

Landscaping Infrastructures for the Digital Ecosystem





GOAL

Unpacking the need and potential for adopting the infrastructure framing for a wholistic governance of the digital ecosystem



OUTCOMES

- Demonstrating the lacuna in current discourses around digital governance
- An analysis and consequent modular approach to governing digital infrastructure, drawing from existing strategies within governance of traditional critical, open and public infrastructure
- Offering ecosystem-level theory of change on conceptualising key elements of the digital ecosystem and their governance

OUTPUTS



LANDSCAPE DECK

Redefining approaches to digital governance and identifying principles aiding in a more holistic governance



CO-DESIGN WORKSHOPS

Ecosystem events to:






- Create networked feedback loops
- Embed narratives & principles



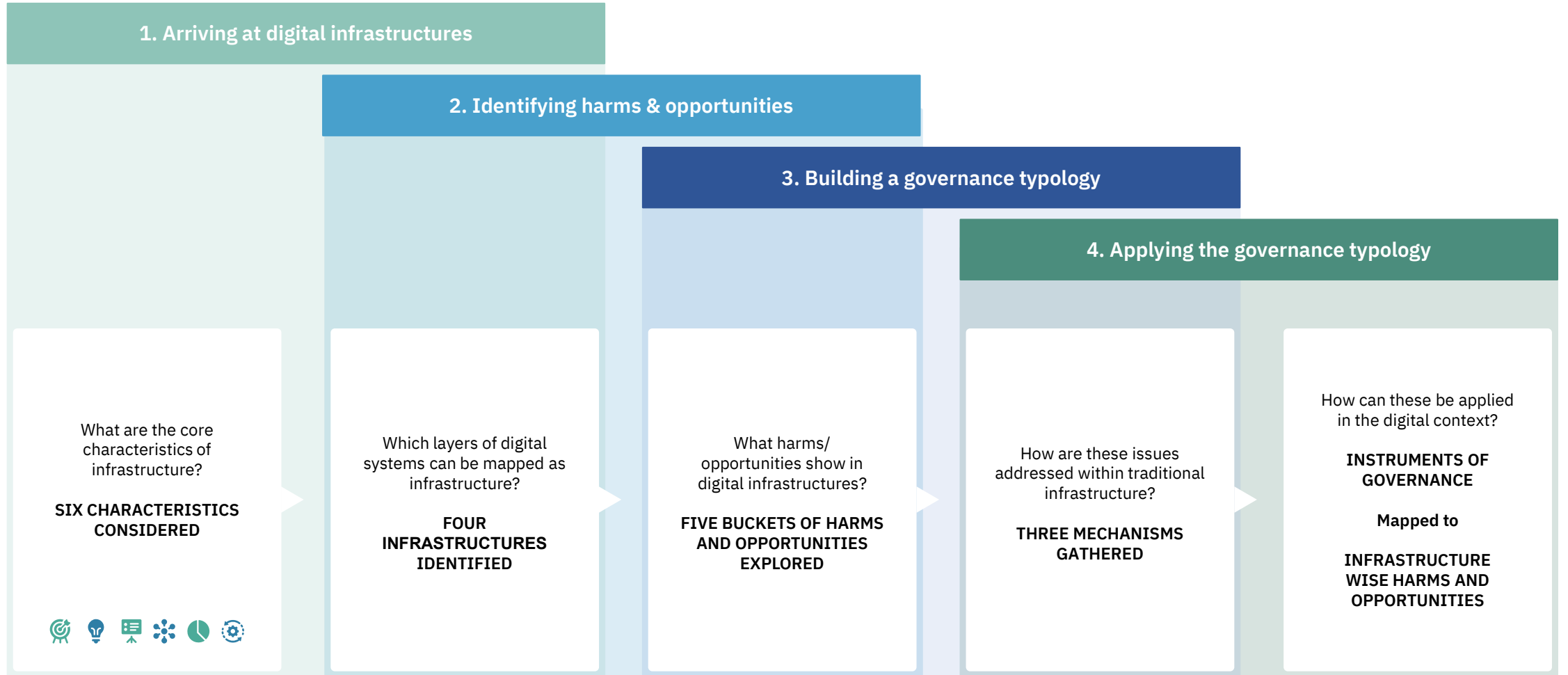
POLICY RECOMMENDATIONS

Best practices and research recommendations for emerging digital infrastructure regulation

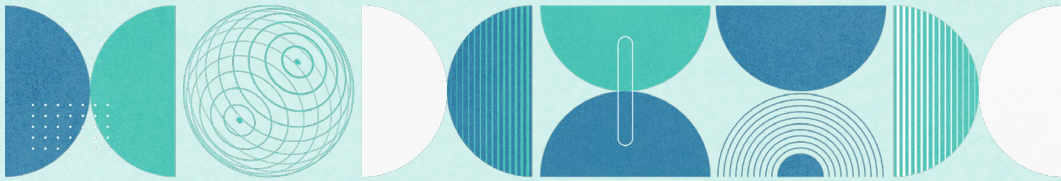
Why is this important? Current approaches have a limited understanding of digital infrastructure and its governance

ELEMENT	GOVERNANCE PRIORITIES	MISSING PIECES
 Data	Privacy Access Consent	Collective rights Trust Cross-border flow
 Cloud	Security Sustainability	Oligopoly Market Sovereignty Equitable Access
 Models	Transparency Bias	Value Competition Equitable Access
 Hardware	Types of use Specifications	Equitable Access
 Standards / Protocol	Interoperability Standardization	Participation

- Prevailing ways of thinking do not capture the gamut of risks and opportunities associated with digital infrastructures
- Consequently, they don't support a broad set of regulatory priorities – particularly in responding to the role of people in the operation and functioning of these infrastructures



Our hypothesis is that using the framing of 'infrastructure' will help approach the governance of the digital ecosystem in a manner that addresses numerous gaps in current approaches and allow for greater claim-making.



Part I

- Arriving at digital infrastructures
- Assessing harms and opportunities
- Building a governance typology
- Applying the governance typology



There are numerous definitions of infrastructure

A. O.
Hirschman

The **basic services**, without which primary, secondary and tertiary types of production activities cannot function.

A **system of interaction** of economic agents, ensuring a link between phases of production and consumption. Individual, institutional and material levels of infrastructure.

R.
Jochimsen

J. E.
Fulmer

All elements of interrelated systems that provide goods and services **essential to enabling, sustaining or enhancing** societal living conditions.

An instrument **essential to efficiently meet (social) needs** of a growing population.

W. W.
Rostow

M. A.
Weisdorf

The essential facilities and services that the **economic productivity** of a community or organisation depends on.

To arrive at a meaningful framing for digital ecosystems, a shared articulation of infrastructure is warranted

Identifying core characteristics of infrastructure

Characteristics of infrastructure can be abstracted from definitions of infrastructure and prevalent literature on its types



NECESSARY FOR FUNCTIONING OF THE SYSTEM

The basic services, without which primary, secondary and tertiary types of production activities cannot function (*A. Hirschman*)



ADDRESS SOCIETAL NEEDS

The networked assets must be designed to address societal needs, which may be most clearly evidenced in the aftermath of service disruption (*Rostow*)



FACILITATE FURTHER PRODUCTION

A system of interaction of economic agents, ensuring a link between phases of production and consumption (*Jochimsen*)



DYNAMIC/INTERRELATED COMPONENTS

They encompass dynamic networks and assemblages that enable and control flows of goods, people, and information over space (*Kingsbury*)



IMBIBE MODULARITY











Infra/elements can be combined and adapted for customised solutions that are independently developed but seamlessly integrate into rest of the ecosystem (*UNDP*)



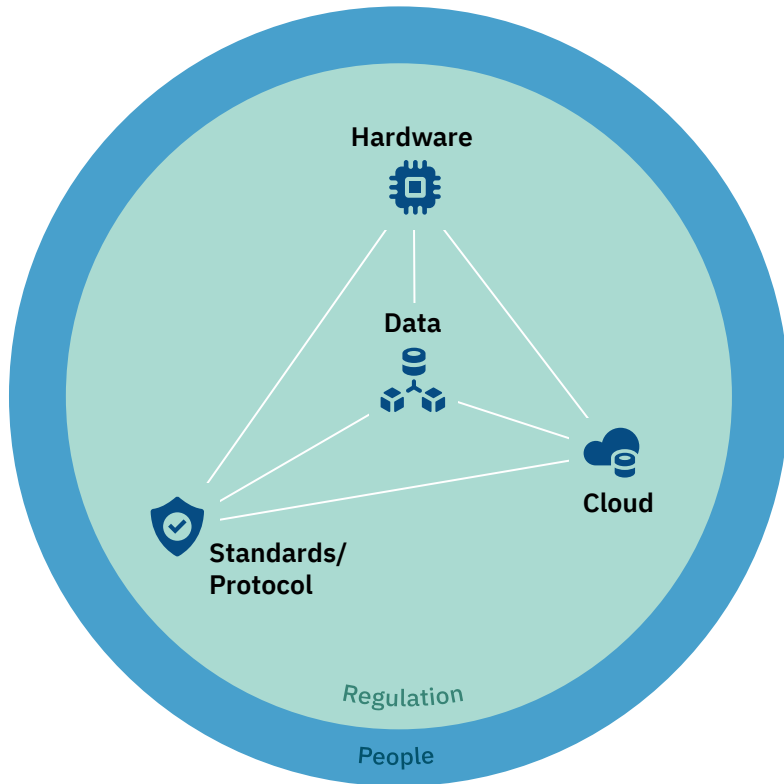
GENERATE EXTERNALITIES

Their operation leads to positive and negative externalities, which are the indirect benefits or harms of a project that are complex and difficult to predict (*Zuckerman*)

