A national 3D SDI: case of The Netherlands

Jantien Stoter, Kadaster & TU Delft & Geonovum

AND MANY OTHERS!

j.e.stoter@tudelft.nl
jantien.stoter@kadaster.nl
j.stoter@geonovum.nl

NCG KNAW

GEONOVUM

Why 3D Pilot NL?

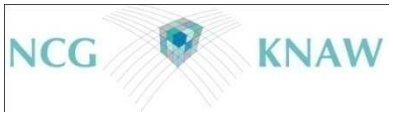
- Push 3D developments in the Netherlands,
  - Study aspects of 3D SDI in an integrated manner
  - Collaborate with many stakeholders on use cases and testbed
  - Establish 3D standard
  - Share 3D technologies, ideas, data, needs in a non- competitive setting

NCG KNAW

GEONOVUM

Leading organisations

- Kadaster
- Geonovum
- Dutch Commission for Geodesy (NCG)
- Ministry for Infrastructure and Environment

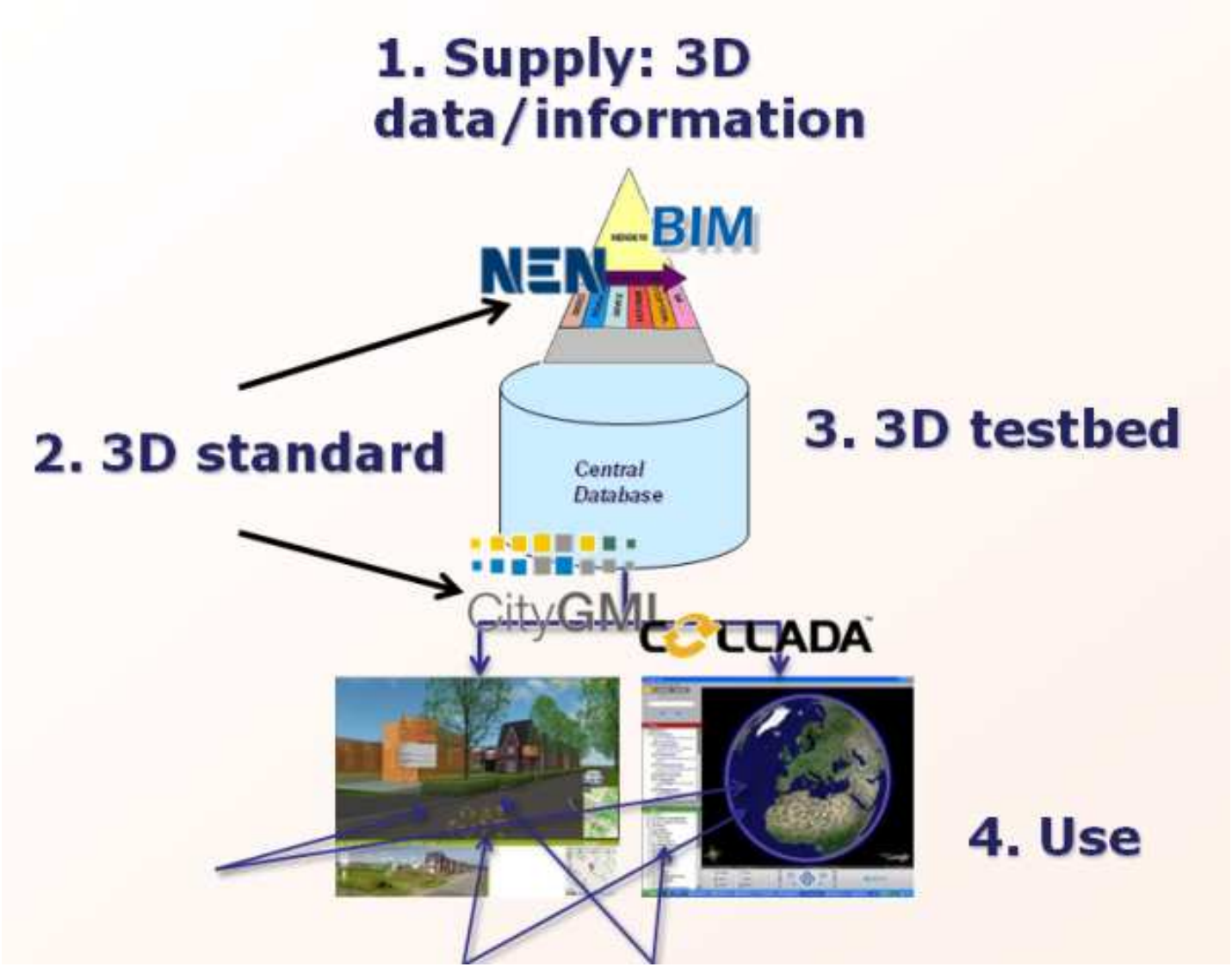


3D Pilot partners (68)

