LNDS

Building Privacy-Preserving AI in a Regulated Landscape

Aligning Luxembourg AI Ambitions with GDPR, the AI Act, and emerging data frameworks

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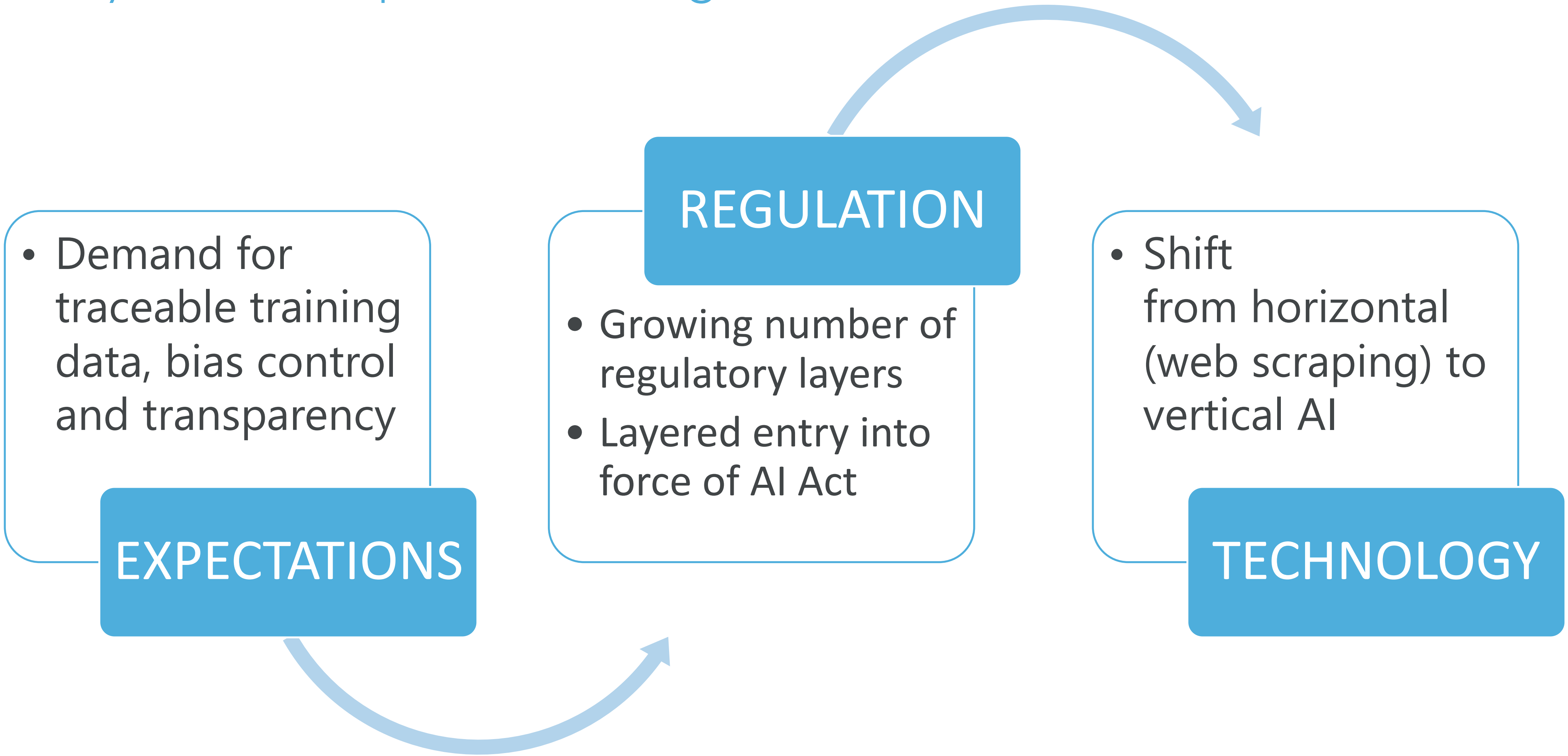
Data Privacy Day 2026 - Maison du Savoir, Esch-Sur-Alzette

28th January 2026

The Burning Platform: Complexity is rising

Why AI now requires more alignment



EXPECTATIONS

- Demand for traceable training data, bias control and transparency

REGULATION

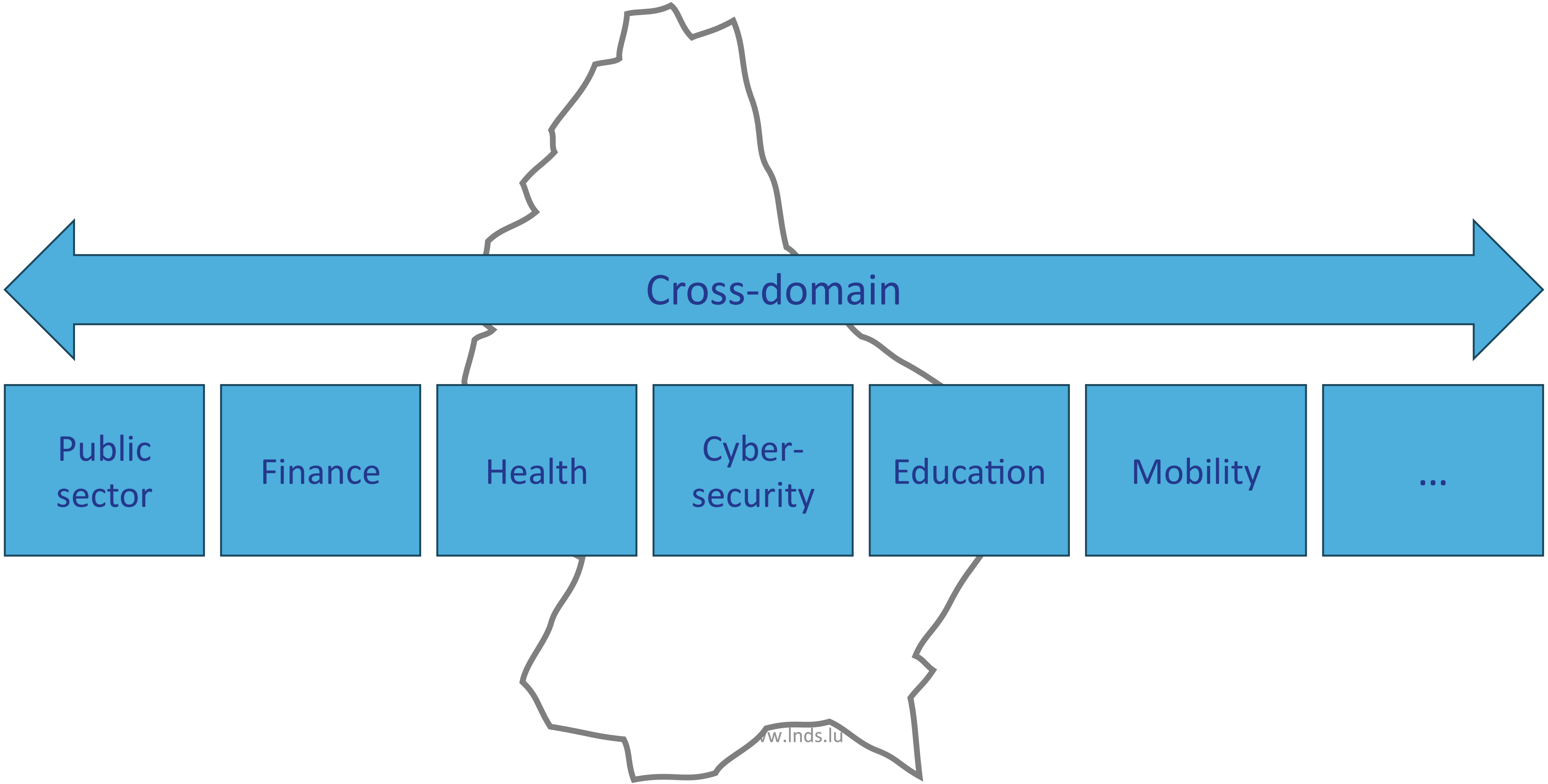
- Growing number of regulatory layers
- Layered entry into force of AI Act

