GeoTechE public lecture
University of Twente, 23 May 2024

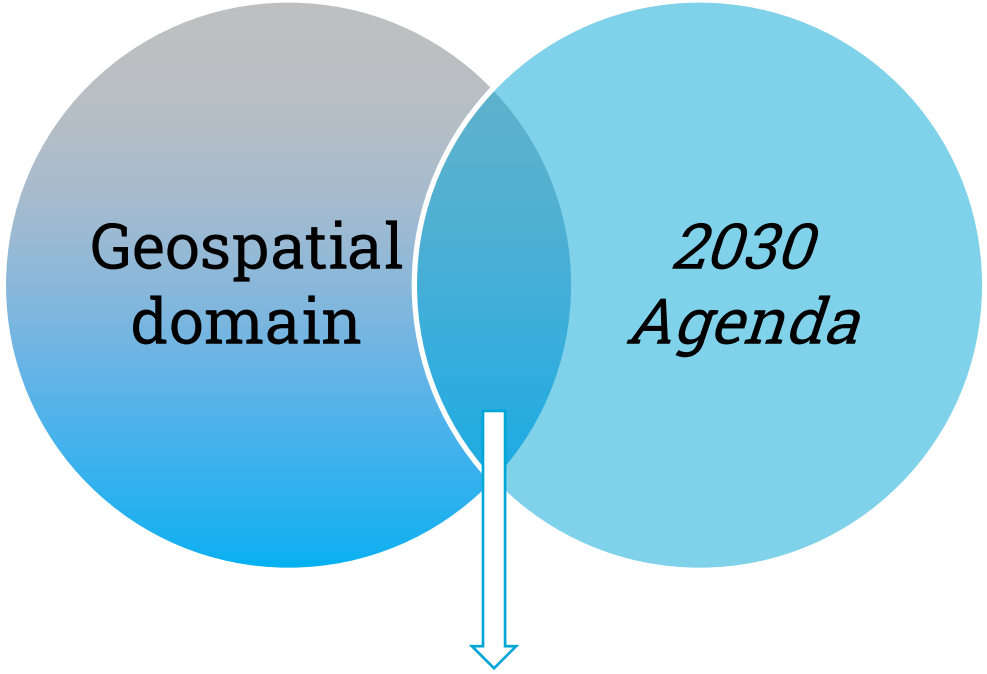
SDGs, Ethics, and the Geospatial Domain

Critical Insights and Ways Foward for the Geospatial Curriculum

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(Common) epistemological limits



How a **certain** **understanding** and **teaching** of ethics can help

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What this lecture is *not* about

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NOT – 1



From **morals** to **applied ethics** (in the geospatial domain)

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NOT – 2



Law **surrounds** ethics (and is informed by ethics)
What is legally possible to do with data (e.g., GDPR) → **data stewards**

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NOT – 3

Data ethics is “the branch of ethics that studies and evaluates moral problems related to data (including gene[illegible] recording, curation, processing, dissemination, sharing and use) [illegible]orresponding practices (including responsible innovation, programm[illegible]acking and professional codes), in order to **formulate** and **support morally good solutions**. (Floridi & Taddeo 2016)

From **normative** and **axiological** ethics
to **non-normative** and **non-axiological** ethics

- The shift impacts on **sustainability** and **SDGs**

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The map is (*not*) the territory

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On the Exactitute in Science

In that Empire, the **Art of Cartography** attained such **Perfection** that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those **Unconscionable Maps** no longer satisfied, and the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided **point for point** with it. The following Generations, who were not so fond of the Study of Cartography as their Forebears had been, saw that **that vast Map was Useless**, and not without some Pitilessness was it, that they delivered it up to the Inclemencies of Sun and Winters. In the Deserts of the West, still today, there are Tattered Ruins of that Map, inhabited by Animals and Beggars; in all the Land there is no other Relic of the Disciplines of Geography.

(Jorge Luis Borges)

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Fiction = to model

1) 1:1 mapping is **unconscionable** and **useless**

2) models (including scientific theories) provide a **certain** formalization of reality – this is what makes them **useful**

3) It's not a matter of **completeness** but **function**

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Geodata, GISs, geomatics and SDGs

Geodata: key asset for **monitoring** and **achieving** the **Sustainable Development Goals**. “Geospatial information is able to provide a set of science and time-based monitoring solutions to [SDGs] challenges» (Scott & Rajabifard 2017)

GISs: «powerful combination of instruments capable of **receiving**, **recording**, **recalling**, transforming, representing, and processing **georeferenced spatial data**» (Gomarasca 2010)

Geomatics: discipline defining a «**systemic**, **multidisciplinary**, **integrated approach** to selecting the instruments and the appropriate techniques for collecting, storing, integrating, modeling, analyzing (…) **spatially georeferenced data**» (Gomarasca 2010)

