

# Using Geo-information: From a Market to a Polis Perspective

Inaugural address

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## Using Geo-information: From a Market to a Polis Perspective

Dear Rector, Board members, professors, staff and students of ITC, distinguished guests, dear family and friends,

The use of geo-information in public governance is a study area of increasing relevance and even urgency. Let us take the use of earth observation in policy making - for example, environmental policy making. In *An Inconvenient Truth*, Gore (2006) describes how a single image of the Earth from space, taken in December 1968 by a crew member of the Apollo 8 mission, apparently triggered not only the environmental movement but also an assortment of environmental policies:

*"... within two years of this picture being taken, the modern environmental movement was born. The Clean Air Act, the Clean Water Act, the Natural Environmental Policy Act, and the first Earth Day all came about within a few years of this picture being seen for the first time"* (p. 12).

Yet a literature review by Jan de Leeuw and co-authors in 2008 came to a puzzling conclusion. The proportion of earth observation literature referring to policy rose from around 1% in the early 1990s to only just above 2% in 2007. Out of 300 peer-reviewed papers (obtained by searching the ISI Web of Science with "remote sensing OR earth observation AND policy"), not a single paper describes and analyses how earth observation actually supports policy-making practices. Instead, these papers only demonstrate or claim the potential of earth observation for environmental policy. We know that earth observation is used in environmental policy. However, if we knew exactly how it is used and embedded in actual policy-making practices, we would have a better understanding of how to scale up these practices.

The use of geo-information and associated technologies encompasses three aspects: the values to which users aspire, people's actual use practices, and the rules that either legally prescribe or just encourage optimal use.

### **I. Values**

Optimal geo-information use is poised to advance certain values, things that we hold

dear (e.g. efficiency, equity, legitimacy, privacy, security and sustainability).

*How can use be evaluated? Whose values matter? And how do we take value trade-offs into account?*

## **2. Practices**

Geo-information is used by politicians in decision and policy making; by citizens and civil society groups in participatory planning processes; by bureaucrats within a single administrative agency; and by various governance actors coordinating the sharing of geo-information, formally and informally, across several administrative, political, cultural and sectoral contexts spread out in time and space, in what have come to be known as spatial data infrastructures (SDI).

*How does the use of geo-information and associated technologies in each of these practices become socially embedded and scaled up?*

## **3. Rules**

Optimal geo-information use is prescribed in influential texts such as policies, principles and declarations of global associations. Examples include national policies (e.g. free or for-a-fee access policies), national and supranational principles (e.g. GIDEON, INSPIRE) and declarations promoted by global, professional and academic associations in the field of GIScience (e.g. GSDI, FIG, GEOSS, etc.).

*How do policies, principles and declarations influence practices?*

In this inaugural address, I will discuss geo-information use from the perspectives of the market and the polis. I will argue that a polis perspective is likely to help us to explain both familiar phenomena of use as well as emerging use and global co-production systems.

The study of geo-information use shifts the centre of gravity of GIScience towards human agents and their relationship with geo-information and technology. It forces us to make explicit our assumptions about the nature of fundamental concepts: humans, geo-information and technology (Table 1).

We can model these concepts from a rationalist-analytic or a political-discursive perspective. I follow political scientist Deborah Stone (2002) and use the terms *market* and *polis* for these perspectives. The two terms stand for different perceptions of human agency and society that are central to geo-information use. The market

comprises individual rational decision makers that are maximising self-interest. The polis implies a political community that does not necessarily follow a mould of consistent rationality, and which is motivated by public as well as self-interest (ibid.). The polis and geo-information make a perfect couple. Power is a primary characteristic of both.

- Power in the polis subordinates a group's interest to other groups' interests, or to the public interest. Power is based, among other things, on the strategic control and interpretation of information (ibid.).
- Geo-information is a formidable mediator not only of spatial knowledge but also of social and political power. Geo-information does not only represent the world - for example, as seen by the state - but also, through its use in society, reinforces the power of the state (Harley, 1989, 1990; Wood, 1992).

The role of policy maps in the European Spatial Development Perspective (ESDP) process is an excellent example of the power of geo-information. The use of maps to visualise spatial problems and policies was so sensitive in the ESDP process that it was decided not to use any maps at all in the final report. The core-periphery map of Europe - known as the "migraine map" - was one of the omitted maps. Faloudi and Waterhout (2002) give an interesting account of the map's fate - from being an apple of discord to its eventual extinction from the final ESDP report. The map shows the distances between Greece, Ireland, Finland and Spain, the natural barriers in-between, as well as the core of Europe, indicated by an elliptical shape. The map reflected a centre-periphery model of Europe, juxtaposing strong regions in the northwest (within the ellipse) and weak regions in the south. The Southern Europeans were not amused by this vision of Europe, although it was the Southern Europeans themselves who had initially identified regional disparities as the central issue in European spatial development. However, representing disparities on a map was very controversial. A temporary compromise was to leave out the elliptical shape representing the core of Europe. Finally, even this (toothless) revised version was omitted from the final report, as were all other policy maps.

