellite Earth stations, as well as other key indicators of the ICT sector.

⁸ Contributions from the South Centre and ODET.

Figure 7. Number of data centers per region and country groups, mid-2026



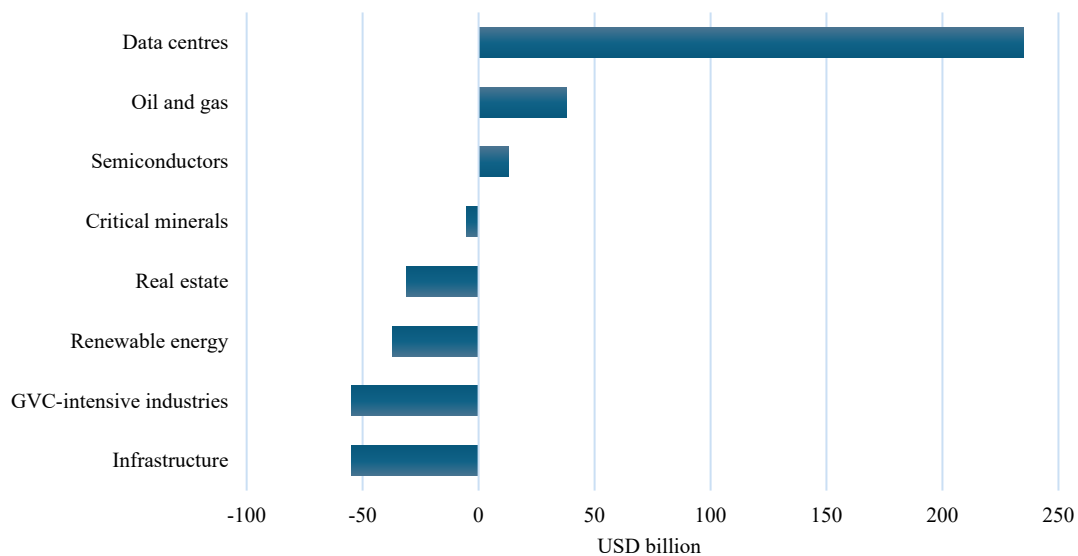
Source: UNCTAD calculations based on datacentermap.com

These differences are reinforced by the rapid pace of investment in data centres, which could further widen gaps in storage and processing capacity between countries. According to the World Investment Report 2026, announced greenfield investment in data centres exceeded \$270 billion in 2025, making the sector one of the largest recipients of new investment worldwide (UNCTAD, 2026a). Data centres were the main driver of the increase in greenfield project values in 2025, ahead of other capital-intensive sectors such as oil and gas and semiconductors, while investment in renewable energy, infrastructure and many manufacturing activities declined (Figure 8).

The environmental costs must also be taken into account, including land use, electricity and water consumption, greenhouse gas emissions and direct heat release. This is particularly important as many data centres are being built in areas already experiencing significant water stress.⁹ These environmental resource costs should be reflected in assessments of the economic and social value generated by data infrastructure, as their energy and resource demands can impose additional environmental burdens and create new forms of inequality.

⁹ Contributions from ITU.

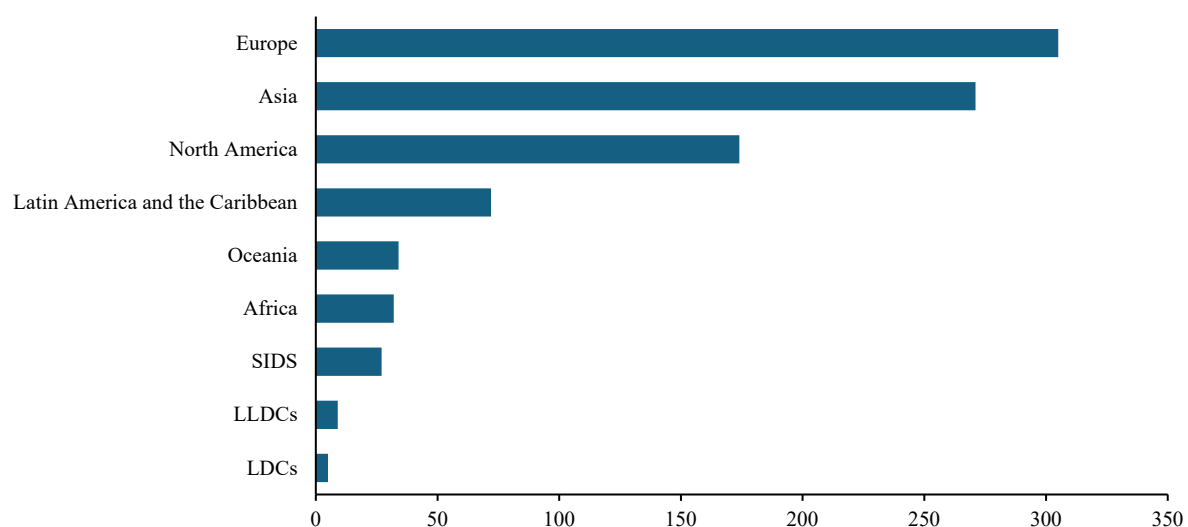
Figure 8. Investment change in 2025 compared to 2024



Source: UNCTAD, 2026a.

A similar concentration can be observed in cloud infrastructure services, which provide the computing and storage capacity required for data-intensive applications and AI. At the regional level, cloud infrastructure is unevenly distributed, with Europe and Asia hosting a large share of available facilities, while Africa, Latin America and several developing-country groups remain comparatively underserved (Figure 9).

Figure 9. Number of cloud data infrastructure per region and country groups, mid-2026



Source: UNCTAD calculations based on datacentermap.com

At the same time, the provision of cloud services is even more concentrated at the firm level. As shown in Table 1, the largest providers are overwhelmingly headquartered in the United States and China. United States-based providers account for around two-thirds of the records in the dataset, while Chinese providers account for the remaining one-third.

Table 1. Number of cloud data infrastructure by providers, mid-2026

Cloud service provider	Number of records	Share of total
Google Cloud	181	21%
Amazon Web Services	144	17%
Alibaba Cloud	107	13%
Microsoft Azure	107	13%
Tencent Cloud	93	11%
Huawei Cloud	78	9%
IBM Cloud	70	8%
Oracle Cloud	58	6%
OVHcloud	13	2%
Total	851	100%

Source: UNCTAD calculations based on www.cloudinfrastructuremap.com.

The table indicates that, even where cloud infrastructure is geographically available across different regions, ownership and control of the underlying services remain highly concentrated in a small number of firms and economies. Brazil provides an illustration of this dependence on external providers for critical digital infrastructure. Between 2014 and 2025, its public sector contracted at least R\$23 billion in ICT services, with a substantial share of major contracts concentrated among four companies.¹⁰ Such dependence may limit the extent to which value generated from cloud services is retained domestically, as revenues, technological capabilities and strategic control over infrastructure may remain concentrated in external providers.

Beyond physical infrastructure, effective data transmission, including cross-border data flows, also depends on interoperability. This requires data systems across jurisdictions, sectors and institutions to be able to exchange and use data despite differences in technical standards, legal frameworks and governance arrangements. Interoperability can help facilitate trusted data flows and responsible access and use, which are important to increase the economic and developmental value of data. These issues are discussed in greater detail in Chapter IV.

¹⁰ Contributions from the Government of Brazil.

C. Gaps in data processing and analytical capacity

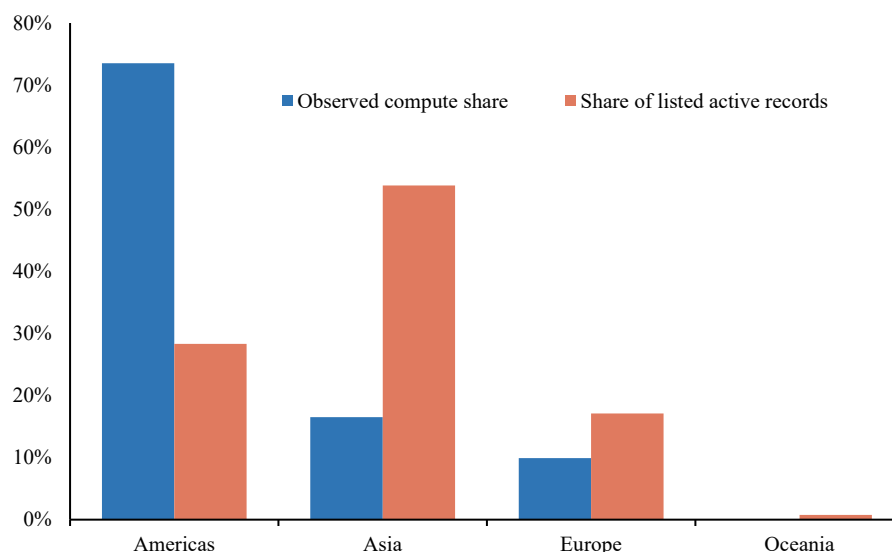
At the data processing and analysis stage, raw data are cleaned, integrated and analyzed using statistical tools, algorithms and AI to generate insights and support decision-making. Processing can generate substantial value by transforming raw data into information, insights, models and other data products. This stage often requires significant complementary capabilities, including computing infrastructure, specialized skills, algorithms and domain knowledge.

As shown earlier, investment in the semiconductor sector has increased because of the growing demand for advanced computing hardware. While such investment extends beyond processors, access to suitable hardware remains an important component of countries' capacity to process and analyze increasingly complex and data-intensive workloads.

One indicator of higher-end computing capacity is access to Graphics Processing Units (GPUs), which are specialized chips designed to perform many calculations in parallel and are widely used for AI and other compute-intensive applications (Scale Computing, 2025). Large-scale GPU capacity is assessed here using Epoch AI's GPU Clusters dataset, expressed in 16-bit exaFLOPS to allow comparison across countries and regions (Epoch AI, 2026).¹¹ The regional distribution in Figure 10 highlights where documented large-scale GPU infrastructure and higher-end computing capacity are currently concentrated. Comparing each region's share of listed GPU clusters with its share of estimated compute distinguishes the presence of infrastructure from its aggregate processing power. Together, these measures may indicate stronger capacity to undertake compute-intensive activities such as AI development and large-scale data processing.

¹¹ Epoch AI's GPU Clusters dataset in 16-bit exaFLOPS measures and compares the real-world computing capacity used for modern AI workloads. One exaFLOP is equivalent to floating-point operations per second. The figures are presented in exaFLOPS to facilitate comparison across clusters and countries; the conversion does not affect their relative size or ranking.

Figure 10. Observed compute share versus share of observed GPU clusters, by region, mid-2026



Source: EpochAI, 2026.

The Americas, largely driven by the United States and Canada, account for only 28 per cent of listed GPU clusters but nearly 74 per cent of observed compute capacity. In contrast, Asia hosts 54 per cent of the clusters but accounts for only around 16 per cent of compute capacity, while Europe represents 17 per cent of clusters and 10 per cent of compute. Oceania accounts for less than 1 per cent on both measures. This suggests that disparities in processing capacity reflect not only where GPU infrastructure is located, but also substantial differences in the scale of available compute, which may affect regions' ability to undertake more computing-intensive and higher-value data-processing activities.

The absence of recorded clusters in Africa should, however, be interpreted cautiously. Epoch AI applies a relatively high inclusion threshold and relies largely on publicly available information, meaning that smaller, private or less visible facilities may not be captured. Compute shares are likewise estimates based on the performance of the included clusters and should not be interpreted as exhaustive regional totals. GPU capacity represents only one indicator of broader computing capability, as CPUs and other forms of general-purpose computing remain important for many data-processing tasks.¹²

¹² GPUs and CPUs serve different functions. GPUs are particularly suited to parallel processing and compute-intensive workloads, while CPUs remain important for general-purpose computing, system coordination and deployment. More information is available at <https://www.home.saxo/en-ch/content/articles/equities/from-gpu-to-cpu-how-ai-boom-is-reviving-old-tech-12052026>.

Despite these limitations, significant disparities in advanced computing capacity are evident at the country level. ECLAC, for example, reports that Brazil accounts for more than 90 per cent of high-performance computing capacity in Latin America and the Caribbean, while more than half of the countries in the region lack advanced GPU clusters or high-performance computing facilities.¹³ Expanding such capacity can involve significant capital costs, hardware supply constraints and energy requirements. India provides an example of efforts to address these challenges through public investment. Under the IndiaAI Mission, the country is expanding national computing capacity and has provisioned more than 58,000 subsidized GPUs.¹⁴

Beyond infrastructure, effective data processing and analysis also depend on the availability of specialized skills. Countries require data scientists, statisticians, engineers and other professionals capable of transforming collected data into information, knowledge and valuable products. Such capabilities are increasingly important as the growing use of digital technologies and AI creates demand for new skills, while limited technical expertise and institutional capacity continue to constrain effective data governance.¹⁵

Yet, shortages of specialized personnel remain a constraint in many countries, highlighting challenges related to limited specialized expertise, data literacy and the retention of skilled personnel.¹⁶ To illustrate differences in this capacity, the skills dimension of UNCTAD's Frontier Technology Readiness Index (FTRI) provides a proxy for the broader human-capital base supporting data processing.¹⁷

As shown in Figure 11, there are substantial regional disparities, with Africa recording the lowest average score and Europe the highest. These differences point to uneven capacities across regions to develop and apply the skills needed for data processing and analysis. Such gaps can constrain countries' ability to move beyond data generation towards more advanced uses of data that contribute to productivity, innovation and value creation.

¹³ Contributions from ECLAC.

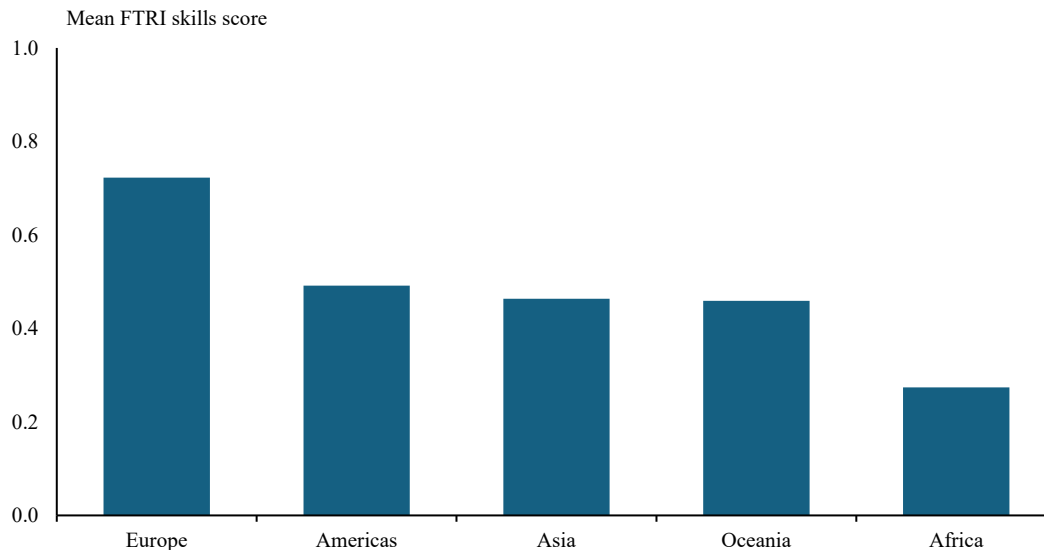
¹⁴ Contributions from the Government of India.

