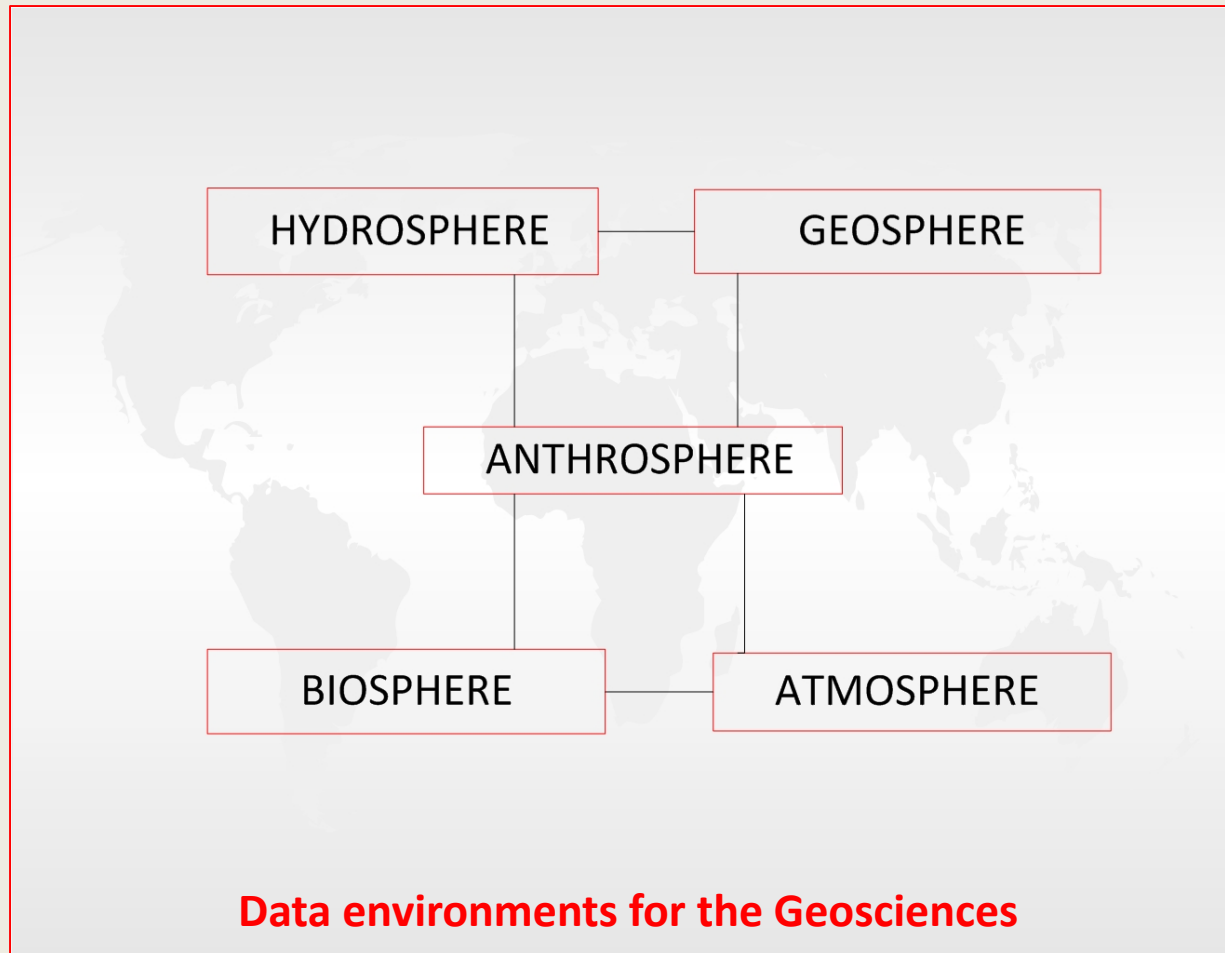


# Integrative view of earth as a system of systems: driver for EarthCube



Use cases to reflect data heterogeneity and are globally distributed

# Data publication and access

Collection

Diversity

Interoperability

Trust

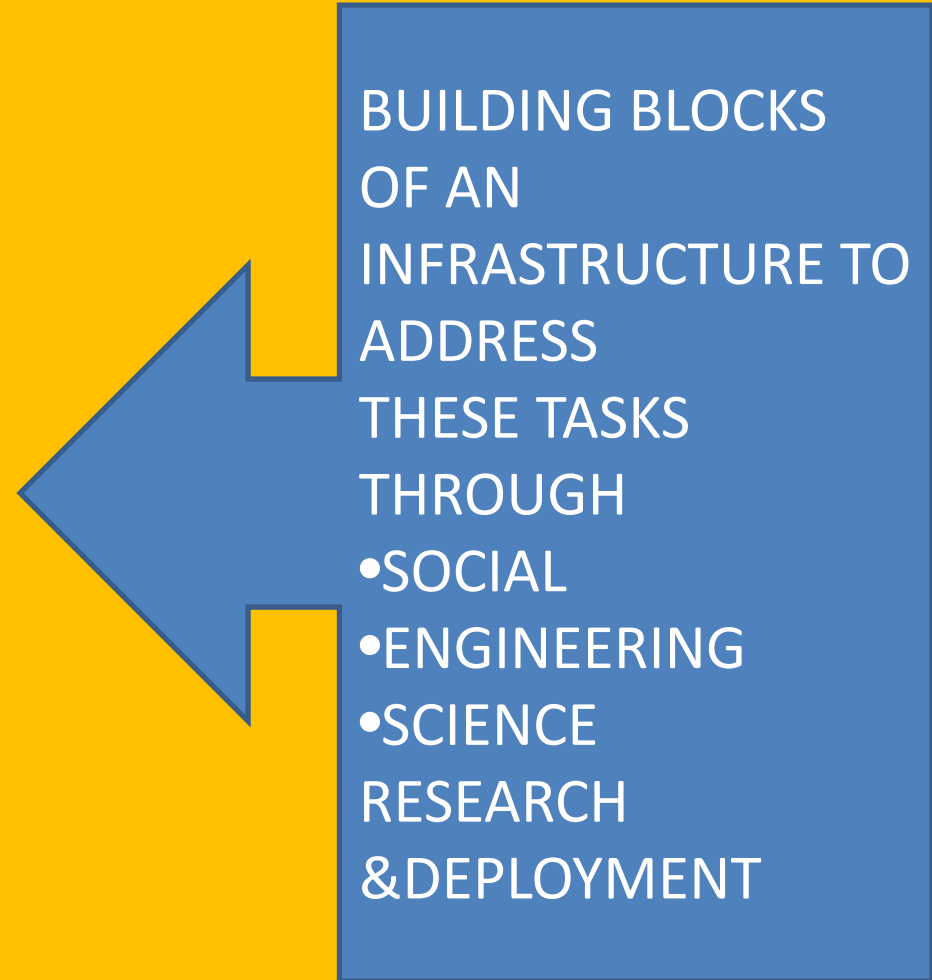
Security

Education and training

Usability

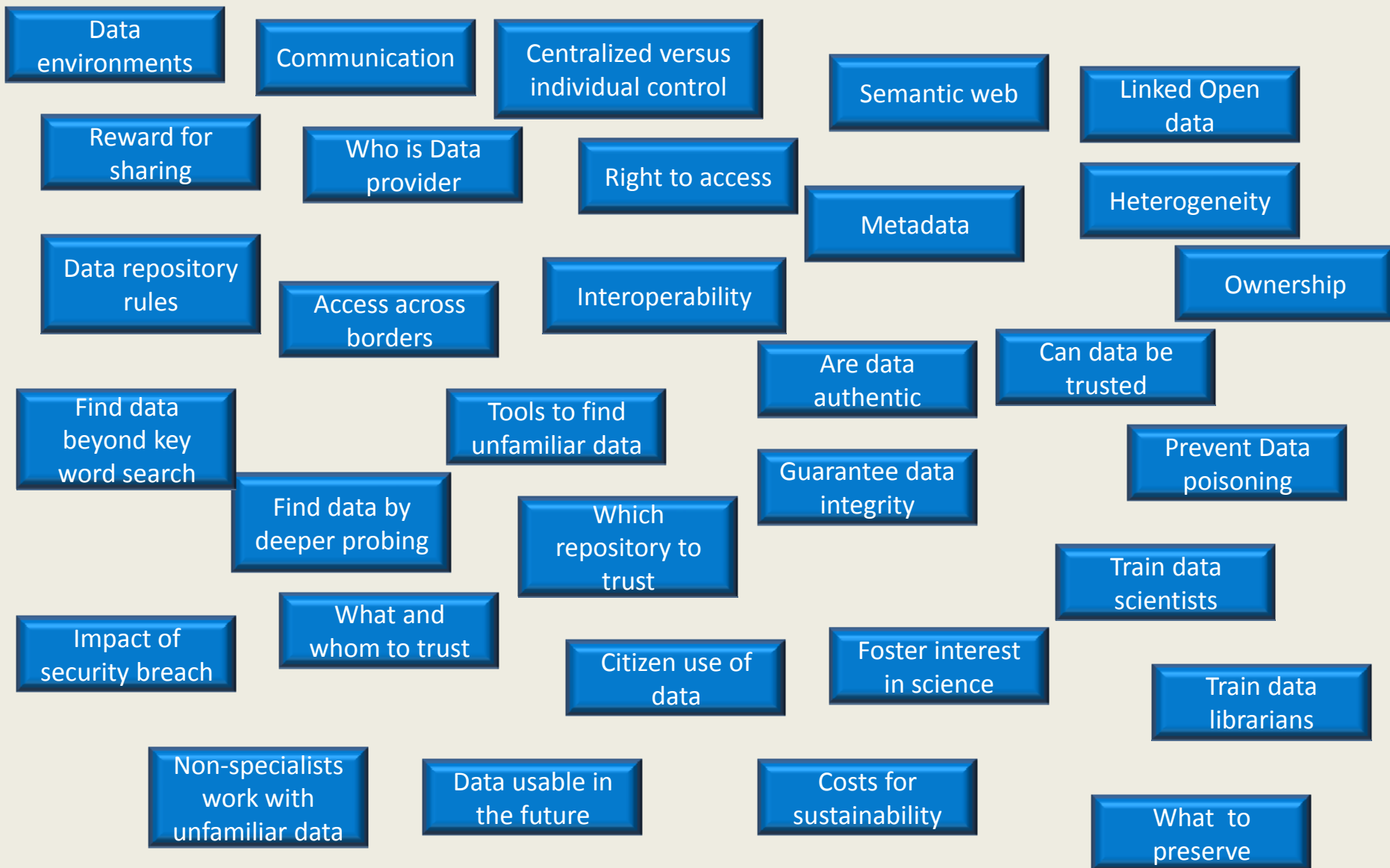
Preservation and Sustainability

Commercial exploitation

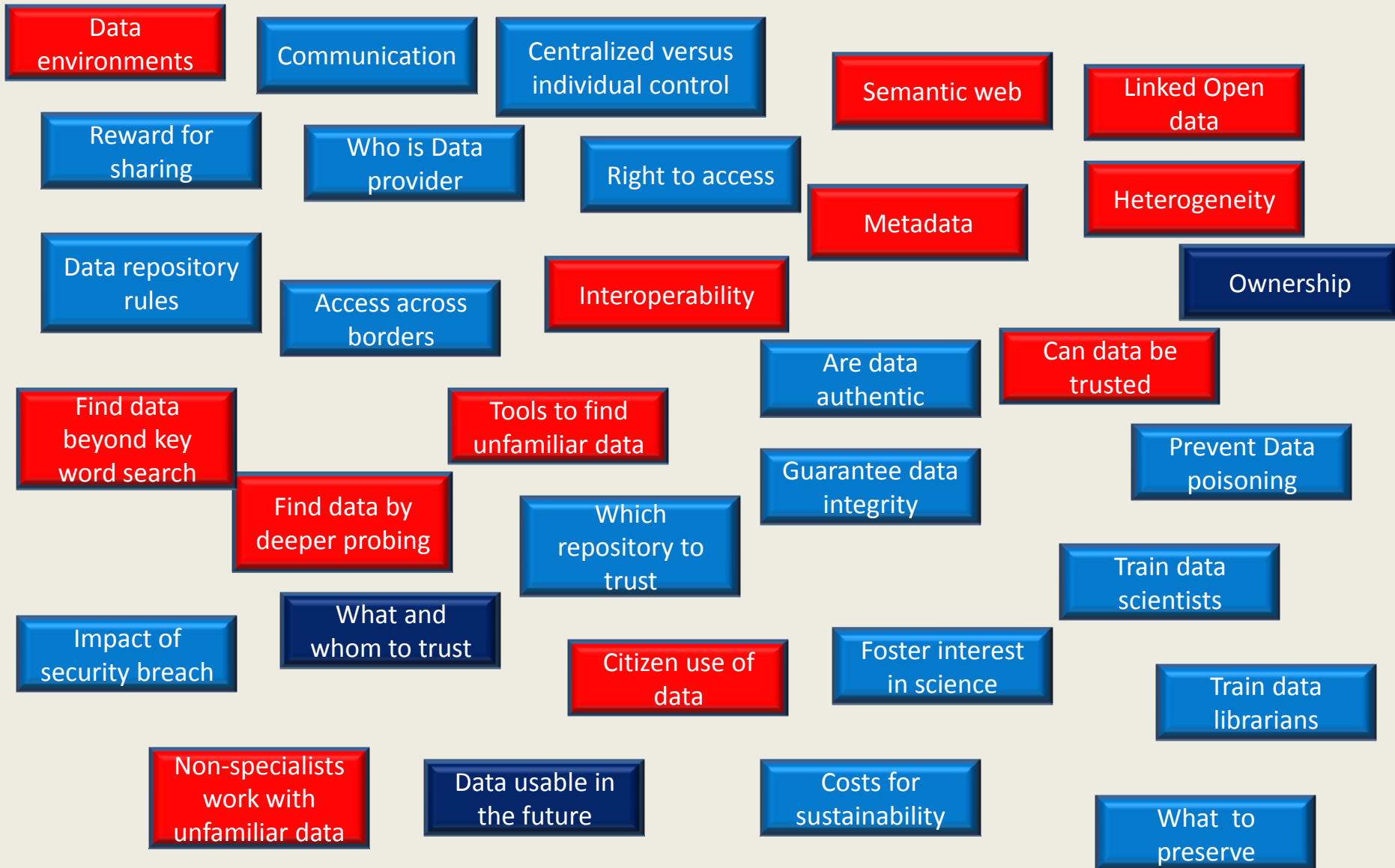


- Data publication and access: enable individuals and large data centers to **publish data**, as well as enabling access through semantic technologies. These technologies must be coupled with a **reward system** to encourage data sharing.
- Collection: community endorsed **simple metadata** requirements for data providers to facilitate access to both curated as well non curated data
- Diversity: provide capabilities to access and discover globally distributed **heterogeneous resources**
- Interoperability: provide capabilities (semantic as well as syntactic ) to understand the content of databases, as well as support discovery of resources **beyond keyword searches**
- Trust: provide innovative algorithms to **enhance users trust of data** they are unfamiliar with, as well as management of resources to enhance trust in the source of the data
- Security: New technologies to **enhance data integrity**, as well as capabilities to detect data biased by a group or individual
- Education and training: New capabilities to generate **interest in geoscience** through training of data scientists and librarians, as well as providing capabilities to bring information to a class room setting
- Usability: Provide new technologies to **enable non-specialists to use data**, as well as scientists to work with unfamiliar data
- Preservation and Sustainability: Develop capabilities to **preserve current data**, as well as legacy data
- Commercial exploitation: Utilize commercial developments to **enable revenue generation** for sustainability of resources