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Epistemological limits

«**Naive empiricism**» which turns
mapping into a «**trivial pursuit**» (Taylor 1990)

«Assumptions of **objectivity**, **value-neutrality**, and the ontological separation of subject and object.» (Lake 1993)

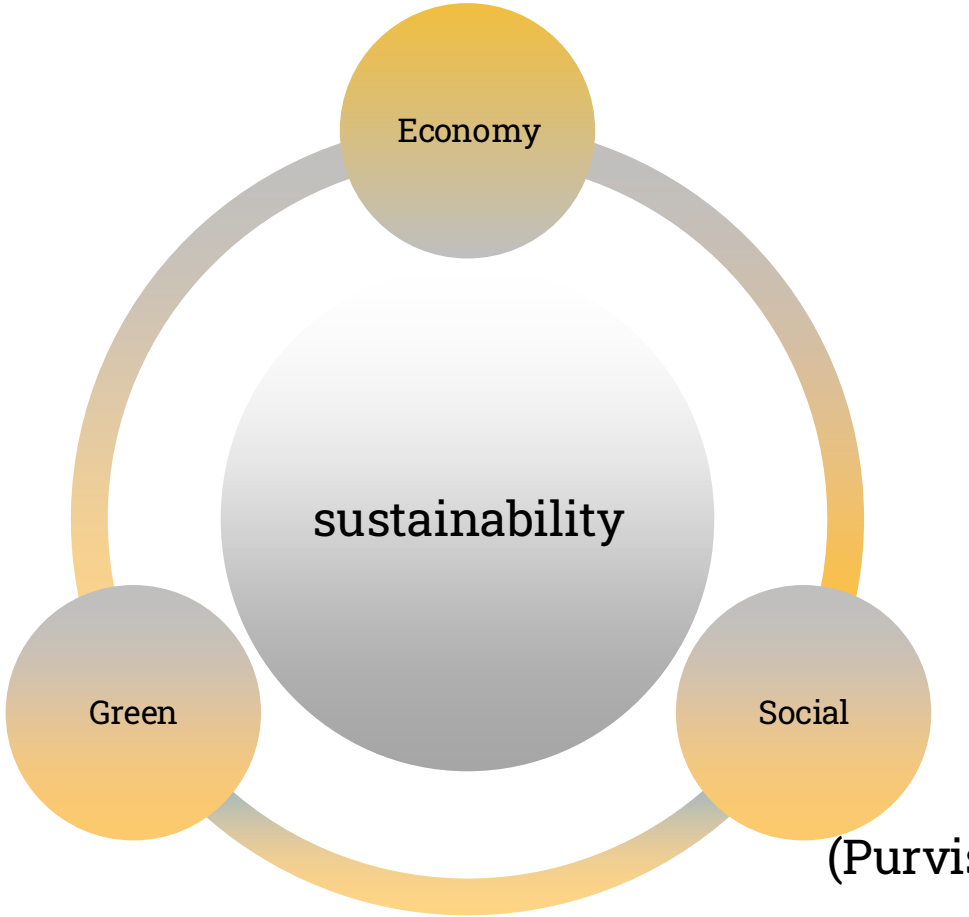
- the recording and representation of **what** happens and **where** this happens are **instrumental acts** assumed as **universal**.
  This is a (rational-efficient) **positivistic** rationale

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Sustainability

In a world of limited resources, **applied ethics** gets **entangled with sustainability**

Yet, sustainability too is **normative**
(Troullaki et al 2021)



(Purvis et al 2019)

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2030 Agenda

Three are the innovative characteristics of the *2030 Agenda*:

1) its **universality**; 2) the necessity that **all contribute** to change;

3) its **integrated vision** over the problems and actions to be realized.

There is the necessity to intervene in depth in how the world consumes and produces, creates jobs, assures the wellbeing of people, manages institutions, defines its value.

[We need] grassroots participation, which generates synergies, identifies innovative solutions, shares objectives and tools, checks results, and assesses the behavior of companies, politicians, media.

[**The integrated vision**] is the most difficult challenge, not only for its **analytic complexity** and practical feasibility, but also for the cultural context surrounding the *2030 Agenda*, almost **"reluctant"** to **holistic thought**.

(Giovannini 2016)

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Epistemological limits

"The agenda's implementation is complicated by the fact that **targets** and **goals interact** and **impact each other** in different ways" (Weitz et al. 2016)

The "**indivisible**" achievement of the *2030 Agenda* is unrealistic because the pursuit of certain SDGs **impinges** that of others (Griggs et al. 2016).