¹⁵ Contributions from UNESCO.

¹⁶ Contributions from the Governments of Brazil, Burkina Faso, Peru, Poland and Portugal.

¹⁷ The skill dimension combines expected years of schooling with the share of high-skill employment and could be interpreted as a proxy for the educational and occupational foundations of data processing.

Figure 11. FTRI Skills by region, 2024



Source: UNCTAD, 2025.

D. Unequal capacity to use and value capture

At the final stage of the data value chain, processed data and the insights derived from them are used to support innovation, public services and decision-making, generating economic and social value. Reuse can extend value creation beyond the original purpose for which data were generated by applying data, derived information or models to new products, services, research and other applications. The use and reuse of data can generate direct economic value, including new business models and productivity gains, as well as broader social value through improved public services, research and evidence-based policymaking.

While data are continuously generated worldwide, not all countries are able to participate in the final segments of the data value chain and capture the resulting economic and social value. Consequently, the benefits generated from data are not distributed proportionately to where data are produced. This has created an increasing geographical separation between data generation and value capture, with a significant share of the benefits accruing to a limited number of digital platform companies, mainly in advanced economies.

For instance, the concentration of digital value creation is reflected in global capital markets. As shown in Table 2, as of end of September 2026, eight of the world's ten most valuable listed companies are headquartered in the United States. Together, these firms accounted for approximately \$26 trillion in market capitalization, representing more than 80 per cent of the total market value of the world's ten largest corporations listed.

Table 2. Technology firms dominate global market value rankings, end of September 2026

Rank	Company	Location	Industry	Market capitalization (USD trillion)
1	NVIDIA	United States	Information Technology	5.6
2	Apple	United States	Information Technology	4.8
3	Alphabet (Google)	United States	Communication Services	4.1
4	Microsoft	United States	Information Technology	3.8
5	Amazon	United States	Consumer Discretionary	2.7
6	TSMC	Taiwan Province of China	Information Technology	2.4
7	SpaceX	United States	Communication Services	1.9
8	Meta Platforms	United States	Communication Services	1.8
9	Broadcom	United States	Information Technology	1.6
10	Saudi Aramco	Saudi Arabia	Energy	1.6

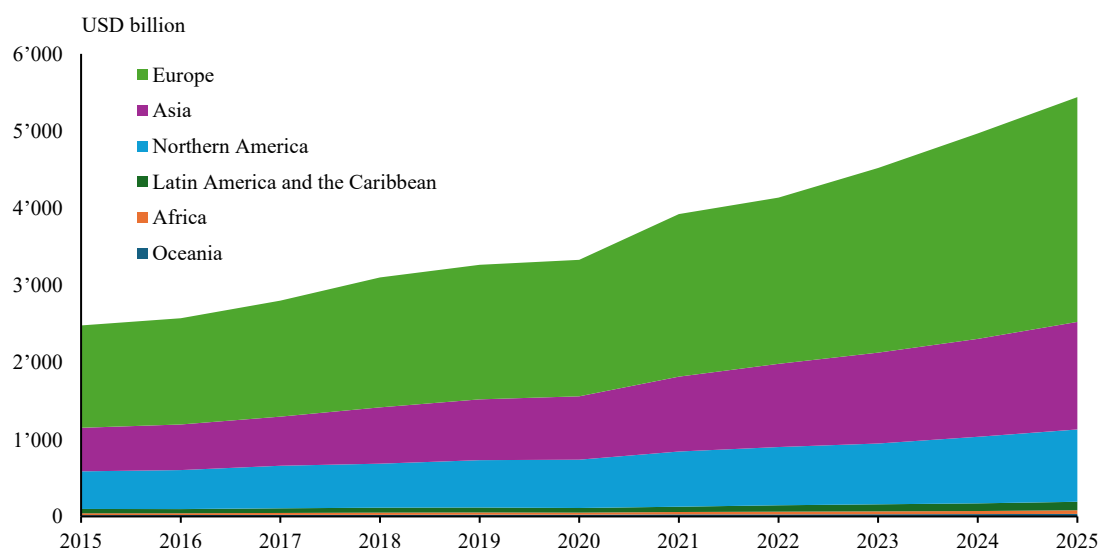
Source: CompaniesMarketCap.com

Data and digital capabilities can generate economic value not only in services but also in manufacturing. This is reflected in the growing servicification of manufacturing, whereby services and digital technologies become increasingly embedded in production processes (UNCTAD, 2026b). Data and AI are used in areas such as predictive maintenance, process optimization, quality control and supply-chain management, while ICT, finance, logistics and business services increasingly contribute to value creation within manufacturing value chains.

Trade in digitally deliverable services provides one measurable indication of countries' ability to translate digital capabilities into economic value. These include activities such as ICT, financial and other business services and represent an important channel through which digital capabilities can be commercialized and exchanged across borders (IMF, OECD, UNCTAD, WTO, 2023).

Statistics from UNCTADStat, as shown in Figure 12, indicate that exports of digitally deliverable services increased substantially across all regions between 2015 and 2025, but their distribution remained highly uneven. In 2025, Europe remained the largest exporter, accounting for around half of the total, followed by Asia at about 25 per cent and North America at around 17 per cent. By contrast, Africa, Latin America and the Caribbean, and Oceania together accounted for less than 4 per cent, a relatively small share given the size of the population represented by these regions.

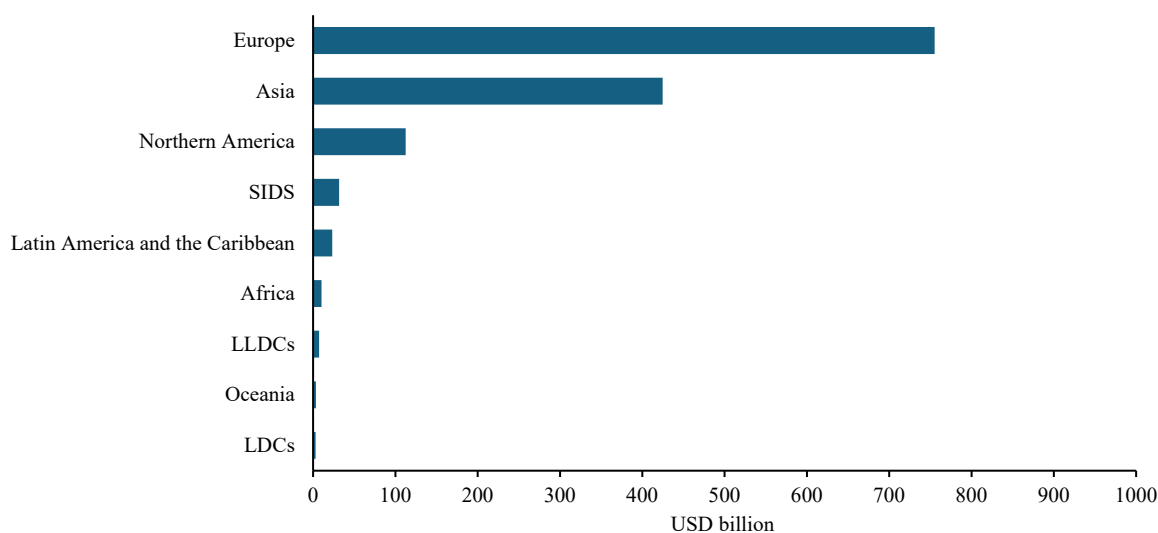
Figure 12. Exports of digitally deliverable services, 2015-2025



Source: UNCTADstat, 2026.

A similar pattern is observed in ICT services trade, which includes telecommunications and computer services and represents a key component of digitally enabled economic activity. Global exports of ICT services reached US\$1.3 trillion in 2025. However, Africa, Latin America and the Caribbean together accounted for only 2.5 per cent of global exports, equivalent to just around US\$23 billion. Most exports originated from European economies (56 per cent), followed by Asia (32 per cent), while Northern America accounted for 8 per cent.

Figure 13. ICT services exports by region, 2025



Source: UNCTADstat, 2026.

E. Differing governance capacities across the data value chains

Beyond the structural asymmetries in the global data value chain discussed above, countries also differ considerably in their capacity to govern data effectively. Data governance shapes the conditions under which data are generated, collected, accessed, shared, transmitted, processed and used, while helping promote more equitable access to the benefits generated from data and foster trust in the responsible use of data (World Bank, 2021).

Data governance depends not only on an enabling regulatory framework, but also on institutional capacities, coordination mechanisms and effective implementation. Such capacities are essential for supporting the responsible use of data while protecting privacy, security and other legitimate public interests.¹⁸

Countries repeatedly highlight the importance of institutional capacity and implementation. Germany, for example, notes that digital transformation often outpaces the institutional capacity of responsible authorities, while effective data governance relies on capable institutions and skilled people.¹⁹ Brazil similarly emphasizes that a sound legal framework needs to be complemented by effective enforcement and strong institutional coordination to prevent fragmentation.²⁰ These challenges can be particularly significant where countries face broader constraints in infrastructure, technology, skills and financial resources.

Governance capacity also affects countries' ability to enable trusted data flows within and across borders. Differences in privacy and data-protection rules, security requirements, transfer mechanisms and technical standards can create uncertainty and increase compliance costs, making data exchange more difficult.²¹ The United Kingdom, for example, identifies regulatory divergence as a source of complexity for organizations operating internationally, particularly smaller firms, while emphasizing the role of legal frameworks, regulatory oversight and international cooperation in maintaining trust in cross-border transfers.²² India highlights the challenge of reconciling trusted cross-border data flows with privacy, security and domestic regulatory oversight.²³ Effective governance therefore needs to support data exchange and interoperability without requiring jurisdictions to adopt identical legal or institutional arrangements.

National and regional data governance strategies can help address these challenges by aligning regulatory measures, institutional responsibilities and implementation priorities. They can

¹⁸ Contributions from the Governments of Brazil, Chile, China and Germany.

¹⁹ Contributions from the Government of Germany.

²⁰ Contributions from the Government of Brazil.

²¹ Contributions from FAO, UNESCO and UNIDO.

²² Contributions from the Government of the United Kingdom.

²³ Contributions from the Government of India.

establish common objectives for data quality, access, sharing, interoperability, protection and responsible use, while improving coherence with broader digital transformation and AI strategies.²⁴ Such strategies can also provide a basis for strengthening coordination across government and for adapting governance arrangements as data-related technologies and uses evolve.

A data governance assessment can provide the starting point for such a strategy. For developing countries, it can help identify constraints across the data value chain, assess institutional and technical capacities, and help countries set priorities suited to their circumstances. The findings can then inform a sequenced roadmap that assigns responsibilities, identifies financing needs for infrastructure and skills, and brings related policies into a coherent framework. Figure 14 illustrates this progression from diagnosis to strategy, implementation and more equitable value creation, with monitoring and learning informing subsequent adjustments.

Figure 14. Theory of change for a data governance assessment



Source: UNCTAD.

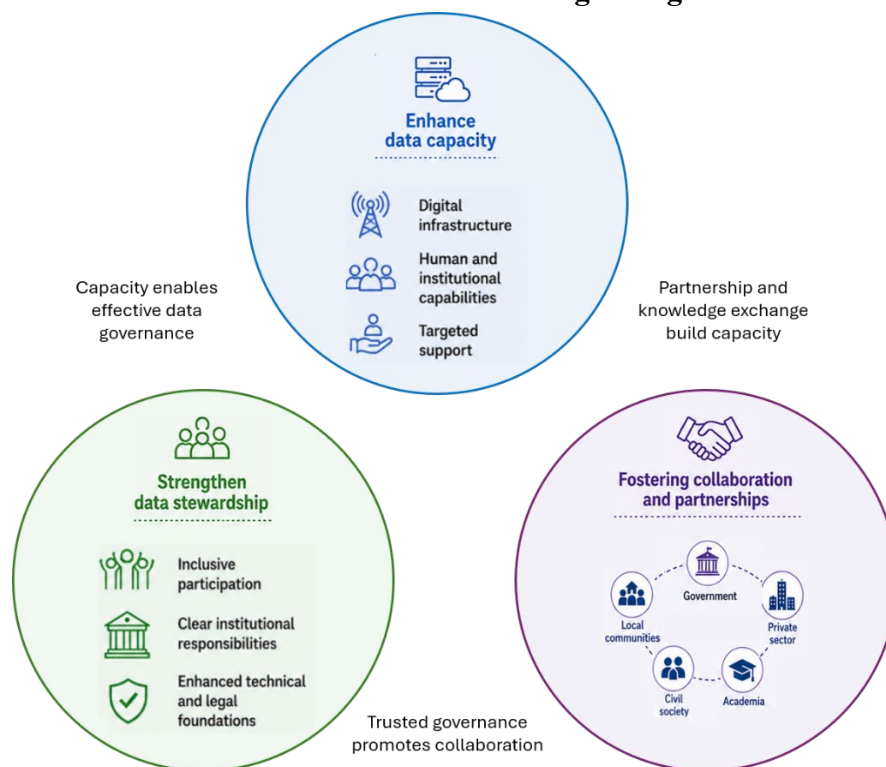
While data governance by itself cannot overcome underlying gaps in infrastructure, computing capacity or skills, stronger regulatory and institutional capacity can enable countries to make more effective and responsible use of available data resources. Governance capacity is therefore not a separate stage of the data value chain, but an overarching condition that influences countries' ability to participate effectively across all its stages. The following chapter examines in greater detail how different data governance approaches and policy responses can help strengthen these capacities.

²⁴ For instance, see national digital transformation strategy by ITU at <https://digitalregulation.org/national-digital-transformation-strategy-mapping-the-digital-journey/>.