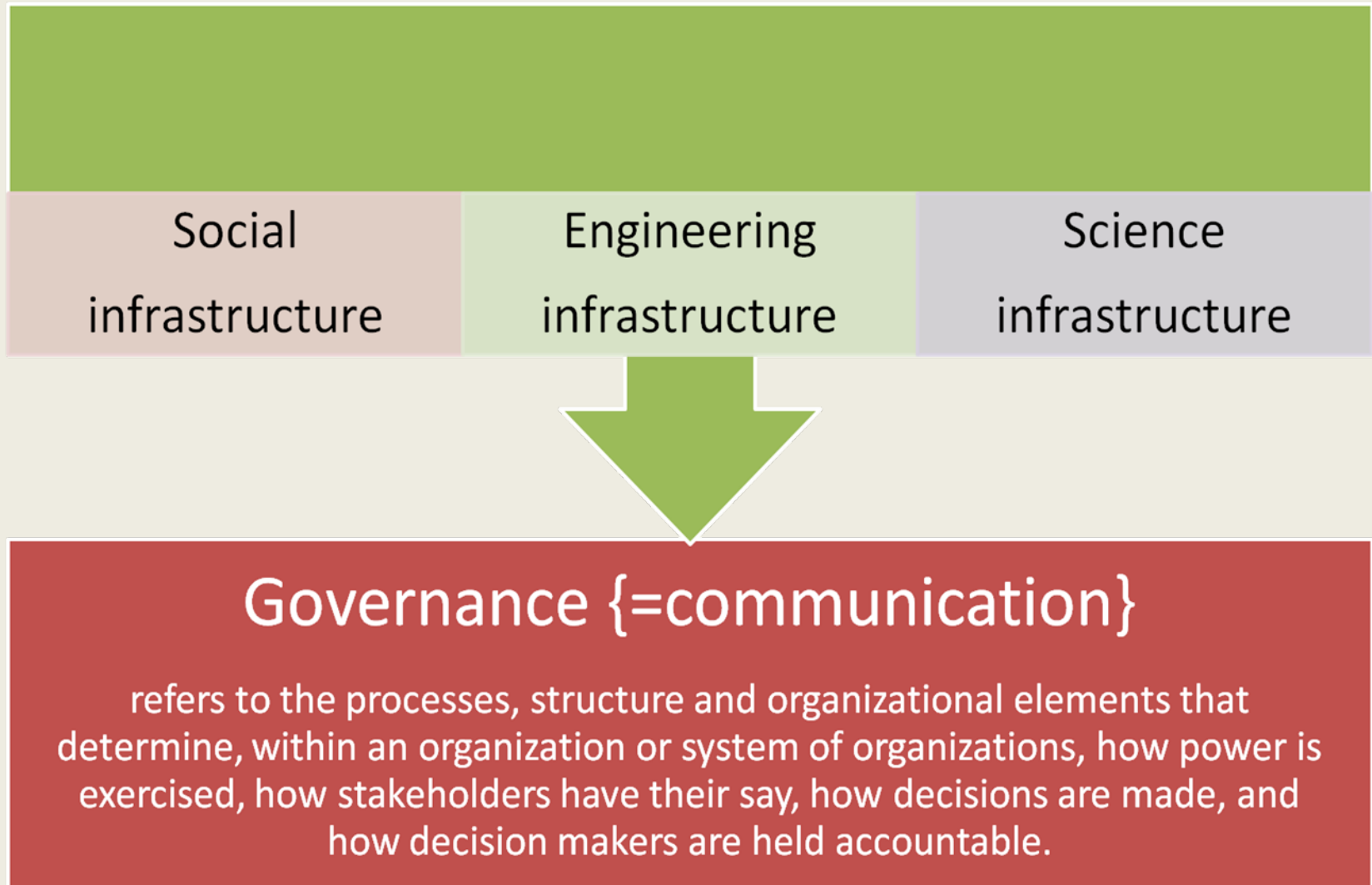
# Challenges that require a systems approach to building an infrastructure: Social, Scientific and Engineering components



# Semantic Capabilities



*Three recognized infrastructures within the EarthCube enterprise are required to meet the staged development of building blocks.*



# SOCIAL INFRASTRUCTURE

## Communication, Governance, Education, Trust

- Communication: barriers between contrasting disciplines
- Governance- centralized or distributed
- Backgrounds and data-sharing cultures in the scientific community
- Data producers be rewarded for publishing data
- Learn from the wisdom of crowds about what and whom to trust
- Enable citizens to utilize these benefits for sensible investigations
- Foster the training of more data scientists and data librarians

# ENGINEERING INFRASTRUCTURE

- Layered architecture: interoperability mechanisms between the community resources and the research environment
- Brokering: connecting disparate systems
- Workflows to manage complex computations and enable selection of models appropriate for their data, configure them with appropriate parameters, and execute them efficiently
- Interop: ability to assess whether a given dataset is “fit for use” in a particular scientific context
- Web Services
- Data Grid
- Linked Open Data
- Web; Semantic web
- Ontology