**Table 1** Models for fundamental concepts in geo-information use

Fundamental concepts	Market or rationalist-analytic model	Polis or political-discursive model
Humans	Autonomous, rational, individual actors maximising self-interest	Individuals, groups and communities do not follow a mould of consistent rationality; they display diverse values and interests and are motivated by public as well as self-interest
Geo-information  Geo-information technology	Standardisable, formal, quantitative; mediates spatial knowledge  Value-neutral; drives organisational and social change	Can be contingent, informal, qualitative; mediates spatial knowledge and social and political power and is strategically manipulated in policy processes  Value-laden, historically contingent; shapes and is shaped by social processes

I will now look at examples of geo-information use from the market and the polis perspectives to illustrate the implications for knowledge development of using either perspective.

## I. Values

The first example concerns values. Values are standards we aspire to through optimal geo-information use. Through a market lens, values offer simple, easily measurable standards that determine goodness. In the polis, values contain ambiguities and problems of interpretation that make them the object of political struggles. Values are continuously socially constructed and are in competition with each other (value trade-offs). I shall examine two values: efficiency and equity.

### Efficiency

No other value has been as pervasive in GIScience as efficiency. Efficiency can be simply defined as “getting the most output for a given input” or “attaining an output for the lowest input”. It is the ratio between input and output, efforts and results, expenditure and income, cost and benefit.

A market perspective on the efficiency of geospatial operations and investments focuses on scoring what can be easily measured, or even measured at all. Geospatial managers in the public sector usually take this simple market perspective on efficiency (Lance et al., 2006). They emphasise operations and investment decisions as inputs and typically measure outputs as ratios, percentages and indices of readily and automatically measurable entities. Table 2 shows a typical example: the objectives and efficiency measures of a geospatial clearinghouse serving a metropolitan area in the USA.

**Table 2** A Market perspective of efficiency for a geospatial clearinghouse

Objectives	Efficiency measures (outputs)
Facilitate widespread sharing of geospatial data by means of improved participant operations, reduced costs, and supporting cross-jurisdictional decision making	Number of visits/sessions to DataFinder website Number of entities visiting DataFinder Number of whole or partial datasets and regional datasets downloaded through DataFinder Number of entities listing metadata on DataFinder Hours of data-producer staff time saved

Efficiency from a polis perspective poses questions such as the following (Stone, 2002, p. 67):

- “ 1. Who determines what is the correct output [...]?
2. How should we value and compare multiple [outputs]?
3. How do different [...] outputs benefit different constituencies or groups? ;
4. How should we count inputs (e.g. labor costs) that are simultaneously outputs to somebody else (e.g. jobs for local community)?
5. How should we decide which of the many benefits of any input to count in the equation?
6. How should we count the virtually unlimited opportunity costs of resources used as inputs?”

Efficiency is not a value-neutral technical term but a contestable political claim. Everybody supports the abstract idea of efficiency but to go “*beyond the value slogans and apply the concept to a concrete policy choice requires making assumptions about who and what counts as important. There are no correct answers to these questions to be found outside the political process*” (p. 65).

Let us consider the “efficiency ratio” of Chicago’s geospatial clearinghouse (Elwood, 2008). In the city of Chicago, grassroots NGOs provide homeownership counselling or disaster response services to residents in poor neighbourhoods. These NGOs identify and represent the needs of neighbourhood residents. They use their own priorities, semantics and attribute schemes in the geo-information they produce. City officials admit that grassroots NGOs are valuable because they are “*always in and out of streets and alleys, and so they’re able to tell you the most current information*” (p. 83). How can these NGOs - who want to use data and maps from the city’s clearinghouse - be included in the efficiency ratio of the clearinghouse cooperative?

To benefit these NGOs, the clearinghouse cooperative would have to modify, supplement or transform data relevant for the NGOs for the GIS applications, thereby increasing the inputs in the efficiency ratio. It would have to include different browsing, query and selection interfaces. It would have to include the possibility for grassroots NGOs to add non-expert, vernacular descriptions of spatial data, thus increasing both the inputs and outputs of the efficiency ratio. However, the trade-off for the decreased efficiency of the Chicago clearinghouse could be an increase in the legitimacy of the Chicago city administration. Isn’t legitimacy the ultimate test of successful innovation in public governance (Bekkers, 2007)?

