

# - Towards new concepts for handling geoinformation

Centre for 3D Geoinformation  
Aalborg University  
Denmark



[www.3dgi.dk](http://www.3dgi.dk)



## Outline

- 1. Introduction
- 2. Digital Northern Jutland – in DK
- 3. Centre for 3D geoinformation
- 4. Drivers on the GI – "FIG" community

*Presented by  
Prof. Esben Munk Sørensen*



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## Starting Point:

- Possible to work with 3D in geographical information systems.
- Representation of objects in three dimensions in all processes.
- Challenges the surveying community, which since the development of the trigonometric surveying largely has been working with two-dimensional systems - for many years analogously and during the last few decades digitally.
- International standardization of data and communication triggered by the Internet and related technologies challenges the national communication procedures.
- The challenge is that the profession has to replace large parts of the scientific and theoretical foundation of its professional efforts. The toolbox is going to change its data handling, which places heavy demands on the educational institutions, on research and on practice.
- This requires close co-operation between universities, profession and research.



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The **metric** system serves today as the common language of high-tech communications, cutting-edge science, machineproduction and international commerce.

....."The Measure of all things".  
About the metricsystem that transformed  
the world 200 years ago.  
Ken Alder 2002



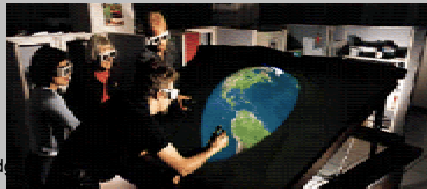
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**GSDI** and related standards will serve tomorrow as a common language of high-tech communications, cutting-edge science, and international commerce and create the **digital earth**



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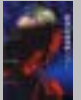


## 2. The Digital Northern Jutland

- A county in Denmark – 0,5 mio inhab.
- A wide-range governmental program to raise a digital region using information technology on all levels.
- Partnership between private sector, local and regional authorities and Government
- Running from 2000 to 2005



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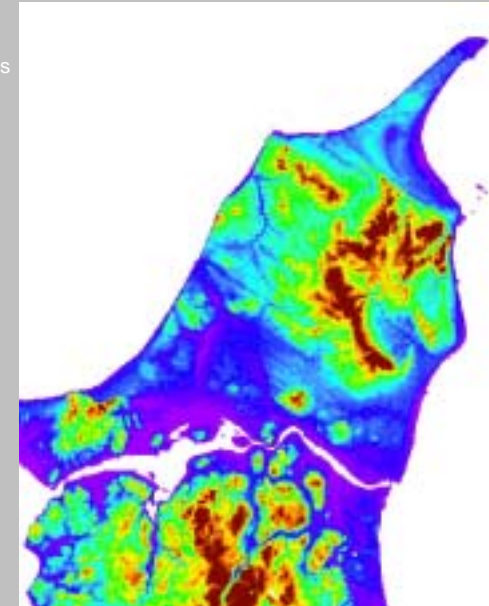
Arial Photos  
1960

Satellites  
1970

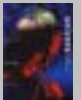


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Digital Elevation Models  
1980



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The University Campus in Aalborg