III. National approaches to data governance for development

This chapter examines how national policies address the structural asymmetries identified in Chapter II. It is organized around three interrelated efforts to advance data governance for development. First, countries could enhance their capacity to generate, manage and use data by investing in digital infrastructure, human and institutional capabilities, as well as targeted support programmes that enable different actors to create social and economic value from data. Second, they could strengthen data stewardship by ensuring that data are managed responsibly throughout the data lifecycle, with inclusive participation, clear institutional responsibilities and enhanced technical and legal foundations to improve accountability, interoperability and public trust. Third, they could foster collaboration and partnerships among government, the private sector, academia, civil society and local communities to overcome data silos, facilitate trusted data sharing and promote more equitable participation in data-driven innovation and value creation (Figure 15).

Figure 15: Three interrelated dimensions for advancing data governance for development



Source: UNCTAD.

A. Enhancing capacity to capture the social and economic value of data

As discussed in Chapter II, inadequate digital infrastructure, skills shortages and weak institutional capacity are key challenges for developing countries. These constraints limit countries' ability not only to generate and use data effectively, but also to translate data into improved public services, innovation and broader social and economic development. Addressing these challenges demands

coherent governance frameworks that combine investments in digital infrastructure with the development of human and institutional capabilities.²⁵ The following countries' experiences demonstrate complementary approaches from which policymakers in developing countries can draw lessons depending on their institutional capacities, development priorities and resource constraints.

India's experience shows how digital public infrastructure (DPI) can address multiple development constraints simultaneously through a modular, integrated architecture rather than isolated digital projects. It has developed a set of interoperable platforms, collectively known as India Stack²⁶, including Aadhaar, Unified Payment Interface and DigiLocker, to provide common digital infrastructure for identity verification, digital payments and document management. It has further expanded the infrastructure to specific sectors such as AgriStack for agriculture and the Ayushman Bharat Digital Mission for digital health.²⁷ A key feature of India's approach is to establish a shared digital foundation through open standards, application programming interfaces (APIs) and interoperability mechanisms to enable government agencies, businesses and other stakeholders to develop and access interoperable digital services.²⁸

India's experience illustrates that investments in DPI can generate economy-wide spillovers when supported by open standards, sustainable governance arrangements and incentives for both public and private innovation. However, this approach requires substantial institutional coordination, long-term political commitment and significant upfront investment, making it more suitable for countries with sufficient implementation capacity and resources.

While India demonstrates the benefits of building foundational digital infrastructure, Estonia illustrates how countries can maximize the value of existing data systems through interoperability. Its digital ecosystem is centred on the X-Road interoperability platform, which enables government institutions to exchange data securely while allowing each institution to retain responsibility for the quality, security and lawful use of the data it manages (e-Estonia, 2024). Rather than establishing a centralized database, X-Road functions as a trusted interoperability layer connecting existing information systems. Combined with Estonia's "only-once" principle, whereby citizens and businesses provide information to government only once, the system reduces duplication and improves service delivery (European Commission, 2019). Businesses can also build services that rely on trusted data exchange, extending the benefits beyond the public sector.

²⁵ Contributions from the South Centre and ODET.

²⁶ More information is available at <https://indiastack.org>.

²⁷ Contributions from the Government of India.

²⁸ To address concerns around data protection and privacy, the central database collects only minimal demographic and biometric data and kept for only six months. The organization that manages Aadhaar also introduced 'virtual IDs' to help mask Aadhaar numbers from commercial or government service providers. More information is available at <https://www.tandfonline.com/doi/full/10.1080/13569775.2020.1751377>

Similar to Estonia's interoperability platform, Latvia has established the Data Governance and Dissemination Platform, a one-stop platform that connects data from multiple trusted public-sector sources, enabling users to access cross-institutional datasets through a unified interface. The platform received the European Public Sector Award 2025–2026, highlighting the practical value of a user-centred and interoperable public sector data infrastructure.²⁹ Meanwhile, Saudi Arabia has developed the National Data Bank as a common platform to democratize access to data and help ensure that smaller or less-resourced agencies are not left behind. The platform has integrated more than 580 data sharing services across over 500 government systems.³⁰ Burkina Faso is also developing a network of integrated citizen service centres, known as Zama Tchény, which combine postal, financial and assisted access to digital public services.³¹

These experiences show that interoperable digital infrastructure can generate significant benefits. Interoperability layers or unified access portals can connect existing systems while allowing agencies to retain responsibility for the data they manage, thereby balancing data sharing with institutional accountability. By reducing duplication, facilitating cross-institutional data access and providing a common interface for users, such platforms can improve government efficiency.

At the same time, effective implementation requires measures to support the uptake and use of digital services, particularly among less-resourced and less-skilled actors. In this regard, Chile has developed the ChileAtiende public service platform and promoted government services through multiple channels, including online portals, physical service and telephone services. By combining digital service delivery with digital skills support and assisted access, it helps ensure equitable access to public services for citizens.³² The Philippines has integrated government services into a single citizen-centred platform, the E-Gov PH Super App, while continuously improving access to STEM education and strengthening the digital capabilities of the workforce.³³ These experiences highlight the importance of capacity-building and public outreach in translating digital platforms into accessible digital services.

Successful digital transformation also depends on sustained implementation and user adoption. Through initiatives such as Irembo, Rwanda has developed an integrated platform that enables citizens to access government services online while improving administrative efficiency (Government of Rwanda, 2026). These services are supported by investments in digital identity, connectivity, digital payments and interoperable systems that facilitate secure data exchange across institutions.

²⁹ Contributions from the Government of Latvia.

³⁰ Contributions from the Government of Saudi Arabia.

³¹ Contributions from the Government of Burkina Faso.

³² Contributions from the Government of Chile.

³³ Contributions from the Government of the Philippines.

A notable feature of Rwanda's strategy is its phased implementation model. The platform was initially developed through public-private partnerships and external technical expertise before gradually transitioning to domestic management as national capabilities expanded (Dolan et al., 2024). At the same time, the government invested heavily in user adoption through public awareness campaigns, training programmes and a nationwide network of more than 7,000 agents providing assisted access to digital services. This approach helps address barriers arising from limited digital literacy and connectivity while ensuring that digital infrastructure translates into actual service use. Building on these foundations, Rwanda has further applied its digital infrastructure in specific sectors, including digital health, where integrated data systems support disease surveillance, improve healthcare delivery and strengthen evidence-based decision-making.

The Gambia demonstrates that strengthening data-driven development requires policies that enable broad participation in the digital economy. Recognizing that women, youth, micro-, small and medium-sized enterprises (MSMEs) and rural communities often face greater barriers to benefiting from digital transformation, the country has combined enabling policy frameworks with targeted support programmes (United Nations Economic Commission for Africa, 2023). While the National Digital Economy Master Plan 2024–2034 and ICT for Development Policy provide strategic direction for improving connectivity, digital skills and access to digital services (Digital Cooperation Organization, 2025), they are complemented by practical implementation mechanisms, including an e-market platform called Gamlumo (GiEPA, 2024), which helps local businesses access wider markets, as well as targeted programmes such as the SheTrades Gambia Hub and youth entrepreneurship initiatives³⁴ that provide training, mentoring and market access to underrepresented groups. Its experience highlights that complementary investments in skills, entrepreneurship support and market access are necessary to ensure that smaller firms and disadvantaged groups can generate economic value from digital technologies.

Uruguay complements The Gambia's focus on inclusion by demonstrating how long-term investments in human capital can strengthen countries' capacity to participate in a data-driven economy. Recognizing that meaningful digital inclusion depends not only on access to digital technologies but also in the ability to use them effectively, Uruguay has adopted a life-course approach to digital skills development, emphasizing on universal capability-building across different age groups.

Initiatives such as Plan Ceibal provide students and teachers with digital devices and learning resources while integrating digital literacy into education (Uruguay Ministry of Social Development, 2021), whereas the Ibirapitá Program extends similar support to older persons with

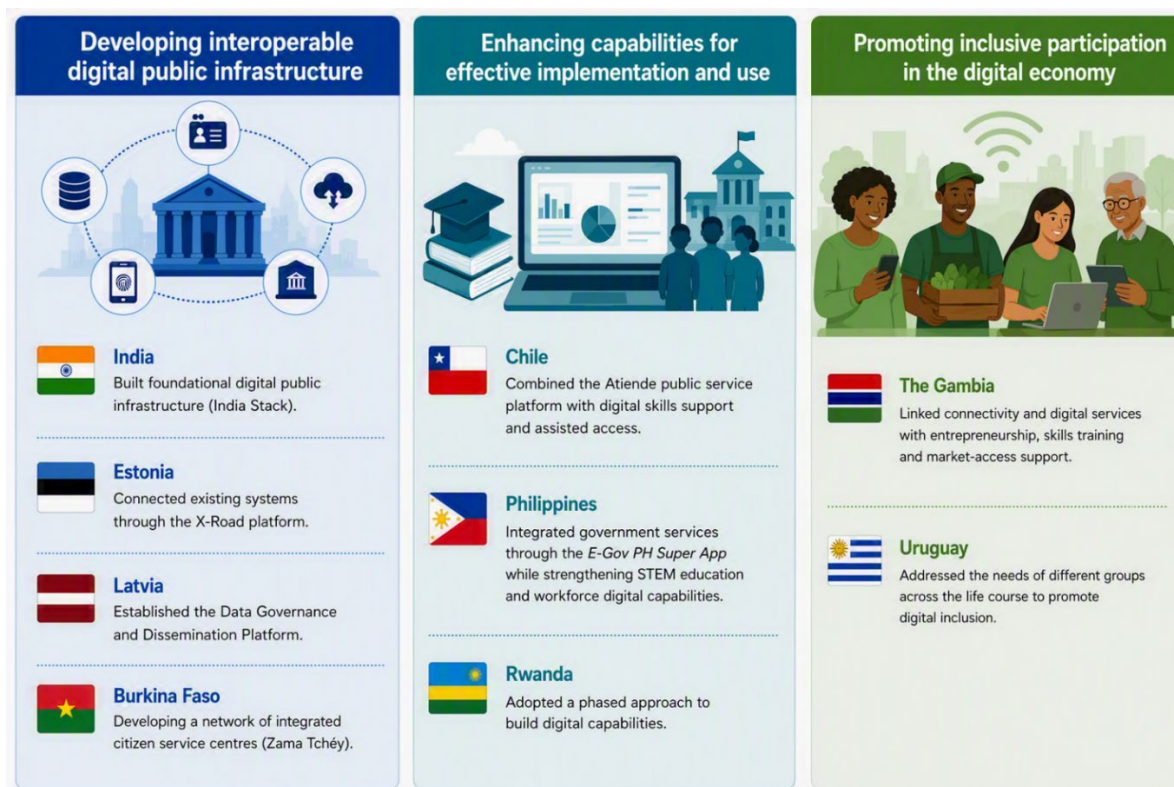
³⁴ The SheTrades Gambia Hub, implemented in partnership with the International Trade Centre, supports women-owned businesses through training, mentoring, market access and networking opportunities. The Youth Empowerment Project provides entrepreneurship training, vocational and digital skills development, and access to finance for young entrepreneurs, particularly in rural areas.

digital devices, training and ongoing assistance (Uruguay Ministry of Social Development, 2026). These efforts are reinforced by comprehensive digital governance measures, including digital identity, accessibility standards and personal data protection, to enable citizens to securely access and engage with digital public services.

Drawing from the examples above (see a summary in Figure 16), countries can strengthen their capacity to capture the social and economic value of data by:

- **Developing interoperable digital public infrastructure:** Governments can invest in shared digital infrastructure such as digital identity, data exchange platforms, digital payments and integrated government service portals. The experiences of Burkina Faso, Estonia, India, Latvia and Saudi Arabia show different ways of building on either foundational infrastructure or existing systems through interoperability and shared access mechanisms. Open standards, interoperability and clear institutional responsibilities are essential to ensure that such infrastructure can scale, support innovation and generate economy-wide benefits.
- **Enhancing capabilities for effective implementation and use:** Digital infrastructure delivers developmental value only when governments and users have the skills and institutional capacity to make effective use of it. The experiences of Chile, the Philippines, Rwanda and Uruguay highlight the importance of sustained investments in digital education, workforce development and user adoption. Rwanda's phased approach further demonstrates how partnerships and external expertise can help build domestic capacity over time. Investments in both human and institutional capabilities are critical for translating digital infrastructure into effective services, evidence-based policymaking and sustained data-driven development.
- **Promoting inclusive participation in the digital economy:** It is important to combine broad-based access with targeted support measures to enable groups and businesses that face greater barriers to participate in and benefit from the digital economy. The Gambia's experience highlights the importance of linking connectivity and digital services with entrepreneurship, skills and market-access support, while Uruguay demonstrates the value of addressing the needs of different groups across the life course. An inclusive approach can help ensure that the economic and social benefits generated by data and digital technologies are more widely shared.

Figure 16: Key measures for enhancing capacity to capture the social and economic value of data



Source: UNCTAD.

B. Strengthening data stewardship to address inequalities in data lifecycle

Another key challenge faced by developing countries is inequality across the data lifecycle, including how data are collected, accessed, shared, used and managed. In many countries, weak institutional coordination and unequal participation undermine trust, quality and interoperability. Addressing these challenges requires governance approaches that establish clear institutional responsibilities, strengthen regulation under existing laws to safeguard rights, enhance accountability and ensure that data are managed and protected responsibly throughout their lifecycle.³⁵ The following country experiences demonstrate how data stewardship can address these inequalities while strengthening responsible data management.

New Zealand shows that data stewardship can strengthen trust and legitimacy by considering affected communities within data governance arrangements. Led by the Government Chief Data

³⁵ Contributions from ESCAP, ESCWA, ITU, UNEP, UNESCO, UNCTAD, UNIDO and WHO. The Broadband Commission for Sustainable Development published a toolkit “Navigating Data in the Digital Age” as a capacity-building resource to help policymakers, regulators and data practitioners navigate the complexities of data governance in the digital era. UNESCO also advocates rights-based and participatory governance. Embedding human rights standards, community participation and transparency requirements in data policies can help strengthen public trust.

Steward, the country has established a comprehensive Data Stewardship Framework that provides a common approach for managing government-held data as a strategic public asset (New Zealand Government, 2020). Through the co-development of Māori data governance frameworks under guidance from government agencies in partnership with Māori representatives, data stewardship is built on principles that recognize Māori rights, interests and aspirations throughout the data lifecycle. Complemented by the CARE Principles (i.e., collective benefit, authority to control, responsibility and ethics) for Indigenous Data Governance (Carroll et al., 2020; Research Data Alliance International Indigenous Data Sovereignty Interest Group, 2019) and the work of organizations such as Te Mana Raraunga³⁶, these arrangements encourage shared decision-making over the collection, access, use and sharing of data relating to Māori communities, ensuring that data governance reflects Indigenous values, supports community priorities and promotes accountability (Walter et al., 2020).