Digital systems can be viewed from an infrastructural lens owing to their resonance with the identified characteristics of infrastructure

	 Necessary to system functions	 Address societal needs	 Facilitate further production	 Dynamic/linked components	 Imbibe modularity	 Generate externalities
 Data	Digital services and interactions rely on data collection, storage, processing, and sharing	Enables social interaction, economic progress, & public service delivery	Data-driven insights power business/state functions, & create opportunities	Datasets overlap within themselves and rely on supporting networks for value	Non-rivalrous and plugged in different context for multiplying utility	Implications for market access, individual/group rights, and social welfare
 Cloud	Backbone for essential services like email, websites, backups, and big data analytics	Essential business/state processes and market stability now depend on cloud access	Foundational system for software/web development, and enables new forms of computing	Relies on numerous banks of servers and GPUs located in different regions	Hosts a range of service offerings customised for individual needs	Security/physical incidents on cloud offsets harms for dependent services & economies
 Hardware	Essential for digital systems and devices to communicate in consistent ways	Enable security and stability for the internet and all digital interactions	Foundations for development of all digital solutions and networked services	Create a web of reflexive channels to operate a system of digital interactions	Adopted per context for customised solutions to societal/economic needs	-
 Standards / Protocol	Digital solutions are tied to physical components that core to powering operations	Core to addressing the increasing need for data storage and processing	-	A physical network of components alongside software & data enables seamless processes	A consistent hardware structure for all digital products is widely customised	Sophistication of hardware determines the environment and system efficiencies

The identified markers of infrastructure do not adequately account for the role of people and regulation



Regulation

Legislations, policies and guidelines lie as a horizontal layer across all infrastructures

They act not just on the infrastructures themselves but also on systems these infrastructures support.

People

People both affect the operation of infrastructures and are affected by their presence in significant ways. They -

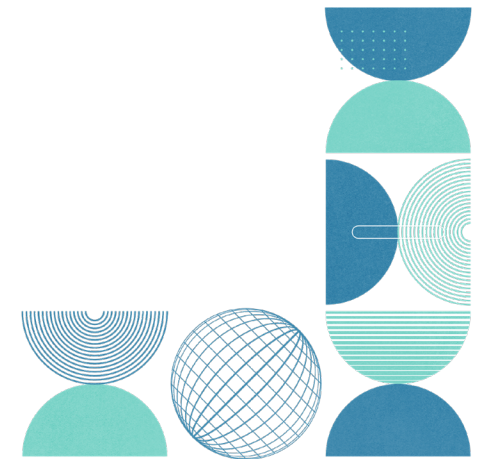
- Generate, refine, and feed data
- Inform standards and define protocols
- Operate cloud system and build on them
- Source, design, and build hardware

Given the intrinsic role of people in the creation and operation of digital infrastructures, it is essential to consider the impact and governance of these systems from a public interest perspective and open nodes for people to engage with its design and regulation



Key takeaways

1. In the absence of a single consensus-based definition for “infrastructure”, it can be seen as consisting of certain core characteristics including – (i) necessary to system functions, (ii) address societal needs (iii) facilitate further production, (iv) dynamic/linked components, (v) imbibe modularity, and (vi) generate externalities.
2. Digital ecosystems that create the backbone of various products and services today, such as data, cloud, hardware, and standards and protocol can be mapped along these characteristics to be viewed from an infrastructure lens.
3. The various infrastructures maintain extensive interlinkages across systems and rely on a horizontal layer of regulations and people that both affect the operation of infrastructures and are affected by their presence in significant ways.
4. Despite the intrinsic role of people in the creation and operation of digital infrastructures, public interest focus is often lacking in the intended impact and governance of these systems in a manner that open nodes for people to engage with the design and regulation of the infrastructures.
5. The adoption of an infrastructure framing can open pathways for improved institutional and community driven action around the wide-ranging and interlinked impacts of technology on people, society, markets, and the environment.



Part II

- Arriving at digital infrastructures
- **Assessing harms and opportunities**
- Building a governance typology
- Applying the governance typology





Having identified the digital infrastructures, this section explores the various harms and opportunities associated with each infrastructure

We found 5 common buckets



National Security and Sovereignty

Risks posed to the nation's autonomy and security by vulnerabilities in digital infrastructure, including threats of cyberattacks, espionage, or foreign regulatory influence.



Access and Participation

Issues surrounding equitable entry to and engagement with digital resources, encompassing both material access and barriers to meaningful involvement in the digital sphere.



Sustainability and Resilience

Challenges related to the ability of digital infrastructure to endure and adapt in the face of evolving demands, environmental pressures, and natural/artificial systemic shocks.



Competition and Innovation

Risks associated with monopolistic practices, stifling of market diversity, and hindrance to technological advancement within the digital landscape.

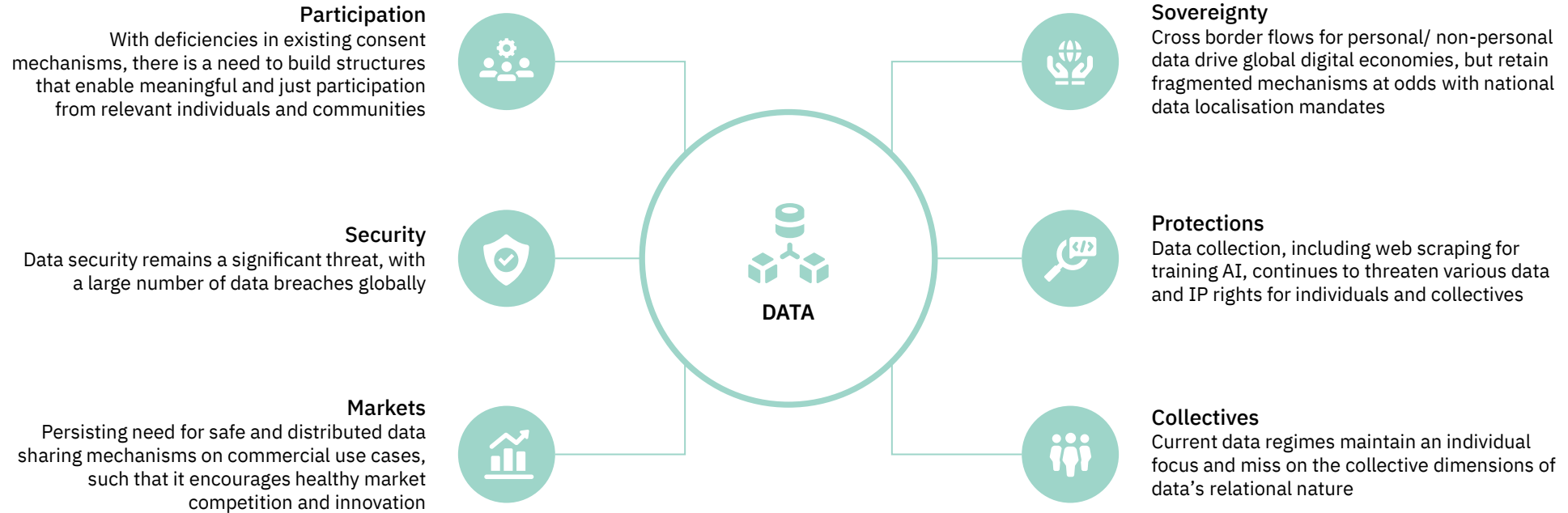


Individual Protections and Collective Rights

Concerns regarding the safeguards to individual economic interests and personal autonomy, as well as the preservation of communal interests in the digital realm.

What are the harms and opportunities associated with data?

Prevalent data governance approaches focus on persisting concerns of individual data protection and regulation of data sharing but fail to adequately account for collectives, participation, and cohesive markets.



- Bangladesh's recent draft for DPA pushes for data localisation, and has been criticised for enabling surveillance infrastructure
- The EU AI act attempts to protect artists' IP rights with opt-out mechanisms and recognition of copyright, but concerns remain on its meaningful implementation
- India's DPDPA and the EU GDPR focus on individual protection but remain lacking in accounting for collective interests

What are the harms and opportunities associated with cloud?

Cloud governance measures are oriented to account for concerns relating to system security and, increasingly, market concentration, but fail to adequately capture risks around sustainability and resilience.