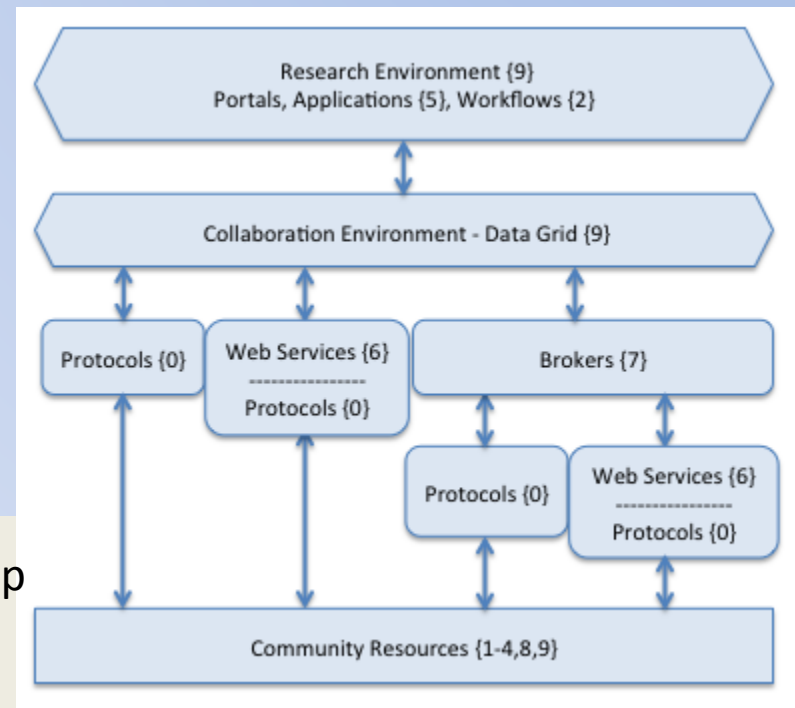
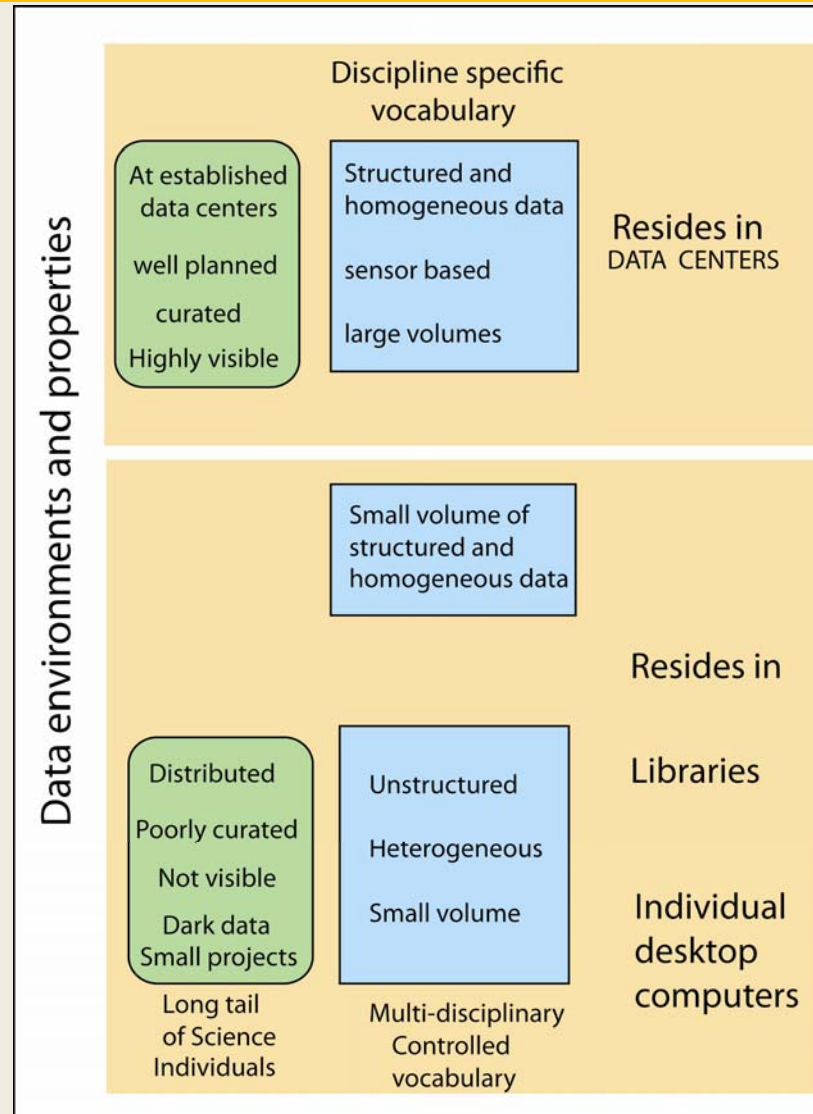