New Zealand's approach illustrates how participatory governance can strengthen trust, improve data stewardship and promote more equitable outcomes. While the specific arrangements reflect New Zealand's Indigenous context, the broader principle of involving affected communities in data stewardship can be adapted to strengthen participation by Indigenous peoples, local communities and other underrepresented groups in different national contexts.

Mexico demonstrates how data stewardship can be strengthened through institutional coordination without centralizing ownership of data. The National Institute of Statistics and Geography (INEGI) (INEGI, 2026) serves as both the producer of official statistics and the coordinator of the national statistical and geographic information systems. Rather than assuming direct control over government data, INEGI establishes common governance principles, quality standards and interoperability requirements while individual agencies remain responsible for managing their own datasets. This model enables decentralized data management while promoting consistency, confidentiality, transparency and responsible data use across public institutions. Mexico is further expanding this approach by developing governance arrangements that facilitate the responsible use of privately held data, extending stewardship beyond traditional government datasets.

Finland exemplifies data stewardship through their coordinated institutional framework that promotes the responsible management, sharing and reuse of public-sector data. Through the Information Management Act (2020) and the Information Management Board, Finland has introduced common standards and guidance for data governance, interoperability, information security and data management across public institutions (Finland Ministry of Finance, 2026). The framework assigns stewardship responsibilities to individual organizations while providing government-wide guidance, monitoring implementation and promoting the adoption of common governance practices. This approach is complemented by institutions such as Findata (2026), the

³⁶ More information is available at <https://www.temanararaunga.maori.nz/>.

national data permit authority for the secondary use of health and social data, which acts as a trusted intermediary by coordinating data access, issuing permits and ensuring that data are securely processed before reuse. Finland extends stewardship by creating dedicated intermediary institutions that facilitate responsible data sharing in sensitive sectors. This approach illustrates how trusted intermediaries can reduce administrative burdens, strengthen privacy protections and improve confidence in data sharing arrangements.

South Africa demonstrates how institutional and legal frameworks can support the responsible management and use of public-sector data. Through the Protection of Personal Information Act (South African Parliament, 2013) and the establishment of the Information Regulator (Information Regulator South Africa, 2026), South Africa has strengthened accountability for the collection, use and sharing of personal data while promoting public trust. Complementing these measures, the National Data and Cloud Policy recognizes data as a strategic national asset and promotes coordinated governance, interoperability and responsible data sharing across the public sector. Statistics South Africa (2008, 2010) further supports this approach by developing common statistical standards and coordinating the National Statistics System to improve data quality and consistency. Together, these arrangements highlight the institutional and legal foundations necessary to support trusted data governance.

Several countries have taken similar measures: Iran has adopted a National Data and Information Management Act to provide the legal foundation for data management and access to information.³⁷ Poland adopted national legislation to complement and operationalize the EU Data Governance Act within its domestic legal framework, helping build trust in voluntary data exchange for businesses and citizens.³⁸ Similarly, Portugal has reviewed its implementing legislation for the EU Data Governance Act to ensure a coherent and harmonized regulatory framework for data.³⁹ The UK's Data Use and Access Act provides the overarching framework for building a modern data economy by improving access to and sharing of data, strengthening public trust, enhancing data skills and promoting interoperability across sectors.⁴⁰ These experiences illustrate that effective stewardship requires enforceable legal safeguards to ensure responsible data management and sustain public confidence.

Apart from institutional arrangements for governing data access and reuse, effective stewardship also requires maintaining the quality and integrity of data throughout its lifecycle. The Netherlands addresses this by embedding dedicated data stewardship across public research and data institutions to oversee the quality, documentation and management of data and guided by the FAIR principles (i.e., findable, accessible, interoperable and reusable) (Wilkinson et al., 2016). Rather

³⁷ Contributions from the Government of Iran.

³⁸ Contributions from the Government of Poland.

³⁹ Contributions from the Government of Portugal.

⁴⁰ Contributions from the Government of the United Kingdom.

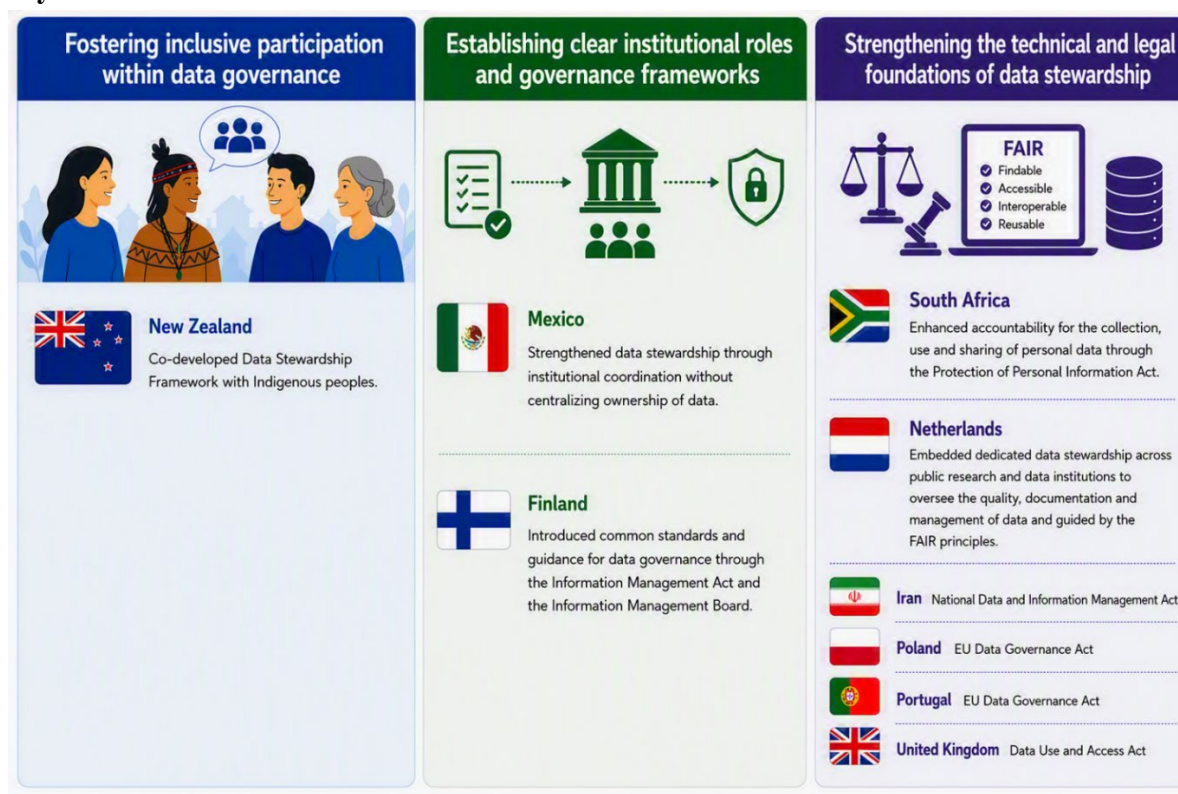
than limiting stewardship to enabling access, these dedicated professionals support data quality assurance, documentation, metadata management and long-term preservation, ensuring that datasets remain usable beyond their original purpose. Although establishing dedicated stewardship functions requires technical expertise and sustained investment, countries can gradually integrate stewardship responsibilities into existing institutions as capacity develops.

Building on these experiences (see a summary in Figure 17), to strengthen data stewardship across the data lifecycle, governments could consider:

- **Fostering inclusive participation within data governance:** Governments can strengthen trust and legitimacy by involving Indigenous peoples, local communities and other affected stakeholders in decisions over the collection, access, sharing and use of data. New Zealand demonstrates how participatory stewardship can recognize community rights and priorities. Inclusive governance improves accountability and helps ensure that stewardship reflects diverse societal interests.
- **Establishing clear institutional roles and governance frameworks:** Effective stewardship does not require centralizing ownership or control of data. Mexico and Finland show how governments can combine decentralized data management with common governance standards, interoperability requirements and coordinated oversight. Clear responsibilities for data quality, security, access and reuse, supported where appropriate by trusted intermediary institutions, can reduce fragmentation and enable more consistent and responsible data sharing across institutions.
- **Strengthening the technical and legal foundations of data stewardship:** Responsible stewardship requires both technical capacity to maintain data quality and integrity and enforceable safeguards to protect rights and accountability. While South Africa illustrates the importance of legal frameworks and independent oversight, the Netherlands highlights the role of dedicated data stewards and the FAIR Principles in ensuring that data remain well managed, documented and reusable throughout the lifecycle.⁴¹ Other countries, such as Iran, Poland, Portugal and the United Kingdom, have also strengthened their legal frameworks for data governance. These approaches help ensure that data remain secure, reliable and reusable while supporting evidence-based policymaking and innovation.

⁴¹ Datasets may satisfy the FAIR principles while remaining unrepresentative. Representativeness should be treated as a quality attribute, with population coverage and known gaps documented as part of quality assurance to prevent reuse from perpetuating existing deficiencies. Contributions from the Gender Advisory Board of the CSTD.

Figure 17: Key measures for strengthening data stewardship to address inequalities in data lifecycle



Source: UNCTAD.

C. Fostering collaboration and partnership to strengthen data ecosystems

Data silos, incompatible standards and restrictive policies often hinder collaboration across public institutions, the private sector, civil society and academia. At the same time, concerns relating to privacy, security, commercial interests and unequal bargaining power can undermine trust and discourage data sharing. These constraints not only reduce the value that can be derived from data but also risk concentrating its benefits among a limited number of actors. It is therefore essential to establish collaborative governance frameworks and inclusive data ecosystems that promote collaboration, improve interoperability and foster multi-stakeholder partnerships.⁴² The following examples demonstrate complementary approaches.

China's approach emphasizes the development and utilization of public data resources and the creation of a national integrated data market. Its basic data system rests on four foundational areas: data property rights, data circulation and trading, revenue distribution and security governance. China has clarified the separation of three types of rights—data holding, data use and data operation—and issued the Guidelines on Data Property Rights Registration (Trial) to strengthen

⁴² Contributions from FAO and UNESCO.

the validity of registration certificates (Chinese National Data Administration, 2026). It has also defined the roles of three key market participants—data circulation service platforms, data brokers and data exchange centres—and encouraged their coordinated development. To facilitate trustworthy data circulation and interoperability, China issued the Action Plan for Trustworthy Data Space Development (2024–2028) (Chinese National Data Administration, 2024), while employing privacy-preserving technologies that enable data to be used without exposing personal or sensitive information. China’s experience highlights the importance of defining clear data rights and institutional roles with public data strategies to facilitate joint development by multiple stakeholders.⁴³

Switzerland has focused on creating trusted governance arrangements that foster collaboration among government, business, academia and civil society while maintaining confidence in data sharing through the Swiss Data Ecosystem initiative (Swiss Federal Chancellery, 2025). The Federal Council has adopted various measures to help promote the Swiss data ecosystem, including a code of conduct for the operation of trusted data spaces based on the principles of transparency, control, fairness and effectiveness, Swiss Data Ecosystem Contact Point to coordinate sectoral data spaces and support implementation standards, as well as two communities of Practice to address the interaction and integration of different data spaces and the design of the various elements required for an interoperable and trustworthy data ecosystem. Switzerland's experience highlights the importance of combining legal, organizational, semantic and technical interoperability with collaborative governance and trust-building measures.⁴⁴

Brazil demonstrates how partnerships across public institutions, technical partners and the private sector can support the development of digital governance ecosystems while maintaining robust governance safeguards. Its data governance framework is underpinned by institutional arrangements that promote coordination across government bodies and levels of administration. A key mechanism is the Central Data Governance Committee (Brazil Digital Government Secretariat, 2026) which defines guidelines and parameters for data sharing within the Federal Public Administration. Complementing this, partnerships with training institutions, such as the National School of Public Administration, as well as initiatives within Brazil’s open-data ecosystem support capacity-building, data governance and cooperation across levels of government.⁴⁵

The above examples approach data collaboration from different angles. China clarifies property rights and the role of key market players, providing a coordinated institutional foundation for cooperation. The Swiss Data Ecosystem initiative shows that interoperability depends as much on trust-building as on technical alignment. Brazil combines efforts in institutional coordination with clear guidelines to promote partnerships.

⁴³ Contributions from the Government of China.

⁴⁴ Contributions from the Government of Switzerland.

⁴⁵ Contributions from the Government of Brazil.

Approaching data stewardship can also take a sector-specific approach. Kenya's experience in the agricultural sector illustrates how government can enable more equitable distribution of economic value among small-scale producers (Kenya Ministry of Agriculture and Livestock Development, 2026). Recognizing that limited access to information, financial services and market opportunities constrains the ability of farmers to benefit from agricultural transformation, Kenya has promoted the use of digital platforms, mobile technologies and data-driven services to support smallholder farmers. Through initiatives such as digital farmer registries, mobile-based agricultural advisory services and platforms that provide access to market, weather and financial information, Kenya has improved farmers' ability to make informed decisions, increase productivity and participate more effectively in agricultural value chains.

Similarly, Peru has strengthened coordination between its national statistics authority and agricultural development ministry to promote more equitable access to information and services for small-scale producers. Since 2021, a formal cooperation framework, supported by standardized survey instrumentation, has enhanced the Integrated Agricultural Statistics System underpinning the National Agricultural Survey. This is complemented by an Agricultural Producers' Registry operationalized through a public Observatory and a Digital Identity tool that connects smallholder farmers with relevant sectoral services. These efforts have helped narrow the agricultural information gap for family farming. In 2025, over 20,000 participants took part in thirty specialized agricultural information events, with women accounting for more than a quarter of participants, while the underlying statistics platform recorded more than half a million visits.⁴⁶

Kenya and Peru demonstrate how sector-specific data ecosystems can help redistribute the benefits of data by enabling traditionally underserved groups to access information and services that were previously available primarily to larger commercial actors. Their experiences show that connectivity gaps, limited digital literacy, affordability constraints and questions regarding data ownership continue to limit participation, highlighting that equitable benefit sharing requires complementary investments in infrastructure, capabilities and governance.