The *2030 Agenda too* rests on a (rational-efficient) **positivistic** understanding of **development** and **sustainability**

"to generate positive **social** and **environmental** changes globally, sustainability science must transform into a **transdisciplinary enterprise**" (Shrivstana et al. 2020)

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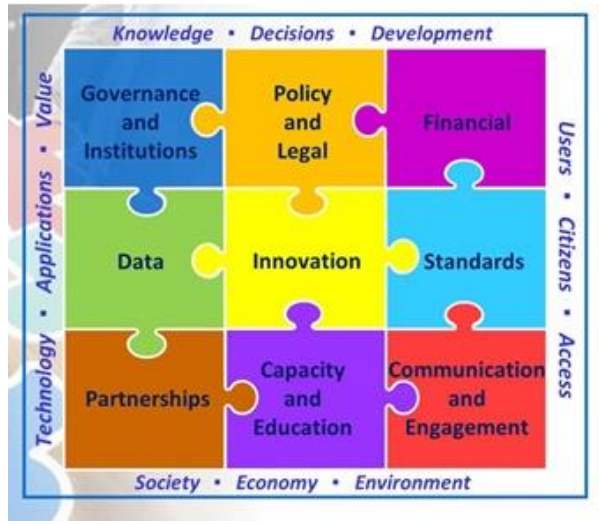
Case study: Intergrated Geospatial Information Framework

"There are **no evident strategic frameworks** for governments to determine **how** geospatial information can be implemented into **sustainable development** processes." (Scott & Rajabifard 2017)

→ **Integrated Geospatial Information Framework** (UN-GGIM 2020)

Geoinformation is the «**digital currency**» which «**reflects** the **physical** world in which all human activity takes place.»

the Framework is made up of "separate pieces of a **jigsaw puzzle**. When the pieces are **all joined together** the Framework is connected, integrated and able to be implemented."



UN-Global Geospatial Information Management (2022)

Epistemological limits (Calzati & van Loenen 2023)

the Framework is built as a «**Lego model**», whereby the combinatory convergence of the nine pathways is assumed to lead to optimal implementation.

The Lego model remains blind over the **tradeoffs** running through the framework as a **complex system**

It might well be the case that some pieces of the Framework **conflict with each other** and/or that some pathways need to be **prioritized** over others.

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How to move forward?

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ONE: critical understanding of technology

"Technology is neither good nor bad; **nor is it neutral**" (Kranzberg 1st law)

"One can always **construct** a set of indicators that proves **any answer** one wants to the question posed." (Drechsler 2019)

Technology is a **sociotechnical apparatus** and data are **sociotechnical assemblages**, both embedding precise values (of rationality and efficiency) foregrounding **one possible** model of reality

«Data are needed to deliver better decisions» (Scott & Rajabifard 2017)
→ What **kinds** of data are at stake? What is there into these «better decisions» that data **might not** grasp? More data is **not** necessarily better.

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TWO: critical understanding of geo and space

"The **uncertainty** of the picture data provides, has always been proportional to the **status** and **power** of those it describes." (Taylor 2021)

"to **understand** 'the data,' we need to understand **both** the **observer** and the **observed**" (Taylor 2021)

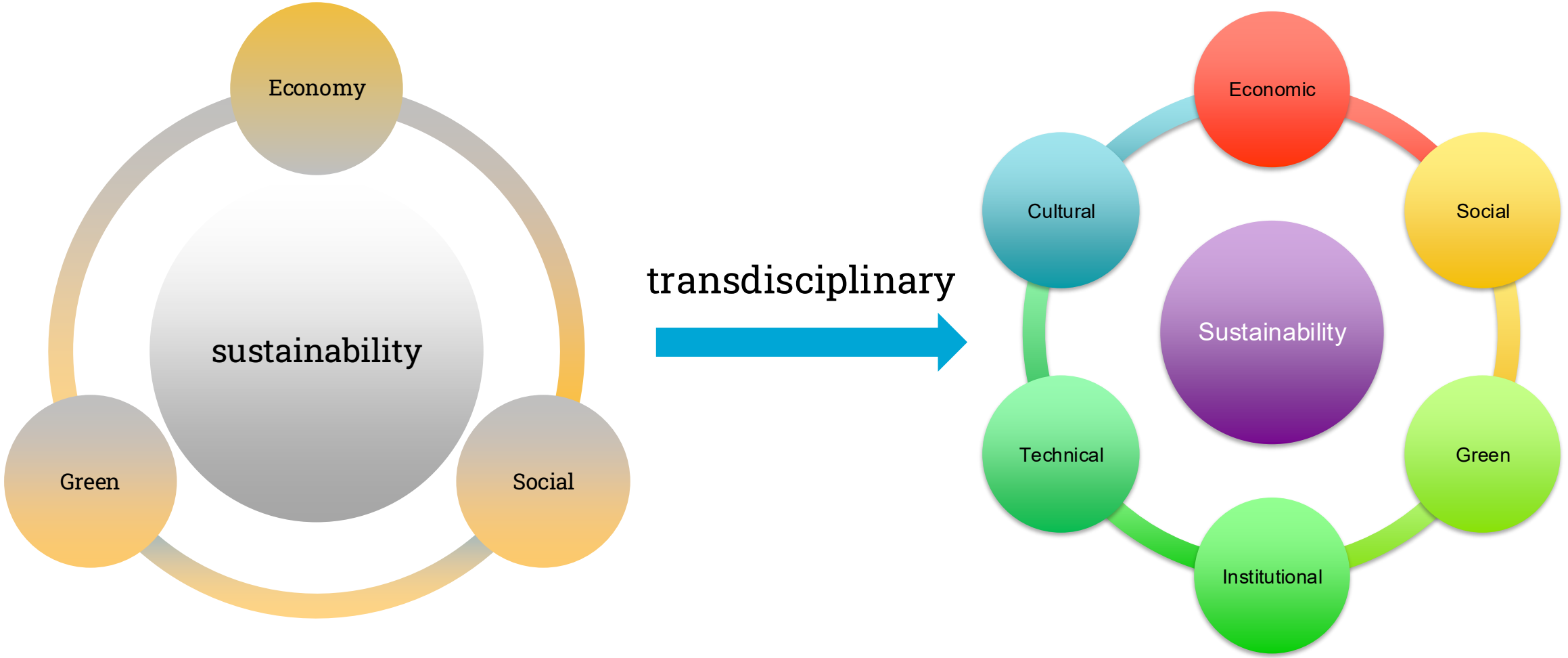
Every space is always already a **social space** (Lefebvre 1974)