TECHNOLOGY

- Shift from horizontal (web scraping) to vertical AI

Dimensions of the Luxembourg data ecosystem: domains

Many sub-specialisations exist, leading to data silos and fragmentation



Cross-domain

Public sector

Finance

Health

Cyber-security

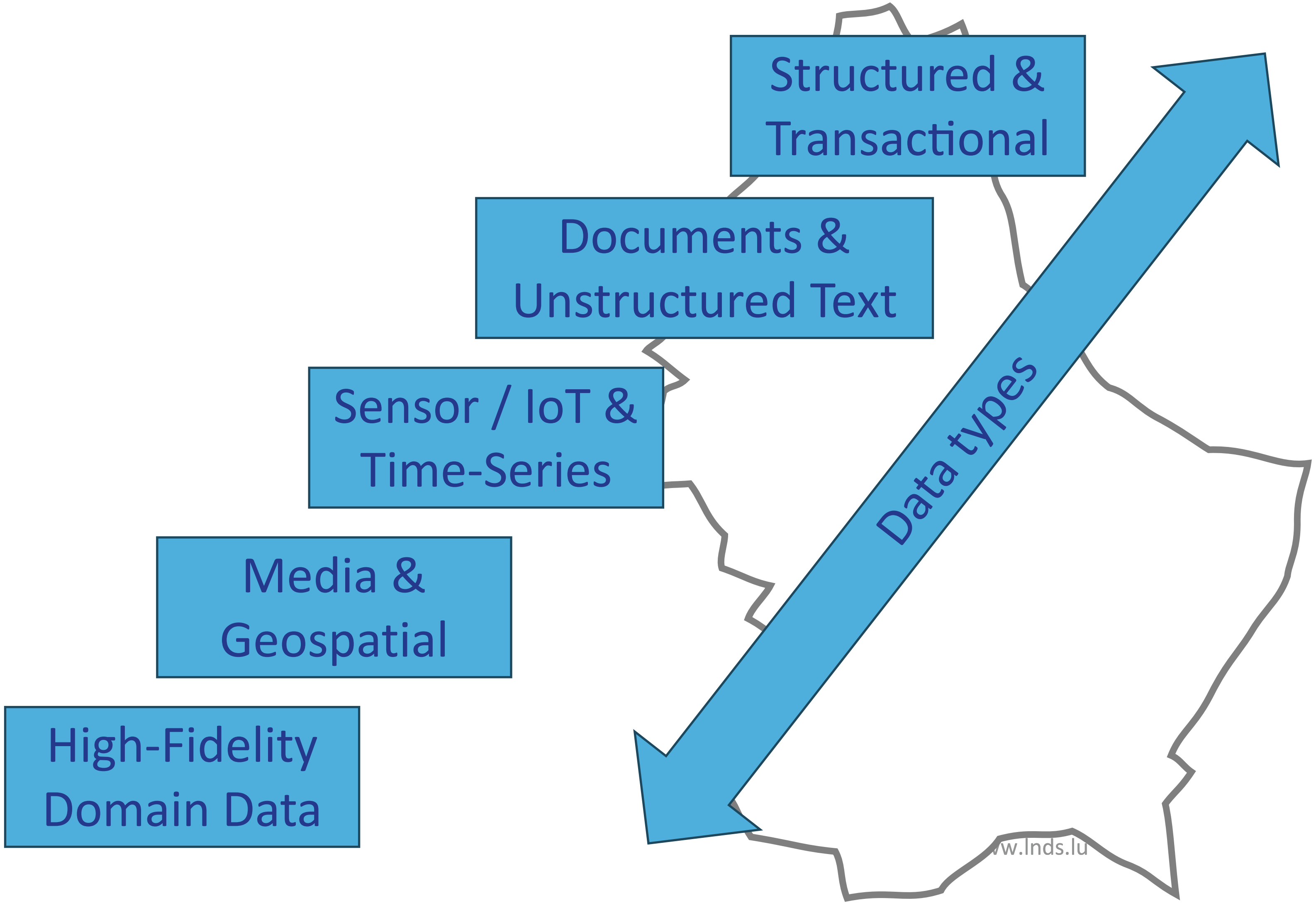
Education

Mobility

...

Dimensions of the Luxembourg data ecosystem: data types

Different data types create dependencies that complicate AI development



Structured & Transactional

Documents & Unstructured Text

Sensor / IoT & Time-Series

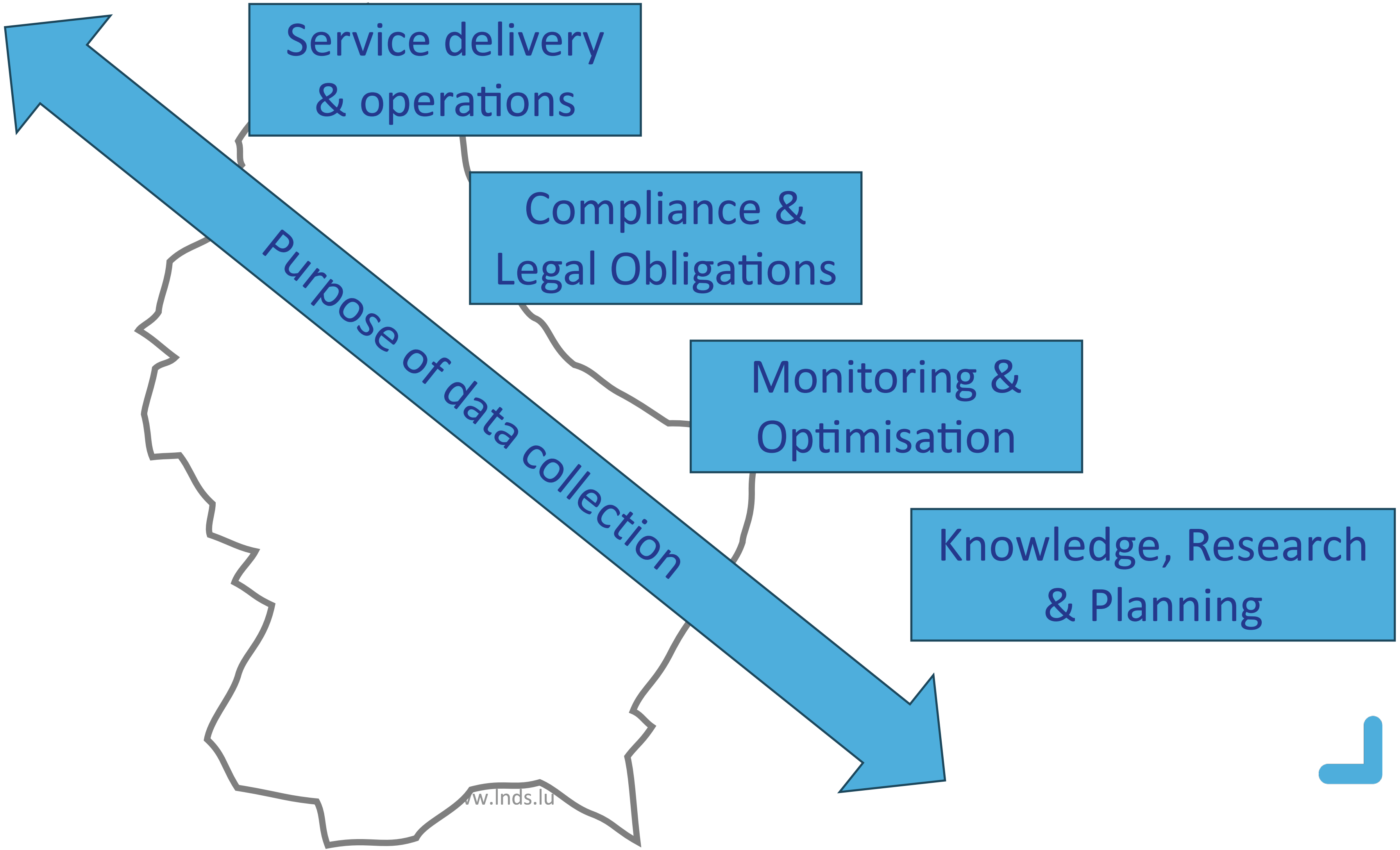
Media & Geospatial

High-Fidelity Domain Data

Data types

Dimensions of the Luxembourg data ecosystem: purpose

Purpose driven data collections tend to reside in separate systems



Service delivery & operations

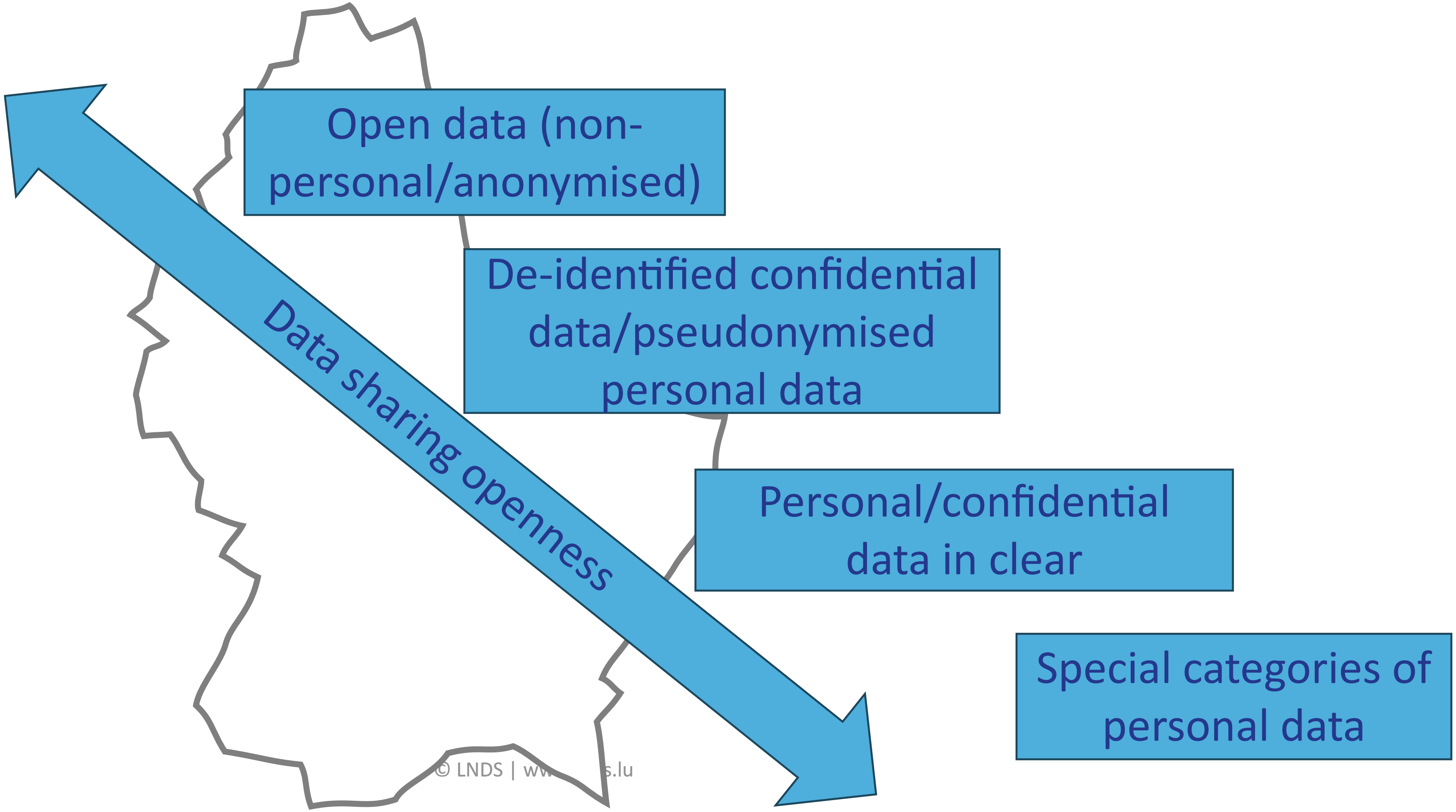
Compliance & Legal Obligations

Monitoring & Optimisation

Knowledge, Research & Planning

Dimensions of the Luxembourg data ecosystem: openness

Strong dependence on sensitivity of data and fundamental rights



Open data (non-personal/anonymised)