The Satu Data Indonesia (One Data Indonesia) initiative further reveals how integrated and interoperable data governance can promote more equitable access to and use of data. Established under the 2019 Presidential Regulation, the initiative seeks to address fragmented government data systems and improve coordination across national and sub-national institutions in Indonesia by establishing common standards for data, metadata and interoperability (Indonesia Ministry of National Development Planning, 2026). The Satu Data Indonesia portal enables government agencies to publish and exchange standardized datasets, expanding access to public information while improving transparency and evidence-based policymaking. Indonesia has also advanced

⁴⁶ Contributions from the Government of Peru.

sectoral integration to reduce information asymmetries and improve data use. In health, the SATUSEHAT system (Indonesia Ministry of Health, 2026) integrates and standardizes data across health facilities to support near-real-time service delivery and policymaking, with differentiated public and restricted access alongside privacy, security and audit controls. In science and innovation, the Open Research Data Policy and National Scientific Repository platform, integrated into the national data infrastructure, apply FAIR principles to prevent R&D budget duplication and accelerate technology transfer.⁴⁷

Indonesia emphasizes collaboration through common government standards and demonstrates how government-wide portal creates the foundation for collaboration across multiple sectors. Its experience suggests that simply making data available is insufficient; governments must also establish common standards, strengthen institutional coordination and invest in the technical and human capabilities needed for different stakeholders to make effective use of shared data resources.

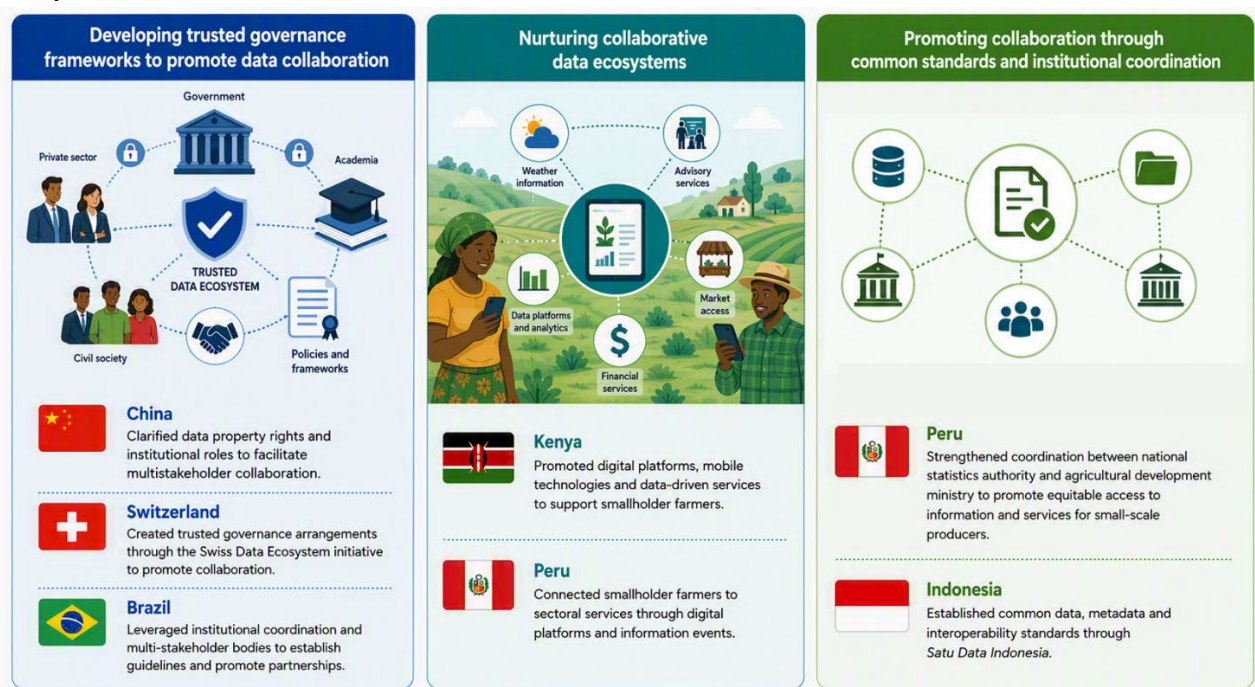
In summary (see Figure 18), to strengthen collaboration within national data ecosystems, governments can consider:

- **Developing trusted governance frameworks to promote data collaboration:** The experience of Brazil, China and Switzerland shows that clear governance rules, codes of conduct and trust mechanisms can reduce legal uncertainty and transaction costs associated with data sharing. Governments should establish governance frameworks that clarify rights, responsibilities and safeguards for data access, sharing and reuse, while providing trusted mechanisms that enable organizations to participate with greater confidence. Such frameworks should balance the interests of different stakeholders and ensure that data-driven collaboration generates broader public value rather than concentrating benefits among a limited number of actors.
- **Nurturing collaborative data ecosystems:** Data collaboration can generate greater developmental value when it is linked to concrete needs and enables underserved groups to access information, services and markets. Kenya and Peru demonstrate how agricultural data platforms, registries and digital services can help small-scale producers participate more effectively in value chains. Governments can foster such ecosystems by bringing together public agencies, businesses, civil society and users around sector-specific challenges and by supporting platforms that translate data into accessible and actionable services. However, collaboration alone does not ensure inclusion; connectivity, affordability, digital skills, institutional capacity and appropriate data governance are also needed to enable disadvantaged groups to participate meaningfully and capture value from data ecosystems.

⁴⁷ Contributions from the Government of Indonesia.

- Promoting collaboration through common standards and institutional coordination:**
 Fragmented data systems limit the ability of institutions and sectors to share and reuse data effectively. Peru and Indonesia demonstrate how common standards for data, metadata and interoperability, combined with government-wide coordination and sectoral integration, can create a foundation for broader data collaboration. Governments could address fragmentation through shared technical and semantic standards, interoperable systems and coordinated governance, while investing in the capabilities needed for stakeholders to make effective use of shared data resources.

Figure 18: Key measures for fostering collaboration and partnership to strengthen data ecosystem



Source: UNCTAD.

IV. International cooperation in data governance for development

As Chapter III highlighted, countries have made notable progress in developing national data governance strategies. Yet the increasingly cross-border nature and complexity of today's data ecosystems across countries create challenges that no country can address alone. As data increasingly move across borders while regulatory authority remains largely national in scope, the structural mismatch between the geography of data and the geography of regulation limits the effectiveness of domestic data governance, while divergent approaches to data governance further contribute to regulatory fragmentation. Navigating complex and sometimes conflicting legal requirements imposes disproportionate compliance burdens on stakeholders in developing countries, especially those with limited technical, legal and institutional capacities. Many developing countries also face broader capacity constraints that undermine their ability to develop and enforce effective data governance frameworks, participate meaningfully in international negotiations and shape the evolving global data governance agenda. These challenges underscore the need for stronger regional and international coordination to promote interoperability and capacity-building and to ensure safe, secure and trusted data flows while supporting development outcomes.⁴⁸

The following sections examine three interconnected dimensions of data governance for development: (i) the movement of data, focusing on enabling safe, secure and trusted cross-border data flows while advancing development objectives; (ii) access to and use of data, focusing on facilitating responsible data sharing and use, including through data and benefit sharing mechanisms; and (iii) interoperability, focusing on enabling diverse data systems to work together while supporting inclusive participation. Together, these dimensions provide a comprehensive framework for understanding how regional and international mechanisms can facilitate data flows and access, enable systems to work across institutional and regulatory boundaries and ensure that the resulting benefits contribute to inclusive and equitable development.

A. Promoting cross-border data flows while advancing development objectives

The movement of data, particularly across borders, has become central to digital trade, innovation and scientific collaboration. It enables access to global markets, knowledge networks and digital services, creating opportunities for economic growth and technological advancement. However, these benefits are not automatic, and their contribution to development depends on the conditions under which data are transferred, accessed and governed.

While international discussions have focused on enabling safe, secure and trusted cross-border data flows, they have paid relatively less attention to ensuring that such flows contribute to broader development objectives, including domestic digital industrialization, technology learning, local

⁴⁸ Contributions from the Governments of China, Germany, the Islamic Republic of Iran, ITU, the Norwegian Agency for Development Cooperation and UNIDO.

value creation and institutional capacity-building. As discussed in Chapter II, many developing countries remain primarily providers of raw data while lacking the infrastructure, analytical capabilities and bargaining power needed to capture greater value from data-driven activities. The policy challenge is therefore not simply to reduce barriers to data movement, but to ensure that international data governance equally addresses the development priorities of the Global South.

Against this backdrop, this section examines regional and international frameworks governing cross-border data flows, compares the extent to which they incorporate development considerations and identifies opportunities for strengthening international cooperation to better align data governance with inclusive and equitable development.

Current regional and international regulatory landscape

Regional and international initiatives provide diverse approaches to governing cross-border data flows, ranging from voluntary principles, certification systems and model contractual clauses to binding trade and data protection agreements. Although these initiatives share the objective of facilitating trusted data flows, they differ considerably in the extent to which they integrate development considerations into their design and implementation.

Among regional initiatives, the African Union Data Policy Framework represents one of the most explicit development-oriented approaches (African Union Commission, 2022). Beyond facilitating data flows across the continent, as envisaged under the African Digital Single Market, it highlights the role of data governance in domestic value creation, treating data as a strategic resource for industrial development, local innovation, poverty reduction and equitable value creation. It extends beyond personal data to include industrial, public-sector and non-personal data, reflecting a broader vision of data governance as an instrument of digital transformation.

A key feature of the African Union's approach is its differentiated treatment of cross-border data flows. Rather than adopting a one-size-fits-all model, it identifies three cross-border data flow regimes (i.e., open transfer, conditional transfer and limited transfer) and emphasizes that countries should choose one that aligns with their development priorities while maintaining appropriate safeguards and recognizing differences in countries' levels of digital readiness, data maturity and legal and regulatory capacities. It also highlights the importance of building African capabilities to govern data flows and capturing greater value from data through complementary policies, including approaches to data ownership and custodianship, domestic data capabilities and enabling institutional frameworks. While endorsed by the African Union Executive Council, implementation depends on domestic adoption and the framework does not provide binding enforcement mechanisms.

The Association of Southeast Asian Nations's (ASEAN) data governance architecture also places significant emphasis on advancing development objectives. Built around the ASEAN Framework on Digital Data Governance (ASEAN, 2018) and complemented by guidelines on cross-border data flows, model contractual clauses and personal data protection principles, it seeks to promote trusted data movement while strengthening institutional cooperation and capacity-building (ASEAN, 2021; 2016). Beyond regulatory interoperability, ASEAN recognizes that meaningful participation in the regional digital economy requires countries to develop domestic capabilities to govern, manage and derive value from data.

The specifics of the ASEAN cross-border data flow mechanism have been subsequently defined, culminating in the ASEAN Digital Economy Framework Agreement (DEFA), up for signature in November 2026 (Šimalčík and Wihardja, 2026). Building on existing cross-border data flow commitments, ASEAN DEFA, similar to the African Union, adopts a pragmatic approach that acknowledges different levels of digital development among member states (ASEAN, 2023). It seeks to accommodate variations in digital readiness, regulatory capacity and institutional maturity while promoting greater regional alignment⁴⁹ and ensuring flexible implementation through tiered commitments, differentiated obligations and periodic review provisions (Boston Consulting Group, 2024; DCO Policy Watch, 2026: 15). This reflects a balance of interoperability and openness with policy space for member states to strengthen domestic capabilities and pursue their own digital development priorities.

The Asia-Pacific Economic Cooperation (APEC) Cross-Border Privacy Rules (CBPR) is a voluntary, certification-based framework that promotes consistent privacy practices for organizations handling personal information across participating APEC economies. While participation is voluntary, commitments must be enforceable under domestic law, as APEC CBPR seeks to facilitate trusted cross-border data flows, reduce regulatory compliance barriers and promote interoperability among privacy regimes (APEC, 2019). Its capacity-building dimension is largely framed as a national responsibility, focusing on enabling organizations and regulators to implement, assess and enforce privacy requirements. The Global CBPR Forum, established in 2022 on the basis of the APEC system, has subsequently extended this approach beyond the APEC region.⁵⁰

The EU's General Data Protection Regulation, together with the Data Act, the Data Governance Act and related legislation, aims at protecting privacy and the integrity of the single market through legally binding obligations and enforcement mechanisms. While these rules represent one of the world's most comprehensive frameworks for governing cross-border data transfers and have

⁴⁹ For instance, the ASEAN Economic Community Council Statement on the Substantial Conclusion of the ASEAN DEFA Negotiations in October 2025 explicitly states the UNCITRAL Model Law on Electronic Transferable Records as a reference in constructing its provisions.

⁵⁰ Contributions from the Government of the United Kingdom.

gained significant global influence, they are primarily designed to safeguard fundamental human rights.

Similarly, many other regional initiatives, such as the MERCOSUR E-Commerce Agreement (Lerman et al., 2022), the Digital Economy Partnership Agreement (DEPA) (2020) and the Ibero-American Data Protection Network (Red Iberoamericana de Protección de Datos, 2020, 2024), mainly focus on promoting interoperability, digital trade or privacy protection but devote relatively limited attention to broader institutional capacity and local value creation.⁵¹ MERCOSUR emphasizes personal data protection and consumer trust to facilitate regional commerce. DEPA promotes digital trade, digital inclusion and MSME collaboration between Chile, New Zealand, Singapore and the Republic of Korea while restricting data localization unless it is justified by legitimate public policy objectives. The Ibero-American Data Protection Network offers non-binding guidance centred on fundamental rights in personal data protection.

The same pattern is evident at the international level. Initiatives such as the G20 Data Free Flow with Trust (DFFT) (G20 Osaka Summit, 2019), the G7 Roadmap on DFFT (2021) and the OECD Recommendation on Enhancing Access to and Sharing of Data (OECD, 2019), primarily seek to strengthen interoperability, build trust and reduce unnecessary restrictions on cross-border data movement. The G20 DFFT establishes political commitment focused on enabling free data flows under safeguards (World Economic Forum, 2020; UNCTAD, 2021). The G7 Roadmap operationalizes this through four workstreams (i.e., data localization, regulatory cooperation, government access and sectoral sharing) for a narrower G7-centred membership and the OECD Recommendation provides technical principles on differentiated access and sharing arrangements.

Lastly, the WTO Joint Statement Initiative on E-Commerce is a plurilateral initiative that incorporates development considerations (WTO, 2026). Despite postponing the negotiations on cross-border data flows, the initiative shows general relevance by creating the conditions for data flows (e.g., infrastructure, trust and openness). In addition to establishing common digital trade rules, it includes provisions on technical assistance, capacity-building, needs assessments and differentiated implementation for developing and least developed countries.⁵² Although

⁵¹ South-South cooperation at the regional and bilateral levels can complement these efforts by strengthening the foundations for interoperability and data sharing. For example, coordination between Brazil's Cooperation Agency and Latin American and Lusophone African countries, as well as China's memoranda of understanding on digital economy cooperation with more than 30 countries, help support interoperable digital identity, payment, data-exchange and public-service infrastructure, alongside technical knowledge and local implementation capacity. Contributions from the Governments of Brazil, China and the South Centre.