Any model is just a **peculiar formalization** of reality that is valuable under **certain conditions** (what, how, why, by whom and with which results).

The **unmappable** – all that resists a certain modeling – is what makes **knowledge (of the mappable) worthy**

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THREE: critical understanding of sustainability



(Abaku et al 2021)

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FOUR: critical understanding of ethics

A **systematic reflection** on **what**, **how** and **why** people **collectively** justify as good or bad.

- ethics is an **ongoing practice**, which **cannot** be defined once and for all or abstracted from the context

- ethics bears a **collective** connotation by default: it **cannot** be reduced to an individual affair (“virtue ethics”), or to a sum of individual positions.

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Implementing Critical Insights

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1. Revisiting the Framework

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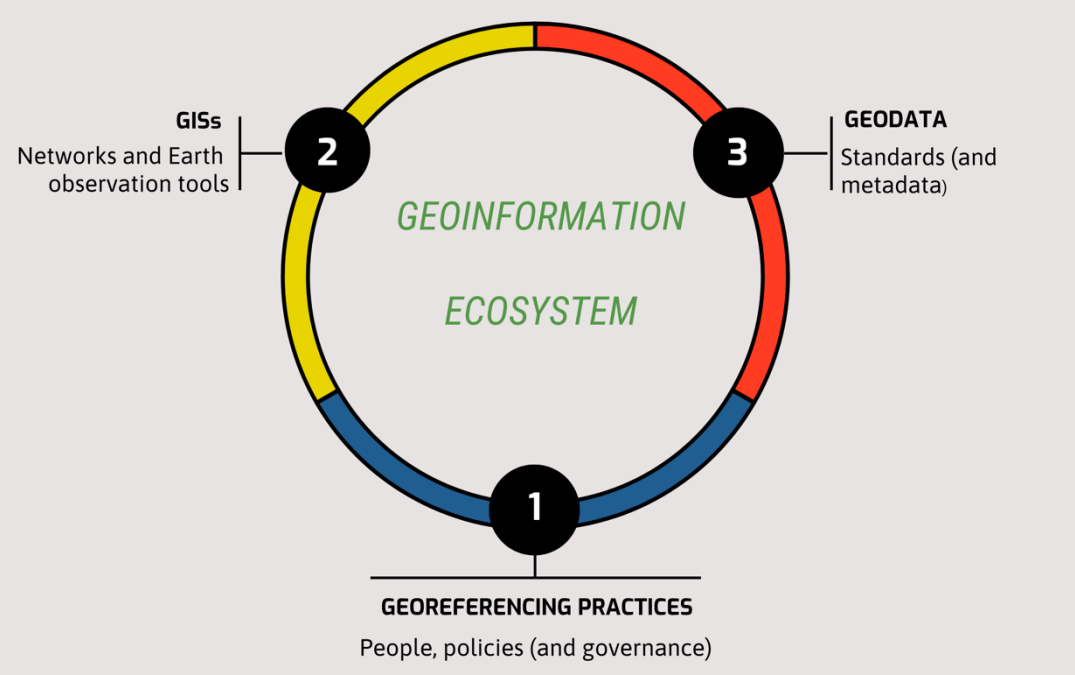
Geoinformation initiatives as sociotechnical ecosystems

Building on data ecosystems (van Loenen et al. 2021) and Critical Data Studies (Kitchin & Lauriault 2014), geoinformation initiatives are regarded as **sociotechnical ecosystems**, comprising of three entangled aspects:

- georeferencing **practices**

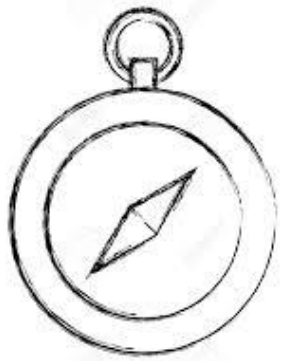
- georeferencing **technologies**

- geodata **life cycle**

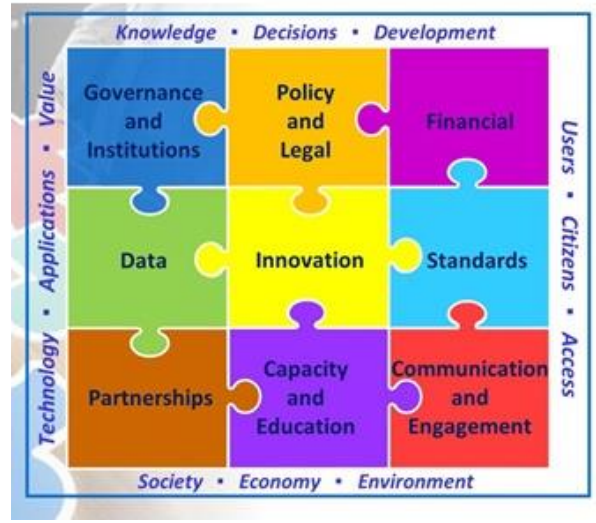


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Ethics compass (Calzati & van Loenen 2023)



ETHICS



Ethics as a **compass** for ongoing scrutiny of the tensions running through the Framework in order to:

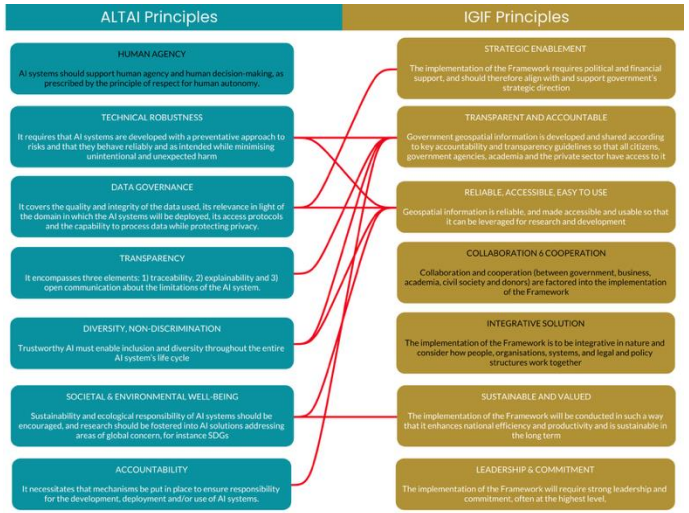
- **assess** the ethical robustness of georeferenced data, practices & techs

- **guide** a more just (i.e. balanced) pursuit of SDGs.

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Give the Framework an ethics boost

The Framework **does not** include ethics → We brought ethics **into** the Framework:



Comparison between the principles listed in the Framework and those defined in the **Assessment List for Trustworthy AI** (EC-HLEG)

Mutuation of the **ethics maturity scale** of the **Joined-up Data Maturity Assessment** (Global Partnership for Sustainable Development Data)