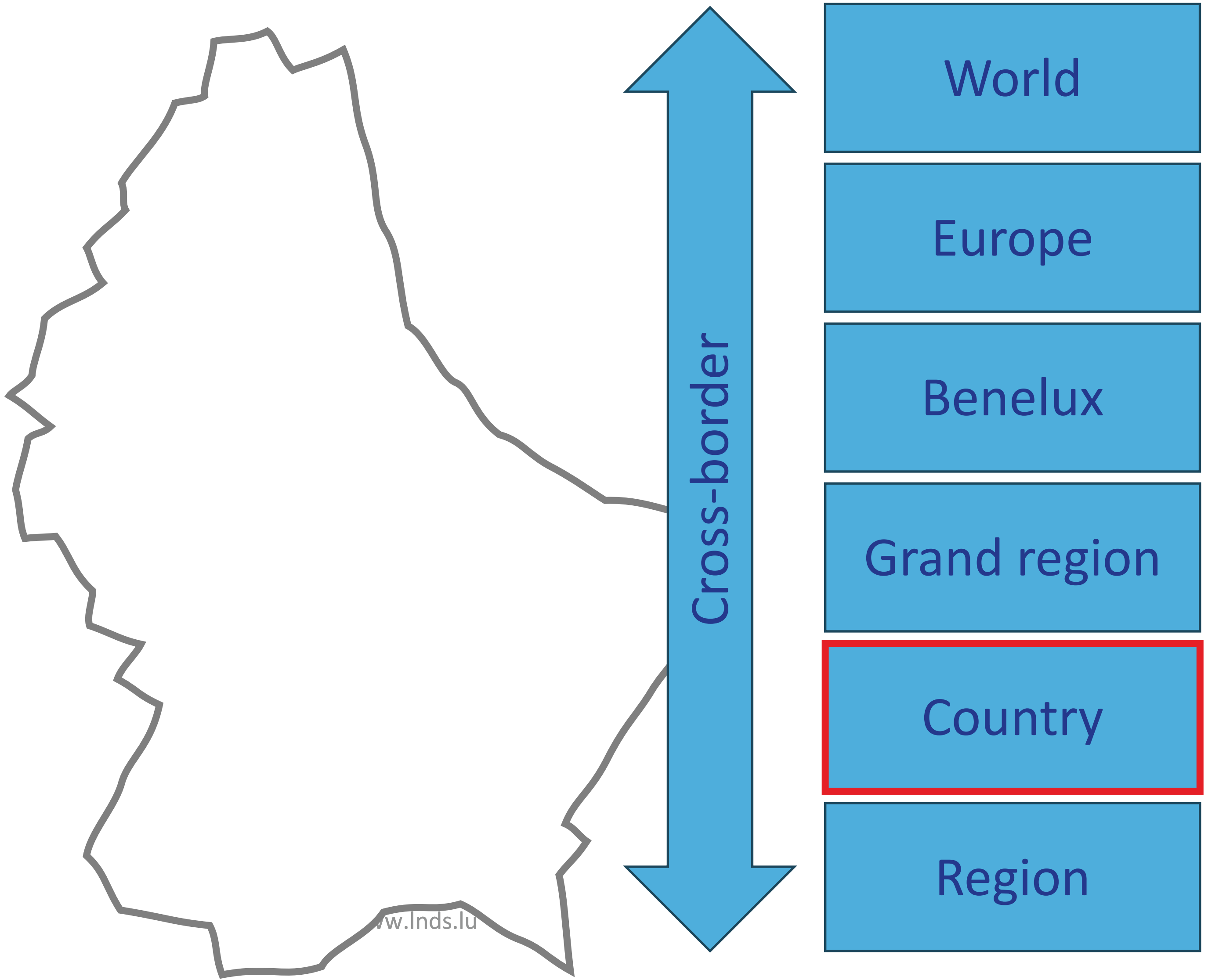
De-identified confidential data/pseudonymised personal data

Personal/confidential data in clear

Special categories of personal data

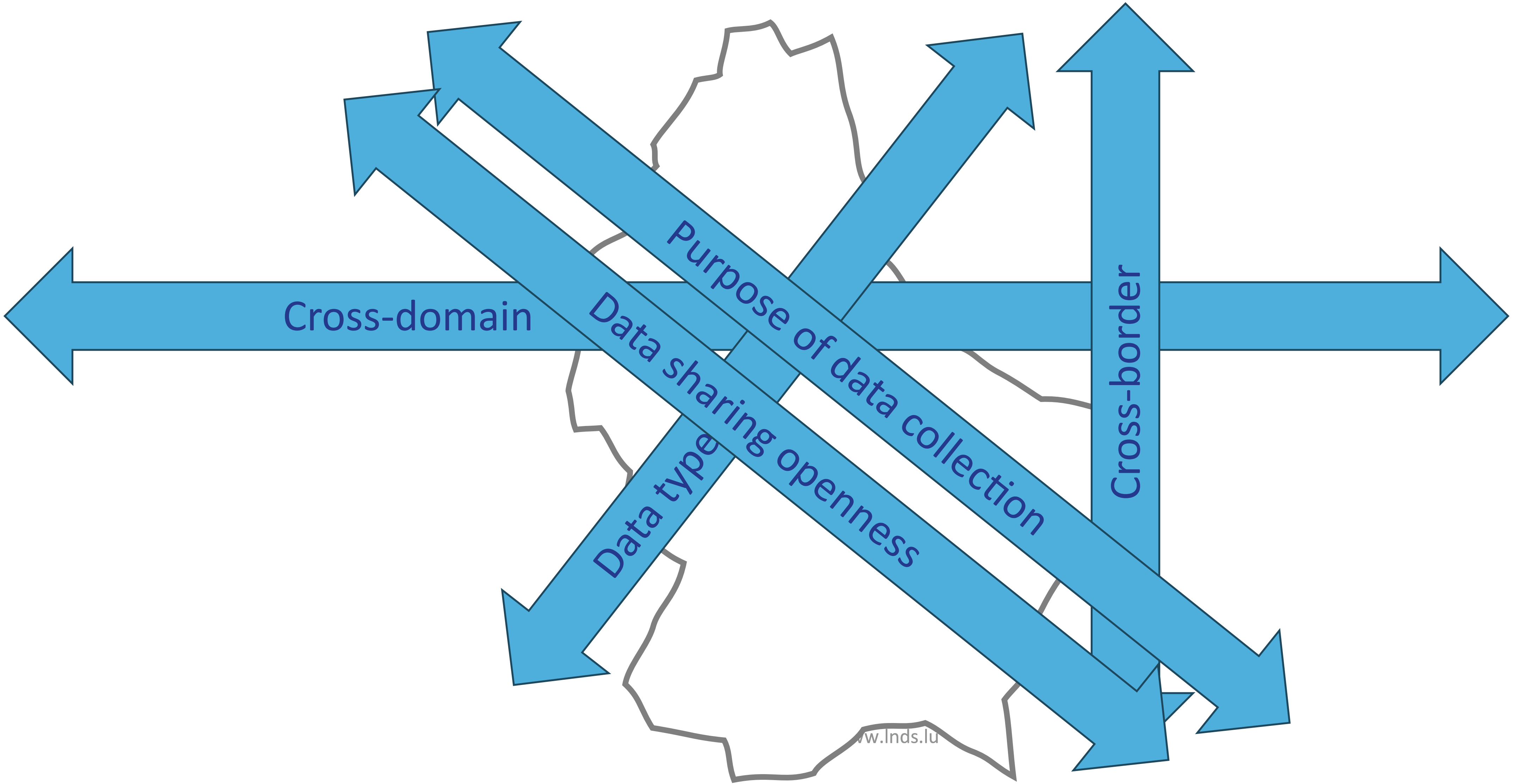
Dimensions of the Luxembourg data ecosystem: geography