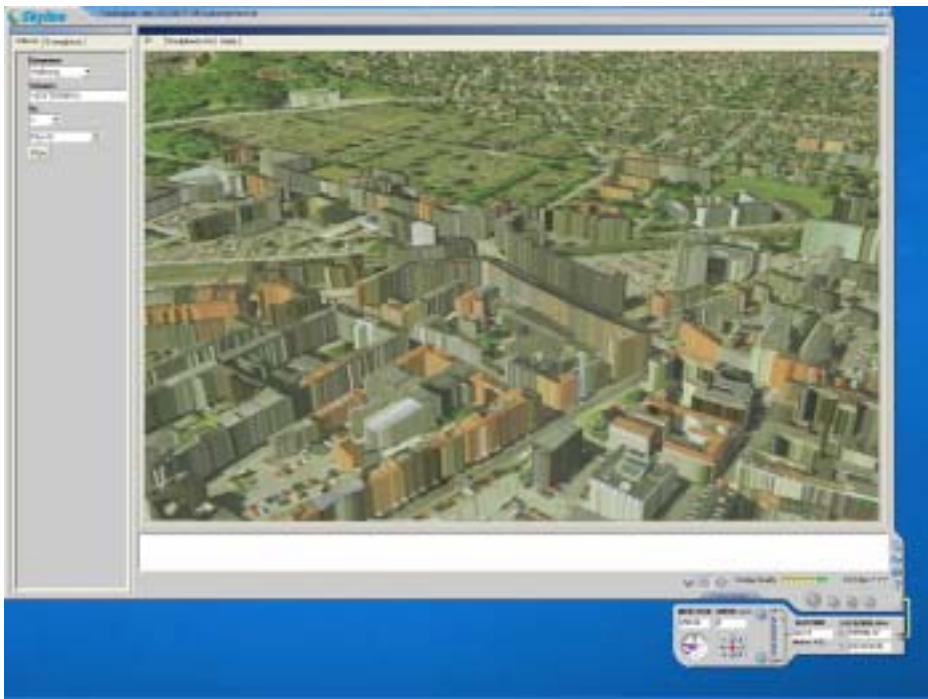
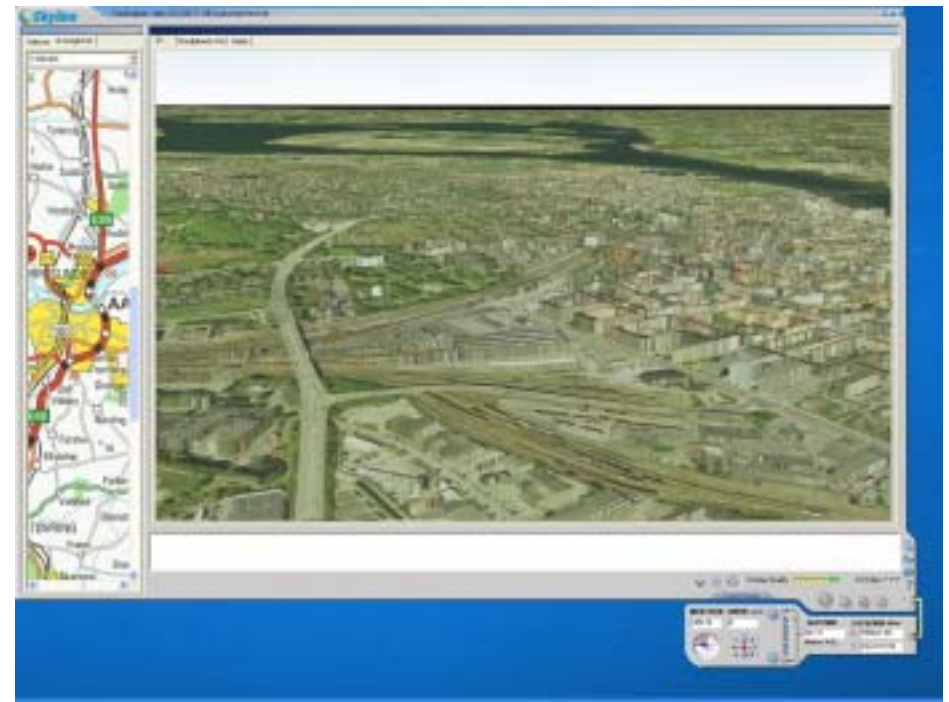
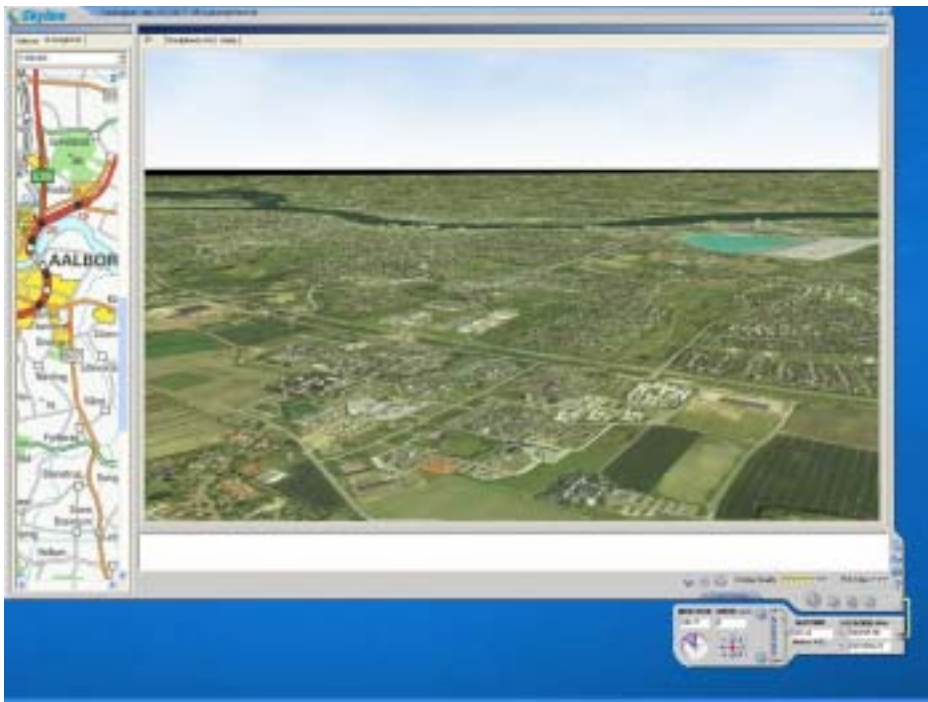