Figure from Layered Architecture Roadmap

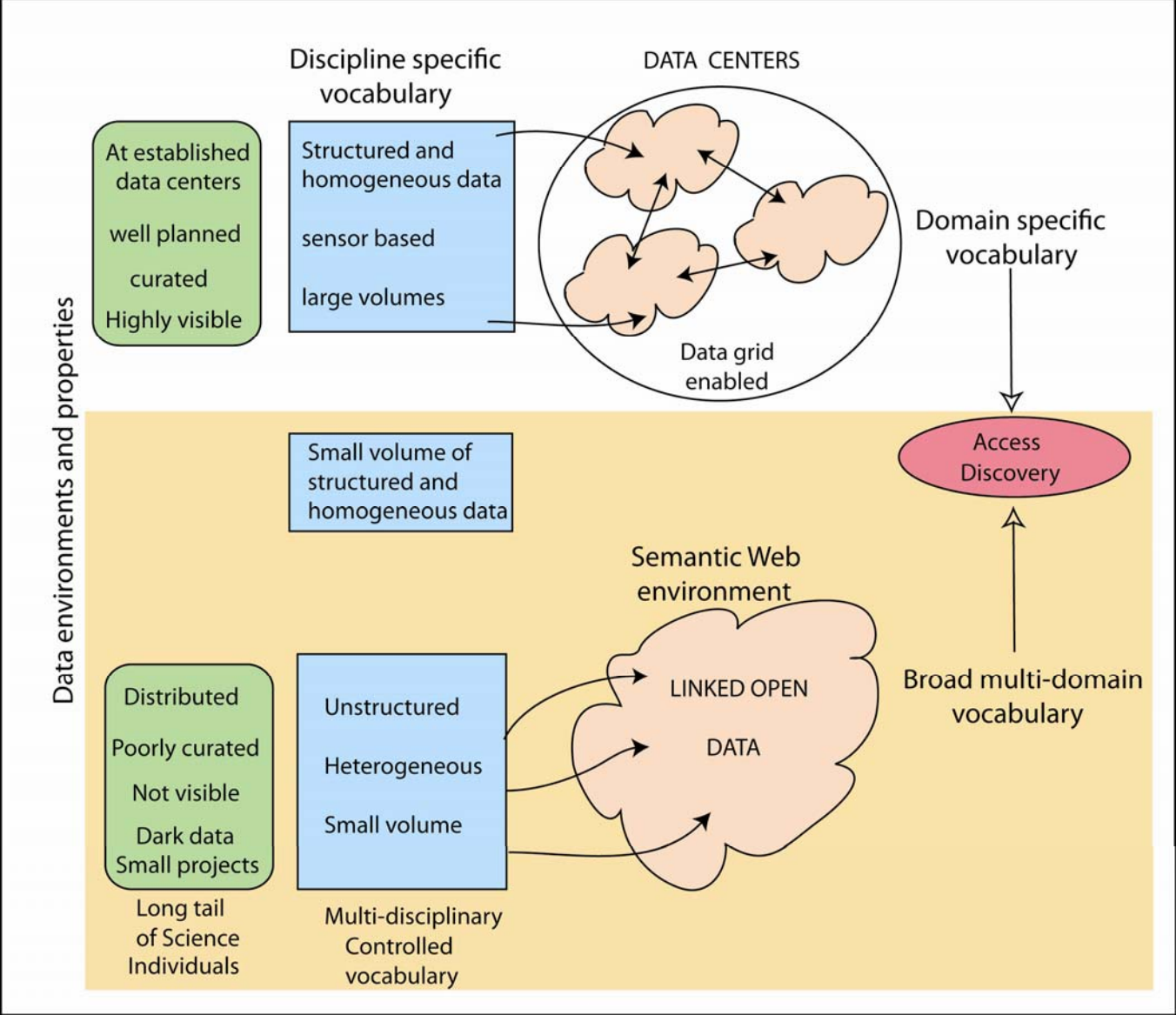


# SCIENCE INFRASTRUCTURE

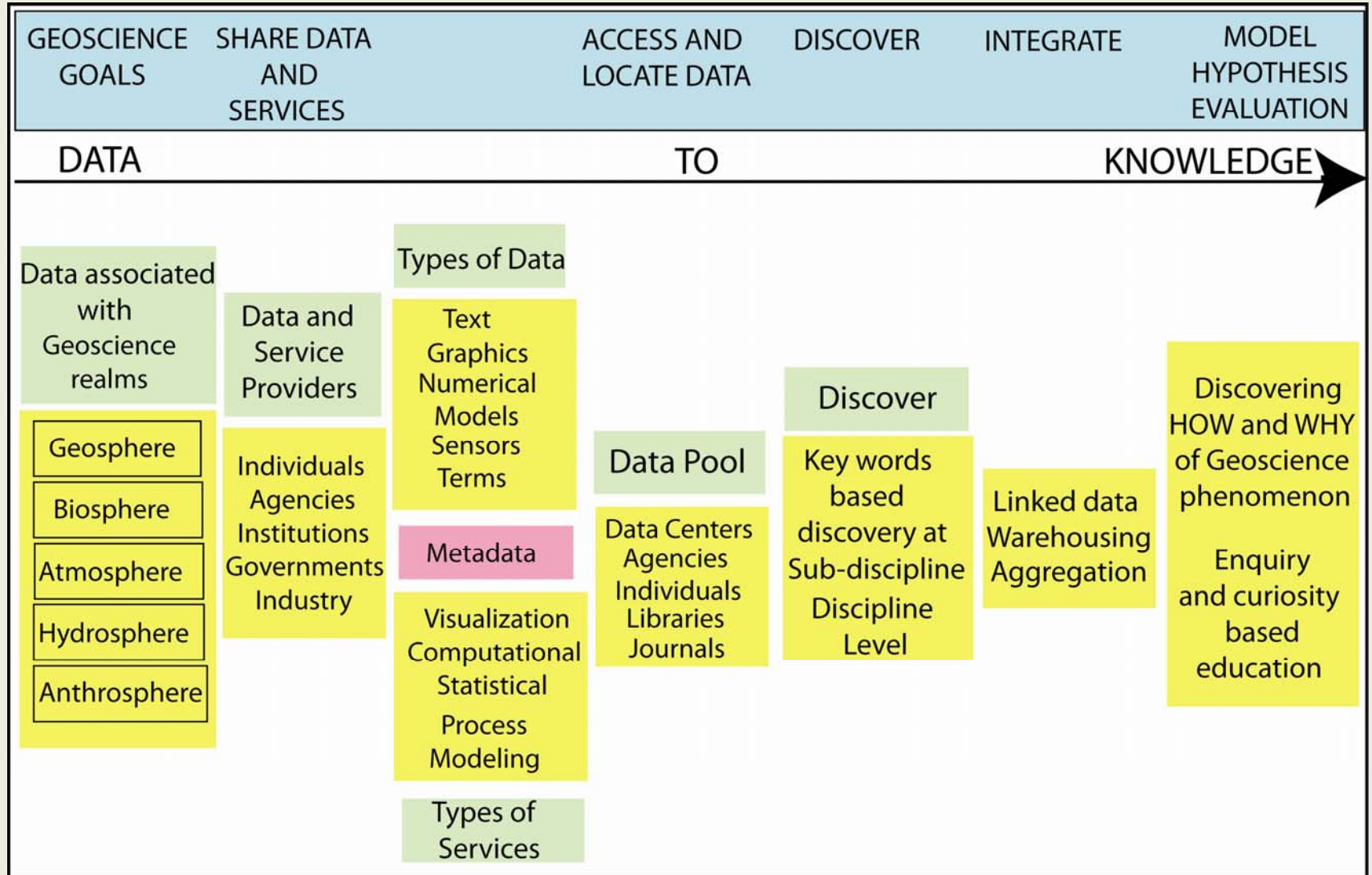
Semantics, Semantic Web, Vocabulary, Metadata, Heterogeneity, Quality, Re-use, Environment, Sharing