⁵² For example, the WTO Agreement on Electronic Commerce and its interim arrangements recognize the need to support developing and least developed country Parties in participating effectively and tapping into growth opportunities in e-commerce and the digital economy. These Parties may require additional time or implementation capacity to comply with certain obligations and may self-designate provisions, requiring an implementation period of up to five years. More information is available at https://www.wto.org/english/news_e/news26_e/mc14_28mar26_341_e.htm

participation is voluntary and the rules apply only to participating WTO members, the initiative demonstrates how international rule-making can combine regulatory cooperation with measures that support implementation by countries with different levels of capacity. A summary of the regional and international initiatives is provided in Table 3 below.

Table 3: Summary of regional and international frameworks on cross-border data flows

Framework	Legal status	Development orientation
African Union Data Policy Framework	Non-binding regional framework	Strong: Explicitly promotes domestic data capabilities and local value creation, while providing policy space through differentiated regimes for cross-border data flows.
ASEAN Framework on Digital Data Governance	Non-binding regional framework	Strong: Emphasizes capacity-building, while tiered commitments and differentiated obligations provide policy space for members at different levels of digital development.
WTO Joint Statement Initiative on E-Commerce	Plurilateral trade initiative	Moderate: Includes provisions on technical assistance, capacity-building, needs assessments and differentiated implementation for developing and least developed countries.
APEC Cross-Border Privacy Rules	Voluntary, certification-based framework	Limited: Provides infrastructure access but focuses primarily on regulatory accountability with limited attention to local value creation or productive capability development.
MERCOSUR E-Commerce Agreement	Binding regional agreement	Limited: Supports regional e-commerce and trust but has limited provisions for capacity building or local value creation.
EU GDPR, Data Act and related legislation	Binding legislation with strong enforcement	Limited: Primarily designed around rights and regulatory accountability, rather than capacity building or local value creation.
G20 DFFT and G7 Roadmap on DFFT	Non-binding political commitment	Limited: Recognizes data's contribution to development, with little emphasis on developing country capacity.
OECD Recommendation on Enhancing Access to and Sharing of Data	Non-binding international recommendation	Limited: Strengthen interoperability, build trust and reduce unnecessary restrictions, with limited support for developing countries.

Source: UNCTAD.

Integrating development considerations into cross-border data flows

Despite significant progress, the landscape of existing frameworks remains characterized by regulatory fragmentation and compliance challenges with differences in data typologies,

classifications, risk thresholds and legal requirements.⁵³ These divergences make it difficult to reconcile national policy objectives with regional and international frameworks, hindering cross-border data flows. The central challenge is not whether data should flow across borders, but under what conditions such flows can generate developmental benefits. This requires consideration of the appropriate scope, governance arrangements and safeguards, including requirements to preserve metadata on data provenance, demographic coverage and disaggregation⁵⁴, and more importantly, how the resulting value can be shared more equitably with countries from which data originates.⁵⁵

International initiatives have generally emphasized market integration, digital trade and regulatory interoperability, reflecting the view that greater openness and fewer barriers to cross-border data flows can promote innovation, attract investment and support economic growth. However, the ability to realize these benefits depends heavily on domestic capabilities, including digital infrastructure, institutional capacity, human resources and competitive digital industries. Without these complementary conditions, developing countries risk remaining primarily providers of raw data, while higher-value activities and associated benefits continue to be concentrated elsewhere.

Regional initiatives, particularly those of the African Union and ASEAN, offer examples of how trusted data flows can be pursued alongside broader development objectives. They consider data flows as a means of strengthening domestic innovation ecosystems, supporting local enterprises, developing digital capabilities and promoting structural transformation, highlighting development as a strategic pillar of their data governance frameworks. These experiences demonstrate how development considerations can be embedded in data governance, providing useful lessons for international rule-making.

A key lesson is the importance of differentiated and context-sensitive approaches that reflect countries' development conditions and institutional capacities. The African Union's three-tier approach provides a useful reference, allowing countries to align data flow policies with their development priorities and levels of digital maturity while preserving domestic policy space. Similarly, ASEAN's tiered commitments and differentiated obligations accommodate varying levels of digital readiness and institutional capacity while maintaining regional alignment. These approaches suggest that a one-size-fits-all model for governing cross-border data flows may not be appropriate for countries at different stages of development. International frameworks should allow greater flexibility in implementation, enabling countries to pursue development objectives while maintaining appropriate safeguards and interoperability.

⁵³ Contributions from the Government of the United Kingdom.

⁵⁴ Contributions from the Gender Advisory Board of the CSTD and UNDP.

⁵⁵ Contributions from the Government of India.

Looking ahead, international cooperation should move beyond facilitating trusted data flows towards enabling trusted and development-oriented data flows. Development considerations should be recognized alongside privacy, security and interoperability as core objectives of international data governance. This should be complemented by stronger cooperation on technology assistance and capacity-building, as well as support for digital infrastructure and regulatory capabilities so that developing countries are better positioned to participate in cross-border data flows and capture greater value from them.⁵⁶ The objective should go beyond increasing the volume of data moving across borders to creating conditions under which such flows contribute to productive capabilities, innovation and inclusive development.

B. Facilitating responsible data sharing and use

The structural disadvantages developing countries face in data capacities, as mentioned in Chapter II, are increasingly shaped by the international dimension of data flows, as data and the value derived from them cross national borders. The challenge is not simply one of access to data, but also of developing the capacity to use data effectively and capture a fair share of the resulting benefits.

New approaches to data sharing have emerged to expand access, facilitate trusted exchange and, in some cases, support benefit sharing. Their effectiveness, however, is constrained by legal fragmentation across jurisdictions, differences in technical standards, uneven institutional capacity and asymmetric bargaining power, challenges that are particularly acute for developing countries. This section reviews major mechanisms through which international data sharing is currently operationalized, examines how they facilitate access to and use of data, as well as identifies how they can be strengthened to support development objectives.

Key data sharing mechanisms

Data sharing can be organized through a range of institutional arrangements, each suited to different types of data and objectives. Understanding these mechanisms clarifies what options exist for facilitating safer and more equitable data sharing, enabling states, communities and individuals to make informed decisions. Clear and enforceable arrangements can reduce information asymmetries, increase predictability and strengthen accountability.

National statistical offices (NSOs) are long-standing public intermediaries that collect, process, validate and disseminate data while protecting confidentiality. Operating under legal mandate, independent authority and public trust, they play an important role in facilitating secure data sharing across borders, beyond their primary statistical functions (OECD, 2025). Many NSOs now collaborate with other statistical agencies, academia and sectoral stakeholders, creating

⁵⁶ Contributions from the Governments of Brazil, the Islamic Republic of Iran, ECLAC and UNIDO.

opportunities for wider data use while raising operational and legal challenges (Hansen et al., 2024).⁵⁷ Organizations such as PARIS21 and the International Data Access Network support these partnerships by developing frameworks and connecting institutions to international networks and public data resources (PARIS21, 2024; United Kingdom Office for National Statistics, 2026). For developing countries, strengthening NSOs as data intermediaries can improve equitable access and meaningful data use by leveraging their institutional legitimacy and technical capacity. By setting transparent access criteria, standardizing and integrating data and providing secure research environments, NSOs can enable government agencies, domestic researchers and other authorized users to work with sensitive or fragmented datasets under common safeguards. That said, effectiveness depends on adequate resources, clear governance frameworks and alignment between data suppliers' interests and end-users' priorities.

Data protection authorities strengthen NSOs broader mandates by serving as independent regulatory bodies with binding power to enforce data protection requirements. They also cooperate through networks such as the Asia Pacific Privacy Authorities Forum (2026), the Central and Eastern Europe Data Protection Authorities (Bulgaria Commission for Personal Data Protection, 2026) and the Global Privacy Assembly (2023). Their primary role is to protect individual rights and ensure compliance.

Data spaces provide a model for data sharing. They create governed environments in which participants retain data ownership while exchanging information under standardized rules. By reducing transaction costs and supporting data exchange and benefit sharing, they enable smaller actors to participate in data-driven ecosystems. With the European initiative Gaia-X (2026), for example, participants can discover data products through federated catalogues and negotiate contracts, specifying access, permitted uses and payment before data are transferred. Japan's DATA-EX (2026) similarly connects sectoral data spaces through common software connectors and cross-domain catalogue search while allowing providers to set conditions for data use. Other examples include the European Trusted Data Framework (European Commission, 2025) and the International Data Spaces Association (2026), which operate at a more foundational level by developing standards for trusted data transactions and exchange. These arrangements help operationalize data and benefit sharing requirements established through regulation or contracts.

Data trusts, commons and cooperatives offer alternative governance models through which individuals, communities and public institutions can exercise control over data and, in some cases, capture a greater share of the value generated from them. Their relevance to developing economies lies particularly in their potential to strengthen collective bargaining power and enable locally determined approaches to data access and benefit sharing. Their effectiveness, however, depends on institutional capacity and appropriate legal and technical safeguards.

⁵⁷ Contributions from ESCAP.

Data trusts establish legal, organizational and technical structures that govern data in accordance with fiduciary principles, while safeguarding data subjects' and owners' interests (Aldenhoff et al., 2026). The fiduciary structure is particularly valuable where communities have limited bargaining power or technical expertise to negotiate with large technology companies. The African Union's Data Policy Framework (2022), for instance, proposes data trusts and data pools as regional governance mechanisms, through which African countries can pool data to ensure access to quality datasets while retaining public oversight and control. This approach can facilitate controlled cross-border data sharing while reducing reliance on private actors to determine governance arrangements. Nevertheless, their use requires enforceable legal duties, effective oversight and institutional capacity that may be limited in developing country contexts.

Data commons pool data as shared resources for public benefit, enabling researchers, firms and institutions to build on shared digital resources. Their strengths lie in scalability and alignment with public value. They can be particularly valuable for developing countries by reducing dependence on proprietary data and platforms, lowering barriers to innovation and strengthening local digital ecosystems.⁵⁸ Examples include the Mozilla Common Voice, which enables underrepresented language communities to contribute to AI training data and has produced more than 130 open speech datasets.⁵⁹ In practice, data commons require processes for curating and standardizing contributions, governing reuse through open or tiered-access licenses and providing shared infrastructure and analytical tools through which participants can access, analyze and build upon the pooled resources.

Data cooperatives, on the other hand, are voluntary arrangements in which members pool and jointly govern data for mutual benefit. Unlike trusts, governance authority remains directly with members, allowing them to collectively determine how data are used and how benefits are distributed. In East Africa and India, for example, farmer organizations and aggregation schemes use digital platforms to pool production and market information, coordinate sales and connect smallholders with buyers (East Africa Farmers Federation, 2022; Cooper et al., 2021). Sharing transaction records, digital receipts and prevailing market prices enables producers to compare offers across buyers and locations, reducing information asymmetries and dependence on individual intermediaries. Combined with collective sales at a greater scale, this can strengthen small-scale producers' bargaining position. That said, their effectiveness depends on platform governance, local market conditions, sustained member participation and adequate organizational capacity.

⁵⁸ At the same time, appropriate safeguards are needed to ensure that the benefits of data commons are broadly shared and that they are not unduly appropriated by powerful commercial actors. Similar considerations have arisen in the open-source software ecosystem, where for-profit companies may benefit from volunteer contributions under permissive licensing arrangements.

⁵⁹ More information is available at <https://commonvoice.mozilla.org/en>.

A summary of different data sharing mechanisms is provided in Table 4 below. These models are not without risks. Research has highlighted the danger of “commons-washing” (Fia and Maanen, 2025: 132), whereby the appearance of collective ownership or participation is created primarily to facilitate data access rather than to protect community interests and enable meaningful participation in value creation. Strong representation, transparency and enforceable rights are therefore essential if collective governance models are to deliver their intended benefits.

Table 4: Data sharing mechanisms and their applicability to the development context

Model	Key focus	Main functions	Pros & cons	Best suited for
Data Spaces	Trusted data exchange	Set common rules, standards and contracts while retaining ownership	+ Lower transaction costs through shared standards and machine-readable terms - Complex governance and technical capacity requirements	Multiple autonomous actors requiring recurring exchange
Data Trusts	Protection and representation	An independent trustee stewards data under fiduciary duties towards defined beneficiaries	+ Stronger bargaining power - Requires strong legal and institutional capacity, enforceable duties, specifies beneficiaries and benefits	Individuals and communities with limited bargaining power
Data Commons	Shared data resources	Pool, curate and provide access to data for public benefit and reuse	+ Broad access and reuse - Requires sustained curation, concrete licensing, data-quality standards, sustainable funding and representation measures	Non-sensitive public-interest data with high reuse value
Data Cooperatives	Collective control and benefits	Members jointly govern, use and benefit from pooled data	+ Direct member control with strong safeguards of interests - Requires sustained participation and accountable governance through legal recognition and organizational or technical capacity	Defined groups with shared interests and the capacity for democratic governance

Source: Synthesis based on sources cited in this section; distinctions concerning data trusts, commons and cooperatives adapted from Aldenhoff et al., 2026.

Effective data sharing requires recognizing that not all data are equivalent. The appropriate governance model depends on the type and sensitivity of data. Personal data requires stronger

privacy protection than non-personal business records, while health and financial data may need more stringent safeguards than open government information. Likewise, sector-specific data such as agricultural or climate information has unique regulatory and operational requirements. Treating these different categories as a single class can result in frameworks that are unnecessarily restrictive for low-risk data or inadequate for sensitive data, limiting both protection and beneficial use.

Sector-specific intermediaries and controlled-access environments can address these differences by tailoring governance to particular risks and purposes.⁶⁰ One example is the Pan-American Highway for Digital Health, which supports secure health-information exchange across Latin America and the Caribbean. Through coordinated working groups, participating countries test common standards and integrated cross-border solutions, including the International Patient Summary and digital vaccination certificates, thereby helping to build a regional interoperability architecture (IDB, 2026). Humanitarian OpenStreetMap⁶¹ and UNHCR data frameworks (2018), for instance, demonstrate how community-generated information and displacement data can be managed in crisis contexts. Such arrangements can make data sharing more proportionate by aligning access conditions, safeguards and oversight with the characteristics of the data and its intended use.