- You're welcome to visit the Region of Northern Jutland and navigate your self over a simple 3D visualization covering the entire region
- Take a look at [www.3d.nja.dk](http://www.3d.nja.dk)



[www.3dgi.dk](http://www.3dgi.dk)





To see the model on Internet: [www.3d.nia.dk](http://www.3d.nia.dk)

Planning and  
Decision Making  
in VR-MediaLab  
Aalborg



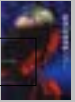
Local Planning for Suburbs  
[www.3dgi.dk](http://www.3dgi.dk)



Planning and  
Decision Making  
in VR-MediaLab  
Aalborg



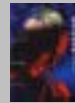
MusicHouse on The Harbour Front of Aalborg  
[www.3dgi.dk](http://www.3dgi.dk)



Planning and  
Decision Making  
Using the WEB



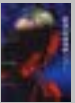
New high-way passing green areas  
[www.3dgi.dk](http://www.3dgi.dk)



Planning and  
Decision Making  
Using the WEB



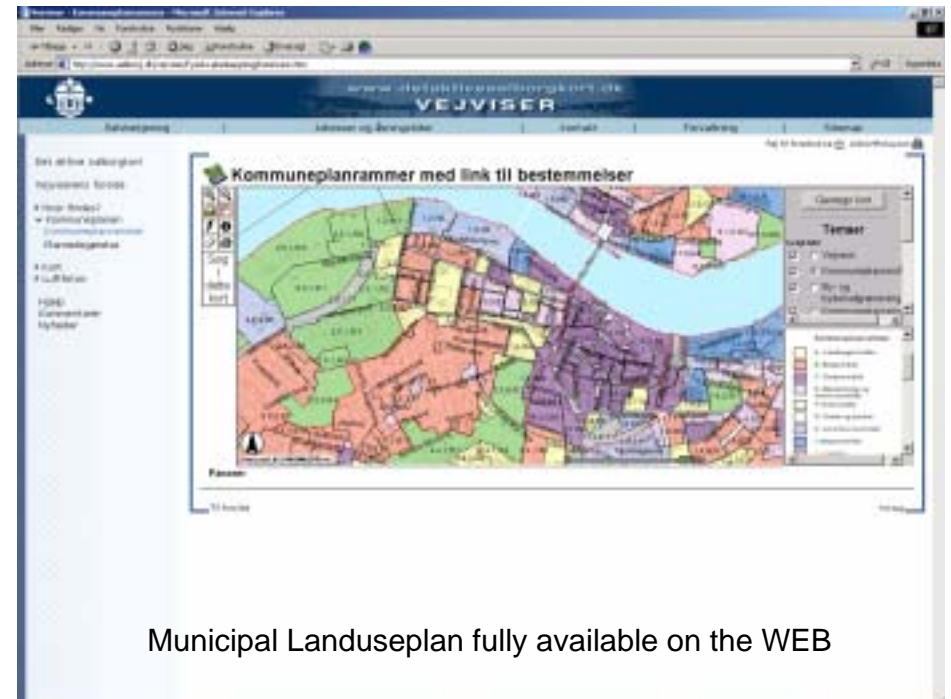
New high-way passing green areas  
[www.3dgi.dk](http://www.3dgi.dk)