## **Equity**

Equity is the primary goal in the distribution of wealth, goods and services and of information resources. In any distribution, there are three dimensions: the recipients, the item and the process (Stone, 2002). Everybody supports the abstract idea of equity, but to distribute equitably poses a number of questions: who should count as a member of the class of recipients? how should the boundaries of the item be (re)defined? how should the item be customised to individual needs? which process of distribution guarantees fairness (ibid.)?

Participatory GIS (PGIS) embodies the value of equity. That is why I discuss it under “values” and not under “practices.” PGIS is unambiguously situated in the polis. It has no counterpart in the market. PGIS is a genuinely political response to concerns for equity in the distribution of the valuable resource geo-information, related technologies and the societal processes that shape them. PGIS redefines the recipients and the item to be distributed and establishes a process of distribution (Table 3).

**Table 3 Equity and participatory GIS**

Dimensions of equity	Equitable distribution	Participatory GIS
Recipients	Who should count as a member of the class of recipients?	Redefines recipients by including resource-poor organisations and "non-traditional" users, NGOs, grassroots groups, and community-based organisations (McCall, 2003)
Item	How should the boundaries of the item be (re)defined?  How could the item be customised to individual needs?	Expands the item to also include multimedia strategies (digital photographs, sound files, sketch maps, etc.) and representations of diverse and vernacular forms of spatial knowledge in a GIS (Elwood, 2006)  "Rewires" the item (as in GIS/2) to represent different visions of place, to support cultural and multilingual distinctions, to integrate local knowledge (Sieber, 2004)
Process	Which process guarantees fairness?	Participation as distribution process

The process dimension is integral to the distribution of public goods (and bads). Public goods (e.g. location of city parks) or public bads (e.g. location of city garbage dumps) cannot be distributed in equal slices (equal slices of the park or dump distributed evenly) to all recipients (Stone, 2002). Solutions to commons problems are often based on unequal slices of the good or bad but on a fair process (in the case of PGIS a participatory distribution process of geo-information and related technologies). Equity is continuously socially constructed in PGIS. There is never a final solution.

## 2. Practices

The second example concerns two practices: coordination of data sharing and policy making.

### Coordination of data sharing

Sharing data is vital because the more data are shared, the more they are used. Successful sharing of geospatial data occurs in various circumstances. Table 4 summarises successful sharing practices in Australia and the Netherlands (Masser et al.,

2007). Through a market lens, data sharing increases when networked; equal, self-organising, rational government actors engage in appropriate technical redesigns, which then drive successful changes in organisational structures.

**Table 4** *Technical and organisational redesign for coordinating data sharing*

Cases	Technical redesign	Organisational redesign
<i>SLIP</i> : Shared Land Information Platform, Western Australia	Creation and maintenance of an integrated land-information database	Restructuring within government structures
<i>PSMA</i> : Public Sector Mapping Agencies consortium, Australia	Integration of datasets held by state and commonwealth agencies	Joint venture: consortium of data producers
<i>GBKN</i> : Large Scale Base Map, the Netherlands	Maintenance and dissemination of core datasets	Joint venture by key data users

Through a polis lens, the success or failure of technical-organisational redesign (seen as a technical-organisational reform) can be explained by foregrounding social factors, for example, dominant public management ideas at the time of the reform. In the polis, dominant public management ideas frame opportunities for reform and shape what and how things should be done and who should do them. I draw on public administration literature, in particular Hood and Jackson (1991) and Hood (1998), to sketch out how a polis lens can be operationalised to explain these three successful reforms.

In a particular country at any time, a certain public management paradigm (individualism, egalitarianism, hierarchism or a hybrid thereof) dominates the public sector until that paradigm is deemed inadequate and is replaced by another. Each paradigm is a constellation of doctrines specifying who should do what, and how, in government. Reformers argue for paradigm change using three generic types of justification. Individualist justifications commonly include the limitation of waste, the pursuit of efficiency, and the avoidance of muddle and confusion. Egalitarian justifications include fairness, mutuality, the pursuit of accountability, and the avoidance of abuse of office. Hierarchist justifications include reliability, robustness and resilience, particularly in adverse conditions.

The three technical-organisational reforms (SLIP, PSMA and GBKN) correspond to three sourcing doctrines for government that are well established in the literature (Hood and Jackson, 1991; Hood, 1998). Reformers defend the change in sourcing doctrine with a battery of also well-known justifications (Table 5).