Most data sharing initiatives are confined within national borders



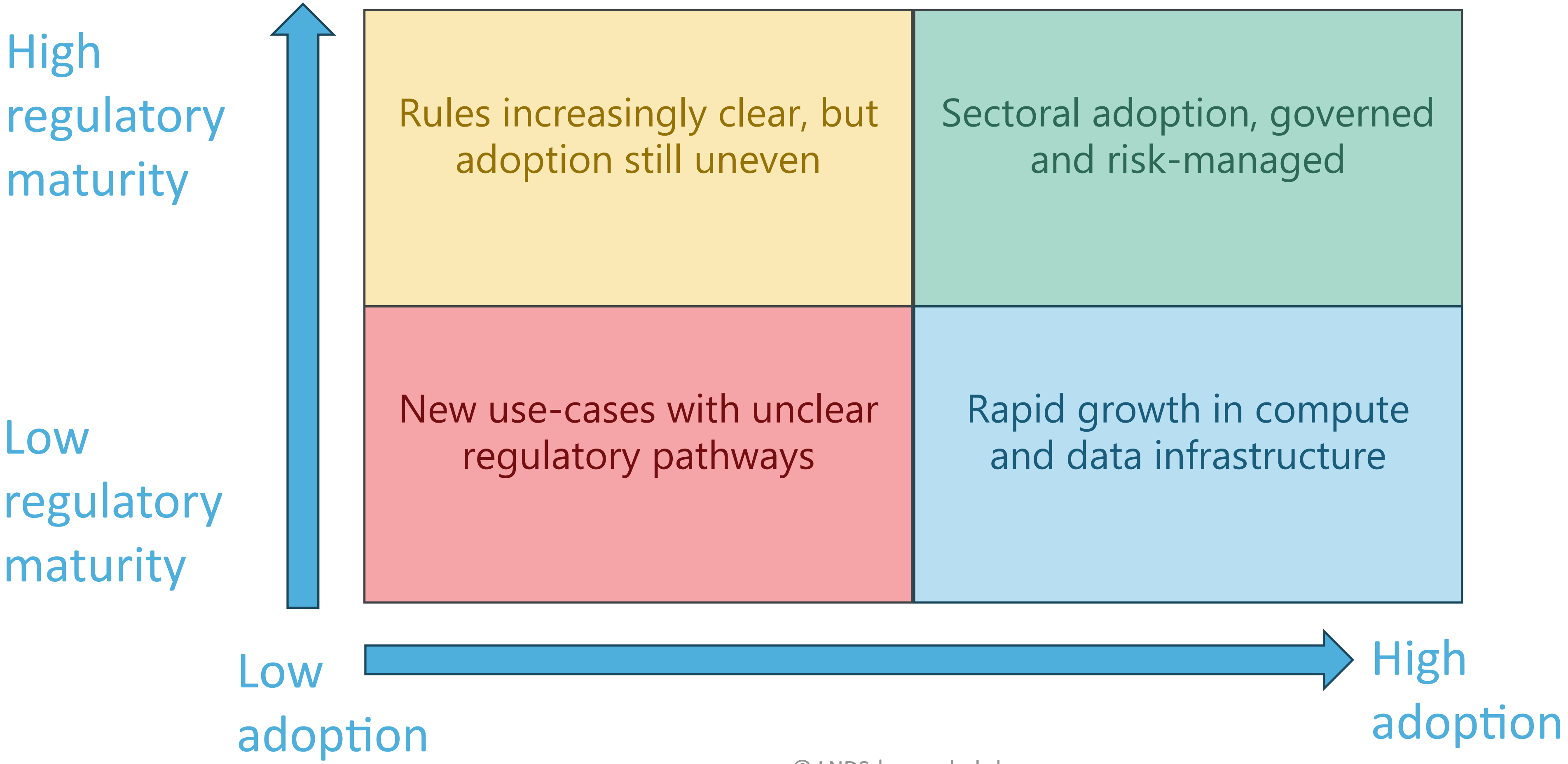
Dimensions of the Luxembourg data ecosystem

Different data dimensions shape how AI can be designed



Current and Emerging Trends

Understanding where organisations stand as AI scales under EU rules



Rules increasingly clear, but adoption still uneven

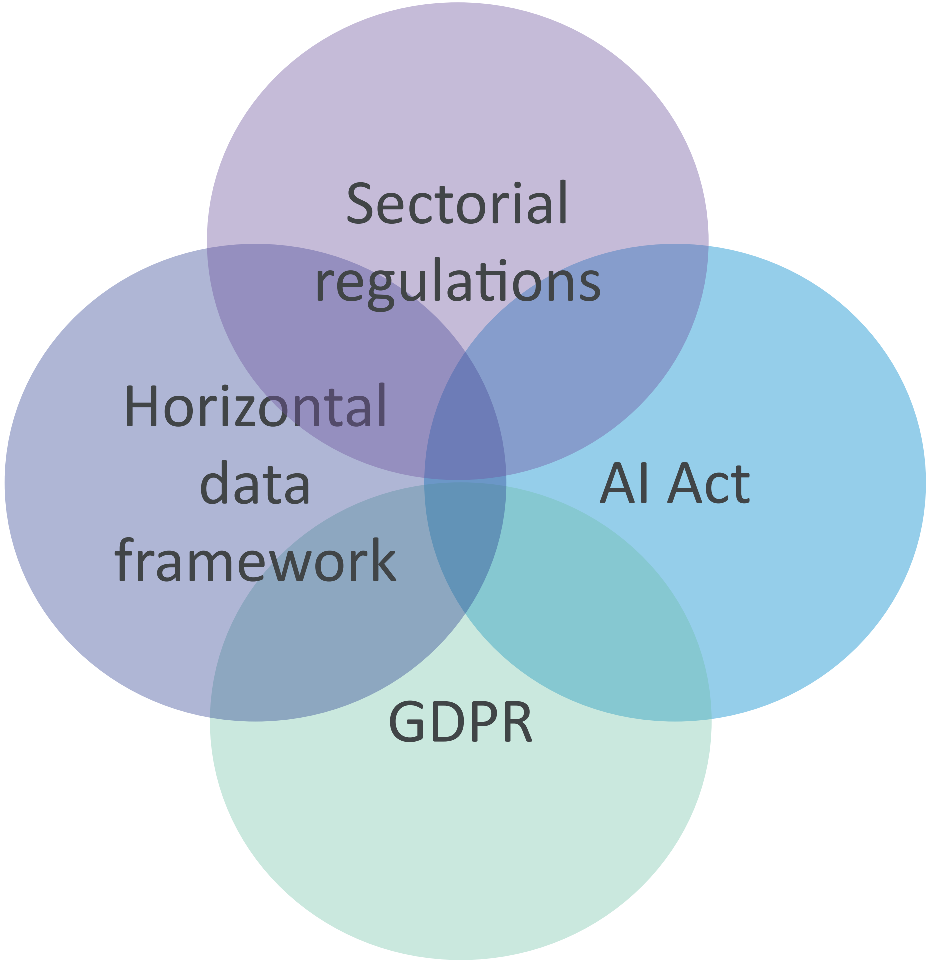
Sectoral adoption, governed and risk-managed

New use-cases with unclear regulatory pathways

Rapid growth in compute and data infrastructure

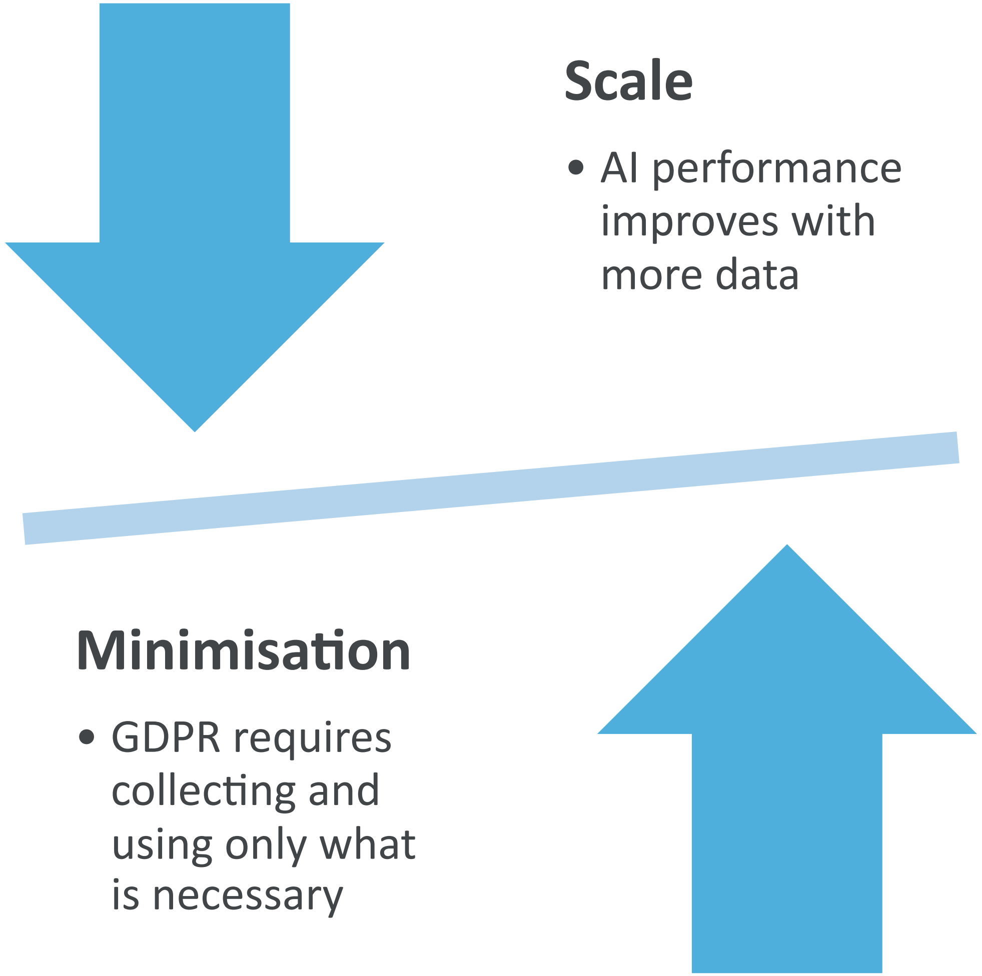
What Regulation means for AI

How EU Regulations overlap in real projects



Core Tensions Between AI & Privacy

Where are the frictions?