of data



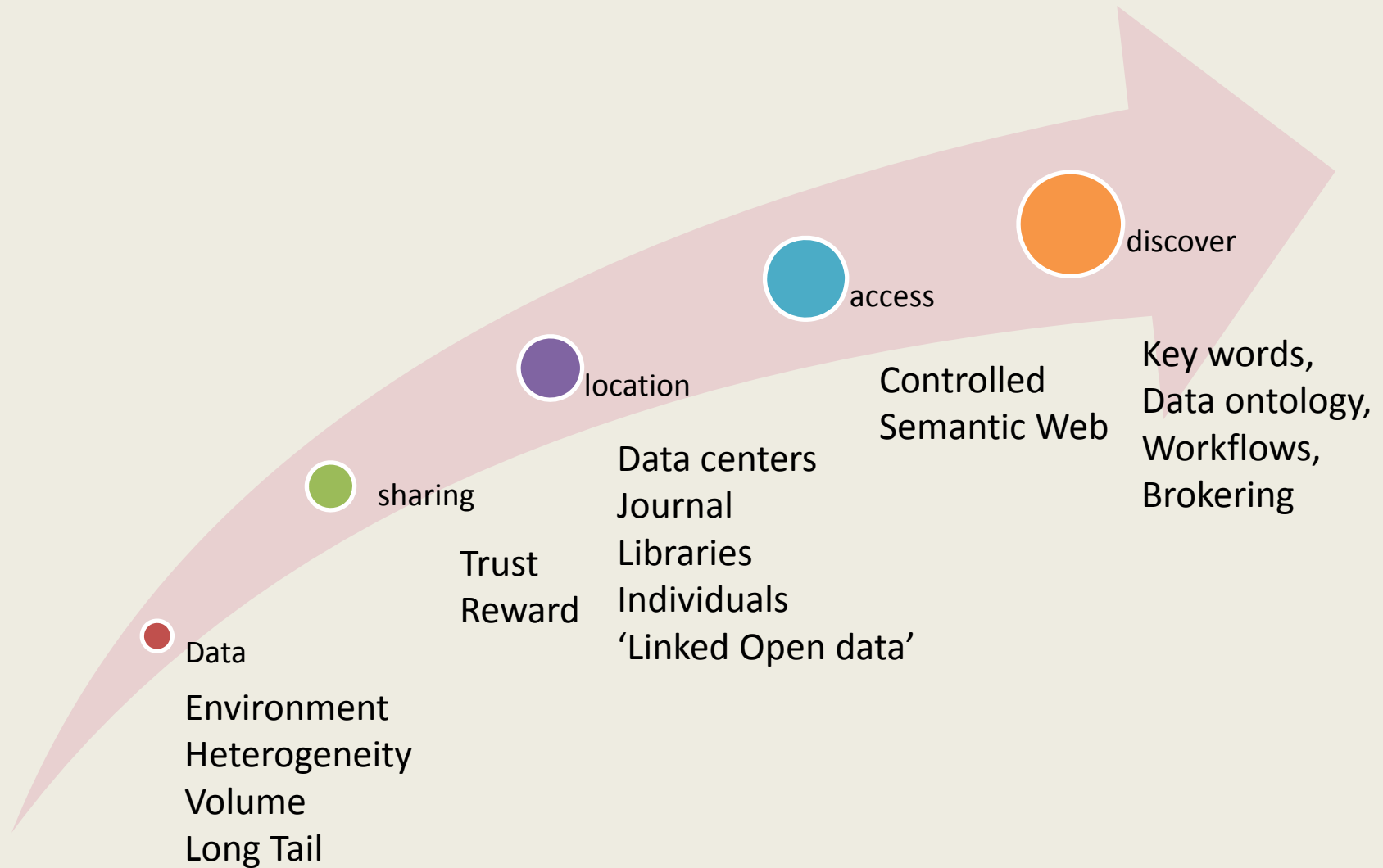
# Deploying three infrastructures (social, engineering, science) together to provide an integrative view of earth as a system of systems



