DIGITAL EARTH

SWOT of DE

Prof. Dr. Milan KONECNY

DIGITAL EARTH, FUTURE EARTH

DIGITÁLNÍ PLANETA ZEMĚ

BUDOUCÍ ZEMĚ

EU SWOT ANALYSES – DIGITAL EARTH

Digital Earth Concepts

Historie vzniku Digitální (planety) Země:

Otcové:

Al Gore

(Bill Clinton)

První mezinárodní konference:

1999: Beijing, P.R. China

2001: New Brunswick, Canada

2003: Brno, Czech Republic

Digital Earth Definitions

Technological:

Gore: A multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data.

Chen Shupeng, Fukui, Foresman, Guo, Goodchild

Sustainable development oriented:

Beijing Declaration, Brno discussions, Global Society Dialogue, Global

Digital Earth

Digital Earth is a concept that aims to incorporate maps and data – ranging from topography and population to weather patterns and migration – into a seamless geospatial system accessible worldwide.

www.digitalearth.gov

www.digitalearth.net.cn

http://digitalearth03.geogr.muni.cz

1. Origin of "Digital Earth"

Al Gore,
January 31, 1998
Given at the California Science Center, Los Angeles, California

Understanding our planet in the 21st century

A "multiresolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data," "navigating through both space and time to view natural, cultural and political information about the planet, virtual reality installations in museums, improved access to public domain data", and "a digital marketplace for companies selling a vast array of commercial imagery and value-added information services.

As a direct result of Al Gore's policy position in 1998, the Digital Earth initiative was established. This was quickly adopted internationally through and an increasing community of international enthusiasts is constructing major components of the Digital Earth vision.

BACKGROUND

a) **A multi-resolution, three-dimensional representation of the planet**

b) **A new framework for integrating a wide variety of geo-referenced data, including natural, cultural and historical components, not limited to 3D space, but also able to deal with time.**

c) Excellent for modelling processes, be it short term hazards, or long term climate change, geological processes, etc.

Prof. Lu Yongxiang, the president of International Society for Digital Earth

described Digital Earth as "a fundamental work of the Earth Sciences. As a common framework for describing Earth's information in the temporal and spatial domains, Digital Earth is at present mainly used for information integration of Earth Observation Systems and provides functions for data's acquisition, storage, transfer, analysis, and processing. Its emphases are on establishing a unified coordinate system and on developing multi-dimensional dynamic virtual display." (1999)

Prof. Xu Guanhua

believed that "Digital Earth is located at the interdisciplinary forefront of earth science, space science and information science and technologies, and it will be a fruit of natural science and social science, and closely associated with human requirements. As a powerful supporting tool, Digital Earth can play a key role in new economic growth and in global sustainable development. It is the inevitable outcome of science, economy, politics, and society and their historical development." (1999)

Prof. Michael Goodchild (2008)

digital Earth includes four aspects: visualisation, ease of use, interoperability and mashups, modelling and simulation

Prof. Chen Shupeng and Prof. van Genderen (2008)

digital earth should have five phases: Data extraction, Information extraction, Knowledge extraction, Modelling, and Decision making

Prof. Li Deren

Key technology of the digital earth consists:

- High Resolution Satellite Image
- Broadband Networks and Data Standards
- Spatial Information Technology and SDI (Spatial Data Infrastructure)
- Science Computation
- Vast Storage and Metadata

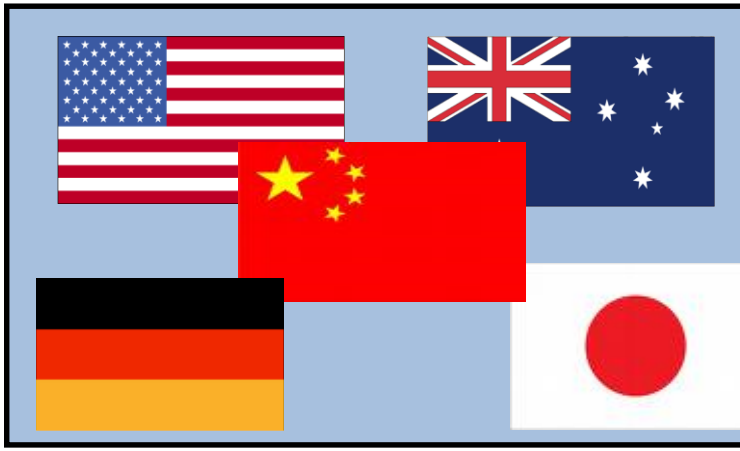
Alexander Martynenko, Russia:

“Today, at the boundary of millennia, the Electronic Earth appears as the prior direction of scientific and technical progress. **Its goal is the cartographic representation of the real world and creation of the global computer model of the Earth,** comprised of millions of space images and electronic maps of various subjects and scales, themes and also reference information.

This fundamental problem can be solved by cartographers from different countries, who should meet in the 21 century as partners, possessing **new ideas, courage and intellectual technologies for creating and application of maps.“**

Platforms of Digital Earth

- Scientific Platform (SP)
  - Scientific projects relating to digital earth science and various practices of earth science
- Commercial Platform (CP)
  - Digital earth software developed in commercial corporations



Three points of view:

-international **general, scientific and research discussion** about the role of Digital Earth as an Integrative Concept and **SDIs** as an Engines

-**Big Data – potentials** of Geoinformatics (RS, GIS,VGE,..) in solving of Contemporary Problems

- The challenges for development of data strategies for National (Mapping) Organizations, wide public society and their potential cooperation via **volunteer society efforts** (Volunteer Geographic Information)

Data, Information and Knowledge

Perhaps sometimes in the future
WISDOM

Deliver to People

How?

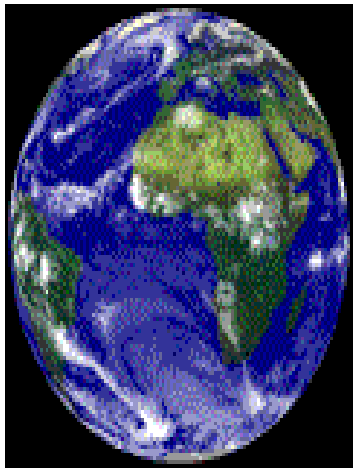
Digital Earth Concepts

www.digitalearth.gov

www.digitalearth.net.cn

http://digitalerth03.geogr.muni.cz

Understanding Digital Earth



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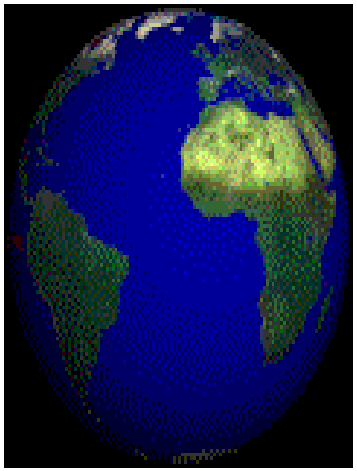

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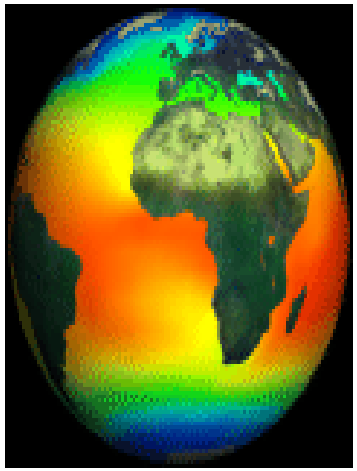
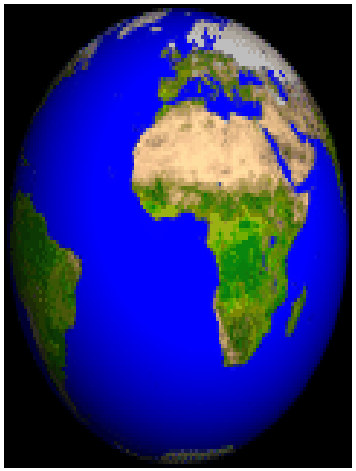
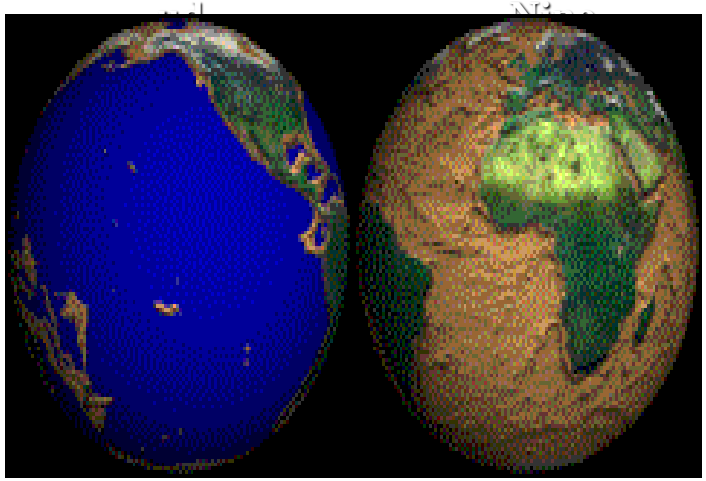