Scale

- AI performance improves with more data

Minimisation

- GDPR requires collecting and using only what is necessary

Core Tensions Between AI & Privacy

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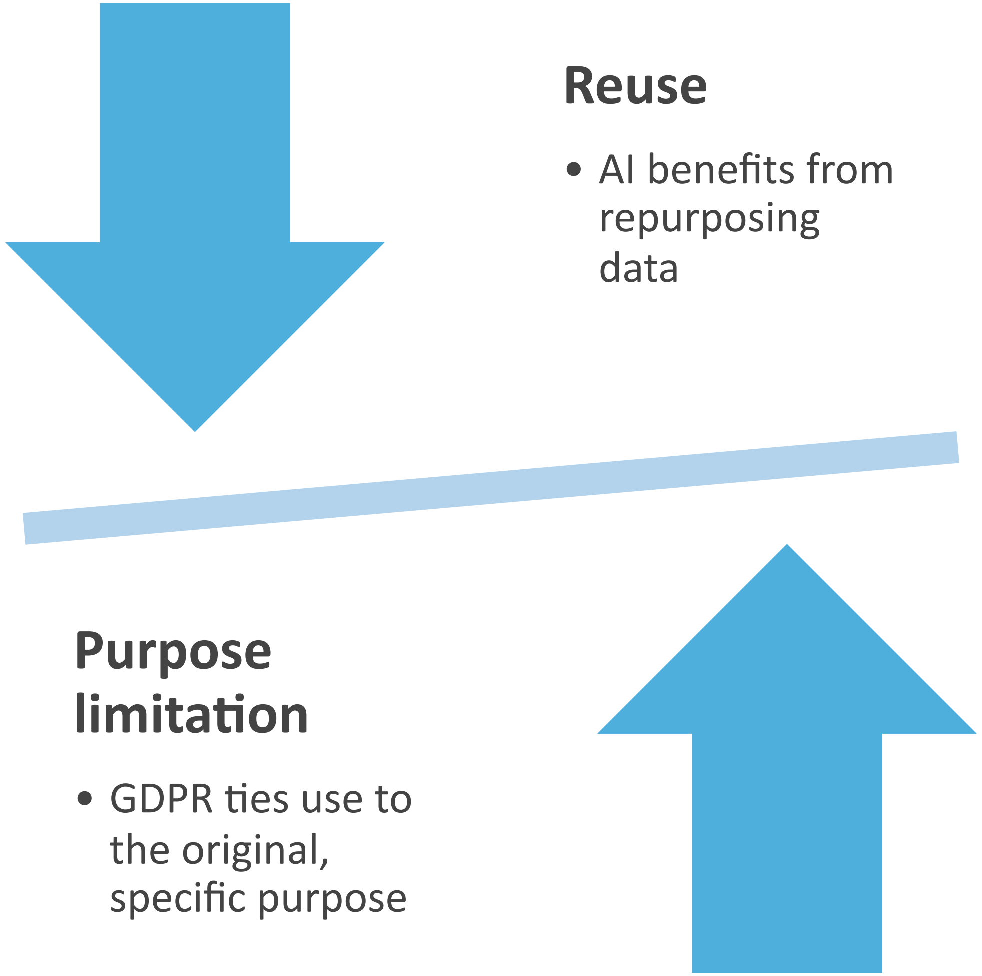

Reuse

- AI benefits from repurposing data

Purpose limitation

- GDPR ties use to the original, specific purpose

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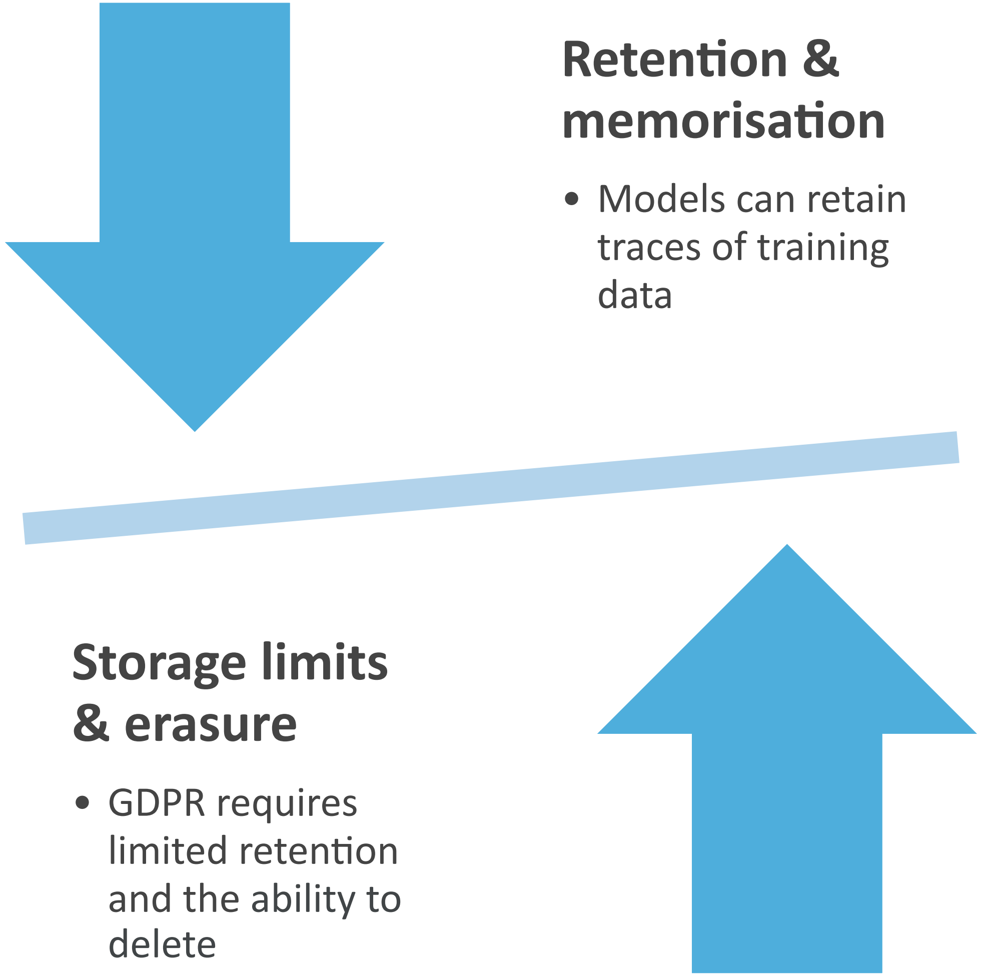

Retention & memorisation

- Models can retain traces of training data

Storage limits & erasure

- GDPR requires limited retention and the ability to delete

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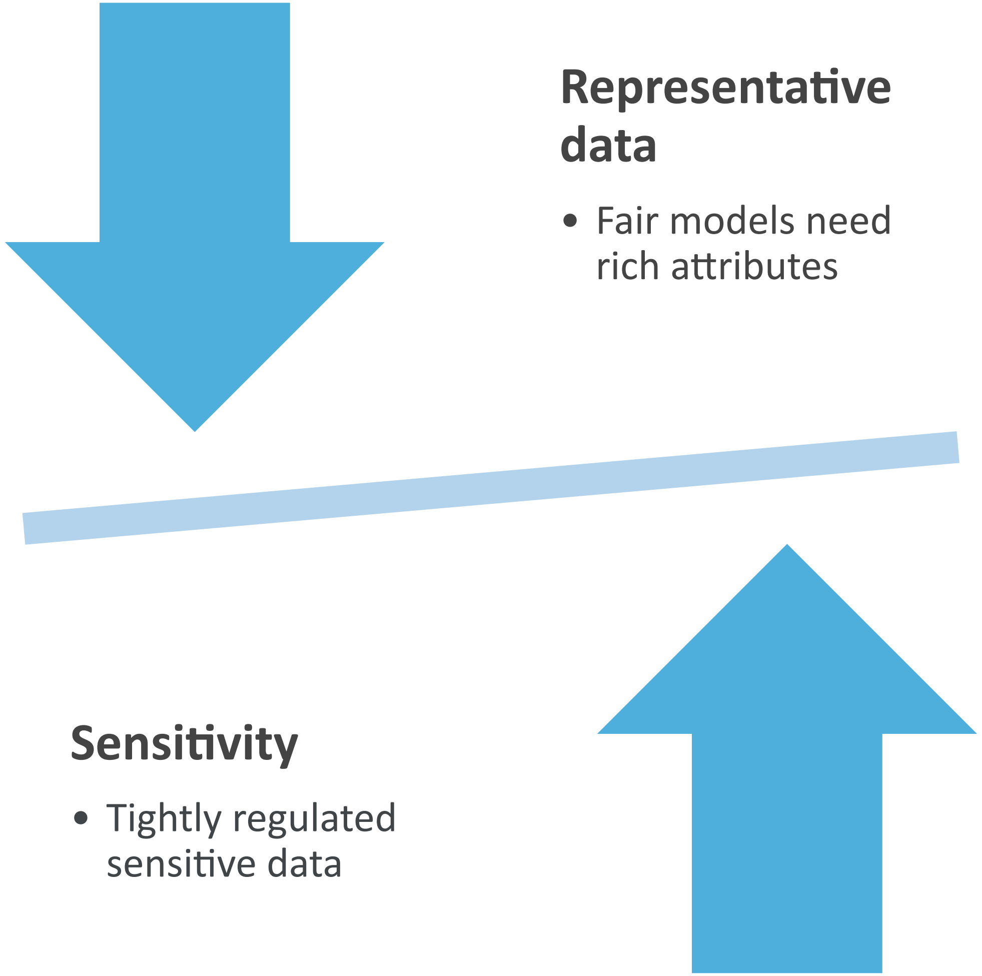