Planning and  
Decision Making  
Using the WEB



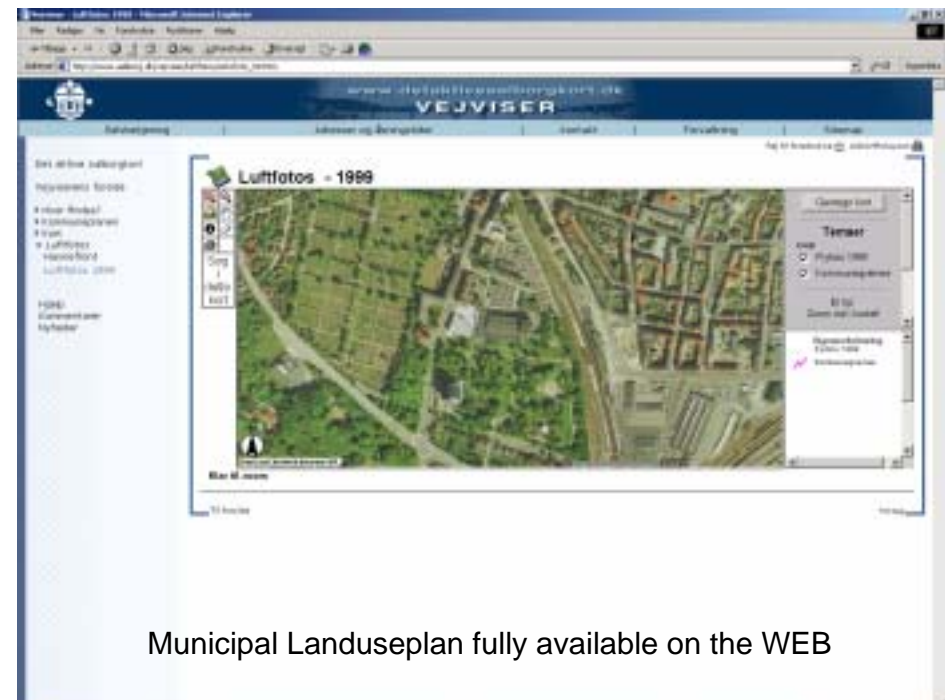
New high-way passing green areas  
[www.3dgi.dk](http://www.3dgi.dk)