Data sharing mechanisms can be combined with financial and capacity-building arrangements to translate data access into tangible development benefits through monetary and non-monetary channels. Revenue-sharing arrangements in data cooperatives provide direct returns to contributors, while data-dividend schemes distribute a share of data-derived income. Such models remain underdeveloped and may require further business model development. Public and donor financing can provide a complementary mechanism by supporting shared digital infrastructure and services.⁶² OpenIMIS (2026), for example, supports health-financing and social-protection programmes reaching more than 39.4 million beneficiaries across 14 countries.⁶³ These approaches illustrate that benefit sharing need not take the form of direct financial transfers, but it can involve access to infrastructure, technology, skills, research opportunities, derived datasets and other capabilities that enable local value creation.

Towards more equitable data sharing

International and regional institutions can play an important role in facilitating data and benefit sharing arrangements, helping ensure that cross-border data sharing strengthens developing

⁶⁰ Contributions from UNIDO.

⁶¹ More information is available at <https://www.hotosm.org/en/data-principles/>.

⁶² Financing should extend beyond short-term project cycles to support the development and long-term maintenance of foundational datasets, standards and data infrastructure as strategic public assets. Contributions from ODET.

⁶³ More information is available at <https://openimis.org/blog>.

countries' capacity to use data and capture value, rather than primarily increasing the availability of their data to external actors.⁶⁴ It is important to consider benefit sharing arrangements that are proportionate to the value and use of data and sufficiently enforceable to ensure that countries and communities contributing data receive commensurate monetary or non-monetary benefits.⁶⁵ These may include revenue-sharing, access to derived datasets and analytical results, technology and knowledge transfer or participation in research and preferential licensing. At the same time, international and regional frameworks could facilitate cross-border sharing through common safeguards, reciprocity and common rules, while preserving sufficient flexibility for countries and communities to establish arrangements suited to their development objectives and institutional capacities.

A key priority is to strengthen accountability and community rights. International and regional frameworks could provide for transparency regarding downstream uses, accessible grievance procedures and mechanisms to challenge activities that exceed agreed purposes. Community-held and Indigenous data may require additional safeguards based on collective authority and benefit, consistent with the CARE Principles (Research Data Alliance International Indigenous Data Sovereignty Interest Group, 2019; UNESCO, 2026).⁶⁶ These broader principles may also be adapted to other communities and representative bodies, including gender equality.⁶⁷ More broadly, transparency over who can access data, for what purposes and with what expected benefits could help strengthen the position of data contributors in data sharing arrangements.

Different types of data and development objectives call for different institutional arrangements. International and regional institutions could support developing countries in assessing data needs and risks, selecting appropriate institutional models and establishing the legal, technical and governance infrastructure needed to operate them. The appropriate arrangement should be determined based on the sensitivity of the data, intended use, institutional capacity and development objective. Such an approach would allow governance arrangements to be adapted to the characteristics of the data and the interests of those contributing, using or benefiting from it.

International and regional organizations could also develop modular guidance and standardized sample clauses that can be adapted to different contexts. Such guidance could distinguish, for example, between personal and sensitive data, community-held or Indigenous data, industrial data and non-sensitive public-interest data, and translate common principles into compatible contractual terms, technical standards and assurance procedures. Arrangements could specify the scope and purpose of data sharing, permitted downstream uses, beneficiaries, the form and timing

⁶⁴ Contributions from the Governments of Saudi Arabia and the United Kingdom.

⁶⁵ Contributions from the Government of India and ESCWA.

⁶⁶ For instance, the emerging Indigenous Languages Data Commons partnership seeks to apply this approach by centering Indigenous-led governance and collective benefits. Contributions from UNESCO.

⁶⁷ Contributions from the Gender Advisory Board of the CSTD.

of benefits, responsibilities for delivery and enforcement, as well as procedures for monitoring, termination and dispute resolution.

For non-sensitive data with broad public value, interoperable data commons could expand access for public agencies, research institutions and local firms. Common standards and open-source tools could make such data more reusable across systems, reduce dependence on proprietary platforms and lower the cost of developing locally relevant applications. Where sensitive or high-risk data are involved, controlled or tiered access with stronger oversight may be more appropriate. Sector-specific arrangements could be particularly useful in areas such as health and finance, where governance requirements can be calibrated to the risks and development value associated with the data. Their effective implementation would require both regulatory clarity as well as semantic and technical interoperability. Legal frameworks could clarify the authority to share data, permitted purposes, rights and duties, liability, oversight, enforcement and redress, while common terminology, metadata and data classifications could help ensure that data are interpretable and usable across systems. These elements provide a more predictable basis for cross-border data sharing while reducing the transaction costs associated with negotiating and implementing individual arrangements.

International and regional institutions could further support effective implementation by providing a facilitation function through which states, communities, research institutions and firms can identify potential partners and obtain legal, financial or technical support. An international or regionally interconnected registry of data intermediaries and cross-border initiatives could provide information on their legal basis, governance structure, covered datasets, intended beneficiaries and permitted uses. This would improve transparency, help identify overlapping initiatives and provide a basis for monitoring benefit sharing commitments. It could also make it easier for developing countries and other data contributors to identify existing governance models and assess potential partners.

Regional cooperation could offer an additional means of strengthening developing countries' bargaining power and regulatory capacity. Regional organizations could, for example, explore common benefit sharing terms, facilitate cooperation among supervisory authorities and provide shared facilities for data-quality assessment, secure processing and contract negotiation. Initial cooperation could focus on sectors with clear cross-border development value, such as agriculture, health, climate adaptation and regional trade. Technical assistance could help strengthen the capacity of research and statistical institutions in developing countries to audit data quality and identify and mitigate algorithmic bias.^{68 69} Pooling resources and expertise at the regional level

⁶⁸ Contributions from the Government of Indonesia.

⁶⁹ General Assembly resolution 80/173 affirms gender equality and women's full, equal, safe and meaningful participation, and calls for closing data gaps, strengthening indicators and building the capacity of national statistical

could be particularly useful where individual countries face constraints in developing specialized legal, technical or regulatory capabilities.⁷⁰

Several existing initiatives provide building blocks for the above approaches. For instance, the Working Group on Data Governance under the CSTD⁷¹ is discussing recommendations towards equitable and interoperable data governance arrangements, while the UN Statistics Working Group on Data Governance is establishing common terminology and a repository of national practices overseen by the UN Statistical Commission (UNSD, 2026). The AU Data Policy Framework illustrates how regional harmonization and shared data infrastructures can be combined with implementation adapted to national conditions (African Union Commission, 2022). At the operational level, the World Bank-hosted Development Data Partnership (2026) connects international organizations and private data providers through standardized legal, technical and governance procedures, while the EU maintains a register of notified data-intermediation service providers (European Commission, 2026). Similarly, the WHO Pandemic Agreement operationalizes benefit sharing by linking access to pathogen sequence data to manufacturers' commitments on product distribution (WHO, 2025).⁷² Public-private and multi-stakeholder partnerships can likewise help developing countries address infrastructure, financing and technical-capacity gaps, provided that clear rules on data access, reuse, stewardship and benefit sharing are established from the outset.⁷³ These initiatives could provide foundations for more interoperable arrangements through which developing countries can identify trusted partners, access legal and technical assistance, review existing models and monitor whether agreed benefits are delivered.

C. Fostering interoperability across different development contexts

As discussed in the previous sections, enabling trusted cross-border data flows and facilitating access to and responsible use of data are essential to unlock their social and economic value. A key prerequisite is the ability of data systems across jurisdictions, sectors and institutions to work together despite differences in legal frameworks, technical standards and governance models.

The objective is not to eliminate diversity, which reflects different developmental priorities, legal systems and societal values, but to enable different systems to work together effectively. This

systems. In this context, it is important to strengthen national statistical systems' capacity to produce, assess and use sex-disaggregated and representative data as well as document population coverage and gaps. Contributions from the Gender Advisory Board of the CSTD.

⁷⁰ The European Union–Latin America and the Caribbean Digital Alliance illustrates cross-regional cooperation by supporting comparable indicators, capacity-building, policy coordination and technical cooperation on AI and data governance. Contributions from ECLAC.

⁷¹ More information is available at <https://unctad.org/topic/commission-on-science-and-technology-for-development/working-group-on-data-governance>.

⁷² Contributions from WHO.

⁷³ Contributions from ODET.

distinguishes interoperability from harmonization. Harmonization seeks to align rules, standards, definitions, technical requirements, institutional practices or governance approaches across jurisdictions, whereas interoperability allows different legal and technical systems to interact without requiring them to become identical. Interoperability can thus facilitate cooperation while preserving legitimate differences in national policy objectives, development initiatives and regulatory approaches.

Four complementary dimensions of interoperability

Effective interoperability requires compatibility across four interdependent dimensions: legal, technical, semantic and institutional (European Commission, 2017: 22). Progress in one dimension cannot fully compensate for weaknesses in another.⁷⁴ Legal permission to share data is of limited value if digital systems cannot connect. Similarly, technical connectivity is restrained if data cannot be interpreted consistently through shared understandings of relevant concepts. Both, in turn, depend on institutions capable of implementing safeguards and sustaining cooperation.

Importantly, interoperability is not neutral and it has distributional implications. The rules, standards and infrastructures that determine how systems connect can affect who participates, whose systems become the reference point, who bears adaptation and compliance costs and who captures the value generated through greater connectivity (Oever and Milan, 2022; Barrios Villarreal, 2018). Interoperability should thus not be assumed to generate development gains automatically. Its impact on inclusive development depends on how these four dimensions are designed and implemented.

First, legal interoperability establishes the conditions under which data can move and be used across jurisdictions with different regulatory frameworks. Ensuring interoperability within the legal dimension means enabling organisations governed by different laws, policies and strategies to exchange data and cooperate across jurisdictions without conflicting requirements obstructing their activities. This requires screening existing rules for barriers such as territorial or sectoral restrictions on data use and storage, incompatible licensing arrangements, technology-specific mandates, contradictory procedural requirements or outdated security and data-protection provisions (European Commission, 2017: 27). Various mechanisms, such as adequacy and equivalence arrangements, mutual recognition, model contractual clauses, certification schemes and common regulatory principles, can enable countries to pursue distinct approaches while reducing legal uncertainty and compliance costs.

The development implications of legal interoperability depend in part on who defines the applicable rules. Developed countries and dominant firms may be better positioned to shape

⁷⁴ Contributions from the Government of Peru.

interoperability arrangements, while developing countries and smaller firms may face substantial costs in adapting to external requirements, obtaining certifications or demonstrating compliance (Maskus et al., 2013; Zúñiga et al., 2024). Legal interoperability should not become a mechanism through which developing countries primarily become rule-takers. Meaningful participation in the development and negotiation of interoperable frameworks is important to ensure that international arrangements reflect diverse development priorities and preserve appropriate policy space.

Second, technical interoperability provides the infrastructure via protocols, interfaces and procedures through which data can be exchanged securely and reliably across systems (Franzl et al., 2023). Open standards, common protocols, APIs and interoperable digital public infrastructure can facilitate connectivity, reduce duplication and limit vendor lock-in (Borgogno and Colangelo, 2019; European Commission, 2016).⁷⁵ However, connectivity alone does not ensure equitable participation as smaller firms may face higher relative adaptation, investment and compliance costs (Konrad Borowicz, 2025). Moreover, open technical interfaces may lower barriers to entry but do not, by themselves, prevent market concentration where dominant providers retain control over the underlying infrastructure, interface specifications or key access conditions (Boudreau, 2010; Ghazawneh and Henfridsson, 2013). Ensuring accessible standards, affordable infrastructure and effective competition is important to translate technical interoperability into broader development gains.

Third, semantic interoperability ensures that data and their interactions exchanged across systems retain a consistent interpretation (European Commission, 2017). Differences in definitions, classifications, metadata, languages, gender representation and data models can prevent systems from making effective use of information even where technical connections exist.⁷⁶ Common vocabularies, taxonomies, ontologies, metadata standards and identifiers can support more reliable data exchange, improve data quality and strengthen provenance and traceability.⁷⁷ The joint development of the Handbook on Measuring Digital Trade by the IMF, OECD, UNCTAD and WTO illustrates how international statistical cooperation can advance semantic alignment through common concepts and measurement guidance while reducing the burden of divergent approaches on countries (IMF et al., 2023).⁷⁸ These standards are not merely technical as defining categories, relationships and permissible descriptors, but they shape which data and forms of knowledge are represented, whose perspectives are made visible and how information is interpreted across systems (Di Muri et al., 2024; Montenegro, 2019). Inclusive standard-setting and attention to

⁷⁵ Contributions from the Government of India and UNEP.

⁷⁶ For example, whether data are collected at household or individual level, and how unpaid care, informal employment and household headship are classified, have measurable distributional consequences. Contributions from the Gender Advisory Board of the CSTD.

⁷⁷ This has direct implications for the policy level, as conceptual clarity and mutual understanding of relevant terms can help address awareness gaps between policymakers and support more equitable participation in the formulation of interoperability measures. Contributions from ITU.

⁷⁸ Contributions from UNCTAD.

diverse linguistic, cultural, economic and institutional contexts are key to ensuring that semantic interoperability does not exacerbate existing asymmetries.

Lastly, institutional interoperability provides the foundations needed to sustain cooperation over time by aligning and coordinating institutions, processes and data sharing arrangements (European Commission, 2017).⁷⁹ Regulators, standards organizations, governments and other stakeholders need robust mechanisms for coordination, information exchange, dispute resolution and adaptation as technologies and regulatory requirements evolve.⁸⁰ Institutional capacity also shapes who can participate effectively in global data ecosystems. Developing countries may face constraints in implementing standards and sustaining participation in international governance processes, while smaller firms may lack the technical and legal resources needed to meet interoperability requirements and negotiate access arrangements (De la Cruz et al., 2025; Maskus et al., 2013). Building the necessary institutional capacity should therefore be treated as an integral part of interoperability rather than as a separate technical-assistance issue.

These four dimensions show that interoperability is not simply a matter of making systems compatible, but it also raises questions of how the benefits and costs of connectivity are distributed. Its development impact depends on the conditions under which systems connect and the capacity of different actors to participate on equitable terms. While greater interoperability can reduce fragmentation and create opportunities for data-driven development, it can reinforce existing asymmetries if the costs of adaptation fall disproportionately on less-resourced actors or if the value generated from connected data is captured primarily by those with greater technological, financial and market power. The central policy questions are not only whether systems can connect, but also who sets the rules, who bears the costs and who is able to capture the value created through greater connectivity.

