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FIG WORKING WEEK 2017

Helsinki Finland

29 May - 2 June 2017

Presented at the FIG Working Week 2017,
May 29 - June 2, 2017 in Helsinki, Finland

HUMAN GEODESY – SHAPING A NEW SCIENCE AND PROFESSION FOR THE WORLD OF TOMORROW

Walter Timo de Vries – TUM – München / Germany

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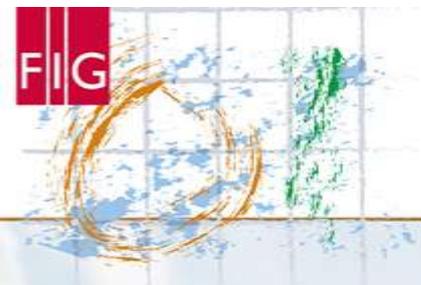


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Walter Timo de Vries

Technische Universität München

Faculty of Civil, Geo and environmental engineering

Chair Land Management

31 May 2017



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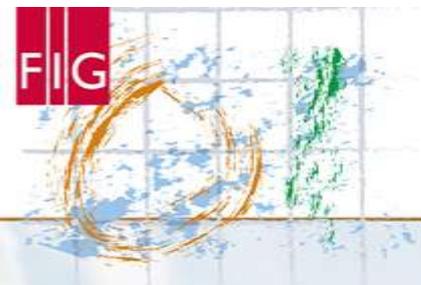


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If human geodesy were a science, what (kind of science) would it be?

- 1) What makes it related to geodesy?
- 2) What makes it human?
- 3) Components of science

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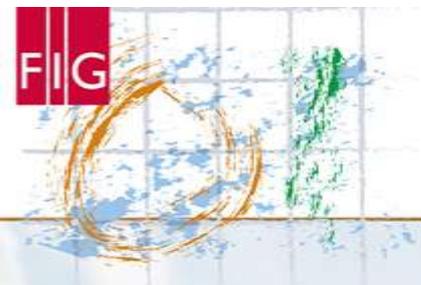


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What is part of geodesy?

- Geodesy — from the Greek word *γεωδαισία* or *geodaisia*
- (literally, "division of the Earth")
- So, original meaning of geodesy deals with activity rather than the static status quo
- -> *divide /dividing* the earth
- Division requires measuring and deciding/determining/adjudicating of boundaries and indicators

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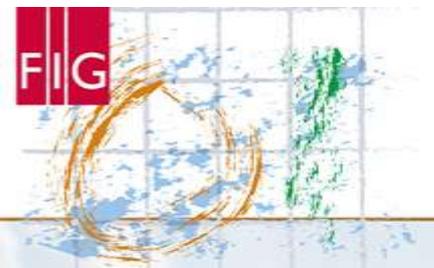


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Ways of dividing the earth – by space and human constructions in space