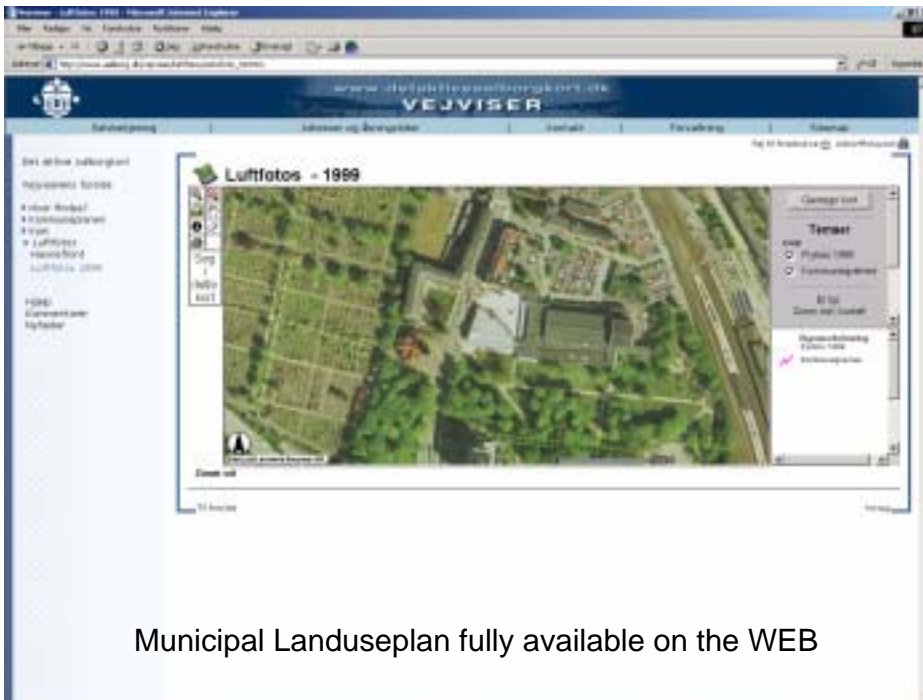
Municipal Landuseplan fully available on the WEB



Municipal Landuseplan fully available on the WEB



Municipal Landuseplan fully available on the WEB



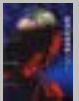
Municipal Landuseplan fully available on the WEB

### 3. Centre for 3D Geoinformation

- Partnership between University, industry (COWI and Informi GIS) and National Mapping Agency (KMS)
- Focus on "remodelling" spatial information to meet the challenge of working in 3D-spaces in full digital integrated environment



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### PURPOSE OF THE CENTRE FOR 3D GEOINFORMATION

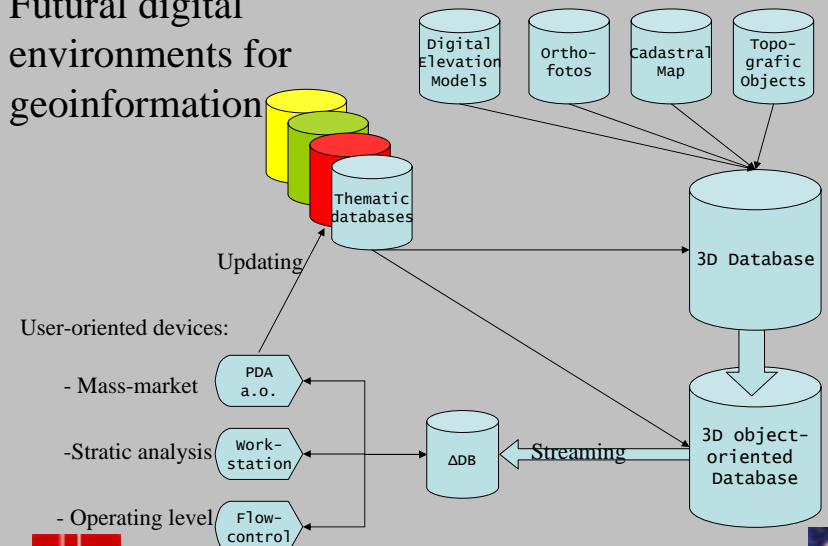
- knowledge and competence in creating 3D models of cities and landscapes
- This will be done by:
- Focus on VR and three-dimensional urban and rural models
  - VR user interface for looking for position-fixed information in the northern part of Jutland
  - creating a "geographical model" of North Jutland developing a basis for the use of a geographical communication on realtime monitoring geospatial databases
  - forming the basis for future research and regional knowledge within location-based services and augmented reality



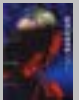
www.3dgi.dk



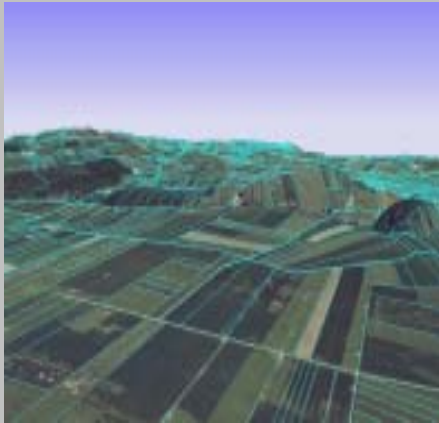
### Futural digital environments for geoinformation