- SLIP corresponds to a sourcing doctrine known as “single source supply”. The doctrine holds that good public administration should avoid rivalry and overlap of producer units for a particular government service. Reformers usually defend it with individualist justifications: effectiveness, avoidance of confusion and deadlocks.
- PSMA corresponds to a sourcing doctrine known as “multisource supply by the public sector”. The doctrine holds that competition and rivalry should be preferred in public administration, and - as often happens with doctrines - is exactly the opposite of the previous one. Reformers usually defend it with mixed egalitarian (reduction of the arrogance of office) and individualist (setting up pressures to minimise cost) justifications.
- GBKN corresponds to a sourcing doctrine known as “multisource supply by metaphytic competition”. The doctrine reflects an attempt to engineer competition between the public and private sectors. Reformers usually defend it with mixed egalitarian (keep the private sector honest) and individualist (make the public sector competitive) justifications.

**Table 5 Sourcing doctrines and justifications related to data sharing practices**

Cases	Technical–organisational reform	Sourcing doctrine	Typical justifications
<i>SLIP</i> : Shared Land Information Platform, Western Australia	Restructuring within government structures Creation and maintenance of an integrated land information database	Single source supply	Individualist (effectiveness, avoidance of confusion and deadlocks)
<i>PSMA</i> : Public Sector Mapping Agencies consortium, Australia	Joint venture: consortium of data producers Integration of datasets held by state and commonwealth agencies	Multisource supply by the public sector	Mixed egalitarian (serves to reduce the arrogance of office) and individualist (sets up pressures to minimise costs)
<i>GBKN</i> : Large Scale Base Map, the Netherlands	Joint venture by key data users Maintenance and dissemination of core datasets	Multisource supply by metaphytic competition	Mixed egalitarian (keeps the private sector honest) and individualist (keeps the public sector competitive)

A polis analysis of the three successful instances of data sharing could test the hypothesis that the justifications given by the reformers in Australia (at the provincial and federal levels) and the Netherlands resonated with the dominant public management paradigm in each case and at the time of the reform, with a successful reform as a result.

### **Spatial policy making**

The power of geo-information is most obvious in spatial policy making, where different group interests collide over different interpretations of geo-information.

If we take a market perspective on spatial policy making, we assume an unproblematic, linear and direct relationship between high-quality geo-information and policy. Geo-information is an objective and scientifically accurate resource with the role of providing spatially relevant information to rational decision making (Dühr, 2007). Either research leads policy and hence policy is evidence-driven, or research follows policy and hence research is policy-driven. Of course, we recognise practical problems. For example,

spatial policy requires geo-information that is not available - at least not in a timeframe necessary to ensure its relevance to the resolution of the issues of the day. Policy problems require a particular kind of evidence that typically is not immediately to hand. The policy-making process and the information generation process have different dynamics.

In the polis, metaphoric reasoning is essential in spatial policy making. When the ESDP process started, the dominant view was shaped by the policy notion of the "Blue Banana", a rather one-dimensional view of Europe. European regions within the Blue Banana were seen as the economic motor of Europe. The European Commission DG XVI responded with the "European Bunch of Grapes" - a view more suited to the polycentric structure of the urban system in Europe (Faloudi and Waterhout, 2002).

In the polis, political arguments are more salient than scientific arguments in choosing between spatial policy options.

*"The question is not whether planning will reflect politics, but whose politics it will reflect. What values and whose values will planners seek to implement?" (Dühr, 2007, p. 21).*

Carton's (2007) research illustrates how policy actors clash over interpretations of geo-information and how they deal with these controversies. In an empirical study of the role of geo-information in deliberative spatial policy-making practices in the Netherlands, she found that the use of map sketches, geodatabases, GIS analyses, spatial designs or local knowledge often deepened the conflict between policy actors. Policy makers' strategies for dealing with controversies varied from placing the problem in a wider context by extending the region represented on the planning maps, to manipulating the map picture by, for instance, hiding controversial boundaries or adding lightning-rods to the maps to shift the attention of stakeholders towards other issues.

### **3. Rules**

The third example concerns policies, principles and declarations. Through a market lens, rational geo-information policies based on hard factual evidence of benefits can be enacted in consultation with fully informed governance actors. Principles and global declarations are invariant as they diffuse from a diffusion centre to adopters. In the polis,

policy ideas win over competing ideas by persuasion rather than by hard factual evidence. Adopters “edit” principles and declarations and often reinvent them. Social actors fit ideas to their idiosyncratic needs in a particular location at a particular time.

## **Policies**

Rights of access to public records are still the paramount social issue in optimising geo-information use (Groot and McLaughlin, 2000). Two competing positions mark the polar extremes of the debate: direct charging for data on the premise that if you need something you should pay for it, or making data available free to anyone in an “information commons” on the premise that charging would be the equivalent of submitting citizens to double taxation. The debate goes on. Discussions are intense and occasionally heated<sup>1</sup>. In the literature, two distinctive styles of reasoning for or against have emerged. They correspond to a polis and a market perspective.