Competition
60% of the market share on cloud services is held by AWS, Google and Azure - this has implications for market health for a highly dependent ecosystem



Sustainability
High computational costs on running a 'cloud' system results in large negative environmental impact



Security

Cloud faces heightened systemic risk as a “system of systems,” with multiple independent yet interconnected components that all rely on a robust larger network

Sovereignty

Various country systems are dependent on privately held cloud systems that raise questions on exercise of sovereignty



Resilience

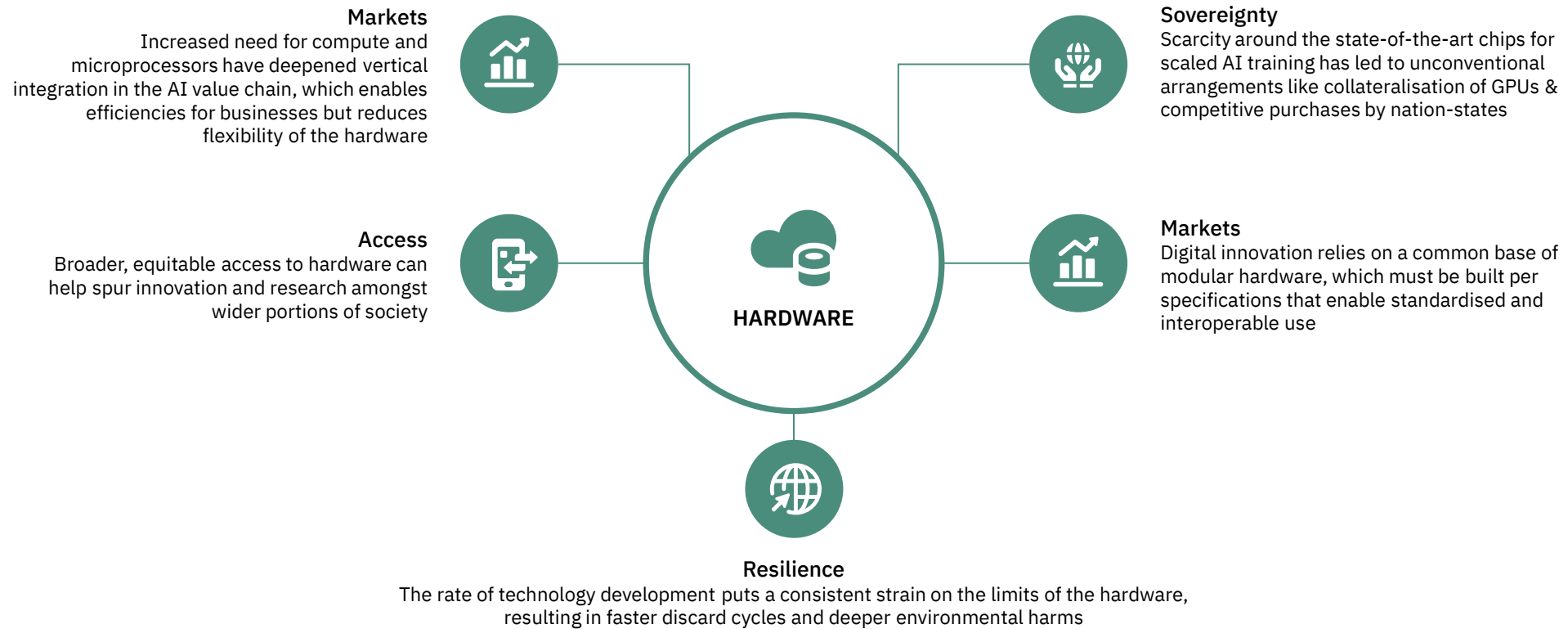
Globally placed data centres for cloud storage present security and jurisdictional challenges around cloud sovereignty for countries and businesses alike



- With no explicit laws governing cloud computing in most jurisdictions, relevant regulations or executive initiatives tend to focus on optimising for data access, national security, and sharing (as in USA and India)
- Existing governance lays inadequate emphasis on the environmental impact of their operation, or sovereignty and market concentration related risks beyond contractual terms

What are the harms and opportunities associated with hardware?

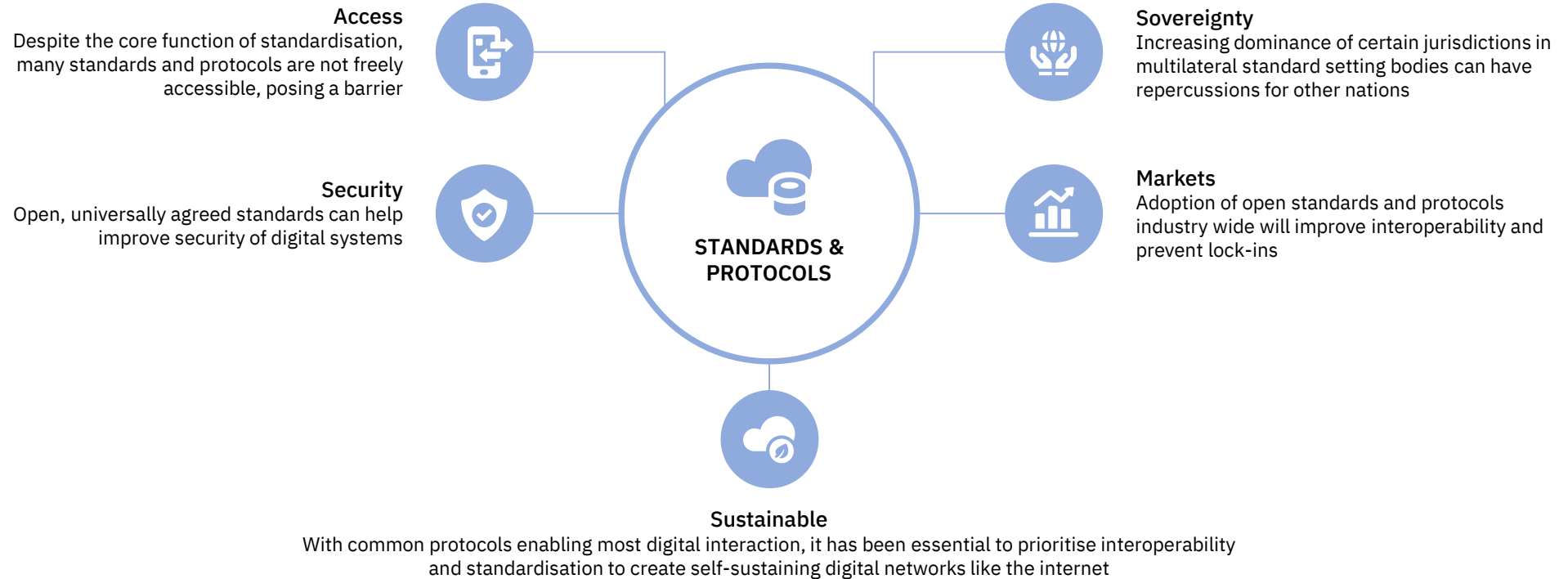
While some countries regulate digital hardware within environmental and market contexts, there is increasing attention brought to the need for regulating hardware from a security and access perspective.



As countries release regulations for emerging risks from AI systems, only few (such as the EU AI Act and a Bill in the USA) have few explicitly call for environmental sustainability but there is persisting need for prioritising sustainable practices and standardised reporting mechanisms

What are the harms and opportunities associated with standards & protocols?

Prevalent governance frameworks for standards and protocols are lacking in accounting for the harms of vertically integrated, concentrated markets that are increasingly common in AI hardware and models.

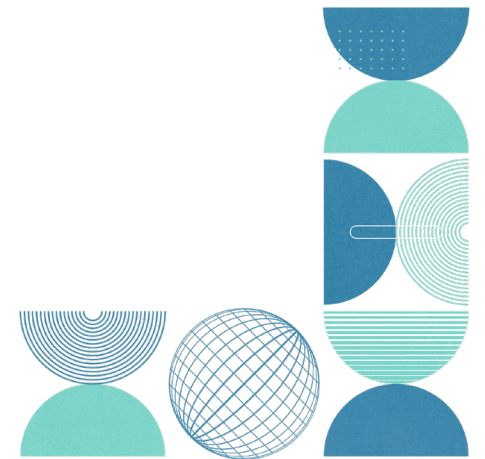


- Standard defining organisations typically operate at an international level, with minimal regulation on the local level
- Available standards often have a high cost of access, and in certain cases standards are determined by private companies and proprietary



Key takeaways

1. Viewing digital systems along the infrastructure framing enables the identification of various harms and opportunities that are either missed or inadequately considered in existing governance contexts. These are:
 - (i) National Security and Sovereignty
 - (ii) Access and Participation
 - (iii) Sustainability and Resilience
 - (iv) Competition and Innovation
 - (v) Individual Protections and Collective Rights
2. The harms or opportunities that surface for different digital infrastructures are varied and wide-ranging, making it essential to unpack the direct and indirect externalities they give rise to. As a result, a set of comprehensive and contextually appropriate strategies should be adopted within institutional or community efforts on governance.