Representative data

- Fair models need rich attributes

Sensitivity

- Tightly regulated sensitive data

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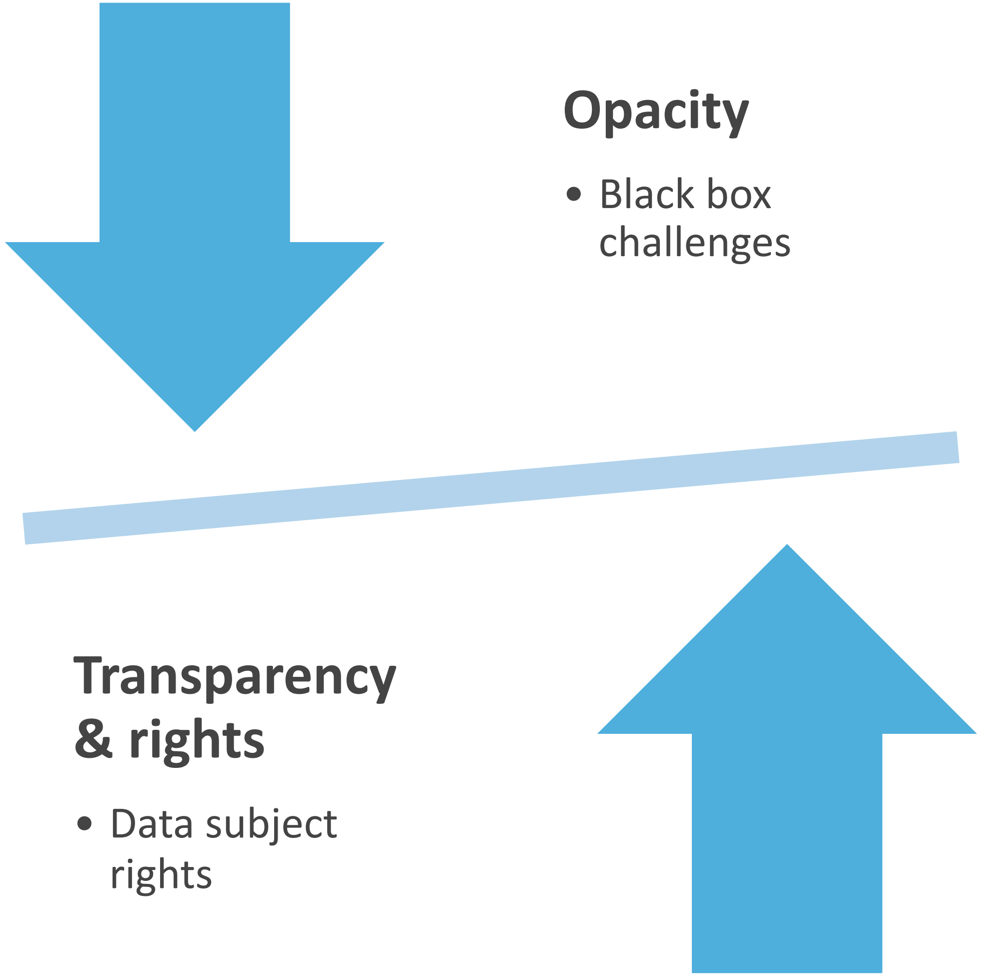


Opacity

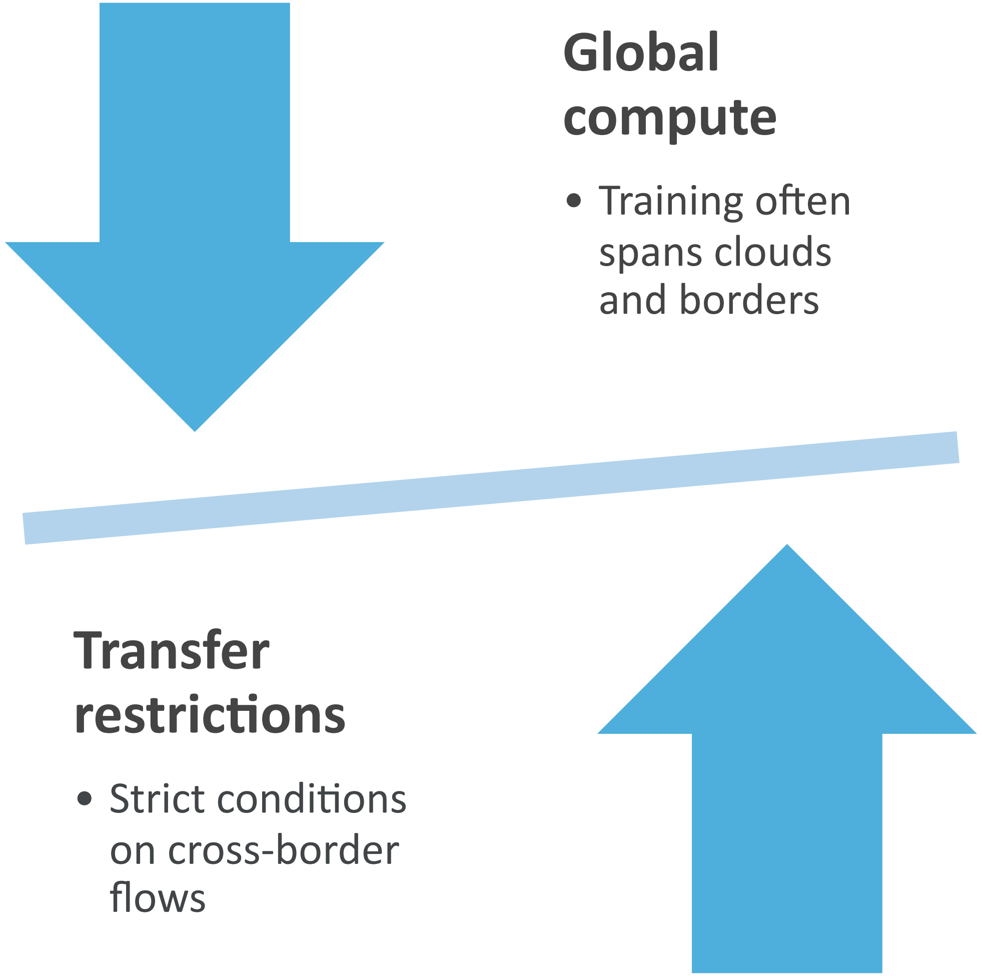
- Black box challenges

Transparency & rights

- Data subject rights

Core Tensions Between AI & Privacy

Where are the frictions?



Global compute

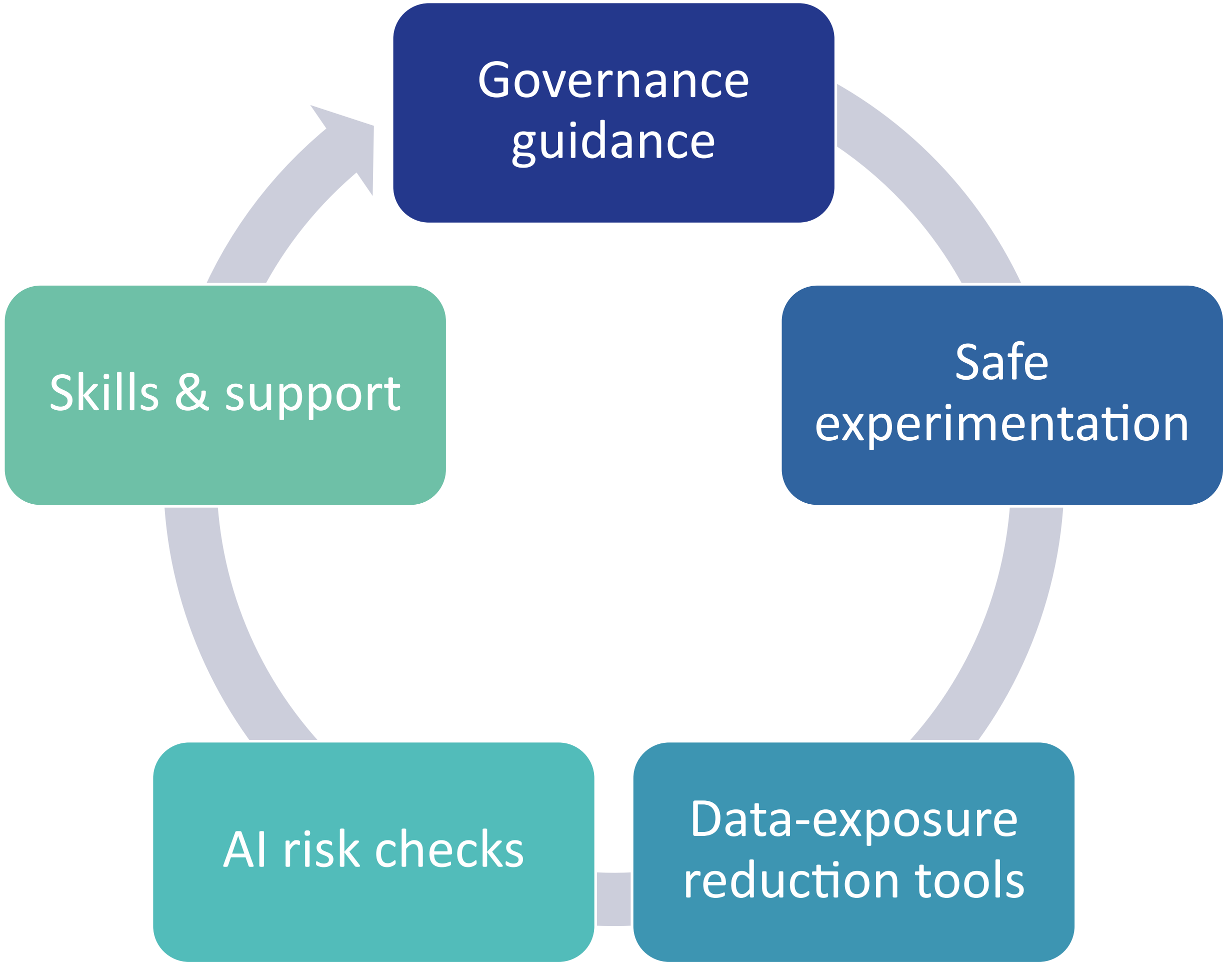
- Training often spans clouds and borders