Sea water temperature



Vegetation



Earth Surface

Earthq
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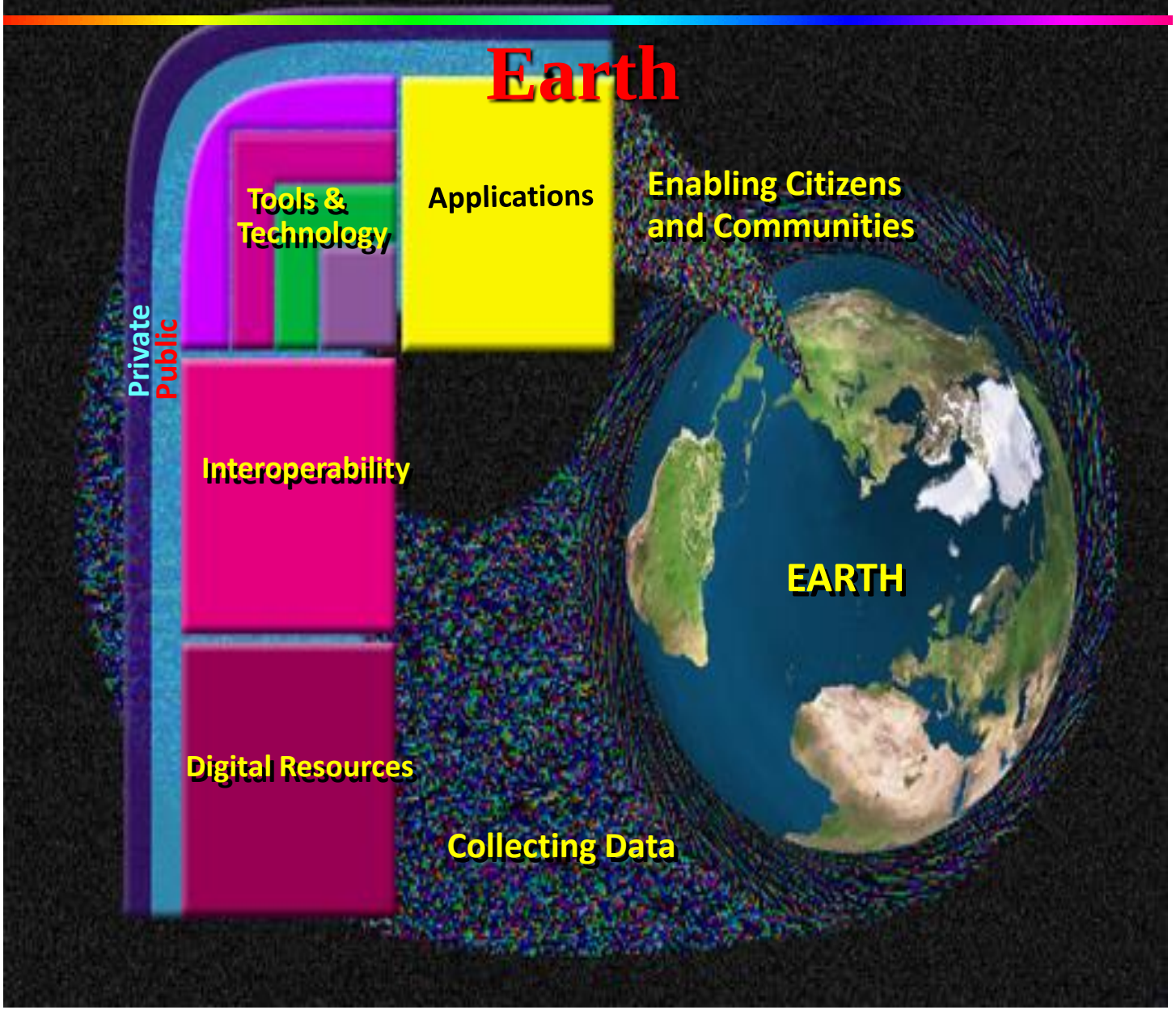
Volcano

Plate Boundary

(http://www.nasm.si.edu/EarthToday)

Understanding Digital Earth



The Digital Earth: Understanding our planet in the 21st Century *by Al Gore*

- A new wave of technological innovation allows us to collect, store, process and display an unimaginable amount of information about our planet and a wide variety of natural and cultural phenomena. Most of this information is "geo-referenced", that is, it is related to a certain specific place on the earth's surface.
- The difficult part of using these advantages is the flood of geospatial information - the problem is converting raw data into understandable information.
- Digital Earth: a multiple view, three-dimensional representation of the planet, using a large amount of georeferenced data.

Digital Earth – necessary technologies technologies (1998)

- Computer science or Computer Science
- Huge storage capacities for data (Mass Storage)
- Satellite Imagery
- Broadband Networks
- Interoperability
- Metadata - Realizing the full potential of the Digital Earth requires technological advances in other areas, especially automated image interpretation, linking data from diverse sources, and intelligent agents that can find and link information on the WEB about any location on the globe. Sufficient information is already available for the process to be successfully developed.

Digital Earth - potential applications

- **Conducting virtual diplomacy** (peace talks in Bosnia, simulated flight over the planned border, establishment of a corridor)

- **Fighting Crime** (Using Salinas City GIS)

- **Biodiversity Conservation:** (Camp Pendelton, California, population growth forecast from 1.1 million in 1990 to 1.6 million in 2010. 200 endangered, rare plants and animals in the region. Based on information on terrain, soil conditions, annual precipitation, vegetation, land use and ownership relationships, the researchers modeled possible impacts on biodiversity in the region

Climate Change Predictions: *(Amazon Deforestation Based on Satellite Data)*

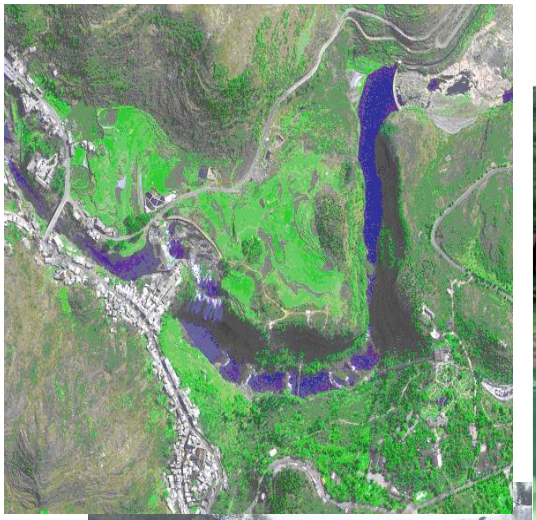
Growth of agricultural productivity: *(satellite images and GPS for early detection of diseases and pests and deployment of countermeasures; "farming by the inch."*

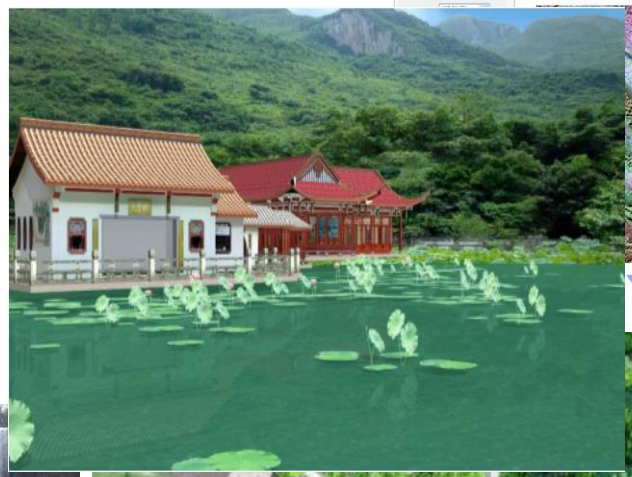
Applications in different areas

- Digital touring
- Digital archaeology
- Digital Olympics
- Dynamic Urban Change Monitoring
- National Standard Digitalization Base

Digital Touring

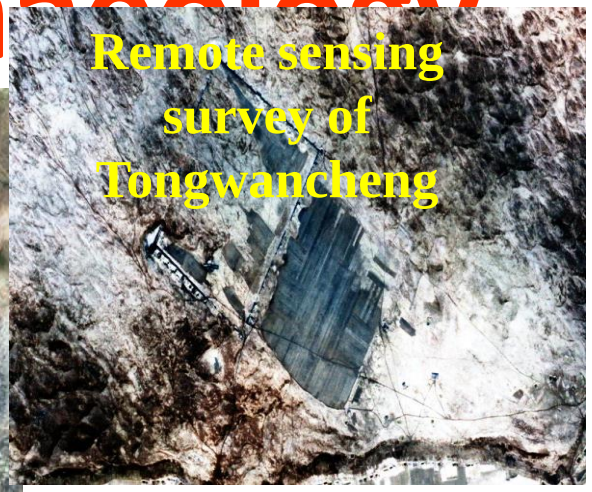
- Digitized and network management of Huangguoshu view designation sector
- development of the 3D simulation system and Internet browsing software
- establishment of the GIS information inquiring links