Different approaches towards interoperability

Regional experiences demonstrate distinct approaches to interoperability, reflecting differences in economic integration, regulatory convergence and institutional capacity. The European Interoperability Framework (EIF) (2017) illustrates the potential of deeper legal and institutional integration where countries have relatively high levels of regulatory convergence and institutional capacity. Targeting European public administrations, the EIF supports the development of a single digital market by promoting interoperable cross-border and cross-sectoral information flows that facilitate the delivery of public services. Recognizing political and administrative diversity, it provides a common foundation through shared definitions, a core framework that allows flexible

⁷⁹ Contributions from UNDP.

⁸⁰ For instance, within the United Nations system, the United Nations Group on the Information Society (UNGIS) illustrates how inter-agency coordination can strengthen information exchange and policy coherence, reduce duplication and support integrated implementation across varying institutional mandates. Contributions from ITU.

but coordinated alignment and a layered conceptual model with actionable recommendations for interoperability by design.

ASEAN adopts a more incremental and business-oriented approach suited to greater diversity in regulatory development and institutional capacity. Its non-binding framework promotes common data classifications, machine-readable standards and voluntary cross-border transfer mechanisms, including model contractual clauses and certification (ASEAN, 2016; 2021b). These mechanisms strengthen semantic, technical and legal interoperability without requiring uniform national legislation.

The African Union takes a broader development-oriented approach, positioning interoperability as a means of advancing continental integration, public value creation and more equitable participation in the global data economy. It connects common data categorisation and open standards with legal harmonisation, regulatory coordination, infrastructure investment and capacity-building, reflecting uneven national readiness and the need to strengthen African countries' participation in data value chains and international standard-setting (African Union Commission, 2022: 36). Regionally operationalizing the continental agenda, the Smart Africa Trust Alliance (SATA) strengthens institutional interoperability through regional working groups, national coordination and shared governance arrangements, while promoting open standards and common platforms for cross-border data and digital identity systems (SATA, 2023).

At the global level, FAIR Implementation Profiles use a community-led approach in which research communities document and share their choices of identifiers, metadata standards, vocabularies, protocols and licences. This promotes semantic and technical convergence across research domains without prescribing a single implementation model.⁸¹

These experiences suggest that interoperability should be understood as a spectrum rather than a single model. Its appropriate depth and form depend on the degree of economic integration, regulatory convergence, institutional capacity and development differences among participating countries. For developing countries in particular, approaches that enable progressive convergence, mutual recognition and flexible implementation may be more feasible than immediate adoption of highly demanding regulatory or technical models.⁸²

International cooperation can support these different pathways by mapping standards and practices, facilitating peer learning, identifying areas where mutual recognition is feasible and enabling regional frameworks to interact. The objective should be greater compatibility among different interoperability arrangements, rather than convergence towards a single global model. Such an

⁸¹ More information is available at <https://www.go-fair.org/how-to-go-fair/fair-implementation-profile/> and <https://www.go-fair.org/wp-content/uploads/2021/06/FIP-mini-questionnaire.pdf>.

⁸² Contributions from the Governments of China and India.

approach can preserve policy space and accommodate different levels of readiness while gradually reducing fragmentation and the costs of cross-border and cross-sectoral data exchange.

Promoting development-oriented interoperability

The growing diversity of national and regional data governance frameworks makes interoperability an increasingly important subject of international cooperation to facilitate trusted cooperation and inclusive participation.

Governments and regional organizations should treat interoperability as a cross-cutting issue and consider legal, technical, semantic and institutional interoperability when developing legislation, digital infrastructure and data sharing arrangements. Interoperability should be incorporated from the design stage rather than treated as a technical issue to be addressed after systems have become fragmented.⁸³ While open standards, interoperable infrastructure, common metadata and compatible governance arrangements can help reduce fragmentation and future adjustment costs, particular attention should be given to affordability, competition and the avoidance of vendor lock-in, so that smaller firms and other actors can participate effectively in interoperable data ecosystems.⁸⁴

International cooperation should prioritize interoperability and mutual recognition where appropriate, rather than imposing unnecessary regulatory uniformity. In practice, mutual recognition would allow a country or regional arrangement to accept data, digital services or compliance outcomes from another jurisdiction where the latter's rules and institutional arrangements provide sufficiently comparable levels of protection, oversight and redress. Common principles and safeguards can provide a basis for cooperation while allowing countries to adopt approaches suited to their institutional and development circumstances and increase trust among states. International organizations can also facilitate dialogue and peer learning among regional arrangements, map emerging standards and practices, identify areas of compatibility and potential mutual recognition, as well as support interoperability assessments.⁸⁵ These assessments should examine how legal rules, institutional responsibilities, data definitions and classifications, metadata and technical requirements interact instead of evaluating different dimensions in isolation. This coordination can help reduce unnecessary fragmentation while allowing different countries and regions to pursue approaches appropriate to their own contexts.

Moreover, it is important to support developing countries in strengthening the technical and regulatory expertise, institutional capabilities and financing required to implement and shape

⁸³ Contributions from the Government of the Philippines.

⁸⁴ Contributions from the Governments of China and Portugal.

⁸⁵ Contributions from the Governments of Canada, India, Indonesia, Peru and Saudi Arabia.

interoperability arrangements.⁸⁶ International organizations and development partners should enhance support for digital infrastructure, skills, regulatory capacity and participation in international standards-setting processes.⁸⁷ Such support should extend beyond short-term technical assistance to enable countries to adapt and implement interoperability arrangements while contributing to their further development.

Looking ahead, the rapid development of AI, especially agentic AI, will change the requirements for interoperability across digital systems and data ecosystems. While conventional interoperability focuses primarily on enabling systems to exchange and interpret data, AI agents can autonomously access multiple data sources, interact with different systems and combine information to perform tasks. Data is also increasingly exchanged not only in their original form, but through models, embeddings, derived outputs and machine-interpretable rules.⁸⁸ This shifts interoperability from the question of whether systems can connect to whether AI systems can safely and reliably operate across heterogeneous technical, data, legal and institutional environments. This increases the importance of interoperability not only across data and technical systems, but also across identities, permissions, legal rules and institutional arrangements. Interoperability will therefore require mechanisms through which information on data provenance, quality, permissions, usage conditions and applicable rules can be communicated and interpreted by both machines and the systems with which they interact. It will also become increasingly important to maintain traceability across the data-to-model-to-output chain, including how data are transformed into models, embeddings, inferences and other forms of derived value.⁸⁹

To conclude, interoperability should go beyond fostering connectivity to supporting inclusive participation in the data economy. A development-oriented approach to interoperability can reduce unnecessary barriers to cooperation and facilitate cross-border data flows and data sharing while preserving policy space, strengthening domestic capabilities and enabling developing countries and smaller firms to participate in and benefit from increasingly connected global data ecosystems. The success of interoperability should therefore be judged not simply by how seamlessly systems connect, but by whether connectivity expand opportunities for countries, firms and other stakeholders to create, capture and share value from data more equitably.

⁸⁶ Contributions from ESCAP and ESCWA.

⁸⁷ For instance, WIPO combines standards supporting interoperable intellectual property data across national and regional offices with Technology and Innovation Support Centres and capacity-building programmes that strengthen developing countries' skills and institutional capacity to use these data. Contributions from WIPO.

⁸⁸ In May 2026, machine-generated traffic surpassed human traffic on Cloudflare's network for the first time. It is estimated that machine traffic will be 1,000 times that of human traffic in five years if this growth continues.

⁸⁹ Representational deficits in the data may compound across the data-to-model-to-output chain as outputs become new training inputs. Contributions from the Gender Advisory Board of the CSTD.

V. Conclusion and recommendations

Data has become a strategic resource for innovation and sustainable development, yet persistent asymmetries in infrastructure and data capabilities limit developing countries' ability to capture the social and economic benefits of the data they generate. Inequalities are also embedded throughout the data value chain, some being reflected in biases and underrepresentation in datasets, while weak institutional capacity, fragmented systems and limited trust can constrain responsible data use and sharing. Addressing these challenges requires governments to strengthen their capacity to manage and use data by investing in digital infrastructure, digital skills and institutional capabilities, while reinforcing data stewardship through clear responsibilities, legal safeguards and inclusive participation. National experiences highlight the value of complementary approaches, including digital public infrastructure, capacity-building, participatory data governance, trusted intermediaries and collaborative data ecosystems, with policies tailored to countries' institutional capacities and development priorities.

The increasingly cross-border nature of data ecosystems makes international cooperation essential to address the mismatch between the global geography of data and predominantly national regulatory frameworks. Existing regional and international initiatives have made significant progress in promoting trusted data flows, regulatory cooperation and interoperability, but have paid relatively limited attention to domestic capacity-building, local value creation and the broader development priorities of developing countries. Greater emphasis on development considerations in the movement, access and use of data, as well as in the interoperability of data systems, is needed to ensure that data contributes to shared prosperity and sustainable development.

In this regard, at the national level, developing countries are encouraged to:

- **Strengthen capacity to capture the social and economic value of data:** Governments should invest in digital infrastructure that enables countries to manage and use data effectively. Interoperable digital public infrastructure, including digital identity, secure data exchange, digital payments and integrated government service portals, can provide a basis for data-driven innovation. Governments should also enhance digital skills and institutional capabilities to foster inclusive digital transformation, improve evidence-based policymaking and ensure that domestic actors can capture greater value from data.
- **Promote inclusive participation in data governance:** Governments should establish mechanisms that enable Indigenous peoples, local communities and other underrepresented groups to participate in decisions throughout the data value chain, including data collection, access, sharing, use and management. Inclusive participation can strengthen trust and accountability while ensuring that data governance reflects diverse societal interests and priorities. Governments should also combine broad-based digital inclusion measures with

targeted support for women, youth, older persons and rural communities to support different stakeholders participating in and benefiting from data-driven development.

- **Enhance data stewardship throughout the data lifecycle:** Governments should establish clear institutional responsibilities and governance frameworks, supported by common standards, data classification systems, interoperability requirements and appropriate safeguards to strengthen coordination, accountability, security and responsible data use. Dedicated stewardship functions and trusted intermediaries can facilitate responsible access to sensitive data while reducing administrative and compliance burdens. Combining robust governance with institutional capacity-building is essential to ensure that data remain secure, reliable and reusable throughout their lifecycle while supporting evidence-based policymaking and innovation.
- **Develop trusted governance frameworks to promote responsible data sharing and collaboration:** Governments should complement data stewardship with mechanisms that build trust among organizations and facilitate participation in data sharing initiatives. Standardized contractual arrangements, codes of conduct, certification mechanisms and trusted intermediaries can reduce legal uncertainty, transaction costs and perceived risks, while providing greater clarity on how data can be accessed, shared and reused. These arrangements can help create conditions for mutually beneficial collaboration among key stakeholders.
- **Nurture inclusive data and innovation ecosystems through multi-stakeholder partnerships:** Governments should foster partnerships among public institutions, businesses, academia, civil society and international partners to build well-functioning innovation ecosystems that promote knowledge sharing, the development and scaling of data-driven solutions and broader participation in data value creation. This requires targeted support for sector-specific ecosystems and complementary investments in connectivity, affordability, digital skills and institutional capacity to enable underserved groups and small actors to participate meaningfully and benefit from data-driven opportunities.
- **Build interoperability into data governance from the outset:** Governments should address legal, technical, semantic and institutional interoperability when developing legislation, digital infrastructure and data sharing arrangements. Open standards, interoperable infrastructure, common metadata and compatible governance arrangements can reduce fragmentation and future adjustment costs. At the same time, governments should pay attention to affordability, competition and vendor lock-in so that smaller firms and other actors can participate effectively in data ecosystems.

To strengthen data governance for development and ensure that developing countries can participate more effectively in global data ecosystems, the international community may consider the following:

- **Integrate development considerations into cross-border data flows:** The international community should, in addition to facilitating safe, secure and trusted data flows, promote their contribution to productive capabilities, local value creation and the broader development priorities of developing countries. International frameworks should recognize development alongside privacy, security and ethics as core objectives and provide appropriate policy space for countries to pursue their development priorities and determine appropriate conditions for data access and use.
- **Strengthen capacity-building and support for developing countries:** International organizations and development partners should provide sustained support for digital infrastructure including establishment of regional digital infrastructure, technical and regulatory expertise, institutional capabilities and financing. Such support should extend beyond short-term technical assistance to enable developing countries to establish and implement effective governance arrangements, negotiate fair terms and participate meaningfully in international negotiations and standards-setting processes. Pooling expertise and resources at the regional level can help address capacity constraints and strengthen collective bargaining power.
- **Promote fit-for-purpose and accountable data sharing models:** International organizations should provide guidance, standards and technical assistance to help countries and communities select and combine appropriate data sharing mechanisms, such as data spaces, trusts, commons, cooperatives and sector-specific intermediaries, according to data sensitivity, intended use, institutional capacity and development objectives. Arrangements should ensure transparency over who can access data, for what purposes and with what expected benefits, while providing for meaningful participation, effective redress mechanisms and collective rights where relevant. International and regional registries of data intermediaries and initiatives could further improve transparency and help developing countries identify suitable partners and governance models.
- **Support data contributors in capturing value from data:** The international community should facilitate responsible access to and use of data through mechanisms that enable countries and communities contributing data to capture a fair and proportionate share of the value derived from it. Benefit sharing may include access to derived datasets and analytical results, technology and knowledge transfer, research participation and preferential licensing. Arrangements should be facilitated through clear, enforceable provisions on beneficiaries, permitted uses, benefit delivery, monitoring and redress, with

stronger safeguards for community-held and Indigenous data. Particular attention could be given to sectors where data sharing produces wider spill-over for crucial development objectives, such as agriculture, health, education and disaster prevention.

- **Enhance international coordination and capacity for interoperability:** International organizations should facilitate dialogue, peer learning and coordination among regional arrangements and national initiatives, identify areas of compatibility and mutual recognition, as well as support interoperability assessments and the development of common standards. International cooperation should prioritize a development-oriented approach to interoperability rather than unnecessary regulatory uniformity, allowing different countries and regions to maintain regulatory approaches catering to their development priorities while enabling their data systems to work together effectively.

Annex: Suggested questions for discussion during the Intersessional Panel of the Commission

To facilitate the discussion at the Intersessional Panel, below presents a set of questions for consideration:

1. What policy measures can countries take to address challenge in asymmetries across the data value chain, including gaps in data generation and collection, digital infrastructure, processing capacity, human skills, institutional capacity and the ability to capture value from data?
2. What successful mechanisms or institutional arrangements have helped foster collaboration around data governance for development among different stakeholders and promote more equitable and effective data stewardship?
3. How can international cooperation strengthen equitable and interoperable data governance to ensure that data contributes to shared prosperity and sustainable development? In what ways can the UN CSTD contribute to this effort?

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