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QUESTIONS-PRINCIPLES/MATURITY LEVELS	UNDEFINED	EMERGING	LEARNING	BUILDING	CONSOLIDATING
	No awareness of epistemological and ethical issues concerning the geodata ecosystem	*Awareness across stakeholders emerges, but no leadership is taken. Epistemological and ethical issues are identified but not tackled.*	*Leadership to address ethical issues is established, but no coordinated effort yet across stakeholders. Advise from third parties is also contemplated but not integrated into an organic approach.*	*Coordination among stakeholders concerning roles and responsibilities to tackle ethical issues. This also includes the drafting of guidelines on how to tackle ethical issues, but no full implementation yet.*	*A systemic approach to epistemological and ethical issues is adopted, identifying not only roles & responsibilities, but also best practices, mitigation mechanisms, ongoing monitoring procedures, which can also involve third parties and training*
ROBUSTNESS					
1) To what extent can the geodata ecosystem have adversarial, critical or damaging effects in case of faulty design, technical defects, inappropriate integration of its socio-technical components, inappropriate practices, malicious data use? 2) What efforts have been placed to ensure the integrity, robustness and overall security of the ecosystem? Have risks, risk metrics and risk levels been identified in the use of GISs and geodata? 3) Is there a process to monitor the geodata ecosystem performance, including the tackling of potential unwanted unintended consequences and their mitigation?	No or limited exploration of the robustness of the geodata ecosystem	Concerns about the robustness of the ecosystem are identified	Leadership to imrpove the robustness of the ecosystem is established, but there is no coordinated effort across stakeholders	Coordination across stakeholders through the definiton of an agreed plan is reached to guarantee/improve the robustness of the ecosystem	A concerted plan is eancted to make sure the geodata ecosystem is robust. This implies identifying socio-technical limitations, their improvement through the allocation of roles and responsibilities, and the establishment of monitoring processes and training
DATA GOVERNANCE					
1) Does the geodata ecosystem include a review and compliance with data governance measures (some of which are mandatory under GDPR or similar laws) such as: A) Data Protection Impact Assessment (DPIA); B) Designate a Data Protection Officer (DPO) and include them at an early state in the development, procurement or use phase of the AI system; C) Oversight mechanisms for data processing; D) Measures to achieve privacy-by-design and default 2) Does the geodata ecosystem align with relevant standards (e.g. ISO, IEEE) or widely adopted protocols for (daily) data management and governance?	The geodata ecosystem does not have a govervance model or govervance-related mechanisms that account for and address epistemological and ethical issues concenring its oucotmes, practices and technologies' use	The need for govervance to deal with ethical issues rasied by, across, and beyond the geodata ecosystem emerges	Sporadic governance intiiatives within the geodata ecosystem are taken that put the tackling of ethical issues at their core; however, there is still no a shared framwork across the ecosystem	A shared governance framework aimed at addressing ethical issues of the geodata ecosystem is defined	The shared governance framework is successfully implemented, monitored, assessed and adjusted according to the onoing evolution of the ethical concerns raising within the ecosystem
TRANSPARENCY					
1) Are there measureS to explain the traceability and working of the geodata ecosystem to users and different stakeholders 2) Are there mechanisms to inform users and other stakeholders about the ethical limitations of the ecosystem working and results?	No or limited attention is paid to the fucntioning of the geodata ecosystem in a transparent way	The principle of transparency as a key feature for a mature functioning of the geodata ecosystem is identified	Stakeholders begin establishing conditions and rules to make the ecosystem trasnparent	Previous efforts towards trasnparency are systematized through the identification of roles and responsibilities	A detailed plan to assure the ongoing trasnparency of the ecosystem is defined, together with mechanisms to balance conflicting interests

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DIVERSITY, NON-DISCRIMINATION, FAIRNESS					
1) Are there procedures to avoid creating or reinforcing unfair bias in, by and through the ecosystem, regarding, for instance, datasets, the practices for their collection and use, or the design of GISs? 2) Has a review of subjects that could potentially be affected by the working of geodata ecosystem been performed? 3) What are the measures enacted to ensure the (up-to-date) quality, inclusiveness and representativeness of data in each situation? 4) What are the measures enacted to monitor the robustness of the georeferencing practices? 5) Have educational and awareness initiatives been put in palce to help GIS practitioners and other relevant stakeholders to be more aware of the possible biases they can inject (even inadvertently) in a geodata ecosystem? 6) Has a mechanism been established to allow for the flagging of issues related to bias, discrimination or poor performance of the geodata ecosystem by any relevant stakeholder? 7) Is there a mechanism to include the participation of the widest range of possible stakeholders in geodata ecosystem?	The extent to which the geodata ecosystem might reinforce and/or create socio-economic inequalities, be based on bias data and practices, or result in unfair outcomes is not acknowleged	Issues of diversity, non-discrimination and fairness concerning how the geodata ecosystem works are identfied	Initiaves to ensure that georefering practices, GIS technologies and geodata account for diversity, non-discrmination and fairnness emerge	Initiatives to ensure the fairness of the goedata ecosystem are accompanied by the defintion of standards, policies and best practicies shared across the ecosystem	The fairness of how the geodata ecosystem works becomes a pillar in the conduct of stakeholders and its achievement is pursued conjointly by all. A culture attentive to fairness is fostered also via the development of training, best practices, and shared knowledge
ENVIRONMENTAL & SOCIETAL WELL-BEING					
1) Is there awareness of the potential impact on the environment of georeferencing practices the use of GISs and the collection and circulation of geodata? B) Has an environmental assessment of the potential impact of GISs, georeferencing practices and geodata been performed (for example, the amount of energy used and carbon emissions)? C) What actions have been identified to mitigate such impact? 2) Has a review been performed on the potential negative impact (including unintended consequences) of the geodata ecosystem on society at large? B) Has an assessment of such potential negative impact at societal level being conducted, beyond the (end-)user and subject? C) What actions have been identified to minimize potential societal harm?	No awareness of the environmental and societal negative impact of the working of the ecossytem	It is incraesingly ackbwoedged that how the geodata ecosystem works can have a (even unintended) negative enviromental and societal imapct	Issues concerning the enviromental and societal scale of the operations of the geodata ecosystem starts to be systematically identfied and addressed	There is widespread commitment across the ecosystem's stakeholders to review how the ecosystem operates following an asssement of its environmental and societal impact	A coordinated effort to review, tackle, mitigate and monitor the (unintended) environmental and societal impact of how the ecosystem works is orchestrated. This implies roles and mechanims to assess such impact, as well as ex-ante, in-the process, and ex-post evaluations. Training are introduced to assure the upskilling of such effort alongiside the evolution of practicies and GISs
ACCOUNTABILITY					
1) Are there mechanisms that facilitate the ecosystem's auditability, especially by third parties? 2) Is it foreseen the possibility of external guidance to review ethical concerns and accountability measures? 3) Has an ongoing process been established to discuss and continuously monitor and assess the geodata ecosystem adherence to ethical standards? B) Does this process include the identification and documentation of conflicts between different ethical principles and tradeoffs concerning georeferencing practices, the use of GISs and the collection and use of geodata? C) Is appropriate training envisioned to those involved in such a process?	No need for the accountability of the ecosystem is identified	Awareness of the need to make the ecossytem accountable starts to emerge within the ecosystem, but no concrete action is taken yet	Efforts to make the ecosystem more accountable are made, although still in an uncoordinated manner across stakeholders	Efforts to make the ecossytem accountable start to be organised coherently and systematized according to shared protcols and best practices	Accountability becomes a pillar of the fucntioning of the ecosystem, to which all stakeholders contribute, following shared protocols, and complying to roles and responsiblities. A culture of accountability is fostered by making the ecosystem auditable by third parties and by fostering training programs