Part III

- Arriving at digital infrastructures
- Assessing harms and opportunities
- **Building a governance typology**
- Applying the governance typology





Having identified the core buckets of harms and opportunities for digital infrastructures, we look at how these harms and opportunities have been governed for in traditional infrastructures

Each major bucket of harms and opportunities has been mapped to a traditional infrastructure sector that it finds close resonance to placed within diverse jurisdictional contexts



Sustainability and Resilience

Renewable Energy | India



Market, Competition and Innovation

Telecommunications and Media | USA



Individual Protections and Collective Rights

Forest and Agriculture | Brazil



National Security and Sovereignty

Financial Services | United Kingdom



Access and Participation

Healthcare | Sweden

Collating the executive, legislative, and judicial action on these core harms and opportunities within prevailing national frameworks introduces pathways for institutional strategies on infrastructure governance that must be adapted for appropriate digital contexts



EXECUTIVE

Unpacking infrastructure governance for sustainability and resilience

Renewable Energy | India | Executive Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>HYDROGEN PURCHASE OBLIGATIONS (HPO)</u> <i>Executive order</i>	<u>R&D ROADMAP FOR GREEN, HYDROGEN ECOSYSTEM</u> <i>Strategy document</i>	<u>PRODUCT LINKED INCENTIVE SCHEME FOR SOLAR PV</u> <i>Executive scheme</i>
Substantive function of the Instrument	Mandates industries like refining and fertiliser to use green hydrogen as a portion of their overall consumption of fossil fuel-based grey hydrogen	Recommends R&D actions for each part of the green hydrogen value chain, and provides guidance on development of the ecosystem required to commercialise green hydrogen production and utilisation	Issues tenders for setting up manufacturing capacities for High Efficiency Solar PV Modules in the favour of successful bidders, to reduce reliance on imports
Core issues addressed	Ensures compulsory action towards incorporation of environmentally sustainable practices to reduce long-term harm	Boosts indigenous production creates domestic competition and innovation towards sustainable network operations	Prevents centralisation of control and solutioning to one part of the system and enables overall ecosystem resilience

The executive actively creates appropriate push and pulls to incentivise sustainable domestic production and utilisation of resources



Unpacking infrastructure governance for sustainability and resilience

Renewable Energy | India | Legislative Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>THE ELECTRICITY (AMENDMENT) BILL, 2022</u>	<u>ELECTRICITY (PROMOTING RENEWABLE ENERGY THROUGH GREEN ENERGY OPEN ACCESS) RULES, 2022</u>	<u>DIRECTIONS UNDER SECTION 11 OF THE ELECTRICITY ACT, 2003</u>
Substantive function of the Instrument	Introduced a cross-subsidy balancing fund for cases of issuance of a licence to more than one distribution licensee in an area of supply, where surplus is used for deficits in cross-subsidy in another area of supply	Addressed issues that have hindered the growth of open access, such as reduction in transaction limits and appropriate surcharges, so that consumers may access renewable energy power more easily	Alleviates the burden on domestic coal through operationalisation of Imported Coal-Based Plants at full capacity via provisions for interim tariff.
Core issues addressed	Prevents centralisation of control and solutioning to one part of the system and enables overall ecosystem resilience	Actively creates an environment of accessible avenues for incorporation of desired practices on environmental sustainability	Regulates for resilience of domestic markets by need-based measures and plugging global support with sustainable strategies

The legislative adopts a liberal and free-flowing approach to regulate the sharing and utilisation of renewable energy and associated resources



Unpacking infrastructure governance for sustainability and resilience

Renewable Energy | India | Judicial Mechanisms

INSTRUMENT TITLE & CATEGORY	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><u>GMR WARORA ENERGY LIMITED V. CERC AND ORS</u> <i>Supreme Court of India</i></p> </div> <div style="text-align: center;"> <p><u>DOLLAR INDUSTRIES LTD. V. TN GENERATION & DISTRIBUTION LTD.</u> <i>(TNERC*)</i></p> </div> <div style="text-align: center;"> <p><u>ARINSUN CLEAN ENERGY PRIVATE LTD. V. CERC & ORS.</u> <i>APTEL</i></p> </div> </div>		
Substantive function of the Instrument	Identifies all additional charges on account of orders, directions, etc., issued after the cut-off date, as “Change in Law” events that have to be accrued from the date of issued by the instrumentalities of state	Recognises Electricity Storage Systems as part of the power system, and observed the need to encourage the establishment of other such projects to provide benefits for both the generators and distribution licensees	Recognised the financial burdens of entering into power purchase agreements, and categorically allowed renewable energy generators to avail the Deviation Settlement Mechanism instead (lower burdens)
Core issues addressed	Adopts interpretations that enable predictability and resilience for the ecosystem in transitory phases to maintain broader stability	Encourages upliftment for the entire value chain to prevent centralisation of opportunities and enable ecosystem coordination and mutual benefit	Actively creates an environment of accessible avenues for incorporation of desired practices on environmental sustainability

Within the same modality, the judiciary offers dispute resolution with multiple levels for issue consideration and appeals

Unpacking infrastructure governance for sustainability and resilience



Sustainability and Resilience (learning from governance of renewable energy infrastructure in India)

MECHANISM	EXECUTIVE	LEGISLATIVE	JUDICIAL
Governance Instruments	<ul style="list-style-type: none"> Order - Hydrogen Purchase Obligations Strategy - R&D Roadmap for Green, Hydrogen Ecosystem, Scheme - Product Linked Incentive Scheme for Solar PV 	<ul style="list-style-type: none"> Act - The Electricity (Amendment) Bill, 2022 Rules - Electricity (PREGEOA) Rules, 2022 Directions - Under section 11 of the Electricity Act, 2003 	<ul style="list-style-type: none"> EGMR Warora Energy Limited v. CERC and Ors M/s Dollar Industries Ltd. v. TN Generation & Distribution Ltd. Arinsun Clean Energy Private Limited v. CERC and Ors
Substantive Nature of the Instrument	<ul style="list-style-type: none"> Boosts indigenous production for domestic competition Ensures compulsory action towards sustainable practices Prevents centralisation of control and solutioning 	<ul style="list-style-type: none"> Resilience of domestic markets by need-based measures Prevents centralisation of control and solutioning Actively creates accessible avenues for environmental sustainability 	<ul style="list-style-type: none"> Enable predictability and resilience in transitory phases Prevent centralisation of opportunities and enable overall ecosystem coordination Creates accessible avenues environmental sustainability

Unpacking infrastructure governance for competition and innovation

Telecommunications and Media | USA | Executive Mechanisms

INSTRUMENT TITLE & CATEGORY			
Substantive function of the Instrument	<u>EXECUTIVE ORDER ON PROMOTING COMPETITION IN THE AMERICAN ECONOMY</u>	<u>FEDERAL COMMUNICATIONS COMMISSION'S COMPANION ORDERS ON ENTRY TO US MARKETS</u>	<u>STATE PUBLIC UTILITY COMMISSION AS A SPECIALISED BODY</u>
Core issues addressed	Encourages the FCC to prohibit exclusivity arrangements between ISPs and landlords, to improve rules for auctioning spectrum, and to increase the transparency of broadband pricing	Implements USA's pro-competitive commitments under the General Agreement on Trade in Services (WTO). Provide a framework on entry into the U.S. market by foreign entities and enable national treatment for a range of telecom service	State PUCs review mergers of intra-state telecom providers and approve interconnection agreements between carriers and operators. These shall be made public and account for the right of other operators to 'opt in' to any current agreement
	Prevents vertical integration and promotes competition within the market by way of access and information symmetries	Reduces barriers to entry to the market and opens the developed domestic space to global competition and participation from entities with fewer resources	Interconnection agreements and pro-competitive merger control encourages interoperability and democratizes access for innovation

Executive action is heavily pro-competition for domestic and global markets, but contends with concerns over participation from Chinese Companies and risks of data privacy related breaches



Unpacking infrastructure governance for sustainability and resilience

Telecom | USA | Legislative Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>TELECOMMUNICATIONS ACT, 1966</u>	<u>NOTICE OF PROPOSED RULEMAKING ON NET NEUTRALITY</u>	<u>FCC DECLARATORY RULING</u>
Substantive function of the Instrument	Mandates Incumbent Local Exchange Carriers (ILECs) to provide interconnection to other operators at any technically feasible point on their network – these go together with FCC’s initiatives on streamlining siting infrastructure	Proposed to categorize ISPs under Tier I services, thereby enabling the FCC to impose net neutrality mandates – these ensure that ISPs may not intentionally block, slow down, or charge money for specific online content	Encourages state and local experimentation on improvements to Competitive Broadband Access to Multiple Tenant Environments via measures like prohibition on exclusivity arrangements, and transparency obligations
Core issues addressed	Encourages interoperability and democratizes access towards a healthy market for competition and innovation	Reduces barriers to entry to the market and prioritises a fair market space for participation from entities with fewer resources	Prevents vertical integration and promotes competition within the market by way of access and information symmetries

Net Neutrality Rules have seen constant friction in the USA and remain a point of contention between different presidential administrations and the Court and FCC

Unpacking infrastructure governance for competition and innovation

Telecom | USA | Judicial Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>US WEST COMMUNICATIONS, INC. V. TCG OREGON</u> <i>Federal district court</i>	<u>UNITED STATES V. AT&T, CIVIL NO. 74-1698</u> <i>Consent Decree</i>	<u>MOZILLA V. FCC (U.S.)</u> <i>Appellate Court, District of Columbia</i>
Substantive function of the Instrument	Reviewed state PUC decision on interconnection and observed that, when appropriate the PUC has broad discretion to establish performance standards to spur service improvements	Provided that AT&T relinquish control of the Bell Operating Companies, thereby splitting their monopoly into separate companies for long-distance and local services, with no direct supply of equipment from the AT&T subsidiaries	In the context of the 2015 FCC classification of broadband Internet access as “telecommunication service”, this case liberated broadband providers from onerous common carrier obligations and reclassified them as ‘information service’ providers
Core issues addressed	Interconnection agreements and pro-competitive merger control encourages interoperability and democratizes access for innovation	Prevents market concentration and vertical integration to promote competition and innovation	Reduces barriers to entry to the market and enables participation from entities with fewer resources