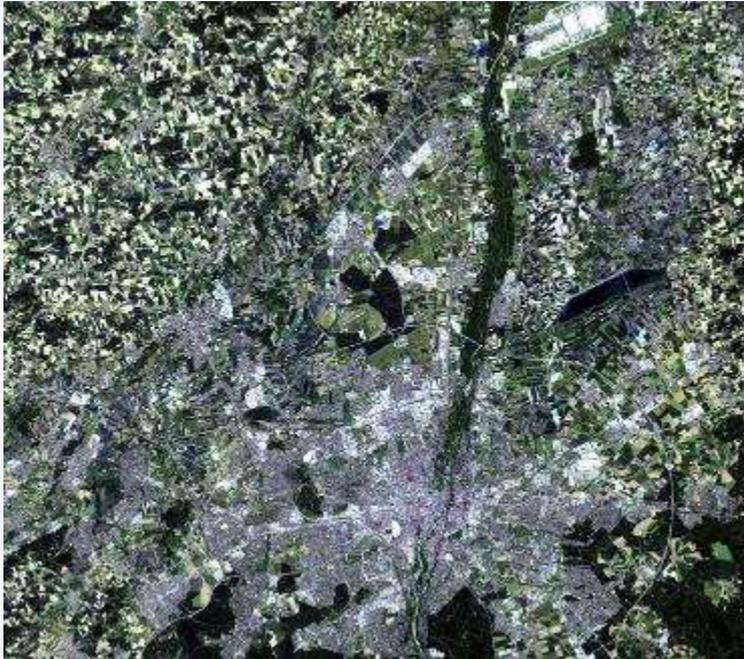




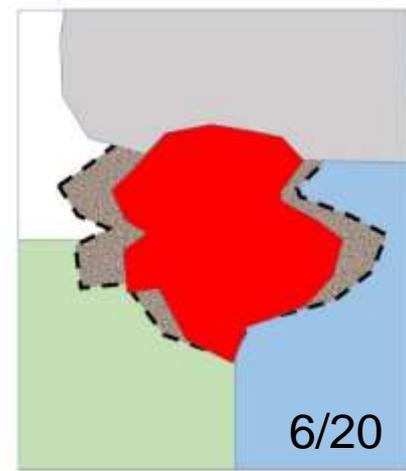
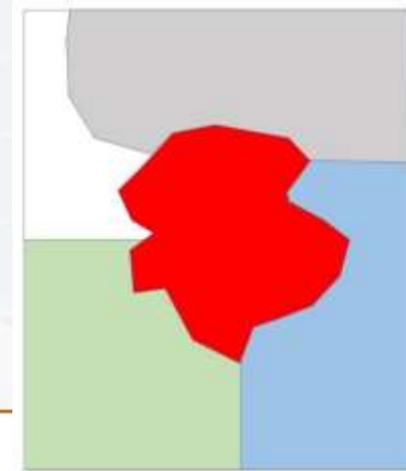
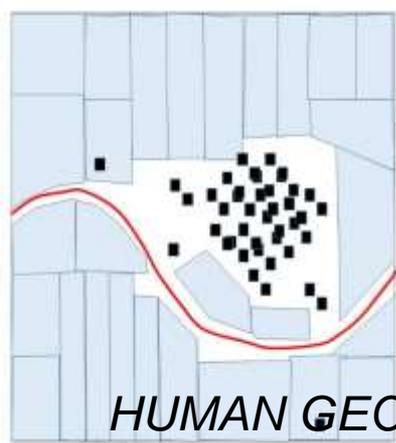
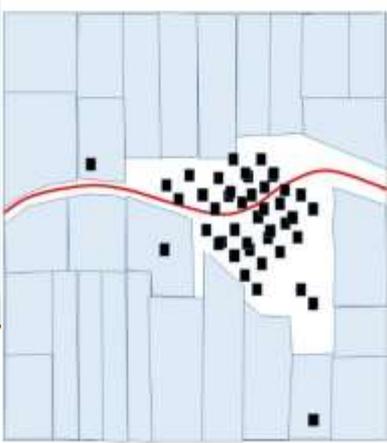
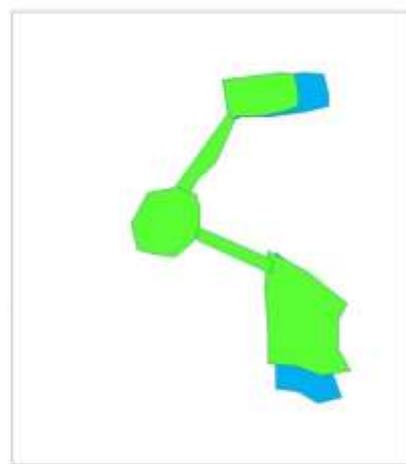
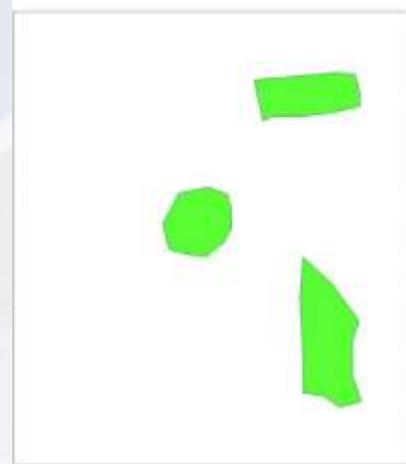
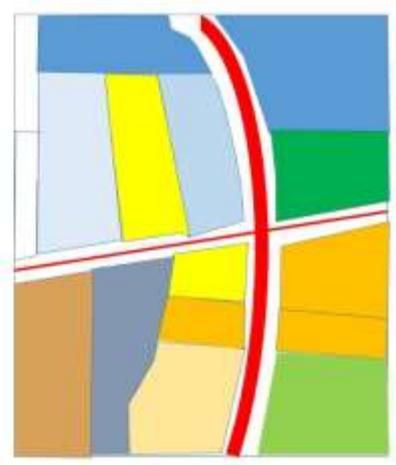
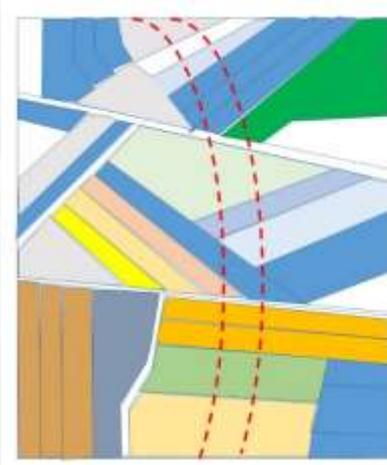
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Ways of dividing the earth – by reforming or consolidation space and human activities in space