Ethics Assessment List for Geoinformation Ecosystems

EALGE is **descriptive** in nature. It contains:

- **6 main principles**: “robustness”, “governance”, “transparency”, “diversity, non-discrimination, fairness”, “environmental and societal well-being”, “accountability”
- **5 maturity levels**: “undefined”, “emerging”, “learning”, “building”, and “consolidating”
- **32 questions** to assess the **ethical soundness** of **geoinformation initiatives**

→ **Validated** during a **Summer School on OpenSDIs** (Zagreb, August 2022)

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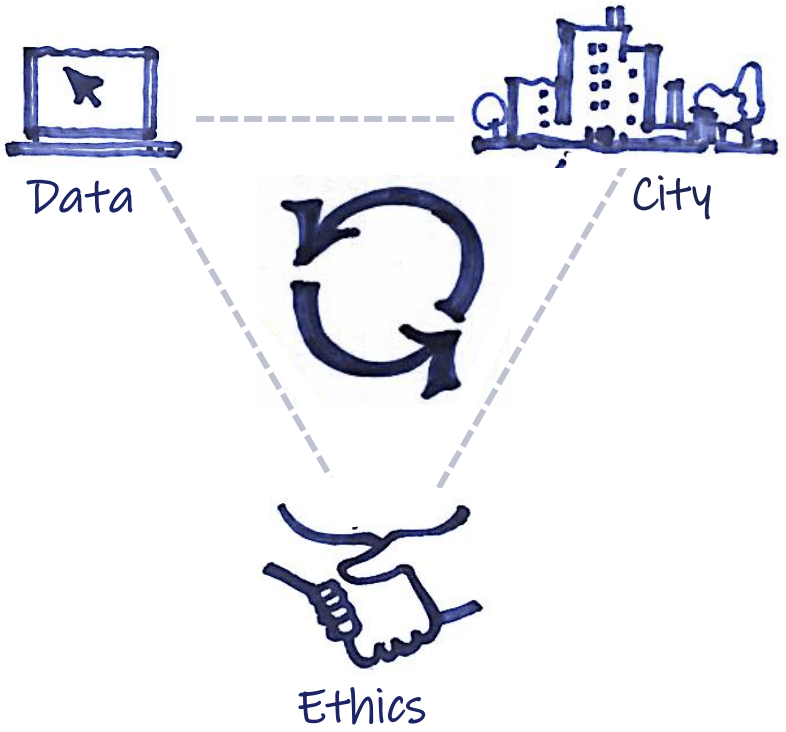
2. Teaching Data Ethics

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Ethics for the Data-driven City

Workshop-style, **research&designed** course, based on:

1. data as **sociotechnical** assemblages
2. cities as **complex systems** (irreducible to computation)
3. ethics as **non-normative non-axiological collective reflection**



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Transdisciplinary problem-seeking approach

Transdisciplinarity posits the unitary nature of knowledge. This helps to explore:

a) the intrinsic **double-sidedness** of tech-related concepts & principles (openness, transparency, personal data, etc.)

b) the **unavoidable emergence** of **unintended consequences** whenever data-driven technologies are implemented and used in an urban context.