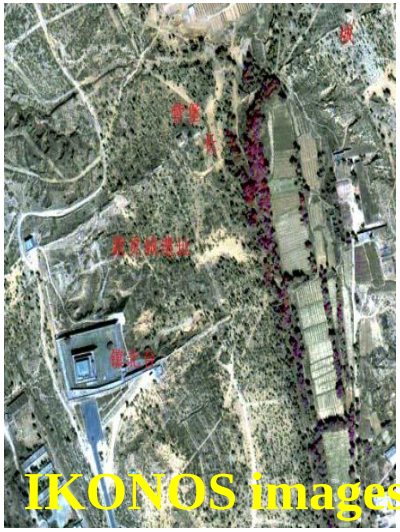


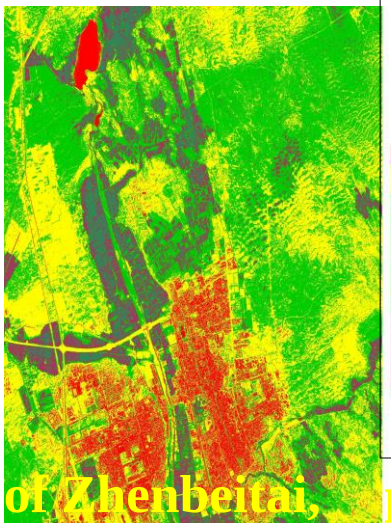


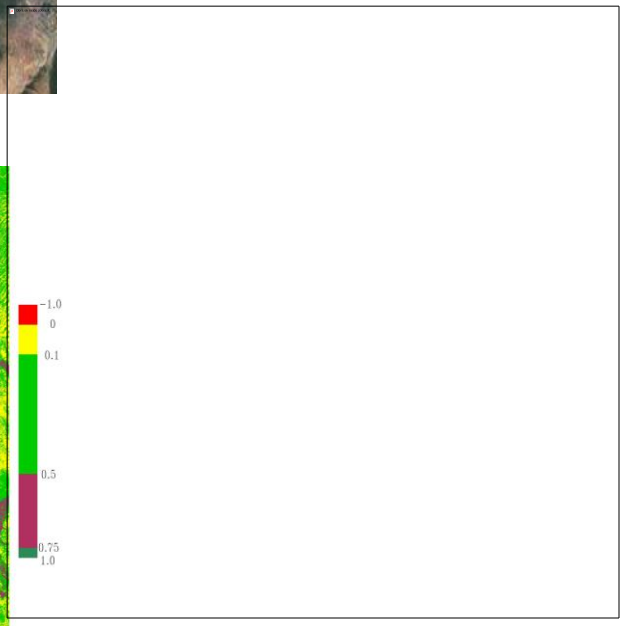
Digital Archaeology

Remote sensing survey of Hailongtun









IKONOS images of Zhenbeitai, Yulin, Shanxi and its surrounding

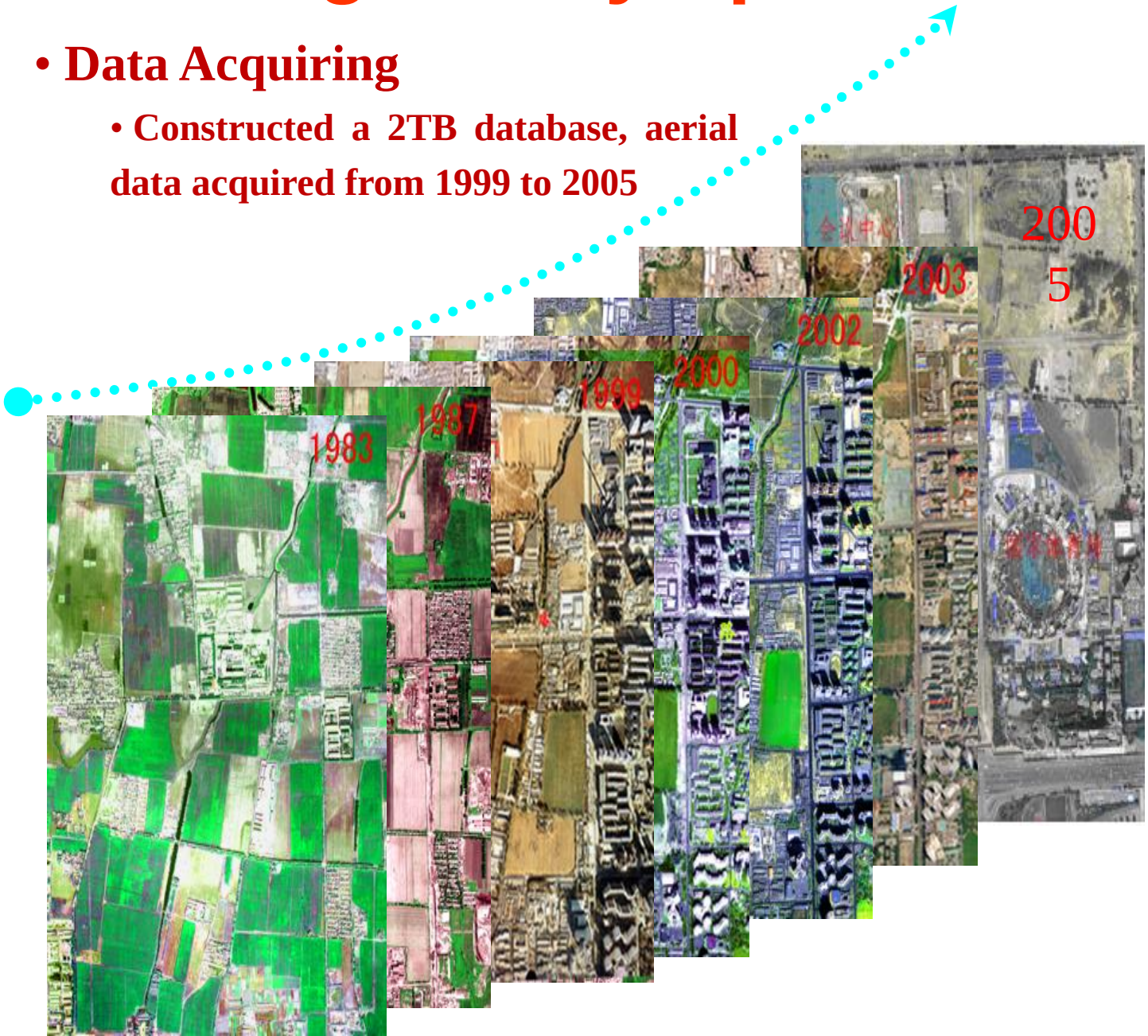
Digitized photo database of World War II

Digital Olympics

Implementation of the dynamically monitoring of the Olympic main venue sector projects and the environment projects in spatial scale;

Digital Olympics

- **Data Acquiring**
  - **Constructed a 2TB database, aerial data acquired from 1999 to 2005**

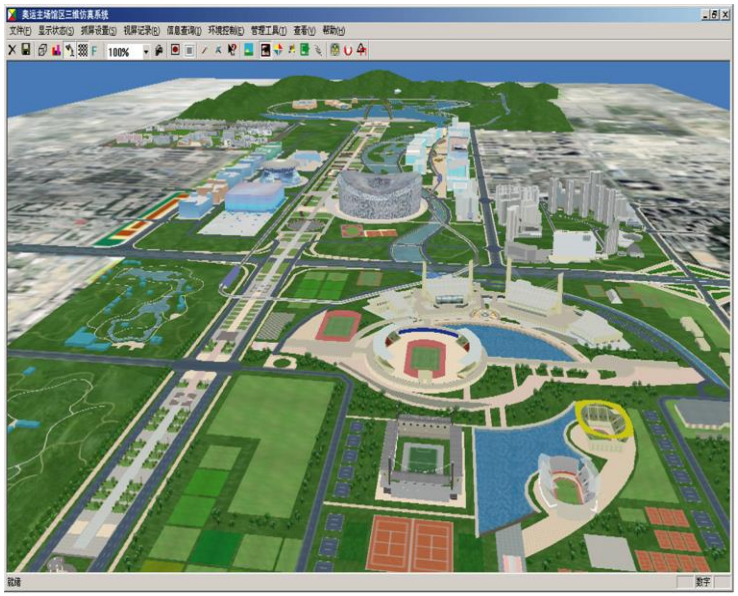


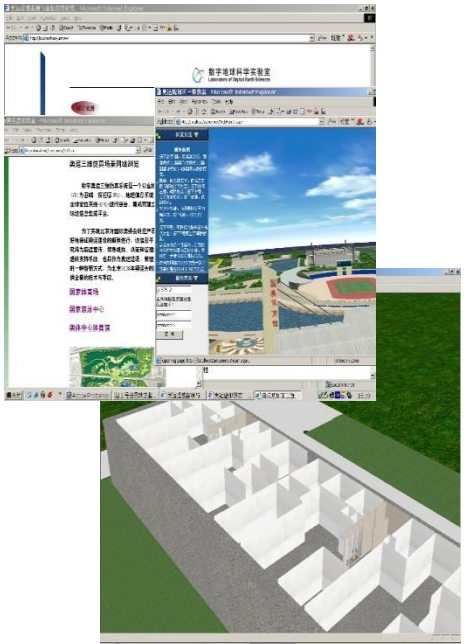
Digital Olympics

1）Development of the 3D visualization scene

2）Implementation of the Internet 3D browsing of the Olympic main venue sectors

3）Discovery of the key technologies in dynamically monitoring engineering





Dynamic Urban Change Monitoring

- **According to the soil resource management and fundamental construction, using multiple remote sensors, multi-resolution remote sensing data to continuously and dynamically monitor the urban area and assist the updating of the land-use status figure.**
- **Monitor the land-use variation types, amounts and distribution status**
- **Provide the technology information and running platform of the related applications for the generalized designation of the urban land use.**


数字地球原型系统
DIGITAL EARTH PROTOTYPE SYSTEM
中国科学院遥感应用研究所
Institute of Remote Sensing Applications, CAS
数字地球科学实验室
Lab. of Digital Earth Sciences

The initiative envisions a three-dimensional globe that users could click on to access data layers.

Sufficient data depth and breadth would ensure its use by researchers, local, planners, and students.

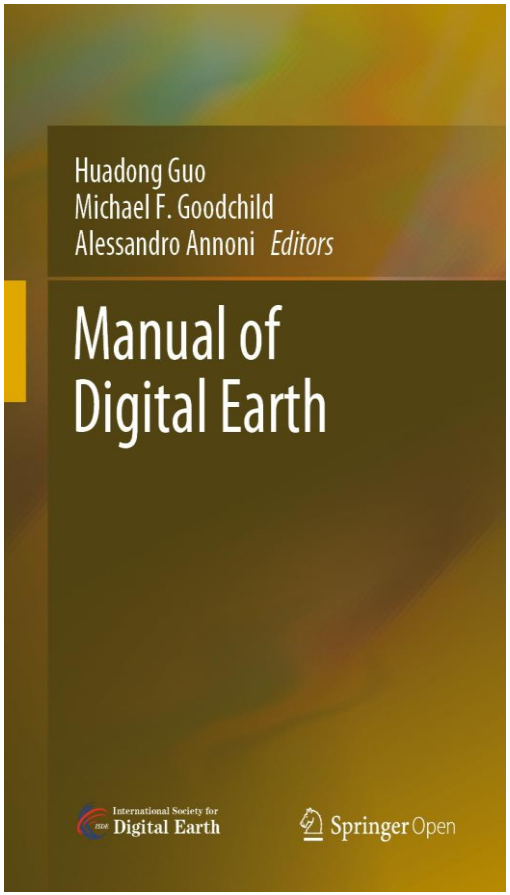
The project encompasses standards development, idea marketing, and data collection and draws openly on the work of other organizations.

The Digital Earth initiative (http://www.digitalearth.gov) has contributed to advancing the concepts and technologies that underlie any SDI and by structuring existing information relevant for the implementation of interoperable geographic information and services.

The 3rd International Symposium on Digital Earth – Information Resources for Global Sustainability.

Knowledge, Networks, Technology, Economy, Society, Natural and Human Resources, Policy and Strategy.

Major Challenges for Digital Earth



- Big Data Management
- DE Platforms implementation and construction
- Developing an Ecosystem for DE
- Addressing Social Complexities
- Diversified curricula toward DE Education

Conclusions

- No single definition of Digital Earth. **DE is an evolving concept** to adapt to social and technological changes
- Its main characteristic is to promote the use of digital the technology to study and safeguard our planet and the people that live in
- Mastering Technologies, Understanding social changes and Addressing societal challenges should be the raison d'etre of the DE community
- Advances in science will be relevant if and only if we can demonstrate their value for big issues of our society

5. FUTURE EARTH

https://futureearth.org/about/our-work/

Future Earth is a network of scientists, researchers, and innovators designed to provide the knowledge needed to support transformations towards sustainability.

Our focus on systems-based approaches seeks ***to deepen our understanding of complex Earth systems and human dynamics across different disciplines.*** We use this understanding to underpin evidence-based policies and strategies for sustainable development.