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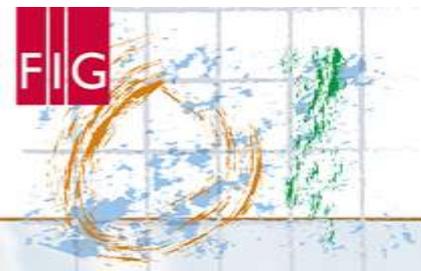


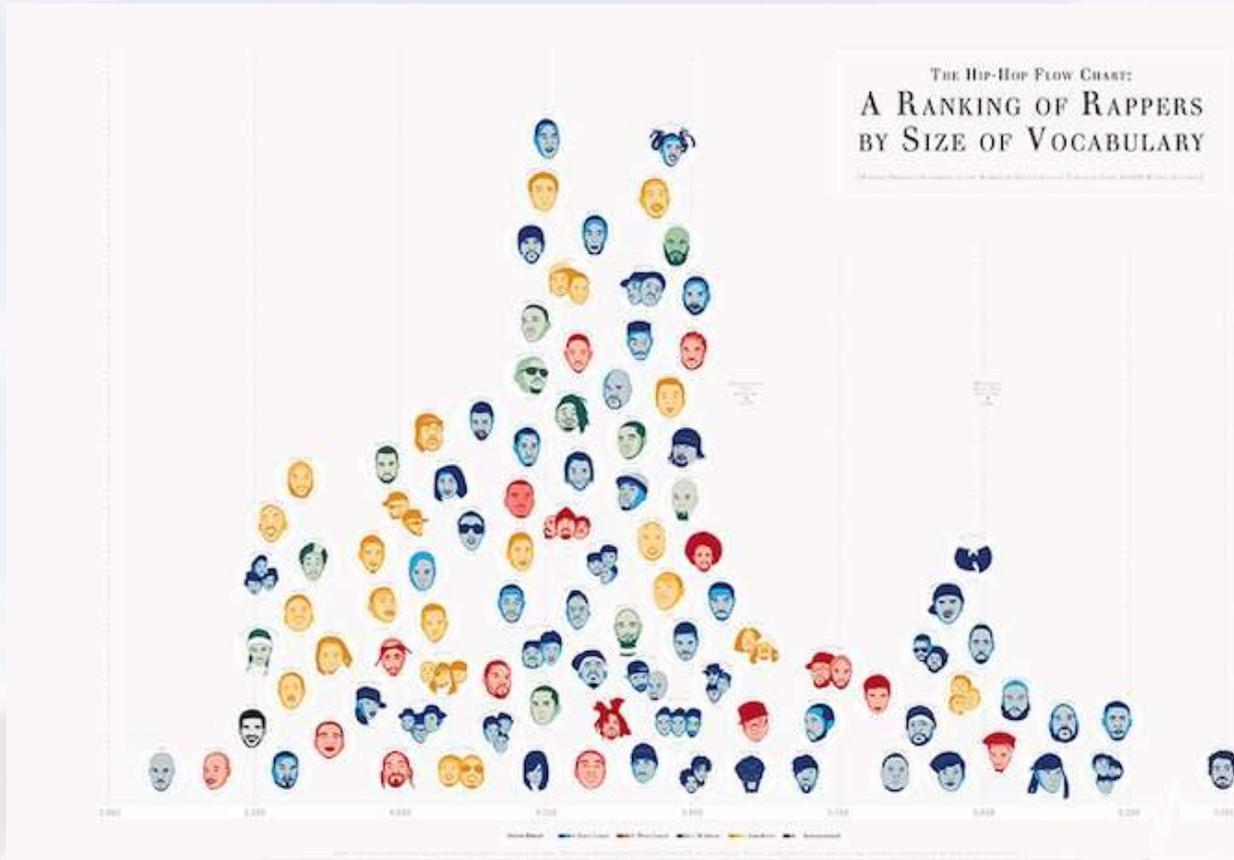
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Ways of dividing the earth – by people and their attributes