The market perspective sees policies as blueprints transportable by virtue of factual evidence of benefits and of rational analysis. Burkert and Weiss (2004) compare the open access policies of the US federal government with the restrictive policies of European countries, find the latter inferior, and conclude that open access policies should be implemented in Europe because of significant macroeconomic benefits. They provide a blueprint for best practices to public sector institutions in Europe. Longhorn and Blakemore (2008) argue that rational charging policies can be enacted in consultation with fully informed end users, private citizens, commercial enterprises or government agencies.

In the polis, policy ideas win over competing ideas by persuasion. Competing groups frequently frame their self-interest as public interest (Litman, 1994):

*“Thus, we have seen an avalanche of proposals to privatize, nationalize, commercialize, or liberate information in general and computerized data in particular. So far, the debate has seemed to be fueled by some combination of almost religious faith [...] with self interest: those who have invested in data collection argue that the public interest is best served by the enforcement of strong property rights in collected data, while those with an interest in mounting competing products incorporating the data assert that the public interest lies in unfettered movement of information.”*

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<sup>1</sup> <http://www.freeourdata.org.uk/>

For Litman, the way forward is to identify, first, our prejudices about information law and, second, our notions of what the government is, what the government does and what it is for. Onsrud (1992a, 1992b) also underlines the politics of policies. However, in contrast to Litman, Onsrud foregrounds the citizen as “citoyen” and vigilant member of the polis, who should:

*“Continually question and investigate whether specific approaches provide greater or lesser economic and social equity benefits than others. In democracies, irrational governmental policies are inevitably exposed over time with the result that the system corrects itself. Whether the policies actually implemented by elected officials and government bureaucrats are successful or unsuccessful is a determination which again is ultimately made at the ballot box.”*

### **(Diffusion of) principles and declarations**

From a market perspective, supranational principles (e.g. INSPIRE) and declarations (e.g. of the GSDI association) are presumed to diffuse from country to country, or from continent to continent, in such a way as though there were some general convergence towards uniform practices and impacts. Ubiquitous political and institutional barriers towards adoption are presumed to exist, while unambiguous sustained capacity building is needed to remove these barriers.

In the polis, principles and declarations are powerful doctrines that integrate behaviour in a sensible way. They are a source of inspiration that experts, politicians and other participants in SDI development can use to enact social reality. Adopters “edit” doctrines and ideas and often reinvent them. Social actors fit ideas to their idiosyncratic needs in a particular location at a particular time. For example, the idea of SDI was developed, transformed and translated in the United States context in which it was conceived. The idea travelled to an African context, and has been translated in that particular context over time. The SDI doctrine in the United States is aligned with theory development and theory use in a clamour for best practices and demonstrated uses of SDI. In Africa, SDI is interwoven with the political agenda of the African Information Society Initiative (AISII) and the National Information and Communication Infrastructure (NICI) community. In neither of the two cases does the rhetoric of SDI team up with the engineering challenge of actually implementing a national SDI (Georgiadou and Homburg, 2008).

## 4. Geo-information use: summary

Table 6 Geo-information use through a market and a polis lens

Geo-information use	Market	Polis
Values	Values offer simple, measurable rules that determine goodness	Values contain problems of interpretation, thus becoming the object of political struggles; continuously socially constructed
Practices Spatial policy making	Linear relationship between high-quality geo-information and spatial policy	Political reasoning (by metaphor and analogy) more salient than scientific facts
Coordinating sharing of geo-information	Rational actors engage in technical redesign which drives organisational change and affects data sharing	Organisational-technical reforms required for coordinating geo-information sharing shape and are shaped by social factors
Rules Geo-information policies	Rational policies are enacted in consultation with fully-informed governance actors	Policy ideas win over competing ideas by persuasion rather than by hard factual evidence
(Diffusion of ) principles declarations	Principles and global declarations are invariant as they diffuse from a centre of diffusion to adopters worldwide	Adopters "edit" principles and global declarations; they reinvent them to fit their idiosyncratic needs locally

## 5. From a market to a polis perspective

The examples show that the polis models geo-information use more accurately than the market does. The design-reality gap is smaller. Thus, we stand a better chance of understanding and explaining how authentic human actors and groups with different loyalties, ideologies and interests use geo-information.