Our mission

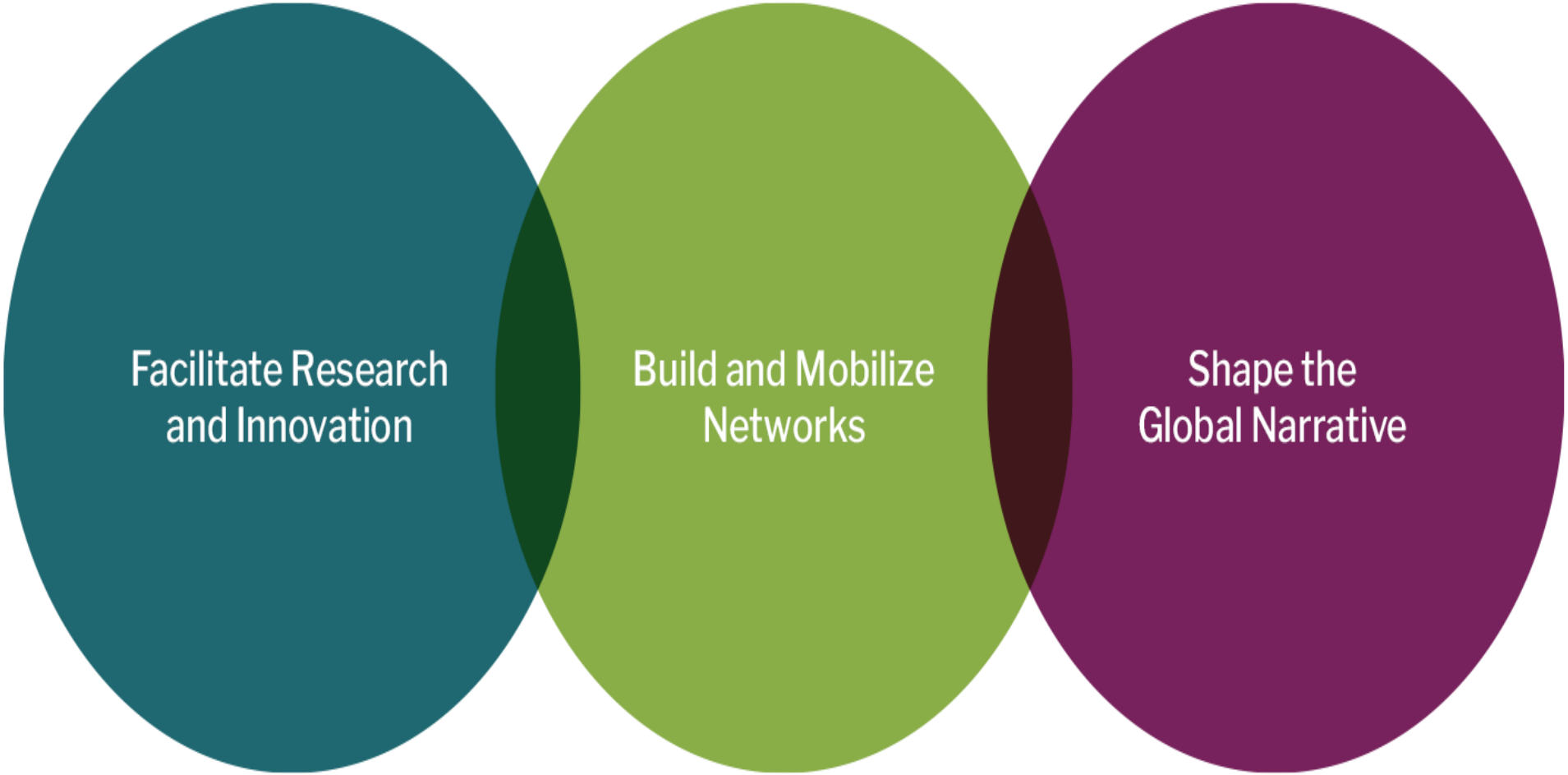
Future Earth's mission is to accelerate transformations to global sustainability through research and innovation.

Our vision

The vision of Future Earth is for people to thrive in a sustainable and equitable world.

Our Strategy

Future Earth develops the knowledge and tools that government, communities, and companies need to meet the United Nations' 17 Sustainable Development Goals. By understanding connections among environmental, social and economic systems, Future Earth works to facilitate research and innovation, build and mobilize networks and shape the narrative, turning knowledge into action.


Facilitate Research and Innovation
Build and Mobilize Networks
Shape the Global Narrative

Facilitate research and innovation

Our 20 Global Research Projects explore interactions among humans and the planet's land, air, water and biodiversity. We develop and partner on initiatives that experiment with technology, data, media, and new ideas.

Build and mobilize networks

Our networks link policy, business and civil leaders with researchers to address themes like health, urbanization, natural assets and more.

Shape the narrative

We help incorporate the latest science into global decision-making and engage in conversations on

3° ISDE Digital Earth Summit, June 12-14, 2010, Nessebar, Bulgaria

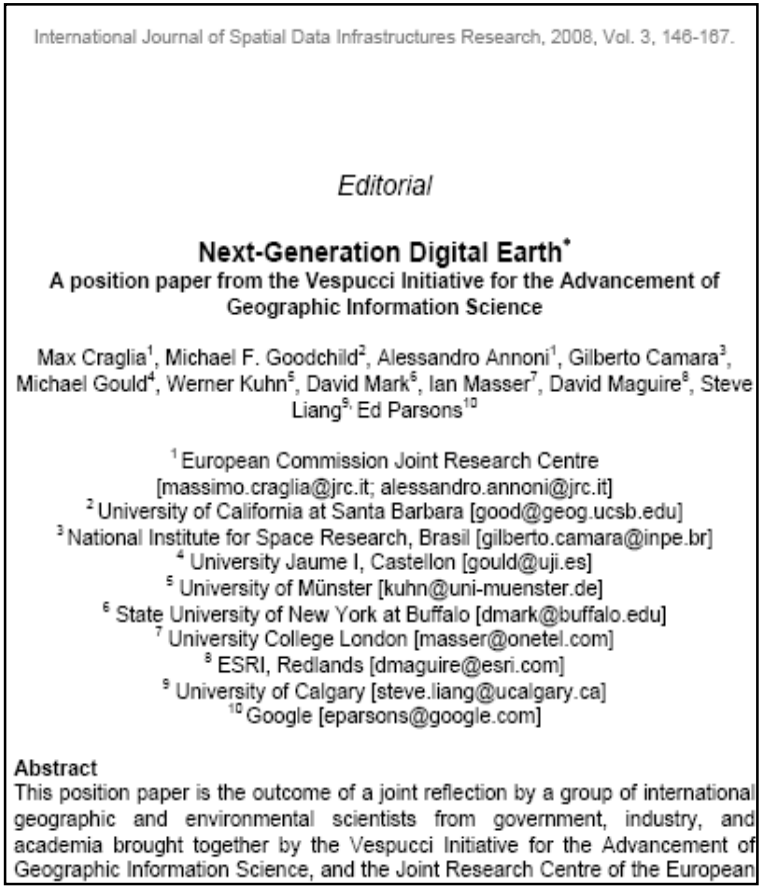
A European Perspective on Digital Earth

Alessandro Annoni

Spatial Data Infrastructures Unit
Institute for Environment and Sustainability
Joint Research Centre
European Commission

Introduction

- Position Paper “Toward Next Generation Digital Earth”, 2008
- Digital Earth Session at ISRSE33, Stresa, May 2009
- Digital Earth 6th Symposium, Beijing
  - ISDE EC members met to discuss how to strengthen European contribution
- JRC Meeting, January 2010, Ispra “European View on DE”



International Journal of Spatial Data Infrastructures Research, 2008, Vol. 3, 146-167.

Editorial

Next-Generation Digital Earth*

A position paper from the Vespucci Initiative for the Advancement of Geographic Information Science

Max Craglia[1], Michael F. Goodchild[2], Alessandro Annoni[1], Gilberto Camara[3], Michael Gould[4], Werner Kuhn[5], David Mark[6], Ian Masser[7], David Maguire[8], Steve Liang[9], Ed Parsons[10]

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[10] Google [eparsons@google.com]

Abstract
This position paper is the outcome of a joint reflection by a group of international geographic and environmental scientists from government, industry, and academia brought together by the Vespucci Initiative for the Advancement of Geographic Information Science, and the Joint Research Centre of the European

Meeting "European View on DE" (JRC, 14 January 2010)

- **Scope**
  - Better understand the DE vision
  - Identify key priorities from a European Perspective
  - Identify actions to raise awareness of DE in Europe
  - Streamline European contribution to DE

- **Participants**
  - **Annoni**, Craglia , De Longueville, **Ehlers**, Georgiadou, Giacomelli, **Konecny**, Luraschi, Ostlaender, **Remetey-Fülöpp**, **Rhind**, Smits, Schade
    - Joint Research Centre, University of Osnabrueck, Institute for Geoinformatics and Remote Sensing, University of Twente, Faculty for Geo-information Sciences and Earth Observation, Critigen Consulting, Masaryk University, Department of Geography, Hungarian Association for Geo-information, Portsmouth Hospitals NHS Trust

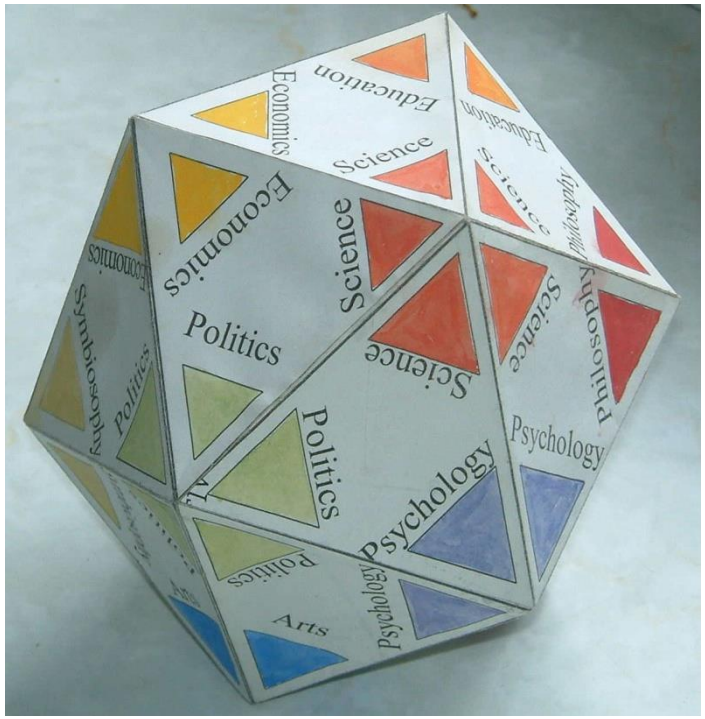
Introduction (1/2)

- Al Gore vision of DE articulated by 1998
- ISDE very successful in promoting DE through Symposia, Summits and IJDE
- Developments such as Digital Asia , Virtual Australia , and the establishment of CEODE indicate the vibrancy of the DE concept in Asia
- Key role by the private sector (e.g. Google, Microsoft,..) in making the concepts of DE familiar to hundreds of millions of users
- In Europe, relevant developments are taking place at multiple levels (INSPIRE, GMES, eGov, Digital Agenda for Europe, Europe 2020,..)