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## Navigating in in 3D-Augmented Reality – seeing "non-visible boarder lines"



FIG

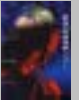
[www.3dgi.dk](http://www.3dgi.dk)

## Datamodel 1(3)

- alarming complexity
- not only be described through points, lines or polygons with well-defined mutual relations.
- When objects are to be described with a spatial geometry and representation, it does not only require some new thinking, especially when the objects are to be used in connection with a GIS.
- Experienced in spatial models in connection with 3D visualizations, 3D animations and latest virtual reality for several decades.
- Still an enormous jump from simple 3D modeling to a 3D model containing knowledge about itself and relations to its surroundings.

FIG

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## Datamodel 2(3)

- simplify the model, and make a choice about the detail level of the object description.
- it is relatively simple to take a position. If for example we take a building, we have to decide how many details we wish to include. Is every roof window or windbreak to be included?
- existing map products and registers, which among other things contain information about the spatial extent of the objects.
- The problem in using different sources of information may be often be that there is conflicting information – describing the object with different values.



FIG

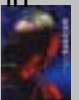
[www.3dgi.dk](http://www.3dgi.dk)

## Datamodel 3(3)

- special focus on spatial legal objects.
- This subject is for cadastral surveyors of great importance, because the technology is near to ready for modeling objects in real 3D.
- The 3D technologies based on Virtual Reality will made it possible to describe ownership to spatial legal object as there are understood in reality, where property rights always is related to three dimension. Ownership to land, buildings, easements, rights to pass (road) is all in three dimensions i in the real world.
- The challenge is not only to develop theoretical concepts for describing the model, but also develop procedures for object-oriented updating and real-time visualizations in virtual environments.

FIG

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# Actual ongoing research in 3DGI

- Organized as a number of projects that cause prototypes, algorithms and documents for the final system structure, system.

The following are ongoing:

- Feature extraction from aerial scanning (LIDAR)
- Organizing 3D object representation using XML-based standards
- Data modeling and queries for 3D geographical data
- 3D cadastre
- Qualification of 3D geovisualization
- Ground laser scanning and modeling 3D objects
- Exchange of data between XML and RDBS
- Landscape visualization in 3D and temporal analysis

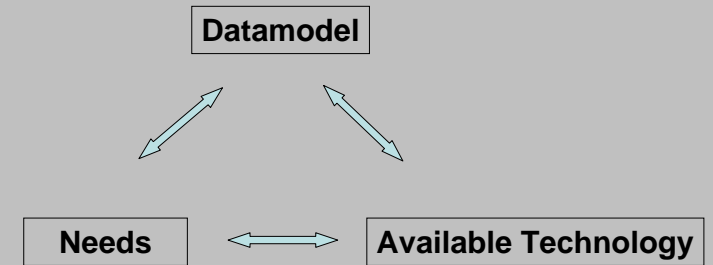
- The coming year will give rise to further projects based on partnerships between research and companies in the private sector.



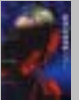
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# 4. Global drivers effecting the GI ( and FIG) community



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## Datamodel - Standardization