Transfer restrictions

- Strict conditions on cross-border flows

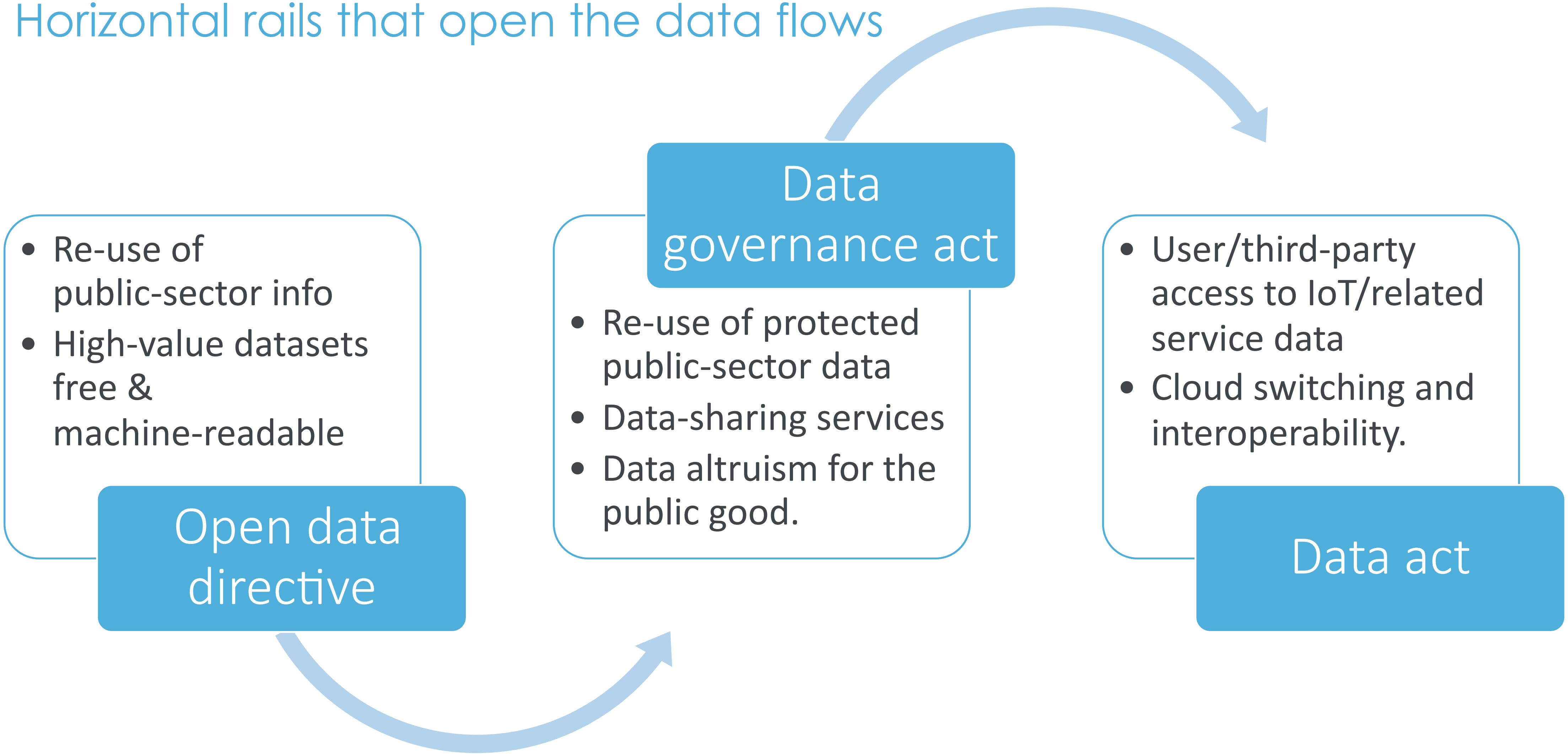
Navigating Uncertainty

What helps navigate AI/privacy tensions



Data Reuse as a Key Enabler

Horizontal rails that open the data flows



Open data directive

- Re-use of public-sector info
- High-value datasets free & machine-readable

Data governance act

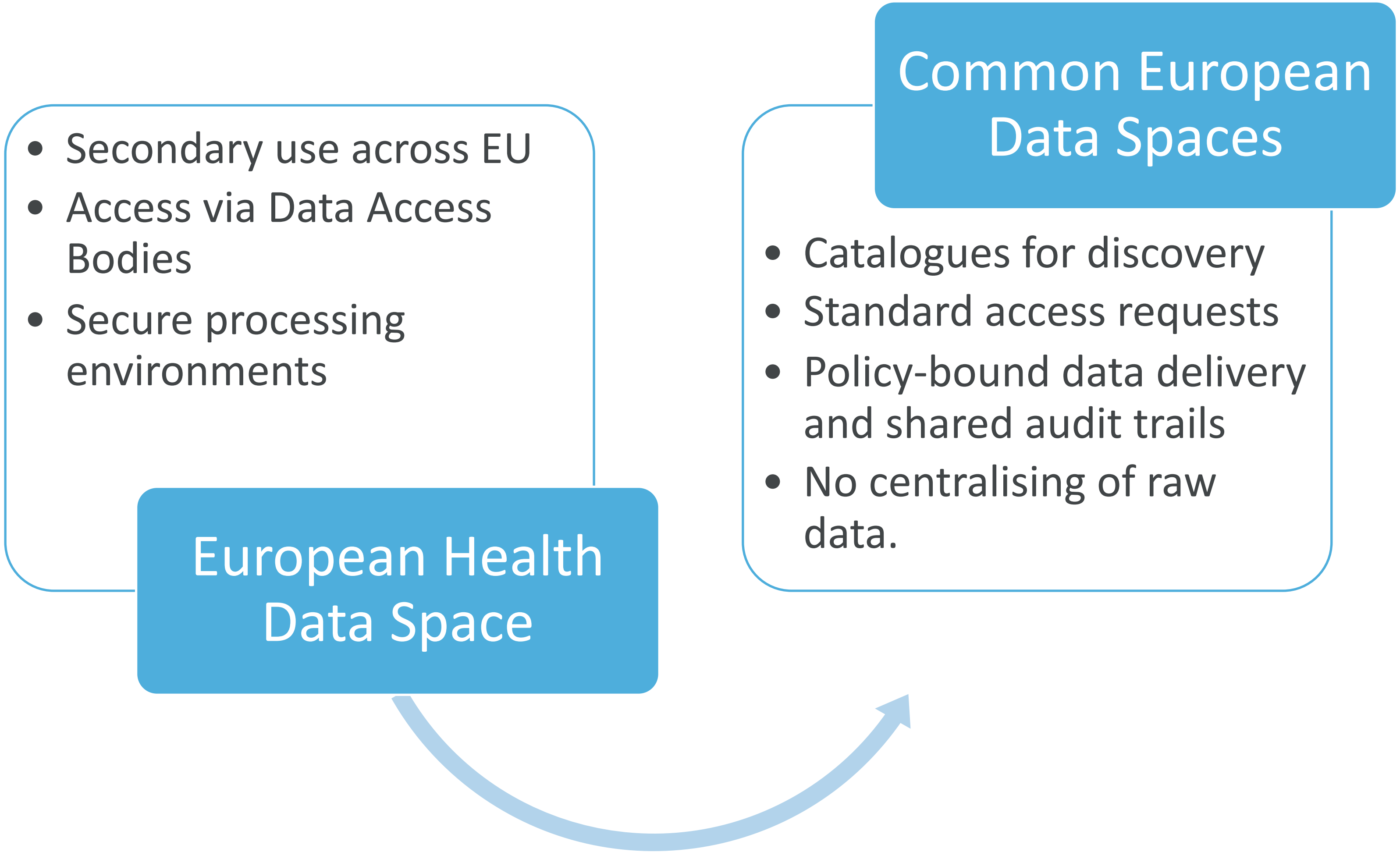
- Re-use of protected public-sector data
- Data-sharing services
- Data altruism for the public good.

Data act

- User/third-party access to IoT/related service data
- Cloud switching and interoperability.

Data Reuse as a Key Enabler

Sectoral, governed channels



- Secondary use across EU
- Access via Data Access Bodies
- Secure processing environments

European Health Data Space

Common European Data Spaces

- Catalogues for discovery
- Standard access requests
- Policy-bound data delivery and shared audit trails
- No centralising of raw data.