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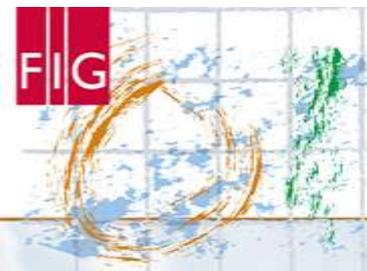


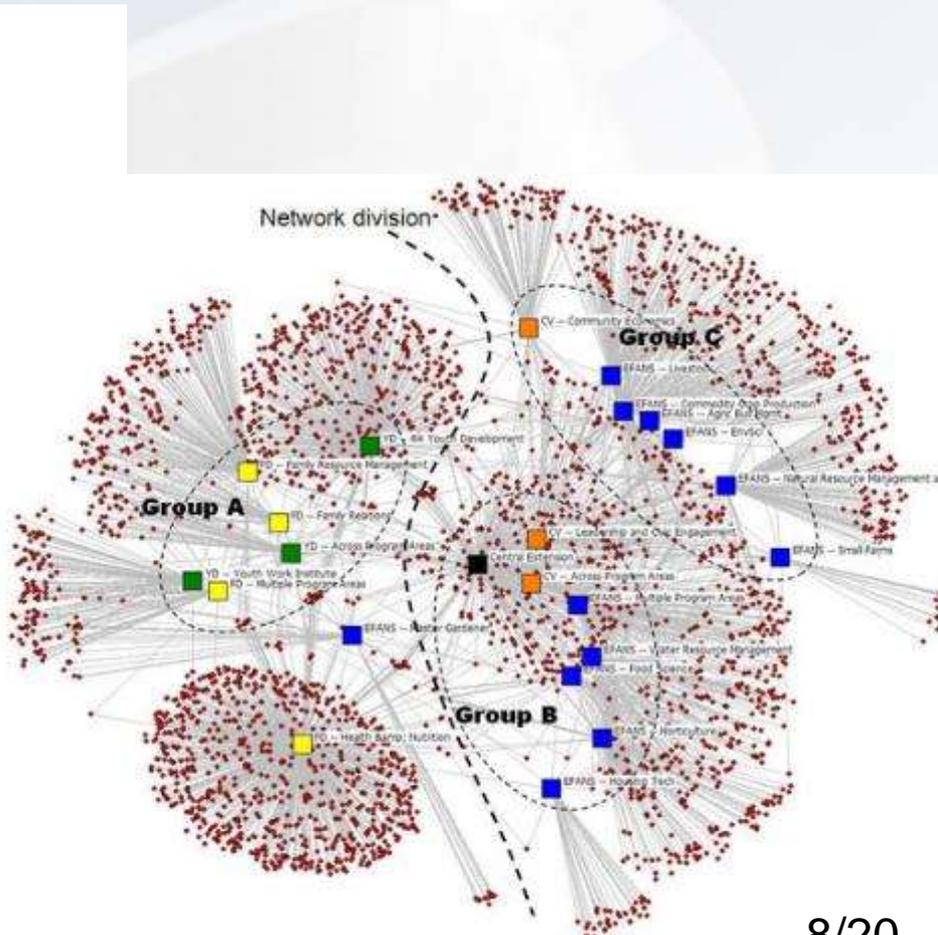
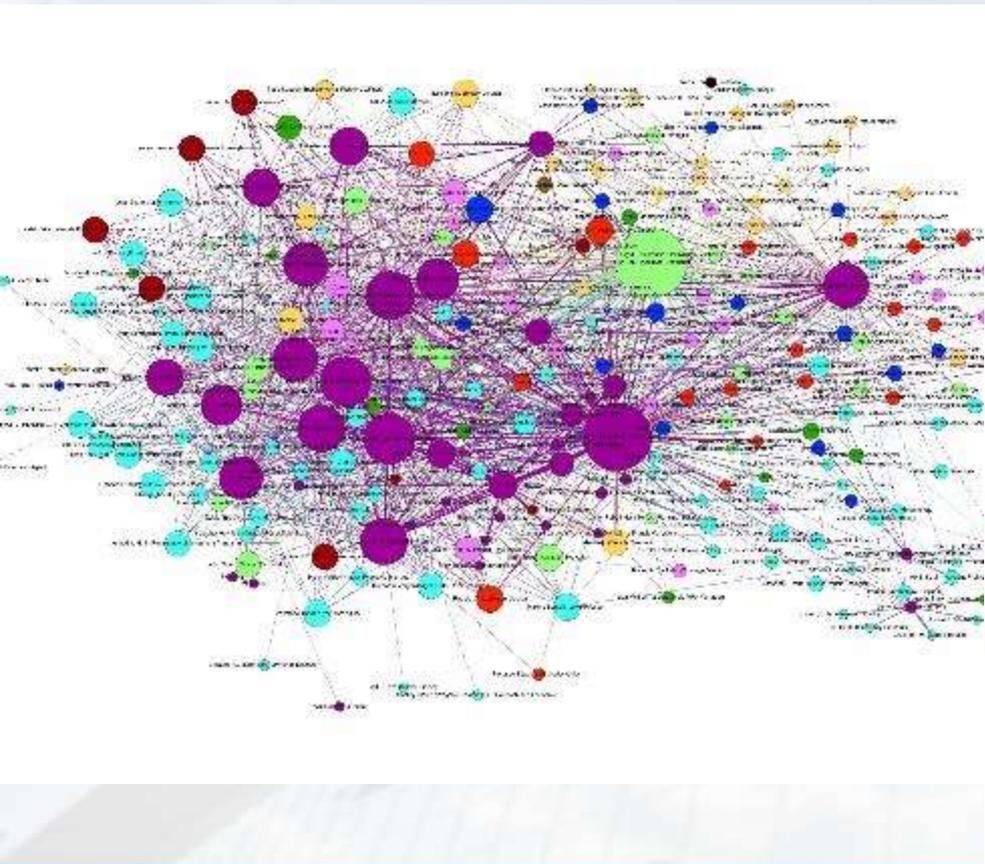
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Social network maps – people and their relation in space