Introduction (2/2)

- Notwithstanding these important developments, the benefits of DE technologies have not yet properly exploited

- **There has been a lack of holistic thinking about what benefits Digital Earth can offer and how best to exploit DE and extend it – the 'why' rather than the 'what'**



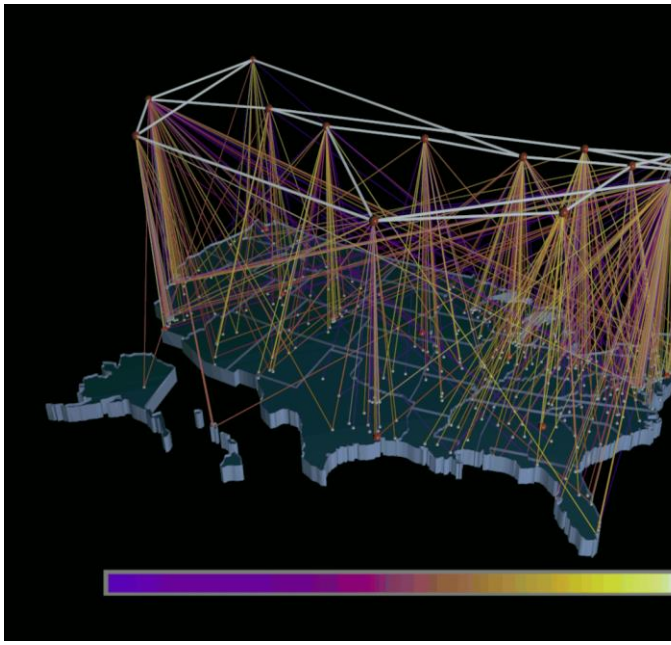
DE Vision – a SWOT analysis - STRENGTHS

- DE is a very useful metaphor
- DE displays some of the characteristics of “magic concepts”
- DE has a global dimension, inclusive of multiple applications and themes
- DE has a strong political backing since the beginning
- DE has a strong technological component
- DE provides a flexible framework to adapt to evolving technologies

Magic Tricycle - Car Design News™ 2008

DE Vision – a SWOT analysis – WEAKNESSES (1/2)

- DE encapsulates many different concepts
  - e.g. information system, infrastructure to visualise and access geo-information, a virtual model of the Earth (or parts of it), an approach to explore the Earth system…
- The DE Vision has
  - Ambiguities on its nature: political, vs. academic, vs. a technological initiative
  - Ambiguities on main target audience: policy-makers and planners vs. scientific community or the general public
  - Unclear research focus, which may reduce interest in the scientific community
- DE has uneven visibility in different regions of the world



National Center for Supercomputing Applic
University of Illinois

DE Vision – a SWOT analysis – WEAKNESSES (2/2)

- Unclear relationships and added value of DE in relation to other initiatives such as GEOSS, SDIs, Eye on Earth,..
- Original DE vision does not properly reflect recent changes in society including
  - major role of the private sector (Google, Microsoft), and
  - emergence of social networks (Facebook) at the global level
- Because of the uncertainties above, it is difficult to communicate clearly what DE is, and how it will be put into practice
- This difficulty in communicating the concept makes harder to consolidate links and collaborations with other initiatives and to develop a DE community with active members from different disciplines

Google

Microsoft

facebook

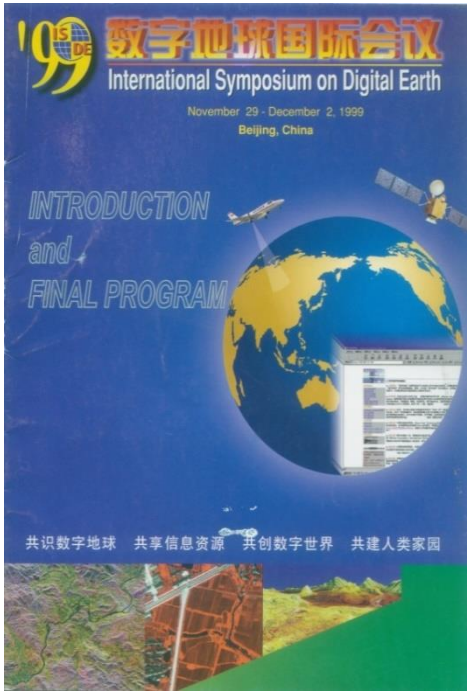
INSPIRE · Infrastructure for Spatial Information in Europe

GMES
European Information Services for Environment and Security

GEO
GROUP ON EARTH OBSERVATIONS

DE Vision – a SWOT analysis –OPPORTUNITIES (1/2)

- The increased availability of digital content from public, private sectors and citizens supports the vision of DE
- Developments in technology and policy foster increased data access and sharing
- ISDE with 10 years of history, strong political backing, and the support of the Chinese Academy of Science provide a sustainable platform for achieving the vision
- Increasing profile of DE within the scientific community through symposia and the inclusion of the IJDE in the scientific citation index
- Increasing recognition of the need to build bridges across different related initiatives, as witnessed by the membership of the ISDE in GEO
- Multiple research and government funding opportunities available to develop components and applications of DE

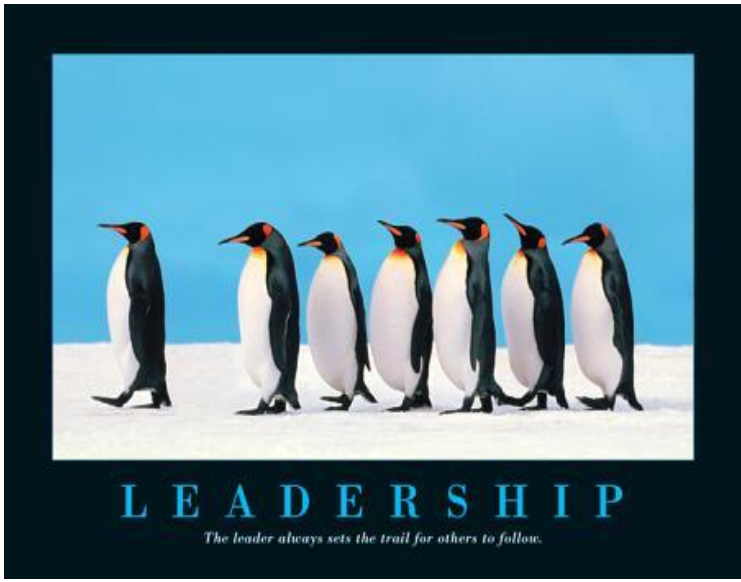


DE Vision – a SWOT analysis –OPPORTUNITIES (2/2)

- Profiling DE as a central vision space where 'Geo-Imagineers' can think out-of-the-box:
  - where they can extend and modify the vision of DE by incorporating innovative ideas and edge-cutting technologies, combining disciplines, and
  - ultimately feeding new ideas and requirements into research projects and more practically oriented initiatives

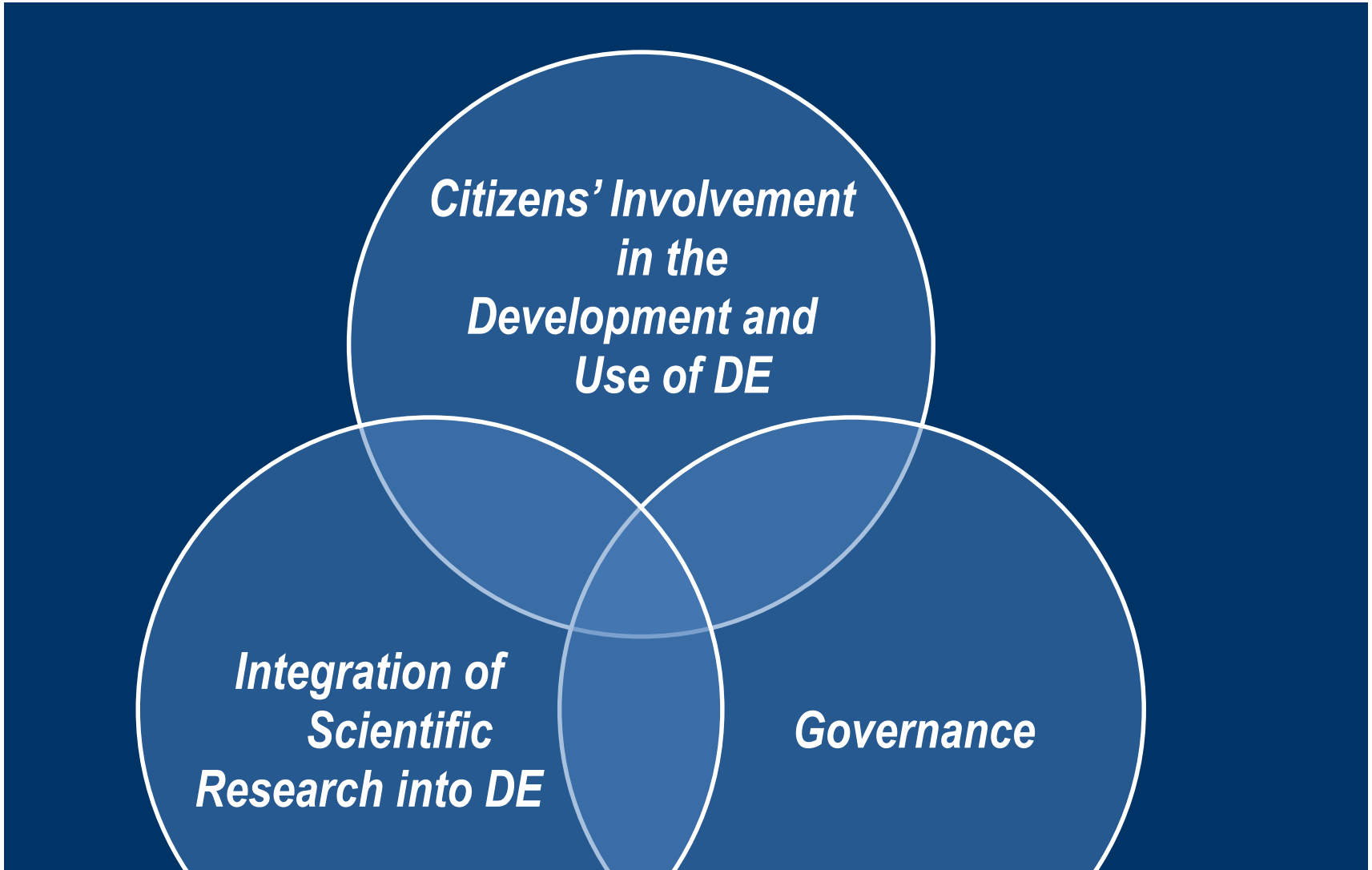
DE Vision – a SWOT analysis - THREATS

- No shared ownership over the vision of DE
- Existing leaderships do not always recognize the importance and power of the DE vision as a mechanism to advance the realisation of DE
- Initiatives are sometimes competing for resources rather than exploiting synergies