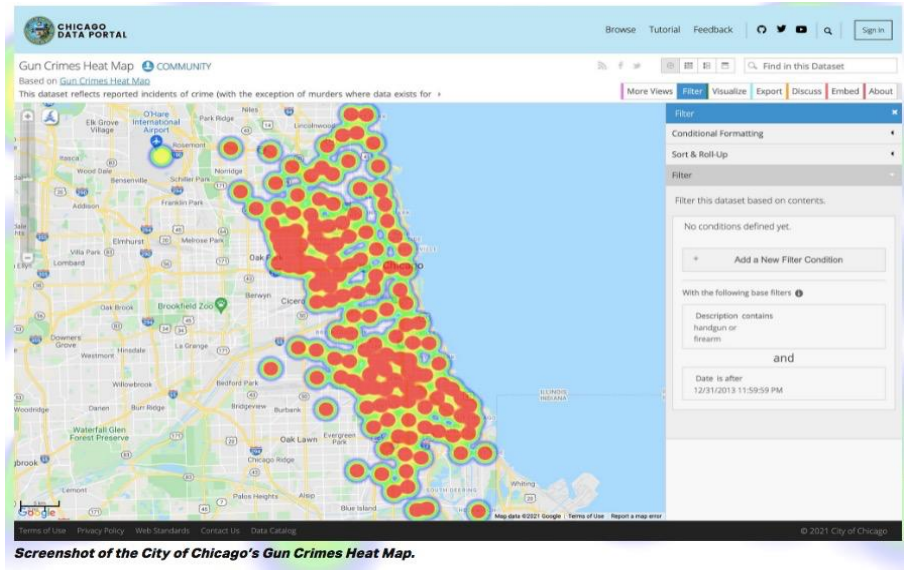
Hence, the course adopts a **problem-opening** standpoint which:

a) **recognizes** and **problematizes** ethical principles and values

b) **identify** the inherent **open-endedness** of all tech "solutions"

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Predictive policing



Screenshot of the City of Chicago's Gun Crimes Heat Map.

"imagine the complexity of what McDaniel was going through: the reason for cops showing up at his door was a **stuff-of-science-fiction computer algorithm** that had identified McDaniel, based on a **collection of data sources that no civilian could gain access to**, as a **shooter or a victim** of a shooting in some future circumstance that **might or might not play out**."

Did it work well? Did it work bad?

à Data might work well, but have **unintened unethical consequences**

Assignment: Research & design

Research:

1) **Identification** of a case study

2) **framing** of the case study (e.g., how it is presented; how it works; etc.)

3) **data-value entanglements** (e.g., values in/excluded; data in/excluded)

4) **open-ended scenarios** (e.g., results and possible unintended consequences).

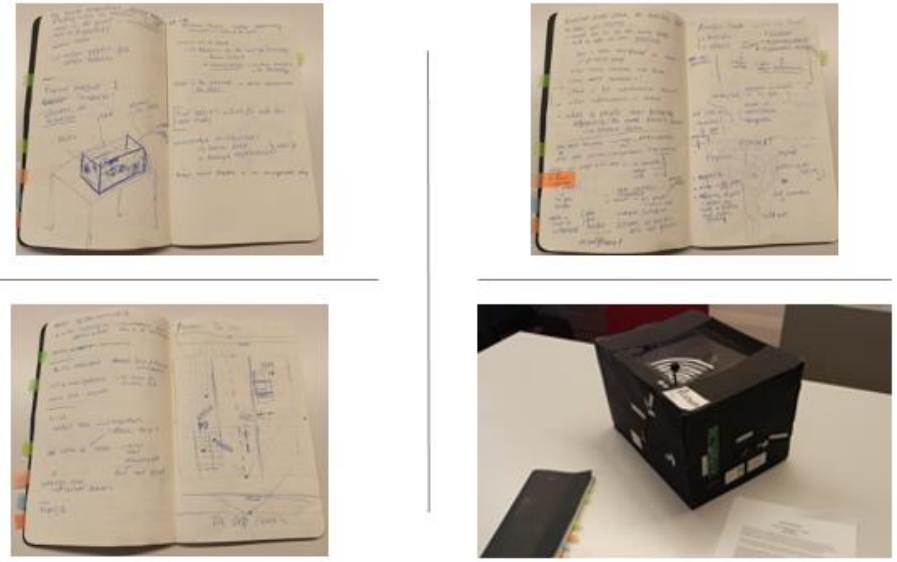
Design:

a) **project journal**

b) **artefact** (e.g., physical or digital object exposing and redressing the ethical tensions identified).

c) **author's statement** describing the artefact

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The main function of the artefact is enabling the observer to see **the same urban mobility scene through different lenses**, both showcasing the data acquisition process, and the ethical perspectives. The fact that one has to hold the artefact close to the eyes to be able to see through the lenses also illustrates the problem of **transparency**

the mystery box signifies the **unknown aspects** related to granting access or storing emails, particularly in weighty situations. (...) The conversations revolve around inquiries regarding the procedure for granting access in conflict situations. (...) The main idea behind was to highlight the **lack of clarity** gained from relevant TU Delft parties.



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Thank you for your attention!

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