The breaking of AT&T is seen as a watershed moment for US Telecommunications sector that led to significantly improved competition in the space

Unpacking infrastructure governance for competition and Innovation



Competition (learning from governance of telecommunications and media infrastructure in the USA)

MECHANISM	EXECUTIVE	LEGISLATIVE	JUDICIAL
Governance Instruments	<ul style="list-style-type: none"> Executive Order: Promoting Competition in the American Economy Companion orders on entry to US Markets State Public Utility Commission as a specialised body 	<ul style="list-style-type: none"> Communications Decency Act Notice of Proposed Rulemaking on Net Neutrality FCC Declaratory Ruling 	<ul style="list-style-type: none"> US West Comms, Inc. v. TCG OREGON - District Court United States v. AT&T, Civil No. 74-1698 - Consent Decree Mozilla v. FCC (U.S.) Appellate Court, District of Columbia
Substantive Nature of the Instrument	<ul style="list-style-type: none"> Prevents vertical integration and fosters access and information symmetries Opens the developed domestic space to global competition encourages interoperability and democratises access for innovation 	<ul style="list-style-type: none"> Encourages interoperability and democratises access for innovation Prevents market concentration and vertical integration Reduces barriers to entry and enables participation 	<ul style="list-style-type: none"> Encourages interoperability and democratises access Prioritises a fair market space for participation from entities with fewer resources Prevents vertical integration and fosters access and information symmetries

Unpacking infrastructure governance for individual protections and collective rights

Forest and Agriculture | Brazil | Executive Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>NATIONAL POLICY FOR TERRITORIAL AND ENVIRONMENTAL MANAGEMENT IN INDIGENOUS LANDS (PNGATI)</u>	<u>RURAL ENVIRONMENTAL REGISTRY (CADASTRO AMBIENTAL RURAL – CAR)</u>	<u>THE ECOLOGICAL-ECONOMIC ZONING COMMISSION</u>
Substantive function of the Instrument	Defines the policy framework as per which to guarantee, promote and protect indigenous lands, ensuring integrity of heritage, participation, and improvement of quality of life while respecting their socio-cultural autonomy	Under the forest code, provides georeferenced data on Legal Forest Reserve within private properties and mandates CAR registration for authorization to remove native vegetation, and to access landowner benefits or rural credit	Uses technical analysis to stratify regions into full protection to intensive agriculture areas, and incorporates additional social and economic criteria with a participatory process including indigenous communities, as well as small farmers and industry
Core issues addressed	Acknowledges the individual as well as collective interests of indigenous populations in their territories	Enables the protection of native lands held by private parties and balances the individual and group property rights	Adopts a participatory mechanisms on the identification, classification, and planning for zone based land used

The Forest code was created under the powerful influence of the bancada ruralista agribusiness lobby and is criticised by environmentalists



Unpacking infrastructure governance for individual protections and collective rights

Forest and Agriculture | Brazil | Legislative Mechanisms

INSTRUMENT TITLE & CATEGORY	ARTICLE 231 OF THE FEDERAL CONSTITUTION	THE BIODIVERSITY LAW 13123/2015	GREEN RURAL PRODUCT CERTIFICATE (CPR-VERDE) Decree No. 10.828/2021
Substantive function of the Instrument	Recognizes the original rights of indigenous peoples over the lands they traditionally occupy, with the Union responsible for delimiting, protecting and ensuring respect for all their property	The legislation governs access to genetic resources and associated traditional knowledge, and provides a legal framework to ensure equitable benefit-sharing arising from such access	The CPR-Verde is a green agribusiness bond for benefit sharing with farmers, allowing them to sell environmental preservation products as carbon credits, for new income streams and enhancing environmental protection
Core issues addressed	Acknowledges the individual as well as collective interests of indigenous populations in their territories	Distributes the benefits arising from resources affected by multiple parties and accounts for the collective dimension of traditional knowledge	Enables participation from farmers in the commercial context by incorporating mechanisms for benefit sharing and new income streams

Critiques of Brazil's Agricultural Policy believe that it indirectly subsidizes foreign investments to the detriment of smallholders and local agribusiness, and the issue remains controversial in the region



JUDICIAL

Unpacking infrastructure governance for individual protections and collective rights

Forest and Agriculture | Brazil | Judicial Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>THE MARCO TEMPORAL TRIAL</u>	<u>FISHERIES CASE</u>	<u>PSB ET AL. V. BRAZIL (ON CLIMATE FUND)</u>
Substantive function of the Instrument	Rejected the Marco Temporal – a legal argument that translates as a “Time Limit” on Indigenous peoples’ land rights – stating that Indigenous peoples are only entitled to lands they physically occupied during the 1988 signing of the Constitution	Awarded the traditional community a concession to manage visitor facilities inside a state conservation unit, and ruled against state government’s partnership with private companies in conservation units on overlapping traditional territories	Recognised the Paris Agreement as a human rights treaty, and ordered the state to properly reactivate the <u>climate fund</u> , prepare annual plans for allocating resources and disburse funds, to protect the constitutional right to a healthy environment
Core issues addressed	Acknowledges the individual as well as collective interests of indigenous populations in their territories	Enables participation from traditional communities in the commercial context and protects the rights of indigenous populations against private companies	Distributes the benefits arising from resources affected by multiple parties and accounts for the individual and collective dimension of rights

Marco Temporal Legal Thesis brought to court for consideration again after a seemingly definite victory in 2023

Unpacking infrastructure governance for individual protections and collective rights



Individual protections and collective rights (learning from governance of Forest and Agribusiness Infrastructure in Brazil)

MECHANISM			
	EXECUTIVE	LEGISLATIVE	JUDICIAL
<p>Governance Instruments</p>	<ul style="list-style-type: none"> National Policy for Territorial & Environmental Management in Indigenous Lands Rural Environmental Registry Environmental Regularization Program 	<ul style="list-style-type: none"> Article 231 of the Federal Constitution The Biodiversity Law 13123/2015 Green Rural Product Certificate (<i>CPR-Verde</i>) Decree No. 10.828/2021 	<ul style="list-style-type: none"> The Marco Temporal Trial – Federal Supreme Court Fisheries Case – Federal Supreme Court PSB et al. v. Brazil (on Climate Fund)
<p>Substantive Nature of the Instrument</p>	<ul style="list-style-type: none"> Prioritises the individual as well as collective interests of indigenous populations Protects native lands held by private parties and balances the individual and group property rights Adopts a participatory mechanisms for zone based land used 	<ul style="list-style-type: none"> Acknowledges the individual as well as collective interests of indigenous populations Distributes the benefits arising from resources affected by multiple parties Enables participation from farmers in the commercial context 	<ul style="list-style-type: none"> Protects the individual as well as collective interests of indigenous groups Enables participation from traditional communities Distributes the benefits arising from multiparty resources

Unpacking infrastructure governance for access and participation

Healthcare | Sweden | Legislative Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>SOCIAL SERVICES ACT, 2001</u>	<u>PATIENTS ACT, 2015</u>	<u>SWEDISH HEALTH AND MEDICAL SERVICES ACT, 1982</u>
Substantive function of the Instrument	Promotes home care over institutionalized care for all adults in later stages of life, and provides reimbursement policies for informal caregivers, either directly (relative-care benefits) or by employing the informal caregiver (relative-care employment)	Clarifies and expands providers' responsibilities in conveying information to patients, guarantees patients the right to a second opinion, and strengthens the wait-time guarantee by clarifying patients' right to seek care in any region	Provides automatic universal coverage to legal residents, emergency coverage to patients from specified countries, the right to healthcare to asylum-seeking and undocumented children and right to care that cannot be deferred to adult asylum-seekers
Core issues addressed	Promoting bottom-up structures for the healthcare industry by addressing access related concerns and enabling systemic mechanisms for support	Adopts transparency with an open data strategy to enable social equity, and empower users with agency	Provides equitable access, distributes opportunity, and prioritises meaningful access in digital health contexts

Home care has been systemised by entities like the Swedish Association of Midwives who work to promote women's sexual and reproductive health and improve reproductive and perinatal care

Unpacking infrastructure governance for competition and innovation

Healthcare | Sweden | Judicial Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>SWEDISH TAX AGENCY V. SÖDERBERG LÄKEKONST AB</u>	<u>SWEDISH SOCIAL INSURANCE AGENCY V. AA</u>	<u>AA V. THE SOCIAL WELFARE COMMITTEE IN KALIX MUNICIPALITY</u>
Substantive function of the Instrument	The Court affirmed that medical care services are exempt from value added tax, and it would be irrelevant whether the services are performed by the company's own employees or externally hired personnel, equipment or premises	Ruling on temporary parental benefit for care of a sick child, the court held that remotely placed employees from another country shall be covered by the Swedish work-based social insurance, regardless of residence or payment of taxes	A minor, who puts their health to a tangible risk of harm by engaging in socially degrading behaviour shall be provided compulsory care in accordance with the Care of Young Persons Act as an intrusive measure, which shall be interpreted on a subjective basis
Core issues addressed	Promoting bottom-up support for the healthcare industry by enabling systemic mechanisms for support to reduce cost related barriers	Provides equitable meaningful access that accounts for the increased mobility in labour markets post digitisation and globalisation	Enable participation against persisting deficiencies for exercise of agency and need for protections