- Private sector's own vision and interpretation of DE, and the resources at its disposal, may overshadow and make irrelevant governmental or academic efforts in this area
- Because the success of the private sector's mass market applications, the need for research and development in the area of DE may become less evident to the funders of public sector research programmes

Topics of European Interest



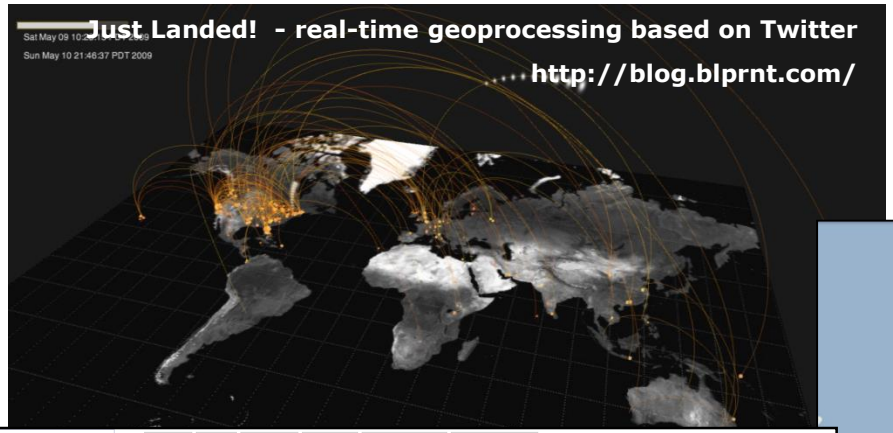
Citizens' Involvement in the Development and Use of DE

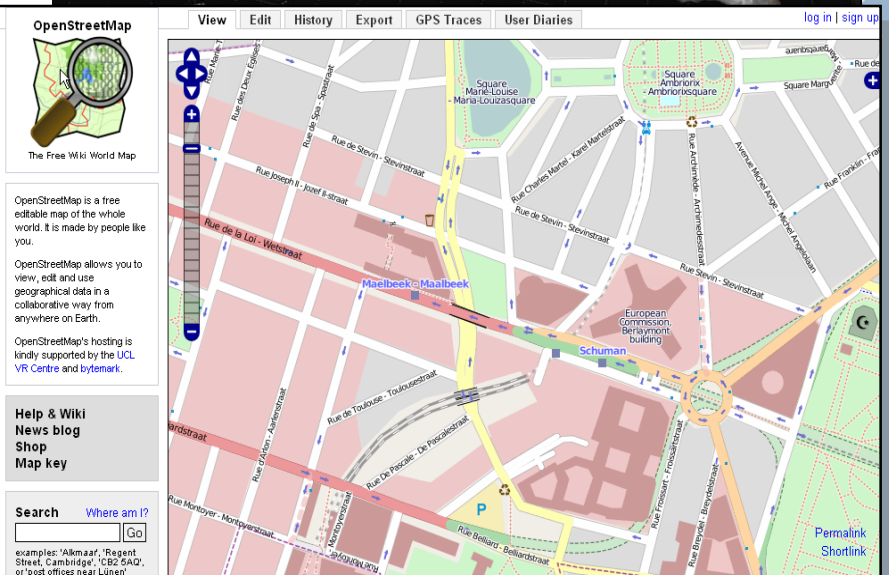
- DE involves multiple stakeholders. While the roles of environmental and social scientists, technologists, and decision-makers are widely acknowledged, those of indiv
  have yet to be articulated
- we suggest giving priority to the following three:
  1. **contribution of individuals as providers of data**
  2. **role of individuals as users of DE**
  3. **impacts of DE on individuals and society at large**

Contribution of individuals as providers of data

- several examples, relevant for a variety of applications, two main classes:
  1. those in which individual provide data through an agreed, and validated methodological framework and
  2. those in which information voluntarily provided by individuals is analysed after the event with different methodologies to control for quality and fitness for purpose
     - Such methods could include the use of editors as in the case of Wikipedia, data mining and clustering techniques, ..

Citizens as Providers of Voluntary Geographic and Environmental Data

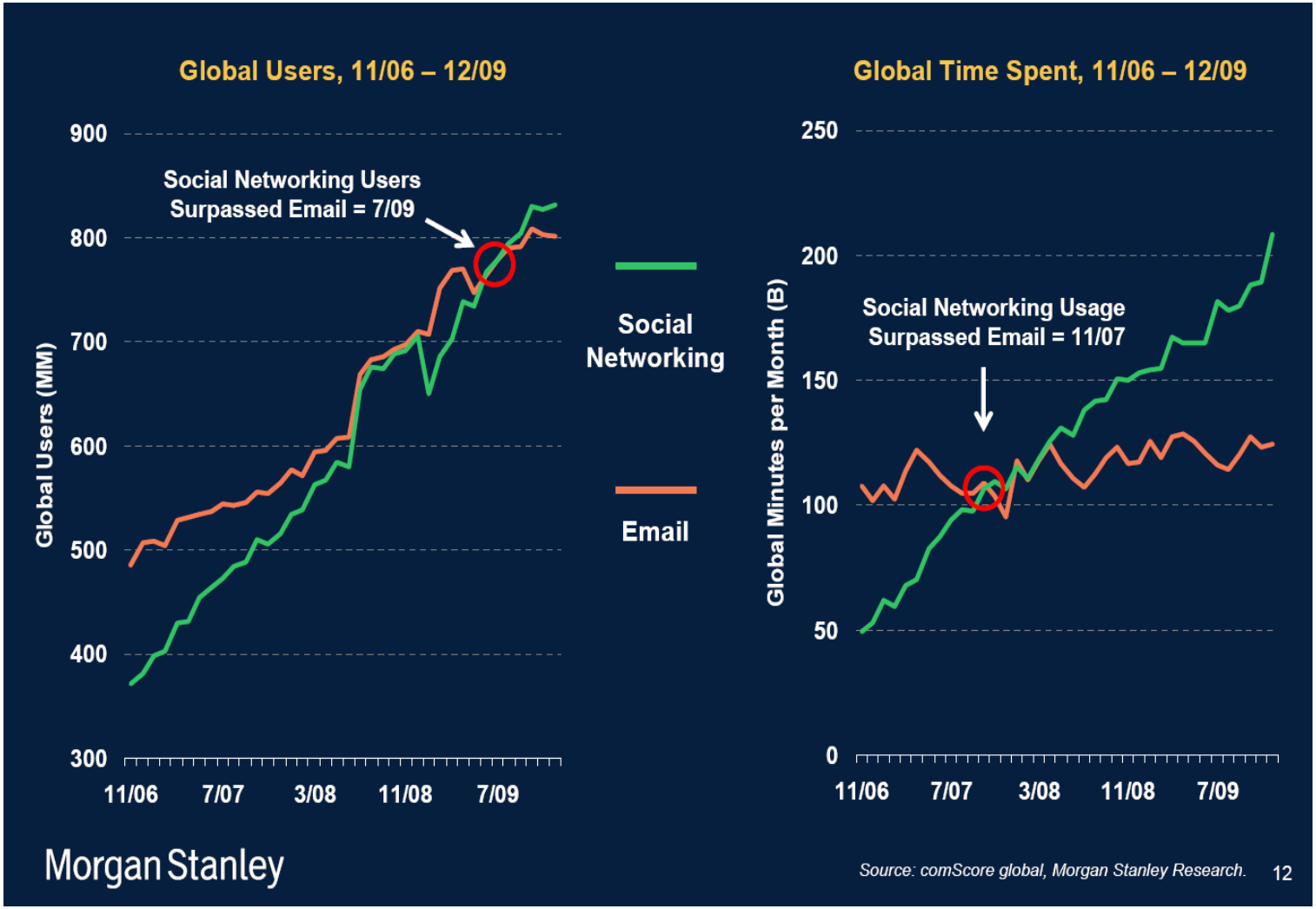




The role of individuals as users of DE

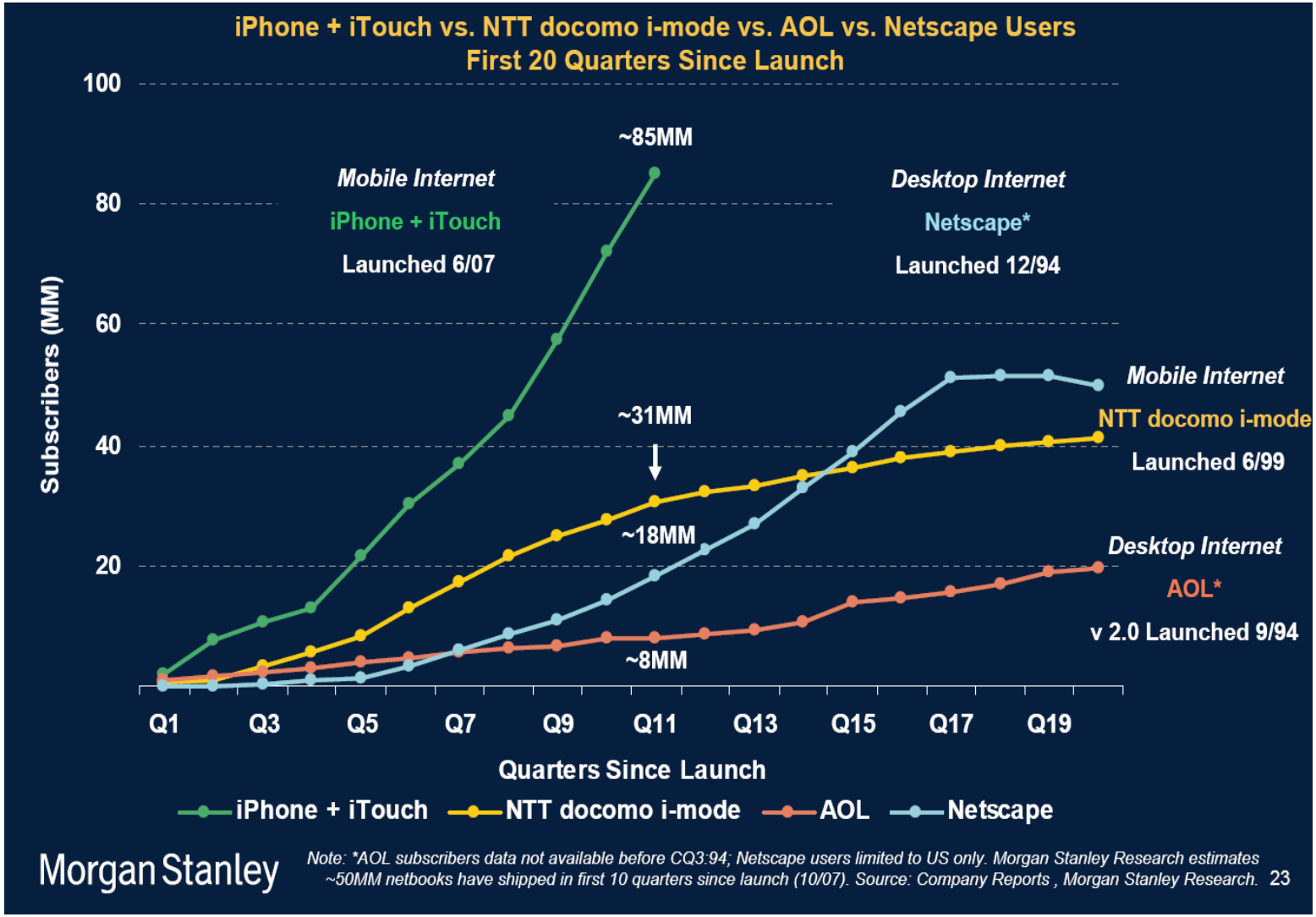
- important to consider issues of usability, relevance, format, i.e. different ways in which DE can become the instrument of choice to access information about the Earth physical and social phenomena as suggested in the original vision in 1998