In the past, we have relied heavily on market concepts to understand how geo-information use is scaled up and how SDI evolves. We should moderate this focus and enrich the debate from other perspectives. In the future, voluntary contributions to authoritative government geo-information can radically shift the traditional balance of practices, values and rules. Moreover, scientific cyber infrastructures and corporate virtual globes are already introducing new practices and new value contests, and point

to the need for global rules. The stakes are high. Even sceptics of the polis lens should welcome every form of prosthesis to tackle these new challenges.

### **Over-reliance on a market lens in SDI research**

The prevalence of market concepts in SDI research can be explained in three ways:

- ***Lock-in in the new public management paradigm of the early nineties***

The inception in 1991 of the SDI concept by John McLaughlin, and further development by Dick Groot and other pioneers, was locked into new public management (NPM), the public management paradigm of the early nineties. Consistent with NPM doctrines (privatisation, performance measurement and public service improvement), SDI initiatives were phrased in terms of economic considerations in those early days. The emphasis was on predictability, rationality and efficiency, a key role for central government in SDI building, and harmonious collaboration between rational, autonomous, government actors.

- ***Disciplinary path dependence***

The majority of SDI researchers have engineering backgrounds. Given specific objectives and conditions of operations, they design geo-information technology models, techniques or devices. They generate situated explanations, develop explicit inventions and propose practical solutions for problems that are contextually, materially and temporally bounded (Orlikowski and Barley, 2001). Their key test is pragmatic. Their aim is to find out what works in specific circumstances and given specific design requirements, but not to explain how and why it works. Furthermore, to account for changing sharing practices, SDI researchers mostly draw from the discipline of business administration. Business administration privileges concepts promoting harmony between information technology investments and the strategic objectives of firms. This state of harmony, referred to as "strategic alignment", requires planned and purposeful management processes to align the strategic context of a firm (and, by extension, of government organisations) with information technology.

- ***Lessons from the history of technology***

Historians of technology teach us that technology-driven debates, such as those concerning information infrastructure, initially (and understandably) privilege a technical, rational-analytic perspective in knowledge development. Problems in this

initial phase are defined in technical terms, needing technical solutions. In later stages of the knowledge development cycle, non-technological dimensions (such as who should pay for the information infrastructure, who owns it and how it should be operated) enter the picture. In an even later stage, social scientists, natural scientists and engineers form multidisciplinary teams to develop and test theories, reflecting on the intricacies of the topic at hand from multiple perspectives. Each and every stage of knowledge development is essential and centrally informs the debate, until a new set of issues comes to the fore, with different arguments, audience, principal authors, concepts and methods.

Engineers and social scientists in the Netherlands, Belgium and India are now forming multidisciplinary research teams to develop theories that explain geo-information use and SDI evolution through multiple social science lenses. The composition of the research teams of GeoGOV<sup>2</sup>, of SPATIALIST<sup>3</sup> and of the Indian urban governance and deprivations project<sup>4</sup> indicates that multidisciplinary research across beta and gamma sciences is now finally picking up momentum.

### **Authoritative geo-information and voluntarism<sup>5</sup>**

In the commercial sector and in social networking, new technologies and online services are dramatically changing the way we use, produce and share geo-information globally. The boundaries between geo-information use and voluntary co-production, between geo-information users and volunteer co-producers, are becoming increasingly blurred. Geo-information use is becoming a slippery concept, maybe even an anachronism.

Already commercial firms such as TeleAtlas, Navteq and TomTom each use web-based customer input to locate and qualify mapping errors and feature updates required in their road network databases. Social networking and collaborative web-based efforts such as *Open Street Map*, *Tagzania*, *Wayfaring.com*, the *People's Map*, and *Platial: The*

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<sup>2</sup> Project within Ruimte voor Geoinformatie (RGI): [http://www.geogov.eu/?page\\_id=2](http://www.geogov.eu/?page_id=2)

<sup>3</sup> <http://www.spatialist.be/index.htm>

<sup>4</sup> <http://www.onderzoekinformatie.nl/nl/oi/nod/onderzoek/ONDI327566/>: Using spatial information infrastructure in urban governance networks: reducing urban deprivations in Indian cities?, funded by NWO-Wotro

<sup>5</sup> Insights from my research collaboration with Prof. David Coleman, University of New Brunswick, Canada

*People's Atlas* now enable experts and amateur enthusiasts alike to create and share limited, theme-oriented geo-information. Commercially, Google now provides GPS kits to citizens in India to help populate and update road centrelines and attribute data of Google Maps in India.

The potential exists for government to improve the currency of authoritative mapping at national and lower levels by leveraging geo-information voluntarism, particularly in resource-poor environments. Voluntarism radically changes the balance between traditional values, practices and rules. Voluntarism is part of broader public governance innovations and underpins the co-production of social services by state and non-state actors (Moore and Hartley, 2008).