The court plays an essential role in interpreting welfare regulations for the benefit of its intended beneficiaries

Unpacking infrastructure governance for National Security and Sovereignty

Financial Sector | United Kingdom | Executive Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>ECONOMIC CRIME PLAN</u> <u>JOINT EU-UK FINANCIAL REGULATORY FORUM</u> <u>AUSTRALIA-UK FTA - FINANCIAL SERVICES REGULATORY COOPERATION</u>		
Substantive function of the Instrument	<p>A collective strategy to ensure that the UK cannot be abused for economic crime, by harnessing the capabilities, resources, and experience of both public and private sectors for law enforcement investigations, arrests, and seizure or restraint of illicit funds</p>	<p>Coordinates and publishes annual performance comparisons for healthcare along an extensive list of indicators – statistics on patient experience and wait times in primary care are also made available online to help guide people in their choice of provider</p>	<p>Acts as the central advisory and supervisory agency to follow up and evaluate the services provided, and set up evidence-based clinical guidelines and performance indicators, which are sometimes accompanied by targeted grants</p>
Core issues addressed	<p>Enables a collective strategy for protection across public and private entities to overcome complex jurisdictional/enforcement related obstacles</p>	<p>Enables co-operation on global flows of information, resources, and knowledge for shared reliance on systems of protection and innovation</p>	<p>Promotes consistency and cohesion in regulatory models across jurisdictions for services with global value and supply chains</p>

The executive adopted strategies to ensure that post-Brexit economic crime in the UK remains contained despite flux

Unpacking infrastructure governance for National Security and Sovereignty

Financial Sector | United Kingdom | Legislative Mechanisms

INSTRUMENT TITLE & CATEGORY	<u>FINANCIAL SERVICES AND MARKETS ACT 2000</u>	<u>NATIONAL SECURITY AND INVESTMENT ACT 2021</u>	<u>SANCTIONS AND ANTI-MONEY LAUNDERING ACT 2018</u>
Substantive function of the Instrument	Under part VI of the act, the Financial Conduct Authority has responsibility for admission of securities to the Official List, with new consultations considering a precautionary power to block listings that may risk being used against UKs national security interests	Mandatory requirements on notice to the Investment Security Unit on transactions involving an entity or asset in 17 specified sectors involving mergers and acquisitions, minority investments, and deals around voting rights or assets, including land and IP	Post-Brexit UK Act to comply with international AML obligations, and establish an independent sanctions framework on security and prevention of terrorism by control on flows of funds, economic resources, or financial services in and out of the country
Core issues addressed	Enables a collective strategy for protection across public and private entities to overcome complex jurisdictional/enforcement related obstacles	Enables transparency and oversight to enable security while maintaining reliability and accountability	Promotes consistency and cohesion in regulatory models across jurisdictions for services with global value and supply chains

The legislature provides detailed regulations establishing granular control on the flow of funds, economic resources, or financial services in and out of the country



Unpacking infrastructure governance for National Security and Sovereignty

Financial Sector | United Kingdom | Judicial Mechanisms

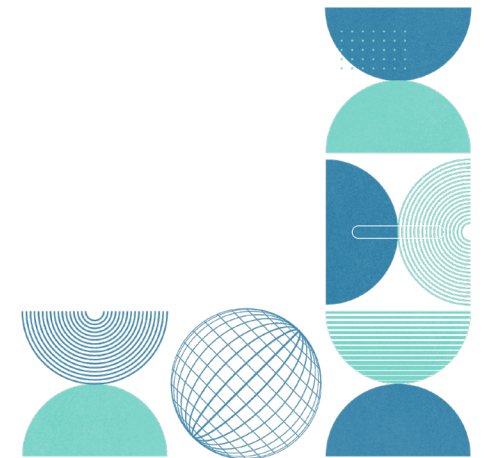
INSTRUMENT TITLE & CATEGORY	<u>REGINA (THE FINANCIAL CONDUCT AUTHORITY) V NATIONAL WESTMINSTER BANK PLC</u>	<u>LLC SYNESIS V SECRETARY OF STATE FOR FOREIGN, COMMONWEALTH AND DEVELOPMENT AFFAIRS</u>	<u>BUSINESS, ENERGY AND INDUSTRIAL STRATEGY DPT ORDER TO NEXPERIA</u>
Substantive function of the Instrument	Ordered the first criminal conviction of a bank under the Money Laundering Regulations 2007 for failing to comply with requirements on monitoring any threats of money laundering and terrorist financing on a risk-sensitive basis	Rules for the first time under Section 38 of SAMLA, to sanction de-listing for LLC Synesis on the basis that it provided the Belarusian Ministry of Internal Affairs with the capability to track civil society and pro-democracy activists	Ordered Nexperia to unwind its acquisition of one of UK's largest semiconductor over concerns that the transaction could risk national security and facilitate access to technological know-how & undermine UK's capabilities
Core issues addressed	Enables transparency and oversight to enable security while maintaining reliability and accountability	Ensures protection in vertically integrated, cross jurisdictional service provisioning to combat risks to national security	Ensures protection in vertically integrated, cross jurisdictional service provisioning to combat risks to national security

The judiciary keeps a check on non-compliant activities within the national security contexts and enforces bans on prohibited or risk generating activities



Key takeaways

1. A review of the strategies adopted for the governance of traditional infrastructures shows that comprehensive frameworks rely on a combination of executive, legislative, as well as judicial action to combat broad and context specific concerns.
2. Governance of infrastructures is seen to be founded on the frictions between the push for developments and their adoption within society. The effectiveness of the mechanisms employed in such a context also becomes a process of continuous negotiation between the state and the needs of the society.
3. To that end, while executive action performs a reflexive quick response function, legislative action is a more considered approach on building the right base, while the judiciary keeps check on the implementation and refines frameworks post enactment.
4. These strategies are used to address the same buckets of harms that have been identified for digital infrastructures and can be adapted to opens pathways for addressing missing or inadequately considered concerns in the digital context, where their effectiveness would depend on the direction of developments and the public's understanding of their impacts.



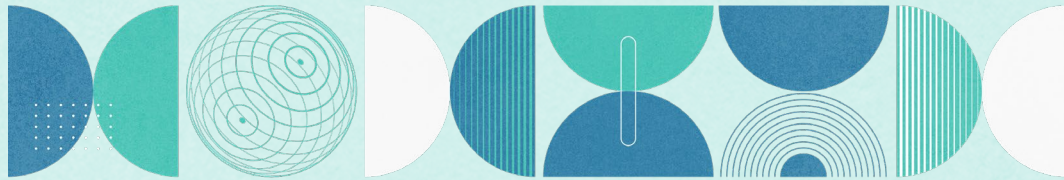
Part IV

- Arriving at digital infrastructures
- Assessing harms and opportunities
- Building a governance typology
- **Applying the governance typology**



Applying the typology of governance to digital infrastructures

Abstracting and collating insights on the various strategies and instruments of governance employed for specific harms in traditional infrastructures, we conduct a preliminary mapping for their application to digital infrastructure contexts