Use Case Stories

4LM – Legal Large Language Model (Public Administration)

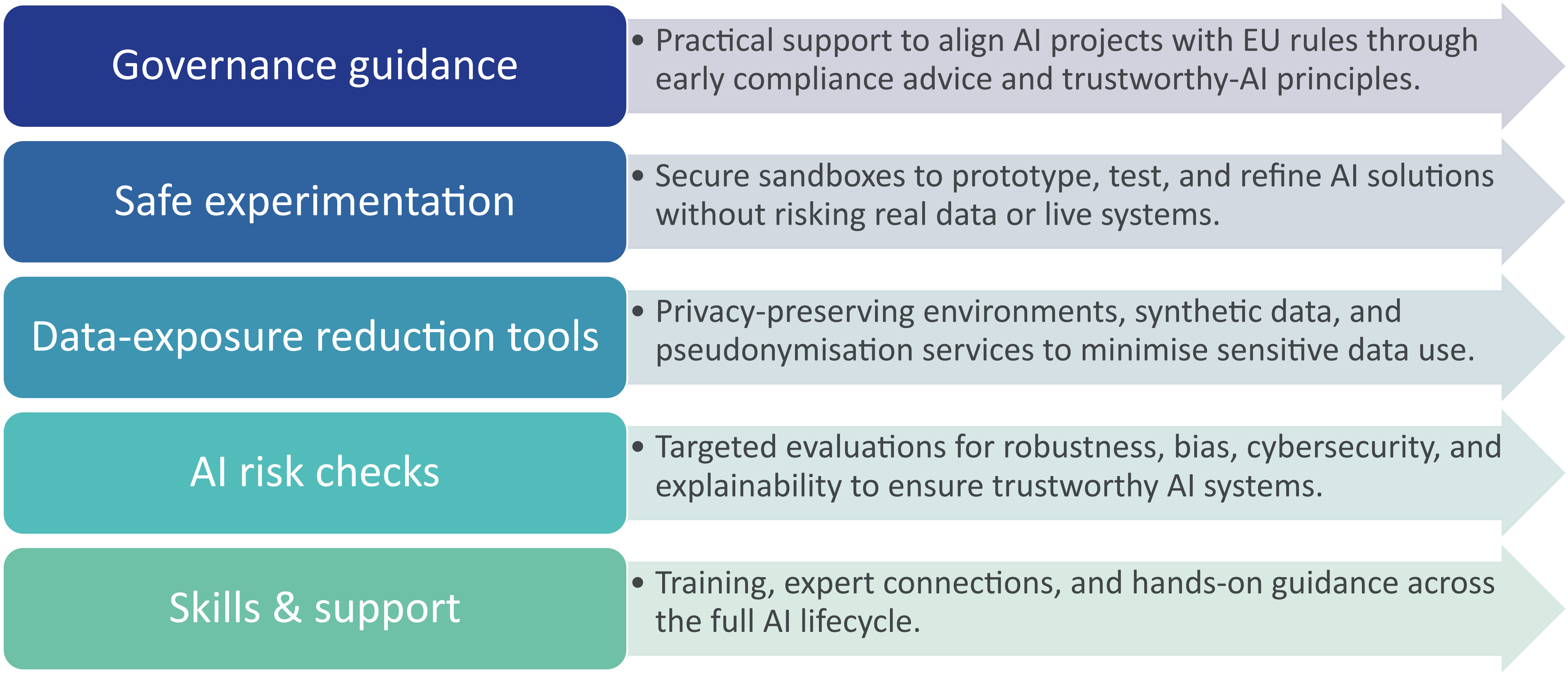
- Few personal data in the current phase (published legislation)
- Next step may involve confidential data (upcoming draft law) as well as personal data (contributors’ contact details)

LIH Precision Medicin (Health)

- AI for personalised medicine depends on highly sensitive health data
- Data scarcity limits model performance while privacy constraints restrict data sharing
- Requires privacy-preserving approaches (e.g., federated or controlled environments)

Luxembourg AI Factory (L-AIF)

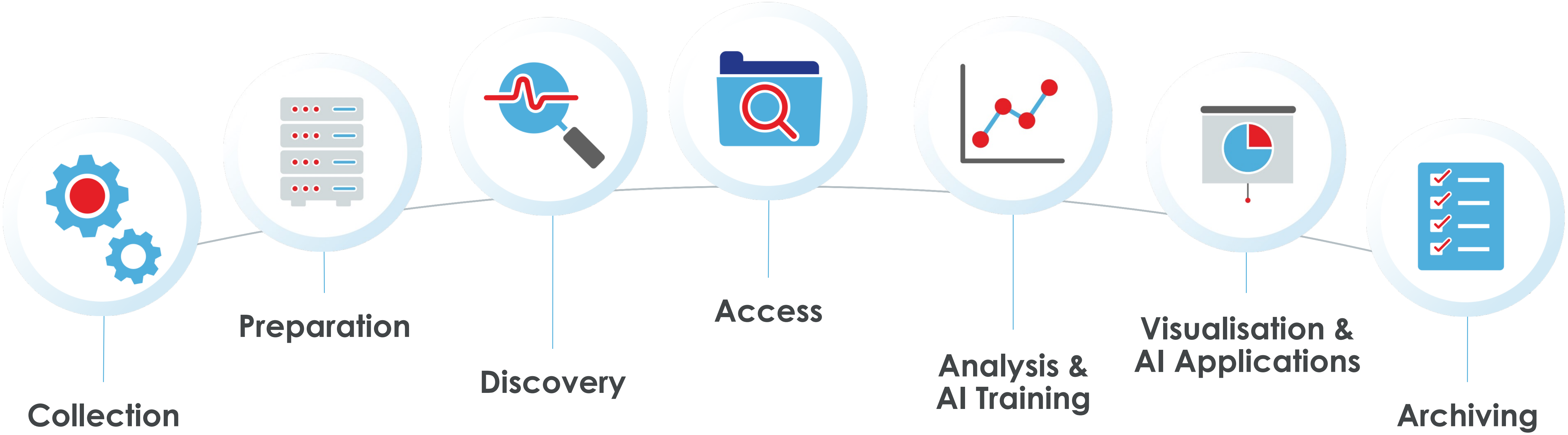
How the Luxembourg AI Factory helps address the challenges



Governance guidance	• Practical support to align AI projects with EU rules through early compliance advice and trustworthy-AI principles.
Safe experimentation	• Secure sandboxes to prototype, test, and refine AI solutions without risking real data or live systems.
Data-exposure reduction tools	• Privacy-preserving environments, synthetic data, and pseudonymisation services to minimise sensitive data use.
AI risk checks	• Targeted evaluations for robustness, bias, cybersecurity, and explainability to ensure trustworthy AI systems.
Skills & support	• Training, expert connections, and hands-on guidance across the full AI lifecycle.

LNDS: Key Enabler for Trusted Data Innovation

Supporting secondary use of data one step at a time



Collection

Preparation

Discovery

Access

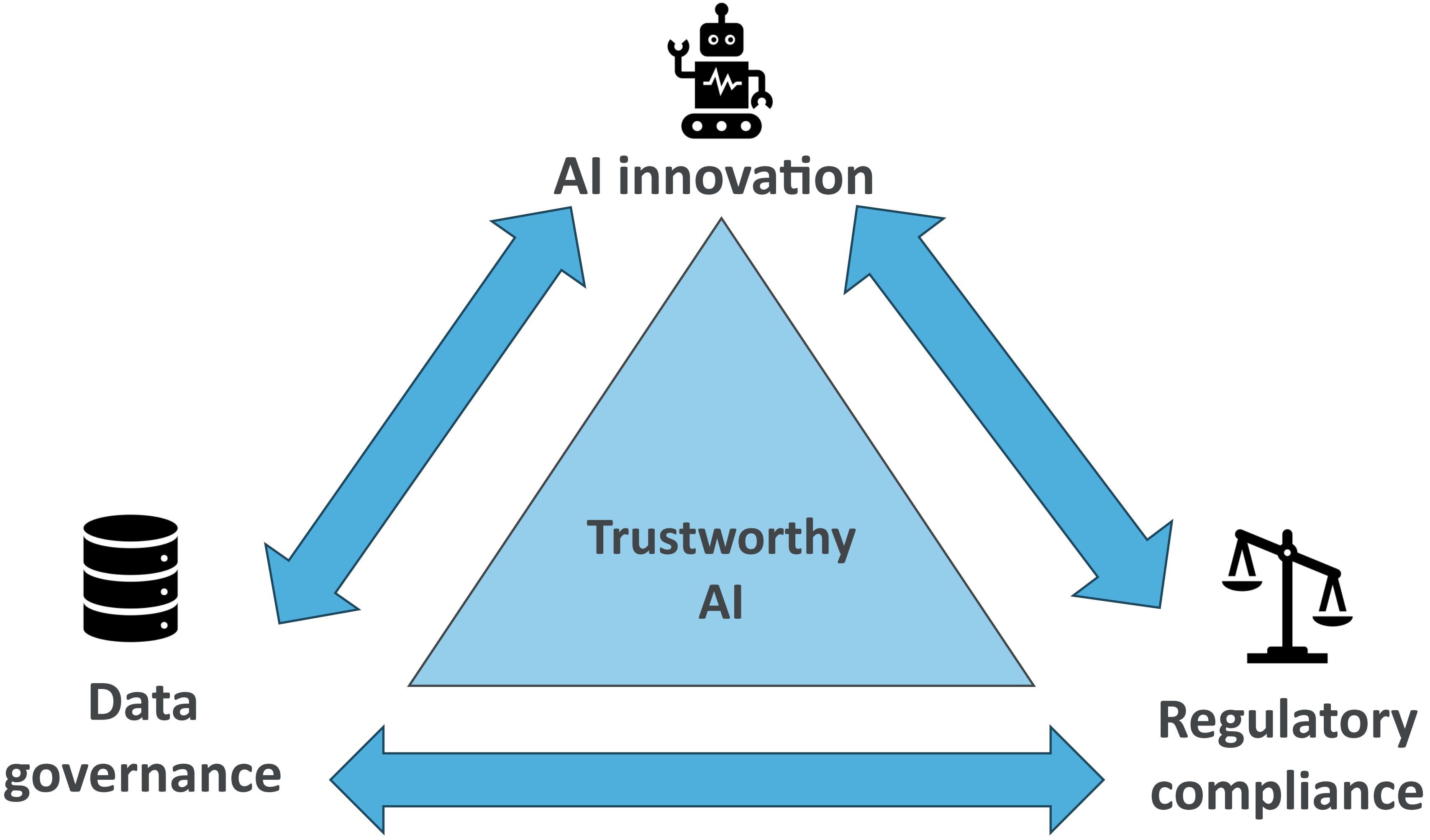
Analysis & AI Training

Visualisation & AI Applications

Archiving

Conclusion

From constraints to enabling an efficient framework for trust



AI innovation

Trustworthy AI

Data governance

Regulatory compliance

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LUXEMBOURG NATIONAL DATA SERVICE