Assume that a national mapping organisation or a city administration chooses to tap the distributed geospatial knowledge and (energy/time) resources of volunteer contributors - individuals or community groups - to produce authoritative data. The national mapping organisation or the city administration is not the locus of change anymore. The organisation's performance is not the focus of evaluation any longer.

Voluntarism in the production of authoritative geo-information is a governance innovation in the sense of Moore and Hartley (2008). Attention shifts from what happens inside a single organisation to what happens in the new social system of geo-information production. As a result (ibid.):

- the right to define and judge the value of the geo-information being co-produced is distributed among all co-producers
- new rules and standards are required to take into account the values of volunteers - equity, security, community building, privacy - in the evaluation of the performance of the new production system.

### **Commercial virtual globes**

Voluntarism underpins global scientific cyber infrastructures such as Digital Earth and commercial virtual globes such as Google Earth. Analyses of the potential and implications of virtual globes are just now surfacing in the literature (Harvey, 2007; Dodge and Perkins, 2007; Zook and Graham, 2007; Blamont, 2008; Sheppard and Cizek, 2008). In Table 7, I organise the reflections of these scholars on the potential and dilemmas posed by commercial virtual globes in terms of new value contests, new emerging practices and the absence of global rules.

Table 7 Commercial virtual globes: new values, practices and (absence of) rules

Geo-information voluntarism	Commercial virtual globes
New value contests	<p><i>Trust</i>: Virtual globes fail to inform users when images have been removed or edited at the request of a government. Trusting commercial companies may lead to public delusion over what is happening in the world.</p> <p><i>Commercial values versus public interest</i>: Image currency and resolution in corporate virtual globes reflect perceptions of market potential not of public interest.</p> <p><i>Legitimacy of visualisations</i>: When visualisations of lay people enter the public discourse or decision making, they can raise difficult value questions: who has a legitimate voice? whose visualisation is right or more legitimate?</p> <p><i>Privacy versus surveillance</i>: Live satellite feeds in commercial virtual globes in the near future will have dramatic consequences for the identification, tracking and sorting of individuals. With close circuit TV (CCTV) the controlling power of surveillance is in a few hands; with live satellite feeds, massive surveillance is available to everybody.</p>
New emerging practices	<p><i>People participate earlier and offer multiple views simultaneously</i> in planning processes, and especially in environmental issues; there is online feedback and dialogue.</p> <p><i>NGOs replace the moralistic rhetoric of "ought" with a technical analysis of "is"</i>. NGOs offer technical analyses countervailing those of intelligence agencies and cause shifts in the epistemic balance of power between civil society and the state.</p> <p><i>Activists consciously re-purpose mapping and satellite imagery</i> as resistance to military secrecy.</p> <p><i>Play and aesthetic performance</i>: People derive pleasure from searching for black helicopters, engage in virtual tourism and creatively make subversive mash-ups.</p>
Absence of new rules	<p><i>No global privacy standards</i>: Google's architecture is based on numerous data centres, each containing hundreds of servers, with each server operating under different (or no) rules in different countries.</p>

Surprisingly, it is Google's Global Privacy Counsel, who worries about the lack of global rules, particularly the lack of global privacy standards (Fleischer, 2007). Fleischer argues that the most globalised and transportable commodity in the world today, data, should be given treatment similar to aircraft safety or influenza pandemics. I agree with Blamont's conclusion that the most troubling effect is that we don't grasp the consequences of the use of space products by millions of users (Blamont, 2008).

Let us have a look at the unanticipated effects of Satnav products used by millions of users, as reported in the *New York Times*, 4 December 2007. The little village in Figure 1 is not an obvious place through which to drive “your average large truck. It is in an obscure, rural location. Its streets were built in the days of horses and carts. There is no room to pass and no room to maneuver. But trucks and tractor-trailers come here all the time, as they do in similarly inappropriate spots across Britain, directed by G.P.S. navigation devices that fail to appreciate that the shortest route is not always the best route. ‘They have no idea where they are,’ said [...] a local store owner who watches a daily parade of vehicles come to grief — hitting fences, shearing mirrors from cars and becoming stuck at the bottom of [the] hill. Once, he saw an enormous tractor-trailer speeding by, unaware that in its wake it was dragging a passenger car, complete with distraught passenger.”



**Figure 1** Satnav products hit the mass market

<http://www.nytimes.com/2007/12/04/world/europe/04gps.html>

We had not anticipated the effects of Satnav products in the mass market. Can we anticipate the consequences of real-time high-resolution satellite feeds in commercial virtual globes, a prospect that is even now technically feasible?