Social Networking > e-mail Usa



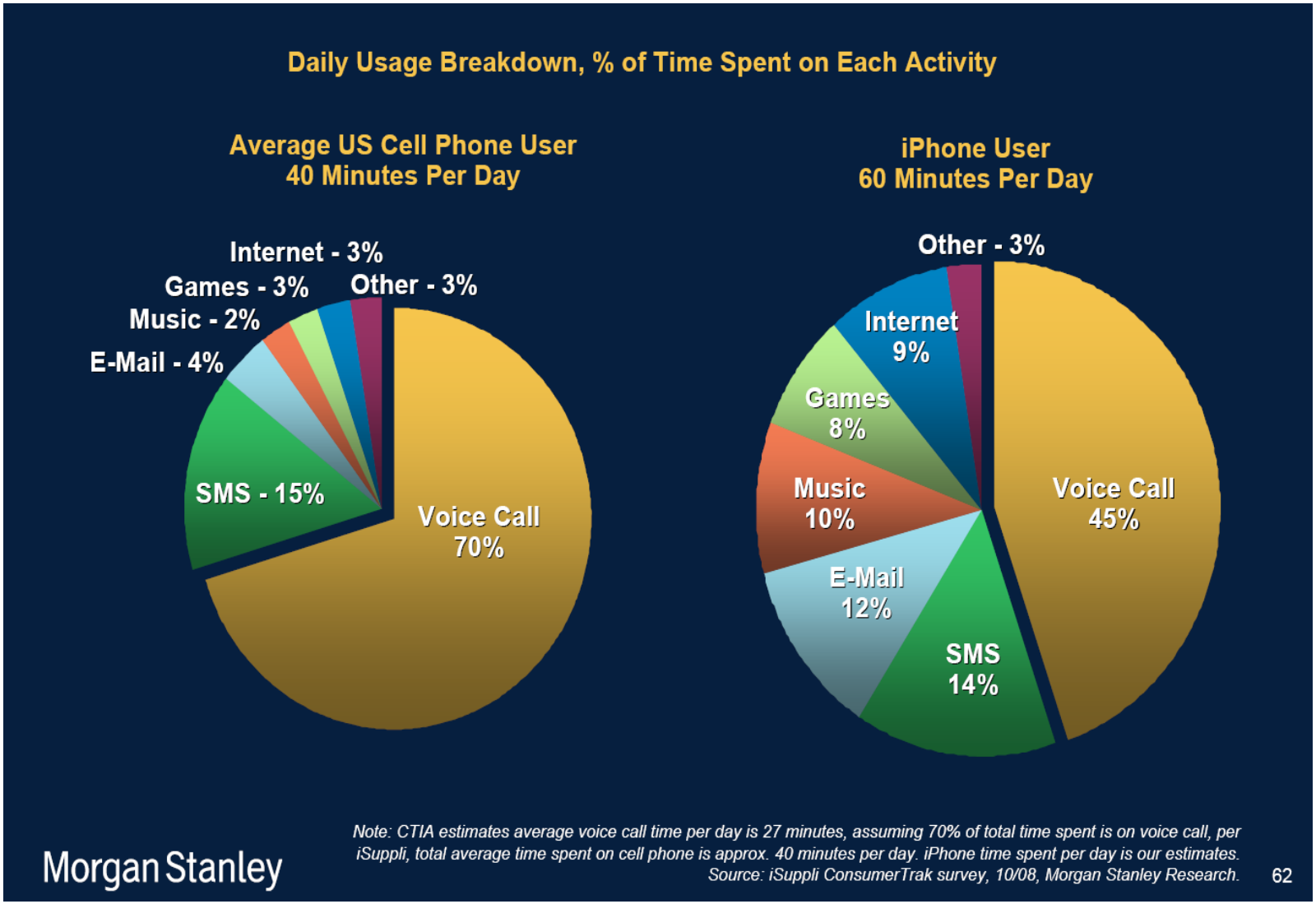
Meeker, M.; Devitt S. and Wu L. 2010. "Internet Trends" http://www.morganstanley.com/institutional/techresearch/pdfs/Internet_Trends

Mobile Internet > Desk Top Internet Adoption



Meeker, M.; Devitt S. and Wu L. 2010. "Internet Trends" http://www.morganstanley.com/institutional/techresearch/pdfs/Internet_Trends

Increasingly Mobile Phone Use is for Data not Voice



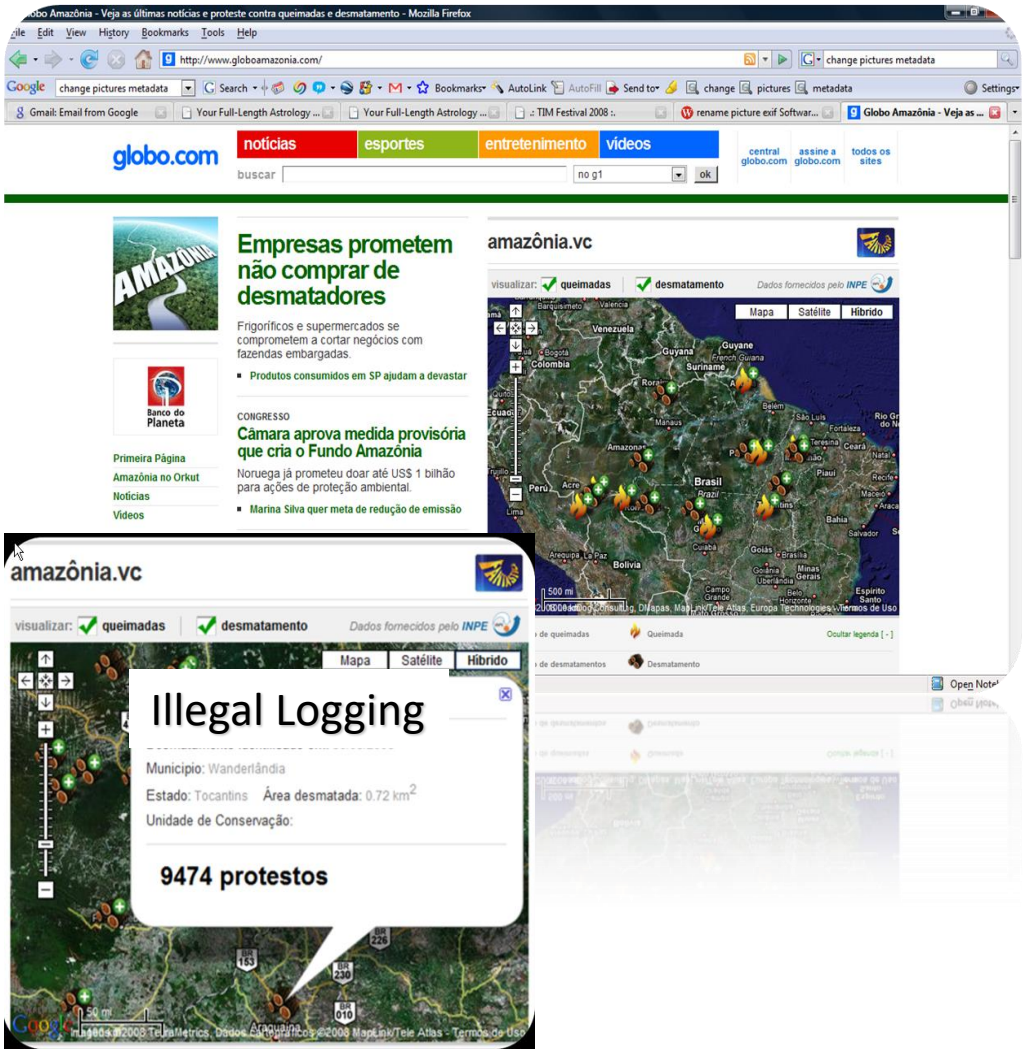
Meeker, M.; Devitt S. and Wu L. 2010. "Internet Trends" http://www.morganstanley.com/institutional/techresearch/pdfs/Internet_Trends

The impacts of DE on individuals and society at large

- research and ethical issues on
  - privacy and confidentiality, openness and transparency versus security considerations
  - measurement of social, economic and environmental costs and benefits of the deployment of DE on society including
    - democratic accountability of the action of government
    - increased trust in science through better understanding and participation in scientific processes

Social impact: greater participation and accountability

- Globo Amazonia launched by TV Globo in Brazil in Sept. 08
- Interactive site with satellite data provided by INPE to report illegal logging and clearing fires.
- 41 million reports in 3 months
- Political impact through back up of TV network



Integration of Scientific Research into DE (1/2)

- Two perspectives are important and must be clearly integrated in DE:
  1. framework for undertaking the research necessary to achieve DE
  2. contribution of DE to science (see for example 1999 Beijing Declaration

by supporting the **integration of environmental and social sciences models** at multiple scales addressing issues such as global change, climate change, land use change and environmental degradation, sea level rises, natural resource depletion, and the impacts of these phenomena on society and the economy at global,

Integration of Scientific Research into DE (2/2)
European perspective

- Important role of DE in representing and understanding cultural heritage (including multi-lingual aspects)
  - **Information integration** (multi source and heterogeneous, multi-disciplinary, multi-temporal, multi-scale, multi-media, and multi-lingual);
  - **space-time analysis and modelling**
  - **Intelligent descriptions** (automatic, user driven) of data, services, processes, models, searching and filtering;
  - **visualisation of abstract concepts in space**
  - **computational infrastructures** to implement the vision of DE and
  - **trust, reputation and quality models** for contributed information and services

Governance (1/3)

- governance is crucial for future development of DE
- **need to build connections and synergies** with the many related developments at national, continental, and global levels
  - *e.g. GEOSS, the United Nations activities on Global Geographic Information Management, the Earth System Governance Project of the International Human Dimensions Programme on Global Environmental Change,etc..*
- **need to work with the private sector to exploit the platforms and technologies currently available** and utilised by hundreds of million of users, **and to involve the public** in the development of DE.