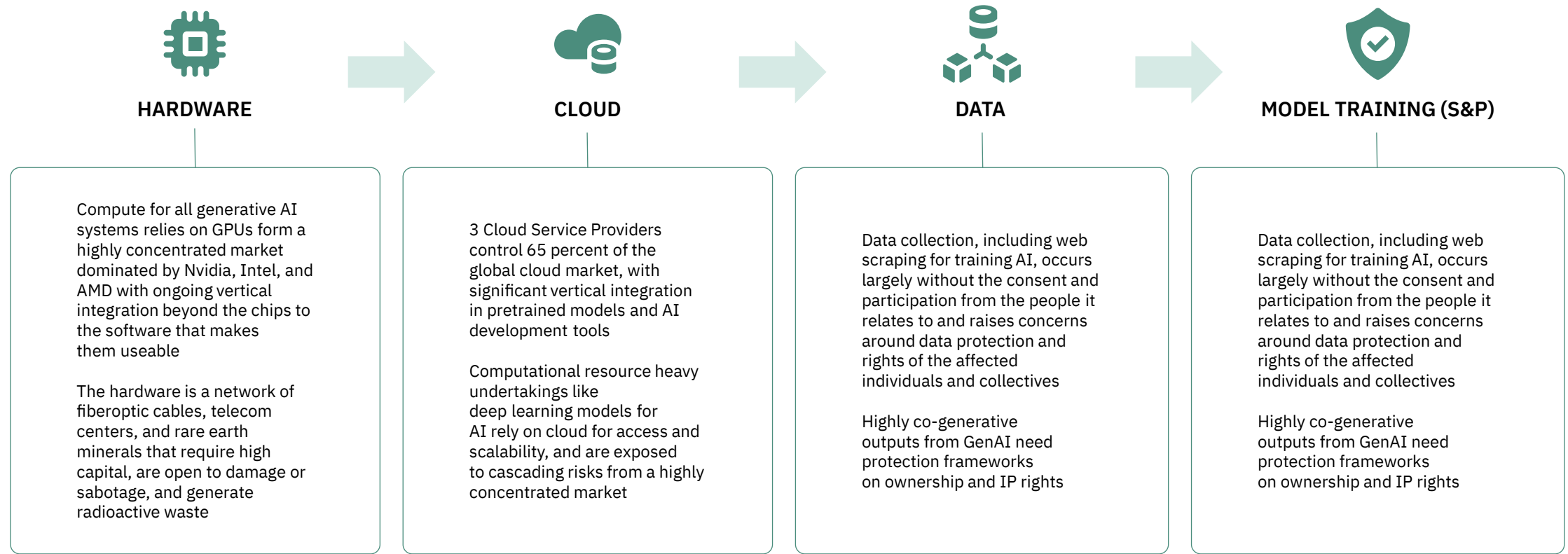


	CLOUD	DATA	HARDWARE	PROTOCOLS
Access and Participation		Enable mechanisms beyond consent for participation by systems for transparency and individual agency as in Sweden's Patients Act and <u>e-health strategy</u>	Improve access to high-cost hardware in academic or small industry contexts by enabling monitoring & grants mechanisms as under Sweden's <u>Board of Health and Welfare</u>	Improve access to standards & information systems via mandates on participation & universal coverage as under Sweden's <u>Patients Act & Swedish Health Act</u>
Market, Competition & Innovation	Prevent vertical integration & promote innovation via judicial actions that restrict harmful monopolistic practices or ease barriers to entry as under <u>US v AT&T</u> and <u>Mozilla v FCC</u>	Provide easier access to data, prevent data hoarding and enable innovation through legislations democratizing access and encouraging interoperability such as <u>USA's Telecom Act, 1996</u>	Enable local innovation and prevent specifications on product that fosters exclusivity in use cases via rules against vertical integration and on interoperability as with <u>US FCC Declaratory Ruling</u> and <u>Net Neutrality Rules</u>	Enable easier access & promote innovation through legislations democratizing access & interoperability such as <u>USA's Telecom Act & Net Neutrality Rules</u>
Sustainability & Resilience	Promote sustainable practices & create avenues for their adoption with mandates on sustainable practices as in <u>India's HPO & Electricity Rules 2022</u>		Increase adoption of sustainable practices for longer life on electronic hardware with mandates on use and creation of sustainable practices as in <u>India's HPO & Electricity Rules 2022</u>	Build domestic resilience & self-sustaining networks with with need-based support from state as under India's <u>PV Solar Scheme & Electricity rules</u>

	CLOUD	DATA	HARDWARE	PROTOCOLS
National Security & Sovereignty	<p>Improve security in a global cloud context & provide boost to domestic capacities through action against threats from cross jurisdictional services and building domestic resilience as in UK's <u>LLC Synesis judgement</u> & <u>India's Electricity Act</u></p>	<p>Enable better flow of data globally and coordination with private sector for maintaining internal security by implementing executive initiatives like the <u>Joint EU-UK forum</u> & <u>Economic Crime Plan</u></p>	<p>Leverage private sector capacities for state benefit by implementing executive initiatives that promote global flow of resources like the <u>Joint EU-UK forum</u> & <u>Economic Crime Plan</u></p>	<p>Enable cohesive cross-country flows & a collective strategy on uniform standards for better security by engaging in multilateral set-ups and develop uniform standards for as with the <u>UK-AUS FTA</u> & <u>Economic Crime Plan</u></p>
Individual Protections & Collective Rights		<p>Account for the relational nature of data and enable protection for collective interests via the acknowledgement of collective rights and equitable benefit sharing from common resources as with Brazil's executive and judicial undertakings in <u>PSB et al. v. Brazil</u> and <u>PNGATI</u></p>		

The digital infrastructure framing resonates for structures around GenAI and present much of the harms identified

DISAGGREGATED AI VALUE CHAIN



Robust and reflexive governance requires a recognition of bottom-up mechanisms in addition to top-down ones

Beyond institutional action, these efforts create the necessary resistance to combat incumbent harms and realise societal good from emerging technologies



TECH-BASED SOLUTIONS

Nightshade

Turns any image into a data sample that is unsuitable for model training without consent, and will result in unpredictable behaviors

ABALOBI

Seeks to enable thriving, equitable, and sustainable small-scale fishing communities, through the joint development of Technology For Good

Glaze

Protects against style mimicry, by altering artwork such that it appears to be a different style to an AI model while appearing unchanged to the human eye

Jugalbandi

A FOSS platform that combines ChatGPT and Indian language translation models under the Bhashini mission to power conversational AI solutions



COMMUNITY INITIATIVES

Te Hiku Media's Data License

Spells out the ground rules for future collaborations on traditional knowledge based on the Māori principle of kaitiakitanga, or guardianship

Protests from Writers and against use of AI

Screenwriters and actors in Hollywood successfully protested for over 150 days to secure significant guardrails against uses of artificial intelligence in creative projects that could threaten their livelihoods

Community resistance against Stack Overflow

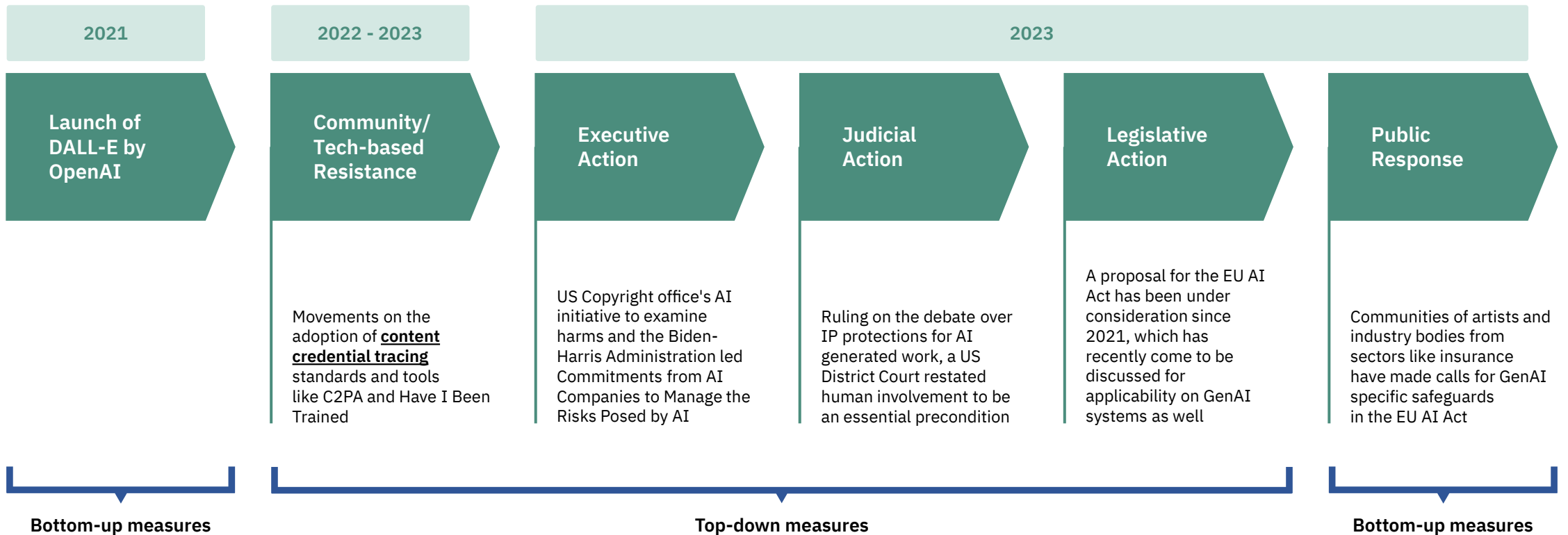
Users altered or deleted their posts and comments in protest, arguing that this steals the labor of the users who contributed to the platform

Resistance from writers & publishers in Singapore

A FOSS platform that combines ChatGPT and Indian language translation models under the Bhashini mission to power conversational AI solutions

Frictions in society's engagement with infrastructures disclose operational gaps and can result in improved design & governance

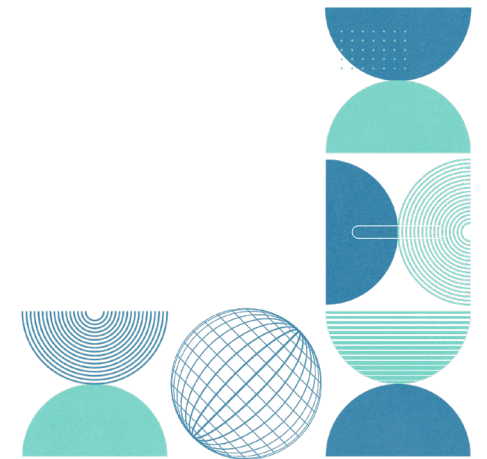
Emergence of generative AI technologies exemplifies such continuously developing governance for digital technologies, involving institutional, technological and community interventions





Key takeaways

1. The infrastructure framing allows for us to reframe the governance approach to break the concentration of power in private hands and distribute it towards the State and the public.
2. The mechanisms we have explored in the preceding sections are all top-down mechanism originating in the State. The operation of these mechanisms in a manner that is equitable and just necessarily requires good State actors invested in the interest of the public. However, this is far from reality and there is a need for transparency and accountability measures embedded with these mechanisms to hold bad State actors to account.
3. Building a robust governance approach to digital infrastructure requires that power is also vested in the public, empowering them to hold both private and State actors accountable to act in greater public interest. To this end, we must consider bottom-up governance mechanisms that can enable this. In the digital ecosystem we have already witnessed a number of technology and community initiatives.