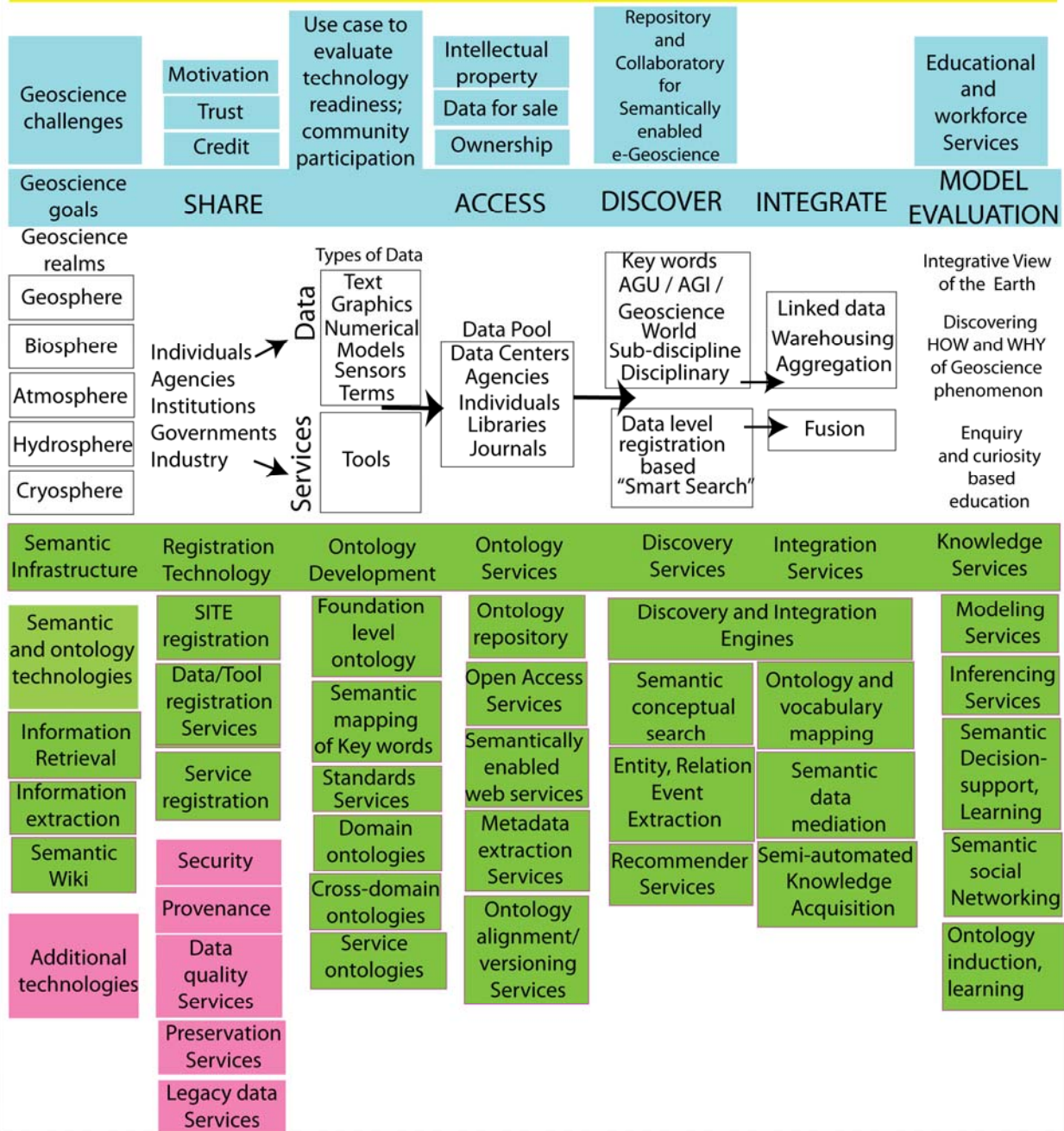
# STAGES ASSOCIATED WITH DATA TO KNOWLEDGE TRANSFORMATION



# Outline for assembling building blocks for EarthCube Infrastructure



# High level view of Semantic/ontologic based infrastructure for Geosciences





# Summary

- Infrastructures development to be co-ordinate through stages
- Individual scientists right to data be protected
- Use cases to reflect social (cultural) and scientific environments
- Semantic capabilities for discovery to go beyond vocabulary to data level ontologies
- EarthCube will succeed through changes in social environment