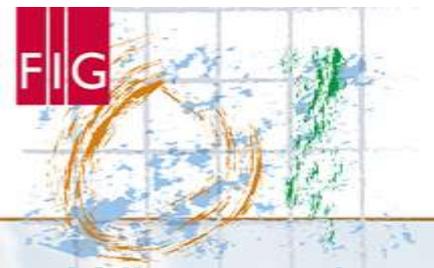


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What makes a science 'human'?

- **Human geography** - the branch of the social sciences that deals with the world, its people and their communities, cultures, economies and interaction with the environment by emphasizing their **relations with and across space and place** (Johnston, 2000)
- **Human ecology** - is about relationships between people and their **environment**. (Marten, 2001)
- **Social anthropology** – focuses on the diversity of **positions and perspectives**, ambiguities, conflicts, and contradictions of social life (Social anthropology journal & wikipedia)
- **Social informatics** is the study of information and communication tools in cultural or institutional contexts (Rosenbaum & Sawyer, 2005) - Studying and Teaching **the Human Contexts** of Information and Communications Technologies

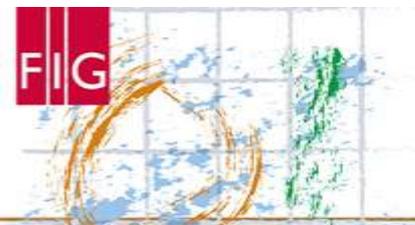
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Comparison physical and human geodesy

Aspects of scientific discipline	Mathematical & physical geodesy	Human geodetic equivalent – expressed through land management teaching and research
Ontologies / reference systems	Datum / geoid / reference systems	Archetype values, beliefs, principles
Axioms, laws	Laws of gravity	Laws of (land) tenure, continuum of land rights, bundle of land use rights
Epistemologies	Measurement of angles, distances, place, height, gravity	Measurement and qualification of tenure claims, rights, restrictions, financial and political claims, beliefs, social perspectives
Axiologies	Quality, Accuracy, laying foundations, servicing other disciplines, registration and providing basic data are key values	Quality, Accuracy, laying foundations, servicing other disciplines, registration and providing basic data are key values
Methodologies	Quality of quantitative measurements is crucial and needs to be checked by mathematical and statistical reliability and replicability	Quality of qualitative measurements is crucial and needs to be checked by social and management plausibility and acceptability