Governance (2/3)
European perspective

- stronger integration of DE with INSPIRE, GMES, and SEIS, as well as GEOSS.
- other initiatives need to be monitored and exploited:
  - e.g. Digital Cities, European Institute of Innovation & Technology, funding opportunities available under the Framework Research and Development programme of the EU,..
- all of these initiatives must be targeted to address the innovation and sustainable growth challenges identified in the **Europe2020** Communication which for example also earmarks a **Digital Agenda for Europe** as one of its flagship initiatives.

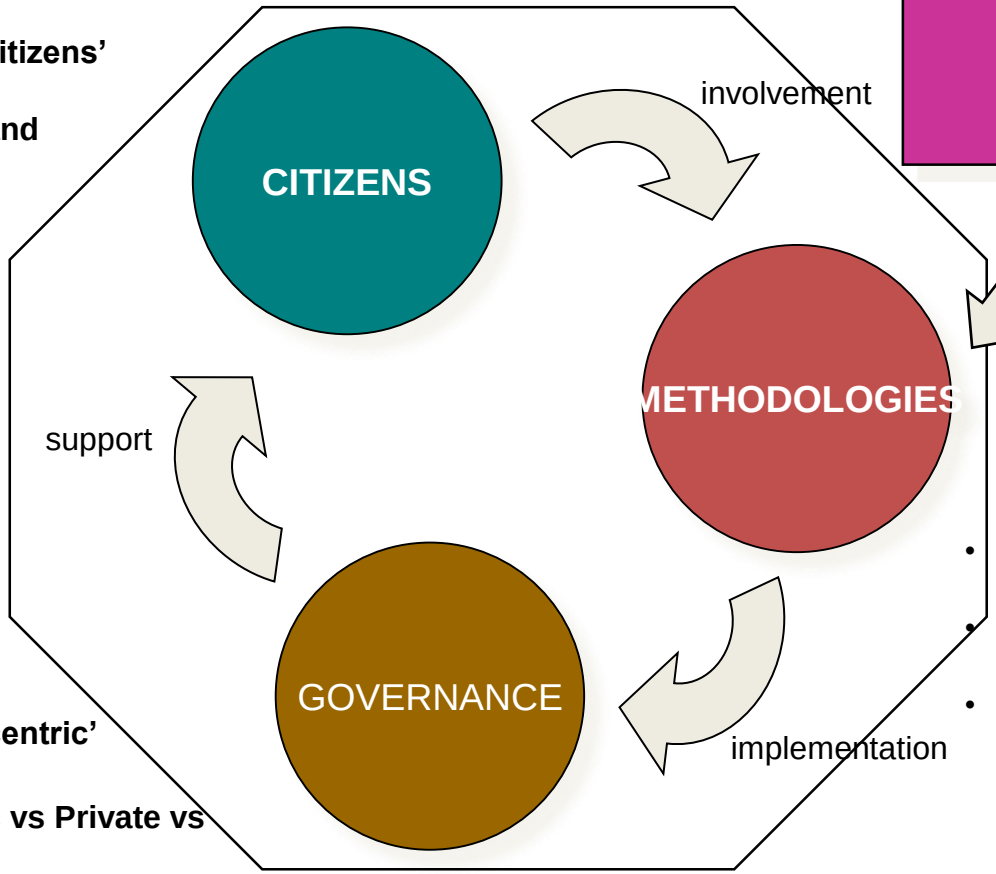
Governance (3/3)
European perspective

- ***Embedding DE as a driver for science but also for innovation and growth will make it possible to flourish in Europe and contribute more strongly to the global objectives of the ISDE***

European Perspec

global change and climate change, land-use change, sea level rise, environmental degradation, urban spread, natural resource depletion, and their impacts on society and economy

The role of private citizens' involvement in the development, use, and management of DE



- **Bring together methods and tools**
- **Integration of scientific research into DE**
- **Trust & Reliability in information content**

- **Distributed' vs. 'centric' approaches**
- **Multifacet: Public vs Private vs Citizens**
- **Multilevel**
- **Link to innovation and growth**

The Way Forward (initial actions)

1. To develop a more structured European research agenda and implementation mechanism e.g. through the establishment of a E rth r (

2. Establish a European Special Interest Group (SIG) and coordinate better the European effort and sustain organisational activities

European Digital Earth research Network (EDEN) (1/2)

- **Federate a number of research laboratories** in Europe doing research on DE and related topics
- Open a European **DE "building site"** by linking through interoperability arrangements the various heterogeneous components already existing (e.g. SDIs) taking advantage of
  - the INSPIRE implementation,
  - digital and virtual cities already in development in Europe,
  - digital landscapes, museums and libraries, and virtual cultural artefacts (e.g. the Acropolis), …
- **In this way synergies, opportunities, and gaps become more evident and the "building Site" itself becomes the virtual laboratory in which to address the research priorities identified;**

European Digital Earth research Network (EDEN) (2/2)

- Link to related activities at the global level (US, China, etc.);
- Provide greater visibility to the research effort
- **Undertake regular technology watch and market evaluation** in collaboration with the private sector to assess the potential impact of DE research on innovation and competitiveness at the European level
  - **ISDE Position Papers & Recommendations**

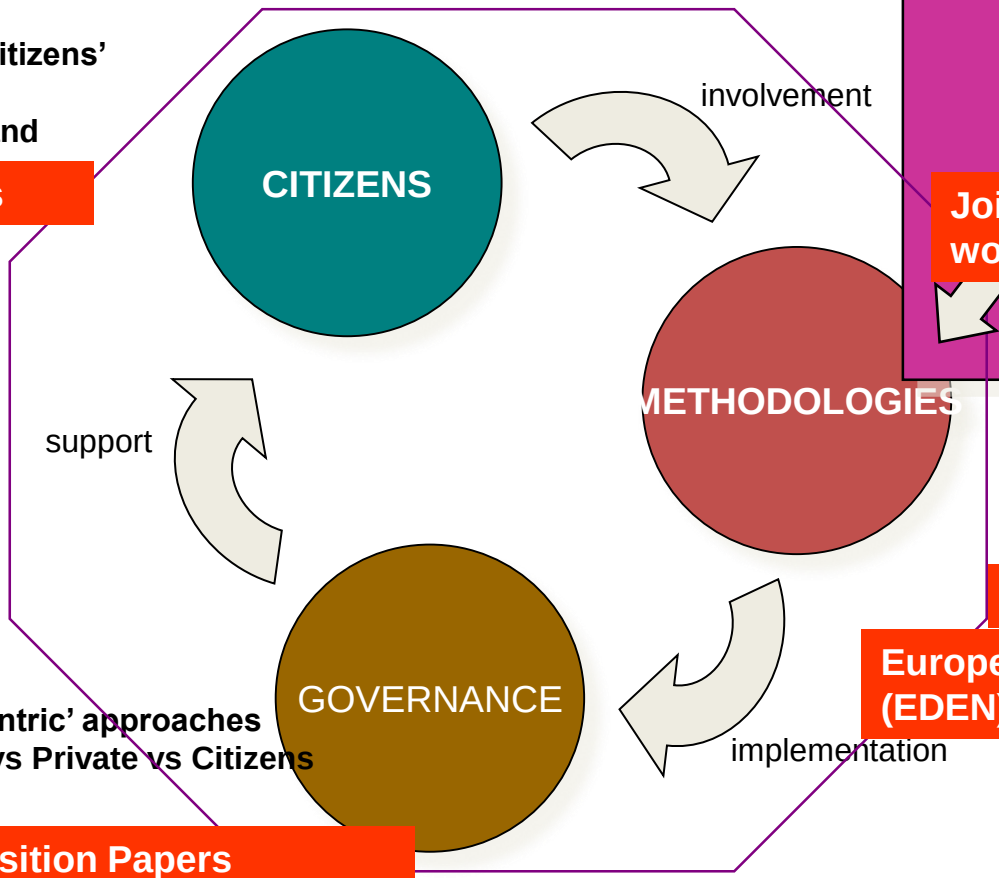
European Special Interest Group (SIG)

- Provide a forum for monitoring relevant initiatives and help identify and channel research funding;
- Provide the base from which to establish linkages to relevant initiatives
- Jointly organise with these communities thematic events and workshops
  - to advance research on applied DE in Europe and raise awareness of the opportunities of DE for these communities;
- Contribute to raising awareness of DE by launching pilot projects and competitions (awards) and joint initiatives with other organisations (e.g. OpenStreetMap, the Electronic Cultural Atlas initiative), and the private sector (e.g. Google, Microsoft);
- Support activities to foster cross-fertilisation between DE and the ISDE with other pertinent activities such as GEOSS.

European Propos

The role of private citizens' involvement in the development, use, and

Pilots and Events



global change and climate change, land-use change, sea level rise, environmental degradation, urban sp[illegible]ad, natural resource

Joint conferences and workshops

[illegible]mpacts on society and economy

- **Bring together methods and tools**
- **Integration of scientific research into DE**
- **Trust & Reliability in**

Pilots & Projects

European DE research Network (EDEN)– technological component

- **Distributed' vs. 'centric' approaches**
- **Multifacet: Public vs Private vs Citizens**
- **Multilevel**

•Research & Position Papers
•European Special Interest Group

European DE research Network (EDEN)– socio-economic component

Digital Earth Vision 2020

Digital Earth

What does that mean DE should look like in 5-10 years?

immediate *towards our vision:*

- be immediate, precise and interactive
- offer access to comprehensive 4D information anywhere and anytime,
and be mobile accessible
- be predictive and retrospective, and offer realistic vizualisations with metric integrity of information

- incorporate sound and other qualities, as well as vision
- integrate data from all available sources
- bring together database designers, modellers, simulators, gamers, roboticists and visualisers
- support multidisciplinary research by connecting across data sets
- empower citizens to facilitate, innovate and interact
- blur the boundary of government versus private ownership

Conclusions

- There is a clear need to refresh the DE vision
- The new vision should be able to adapt to regional diversities and priorities
- Awareness raising and Operations are the keys for enlarging ISDE community
- Need to further discuss and engage ISDE community

Some questions for Today Round Table

- Which additional structures are needed to reinforce ISDE?
  - IJDE (done) ,
  - EDEN vs IDEN? ,
  - ESIG vs ad hoc wgs? , …
- Which ISDE products/services ?
  - ISDE Newsletters (done),
  - Position Papers?,
  - DE Research Agenda?, ..
- Which links should be prioritised, how to connect and contribute?
- Are the identified priorities/solutions for Europe appropriate?

Thank you