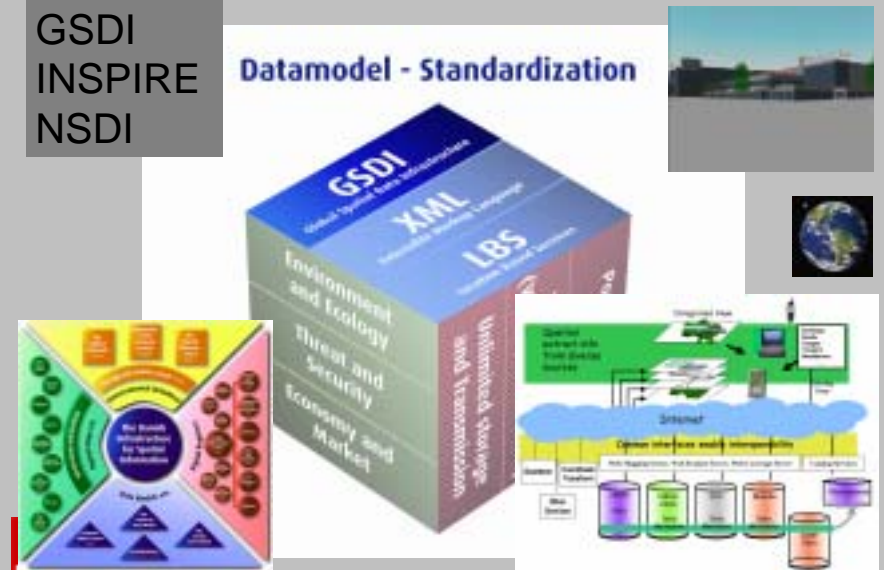
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Global drivers effecting the GI (-FIG) commuty



GSDI  
INSPIRE  
NSDI

## Datamodel - Standardization



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Global drivers effecting the GI (-FIG) commuty



Standards for Scalable Vector Graphics

### Datamodel - Standardization



Standards for 2&3D Virtuel Environments and GeoVisualization

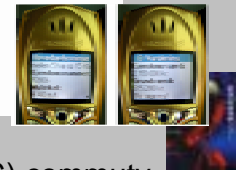
GMXML XML= standard for WEB-communication



Global drivers effecting the GI (-FIG) commuty

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### Datamodel - Standardization



Global drivers effecting the GI (-FIG) commuty

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Pervasive computing  
Small Mobile  
Portable  
Embedded

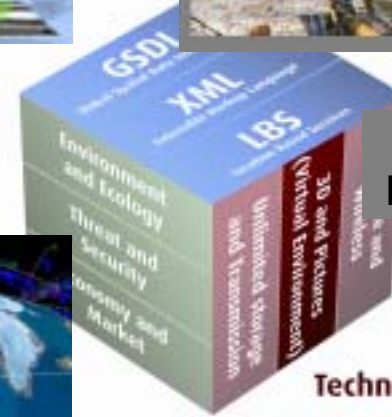
Technology

802.11g  
4.G  
5.G



Global drivers effecting the GI (-FIG) commuty

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Defence  
Entertainment

Technology



Global drivers effecting the GI (-FIG) commuty

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Computers will be scalable, interoperable and networked – from portable to big servers

Speeds and Capacity thousands times faster and bigger within few years



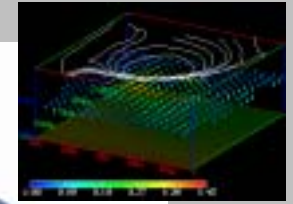
Technology

Internet Protocol version 6 and more

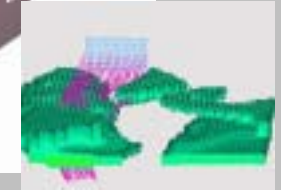
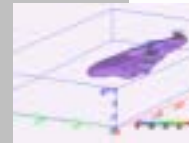


Global drivers effecting the GI (-FIG) commuty [www.3dgi.dk](http://www.3dgi.dk)

Modelling and Dynamic 3D visualization



Needs



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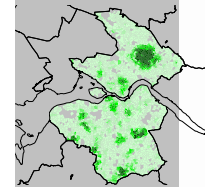
Nature Risks, Homeland Security and Intelligence



Needs



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Modelling Human Activity



Needs



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## Datamodel - Standardization



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### Links:

Videnscenter for 3D GeoInformation ([www.3dgi.dk](http://www.3dgi.dk))

Research Team GeoInformation og Medieteknologi ([www.gim.dk](http://www.gim.dk)) and

Researchcentre Forest & Landscape ([www.fsl.dk](http://www.fsl.dk))  
and partners:

COWI ([www.cowi.dk](http://www.cowi.dk))

Kort- og Matrikelstyrelsen ([www.kms.ds](http://www.kms.ds))

Informi GIS ([www.informi.dk](http://www.informi.dk))



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