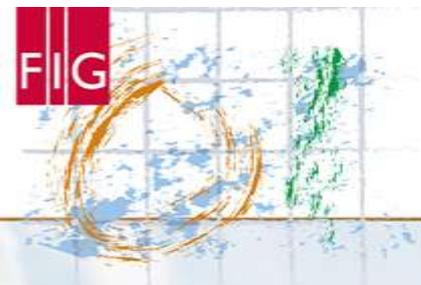


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Crucial concepts in human geodesy

- Division -> **Boundary objects** and **Boundary Workers** (polyrationality of values)
- Perspectives and belief systems -> **Frames** , **Geo-Stake**
- Human base and reference -> **Anthropo-geodetic reference**, **Spatial identity** and **spatial memory**
- Choice -> **Discretionary space** – the space which people seek to enact their spatial influence and stakes; and **operant subjectivity** - references, priorities views and distances from view change in time and place (i.e. fuzzy)
- Scale -> **Inter-scale** – connected scales at which people/humans divide the earth (where is ‘home’)

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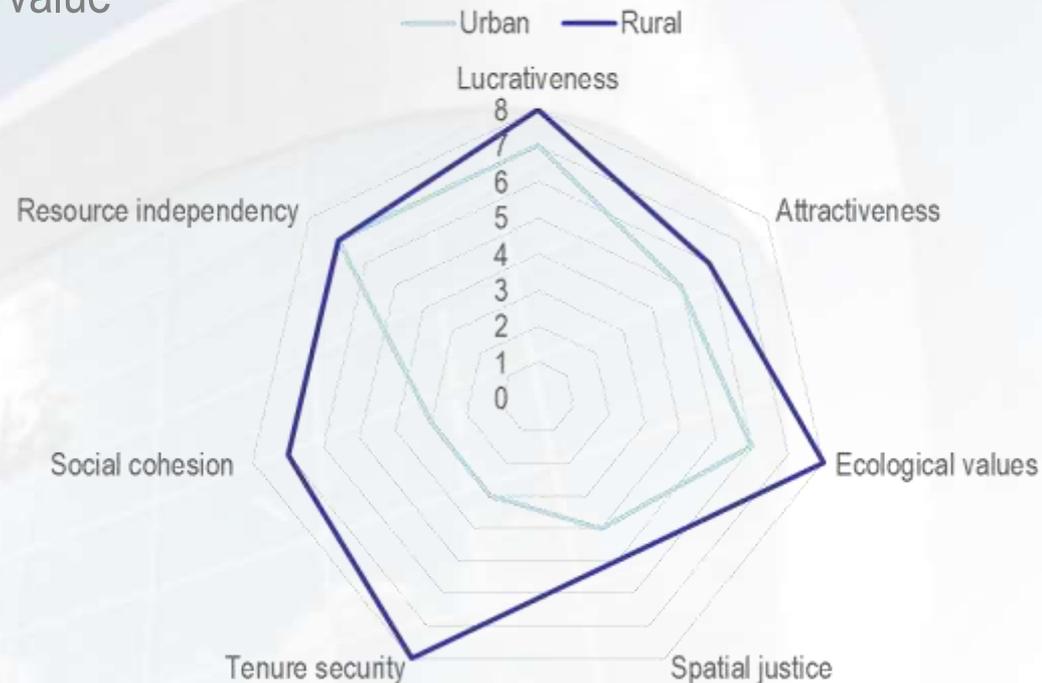
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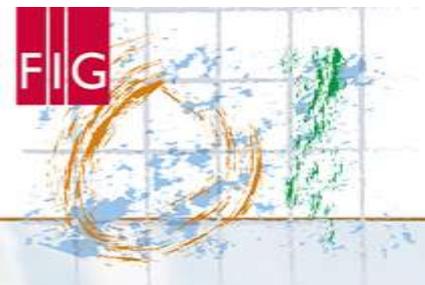
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Division and measuring of socio-economic-legal boundaries

- Based on concepts / goals of:
- Lucrativeness / profits / economic value
- Attractiveness / landscape values
- Spatial justice / moral values
- Ecological benefits / values
- Tenure security
- Resource dependency

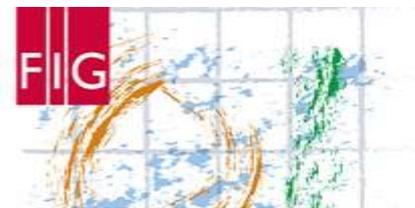
Polyrational values of peri-urban regions





Division and measuring based on (multidimensional) perspectives and belief systems





Division and measuring based on (multidimensional) perspectives and belief systems