## 6. Implications

At the beginning of this speech, I contrasted Al Gore's statement of the power of a single picture of the Earth from space with the scarcity of research on the actual use of earth observation in policy making. I now return to this theme as I approach the end of this speech.

In October 2004, the global air pollution map produced by ESA's Envisat became available. This map of nitrogen dioxide (NO<sub>2</sub>) pollution depicts air quality worldwide. Dutch politicians were shocked to see their country portrayed as the unhealthiest in Europe on the front page of the newspapers. In November 2008, Dr Jan de Leeuw emailed a senior scientist from the Netherlands Environmental Assessment Agency. He asked what the impact of the NO<sub>2</sub> map had been on environmental policy making in the Netherlands.

Question: *"Ik ben me ervan bewust dat publicatie van de NO<sub>2</sub> kaarten in 2005 een sterke reactie teweeg brachten omdat ze aantoonde dat concentraties boven NL erg hoog waren. [...] Is het u bekend of de OMI informatie ook heeft geleid tot aanscherping van nederlands beleid tav NO<sub>2</sub> emissies?"* (de Leeuw, November, 2008).

Answer: *"Zo'n vraag is natuurlijk niet makkelijk objectief te beantwoorden. [...] Ik denk niet dat de kaart direct invloed heeft gehad op beleidsmaatregelen of doelstellingen [...]. Ook luchtkwaliteitsdoelstellingen zijn niet aangescherpt. [...] Wel zou de kaart kunnen hebben bijgedragen aan de acceptatiebereidheid om maatregelen te treffen, **maar dat kan ik niet onderbouwen**"* (senior scientist, Netherlands Environmental Assessment Agency, November, 2008, my emphasis).

I think this is precisely what we need to do. We need to substantiate (*onderbouwen*), understand and explain the use and scaling up of geo-information in the real world of practice: in the coordination of data sharing, in decision making, in policy making, in peer production environments - scientific and commercial, national and global.

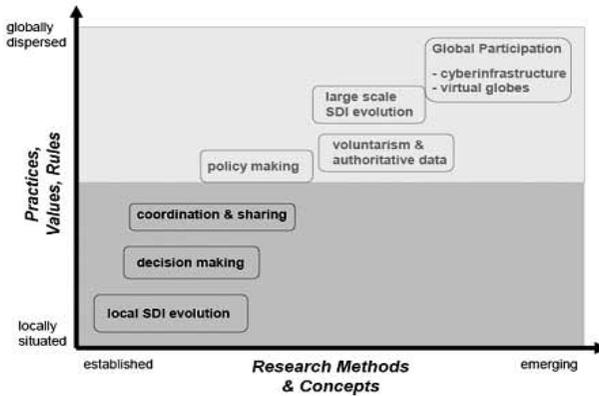


Figure 2 Geo-information use: from local to global, from established to emerging, methods and concepts

Currently, we study local SDI evolution and decision-making practices as well as coordination and sharing practices. Our empirical focus is city and national government (left in the dark grey area in Figure 2). We draw on research methods and concepts that are well established in public administration and information systems research. Public administration, a core reference discipline for geo-information use in governance, is rooted in political science, sociology, economics and law. Information systems is a hybrid field formed by merging informatics with social theory to study information systems implementation and evolution (Avgerou and Madon, 2002). Working at the intersection of GIScience, public administration and information systems offer new insights into geo-information and public governance innovation to all three research communities.

In the future, we shall engage in the study of geo-information use in policy making, as well as in the study of new global phenomena: voluntarism and authoritative data production, large-scale SDI evolution, and global participation in scientific cyber infrastructures and commercial virtual globes (right in the light grey area in Figure 2). We shall strengthen our collaboration with public administration and information systems researchers in the Netherlands, Norway, the United Kingdom and Canada, as well as in the countries where we work empirically. In India, for instance, we need to leverage the support not only of our traditional GIScience partners, but also of

academic departments where Indian public administration scholarship is available. In Africa, we need to extend our collaboration - for example, from the ICT and Science & Technology Division of the UN Economic Commission of Africa (UNECA) to include the Governance and Public Administration Division of UNECA.

As we move from locally situated to globally dispersed phenomena, established research methods and concepts will be less and less useful and relevant. In the future, we will need new research methods and concepts that can shape and guide our thinking about global infrastructural development in science (cyber infrastructures) and commerce (virtual globes).

Emerging methods and concepts are discussed in scientific fora led by the Office of Cyberinfrastructure of the National Science Foundation of USA (Edwards et al., 2007). They are debated in the International Federation for Information Processing (IFIP) Technical Commission 9, dedicated to issues concerning computers and society. We are already actively engaged and will continue to participate in and co-organise debates in IFIP Technical Commission 9.

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