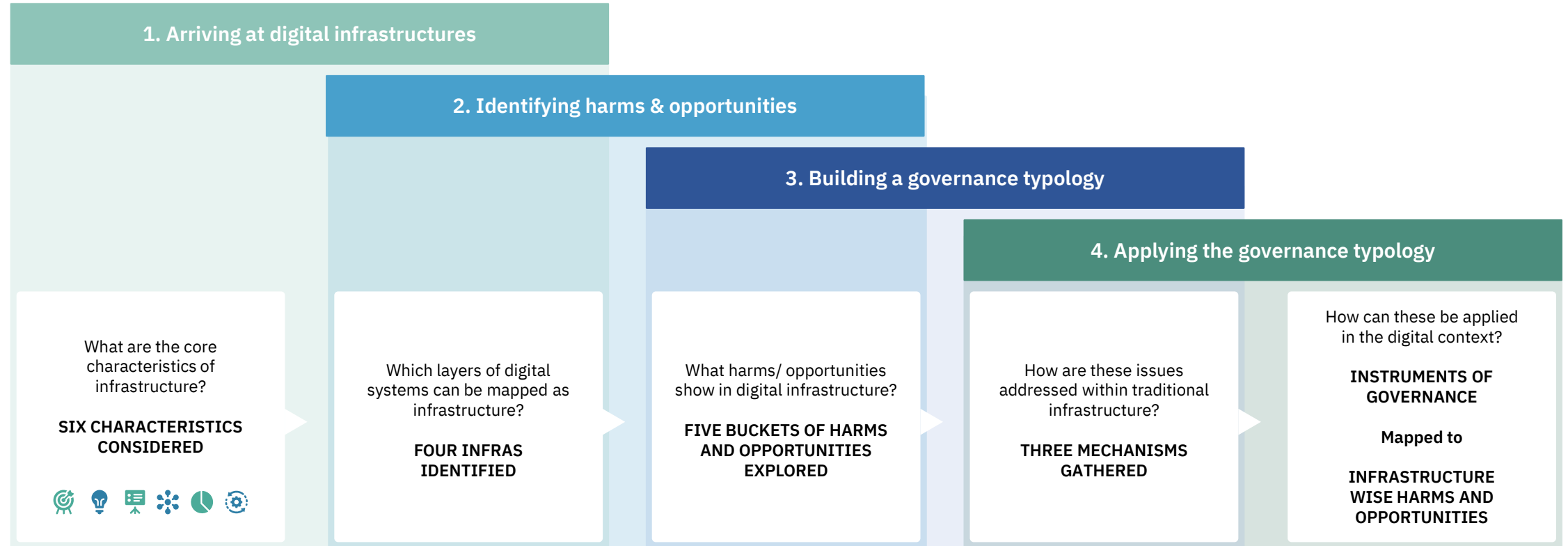




Summary Slides



This project aims to capture the full ambit of harms and opportunities within the digital ecosystem and apply the framing of 'infrastructure' to enable higher State responsibility in the regulation of these systems with improved structures on claim-making for the public



We believe that the adoption of an infrastructure framing can address the inadequate governance of the digital ecosystem by opening pathways for improved institutional and community driven action around the wide-ranging and interlinked impacts of technology on people, society, markets and the environment.

Part I: Arriving at digital infrastructures

Review of literature on the definitions of infrastructure presents six core characteristics



Necessary for
Functioning of
Systems



Address
Societal Needs



Facilitate
Further
Production



Dynamic/
Interrelated
Components



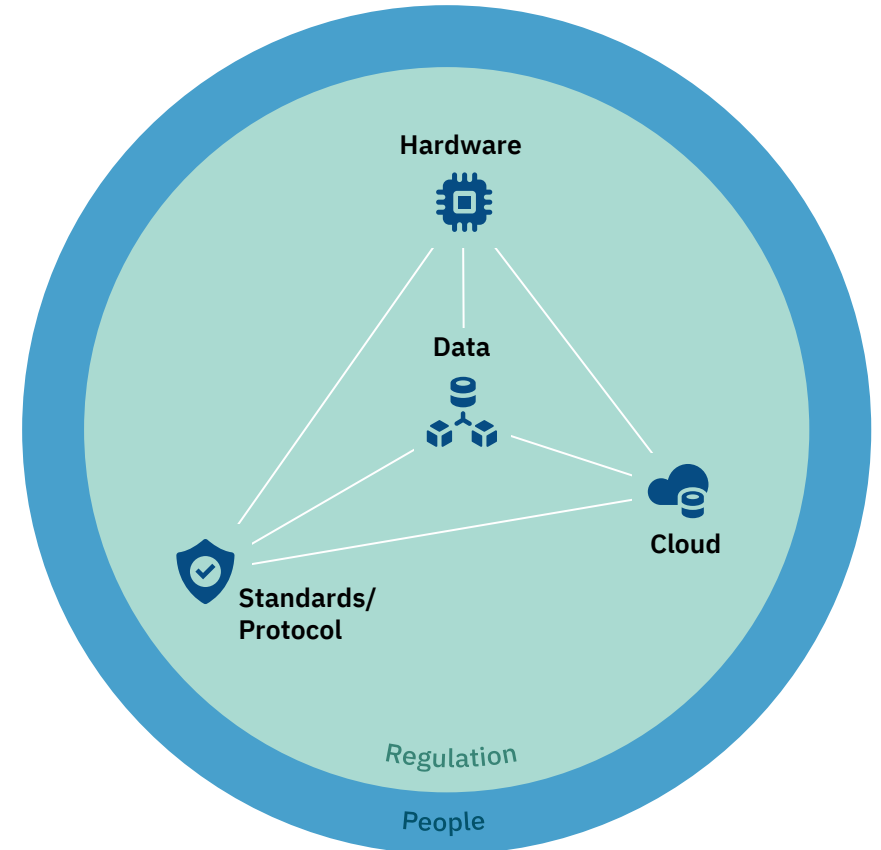
Imbibe
Modularity



Generate
Externalities

Mapping digital systems to these indicators affirms the applicability of the infrastructure framing in the digital context, and gives us 4 interconnected infrastructures for the digital space: **Data, Hardware, Cloud and Standards and Protocols.**

In such a framing, the role of people and regulation can be viewed as a horizontal layer that both affect the operation of infrastructures and are affected by their presence in significant ways.



Part II: Assessing harms and opportunities

Viewing digital systems along the infra framing enables the identification of various harms and opportunities that are either missed or inadequately considered in existing governance contexts.

Having identified the infrastructures for the digital ecosystem, we found 5 common buckets harms and opportunities associated with each infrastructure



National Security and Sovereignty

Risks posed to the nation's autonomy and security by vulnerabilities in digital infrastructure, including threats of cyberattacks, espionage, or foreign regulatory influence.



Access and Participation

Issues surrounding equitable entry to and engagement with digital resources, encompassing both material access and barriers to meaningful involvement in the digital sphere.



Sustainability and Resilience

Challenges related to the ability of digital infrastructure to endure and adapt in the face of evolving demands, environmental pressures, and natural/artificial systemic shocks.



Competition and Innovation

Risks associated with monopolistic practices, stifling of market diversity, and hindrance to technological advancement within the digital landscape.



Individual Protections and Collective Rights

Concerns regarding the safeguards to individual economic interests and personal autonomy, as well as the preservation of communal interests in the digital realm.

Part IV: Applying the governance typology

Abstracting and collating insights on the governance strategies employed within traditional infrastructures, we conduct a preliminary mapping for the application of specific institutional actions for digital infrastructure contexts.



INSTITUTIONAL ACTION

- Promote sustainable practices and create avenues for adoption as with the Mandates on use and creation of sustainable practices as in India's Hydrogen Purchase Obligations and Electricity Rules 2022.
- Enable better flow of data globally and coordination with private sector for maintaining internal security as with executive initiatives like the **Joint EU-UK forum** and **Economic Crime Plan**.

The governance mechanisms investigated are top-down State-led mechanisms that rely on certain prerequisites for appropriate functioning. Adequate governance necessitates bottom-up community efforts that are a pathway for reflexive community action. The digital space has already witnessed examples of this.



COMMUNITY INITIATIVES

- **Writers Protests against use of AI**
Artists in Hollywood successfully protested for over 150 days to secure significant guardrails against uses of AI in creative projects where it threatens their livelihoods.
- **Nightshade**
Turns any image into a data sample that is unsuitable for model training without consent, and will result in unpredictable behaviors.

We believe that such an application of the infrastructure framing to the digital space allows for us to reframe the governance approach to break the concentration of power in private hands and distribute it towards the State and the public.