- -> factor analysis
- -> principle components analysis
- If we have n observations (of empirical expressions/opinions towards a set of views (defined by propositions – and identified through a vector x) and p variables (degree of agreement to archetype belief systems)
- $$y_{ij} = w_{1j}x_{1j} + w_{2j}x_{2j} + \dots + w_{pj}x_{pj}$$
- Then y_{ij} are a set of key reference and independent existent / operant beliefs towards a given intervention -> hence the axes and coordinates of the key 'human - spatial' reference systems towards a given issue

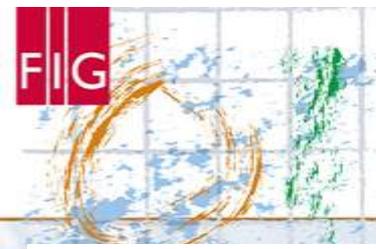
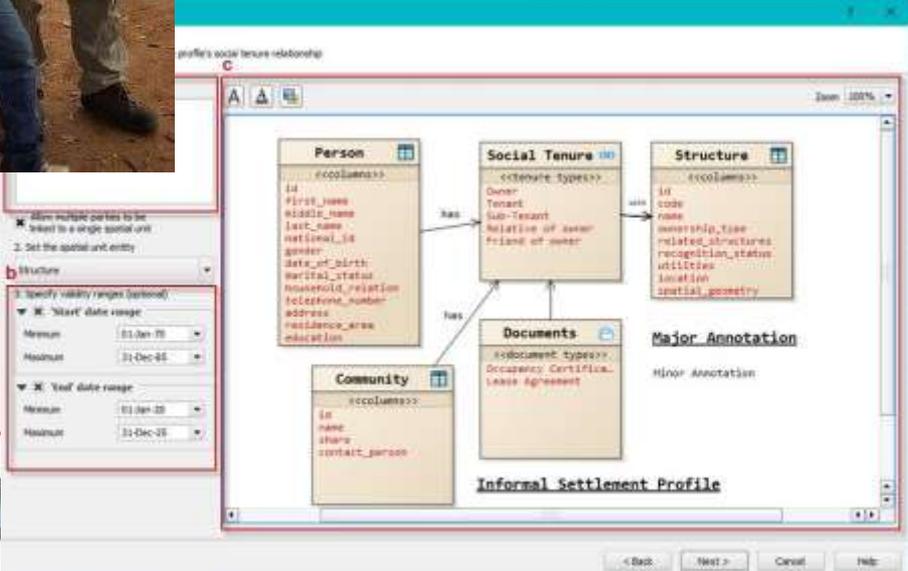


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Human geodesy relies on 'Smart' hardware and software
-> decision support tables, tablets and smart phones



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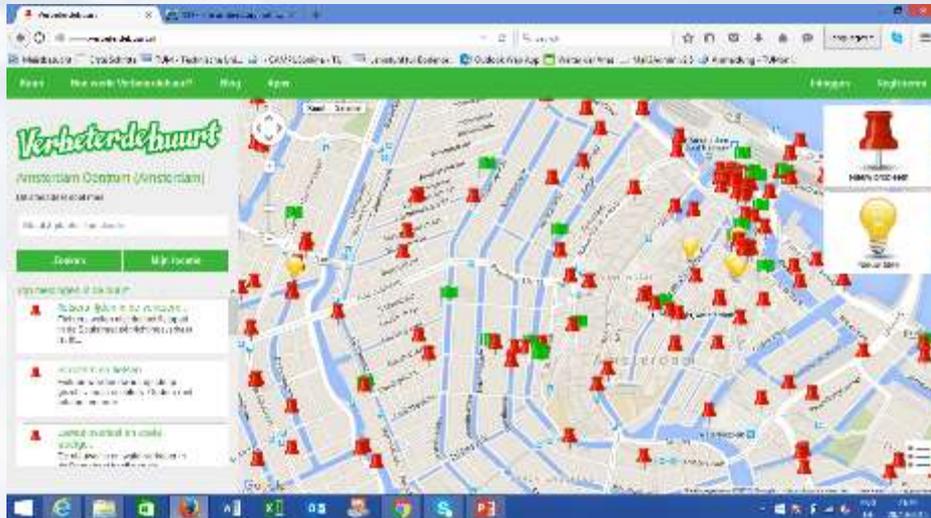
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Using (smart) apps and smart phones

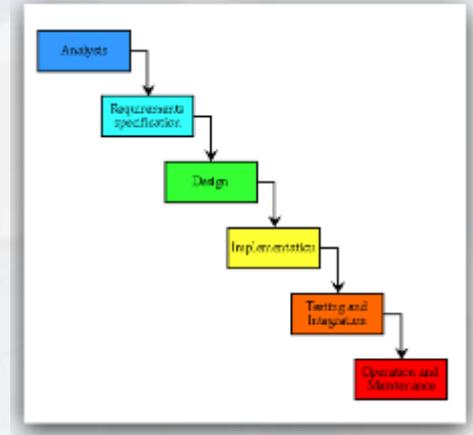
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Using models and tools on behaviour, beliefs, claims

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SWOT ANALYSIS

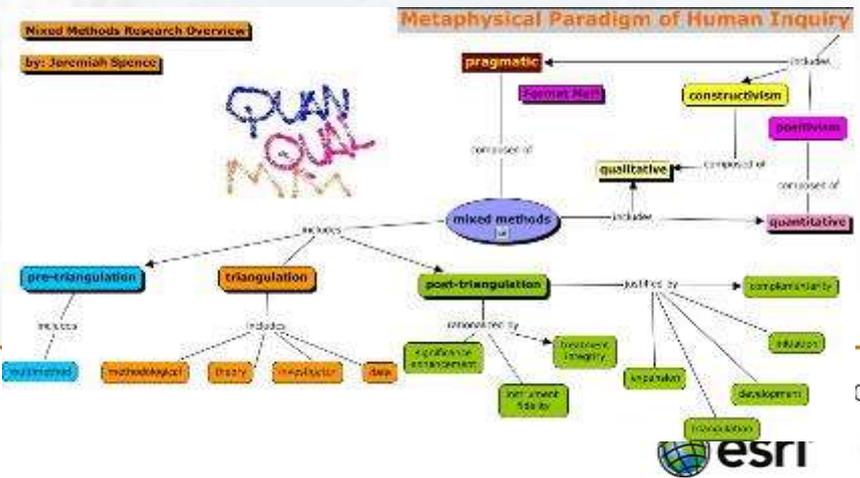




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The scientific discipline of human geodesy

can be explained as

- a **scientific discipline**
- studying how people organise, value, perceive, choose, claim and institutionalise their relations with **land** and **space**
- whereby each **cultural setting** and **personal identity and memory** derives different choices to manage land and space,
- Whereby information, participation and assessment of quality of result are crucial

- Implications:
- The local and contextual differences challenges both engineers and social scientists in close collaboration to come up with feasible and acceptable (socio-technical) solutions to manage land & space in each respective local context.
- Each local contexts derives new solutions and dilemmas at the same time

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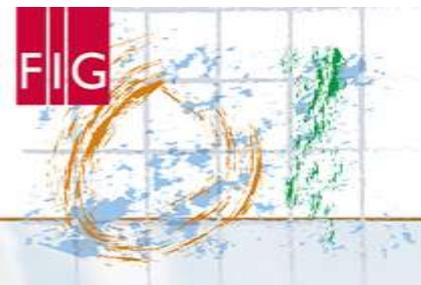


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Utilization of human geodesy

- Technical solutions should not only be created in laboratories, isolate offices, within the government / public administration and by professional (engineering) communities of practice; they require **solid input of stakeholders, beneficiaries or affected people**
- **Local circumstances**, including culture, politics, conventions and traditions, are often crucial in the success, ownership and adoption of the technical solutions
- **Measuring** opinions and views; angles and distances of opinions and views
- There is **not a one-for-all solution**. Often solutions need to be contextualised (issue of inter-scale)
- Be attentive to **other frames**, conceptual beliefs, meanings, perspectives and priorities than your own; sometimes they contradict your own (issue of boundary objects)
- Impact of solution and changes that occur after implementation must always be **evaluated** (a priori and ex post) and monitored (issue of quality)
- **Scale, frames, references, quality**, space and **boundary objects** make the links between technical and social solutions

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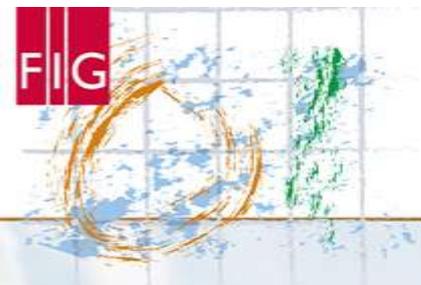


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