4Sight	Gemeente Apeldoorn	Moss (Germany)	TNO ICT
Aerodata	Gemeente Den Bosch	Nedgraphics	Topcon Sokkia
AGIV (Belgie)	Gemeente Den Haag	Neo	TOPOSCOPIE
AHN	Gemeente Groningen	NLR	Triformis
Alterra	Gemeente Rotterdam	Object Vision	TU Delft c-graphics
Bentley	Gemeente Tilburg	Architect ONL	TU Delft-GISt
BGT-LSV GBKN	Geodan	Oracle	TU Delft-L&R
BLOM Netherlands	Geodelta	Oranjewoud	TU Eindhoven
Cebra	Geonovum	Organic Vectory	Universiteit Gent
Crotec	Grontmij	PBS Software L. (MapInfo)	Universiteit Groningen
Curnet	Hansa Luftbild	Planbureau Leefomgeving	Universiteit Utrecht
Cyclomedia	Horus surround vision	Politie KLPD	WUR
Defensie	iDelft	Provincie NB	Cobra Geoadviseurs
Esri NL	Imagem (Erdas)	RWS, DID	TU Berlijn
Eurosense	Intergraph	StrateGIS	
Fugro	ITC - U Twente	Terra Imaging	
Gemeente Leeuwarden	IT-Pro People	TNO Bouw en Ondergrond	
Gemeente Amsterdam	Kadaster	TNO Defensie en Veiligheid	

400 LinkedIn members; also active on Twitter

Approach 3D Pilot: 4 activities



- Meetings every 6-7 weeks

Activity 1:
3D information supply

Leader: Joris Goos, Municipality Rotterdam

Objectives

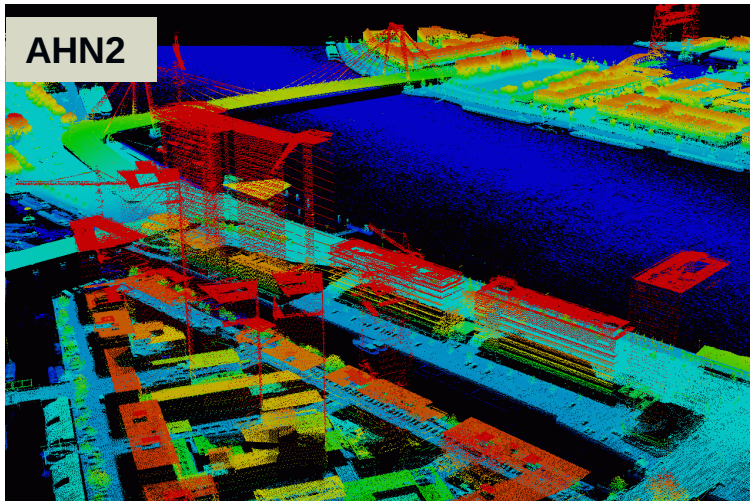
Investigate:

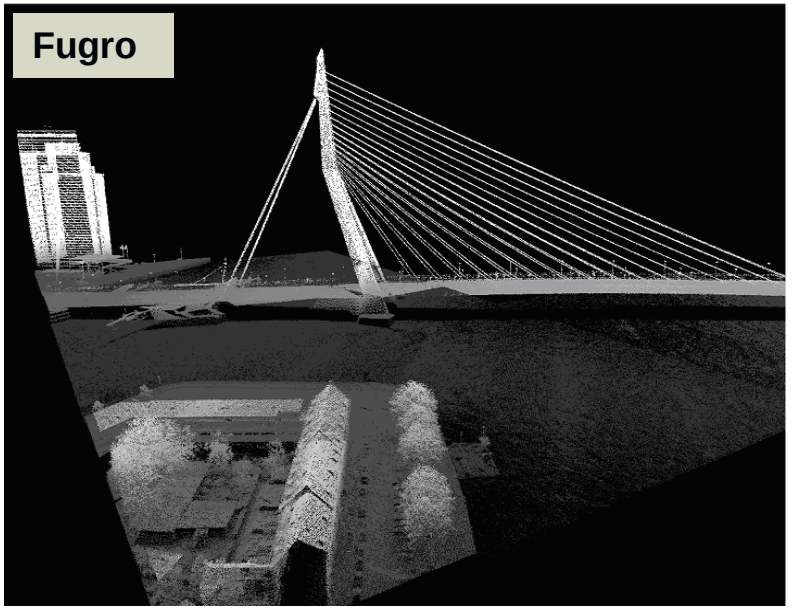
- Availability of data sets to create 3D models
- Procedures for 3D reconstruction
- Study export to 3D CityGML

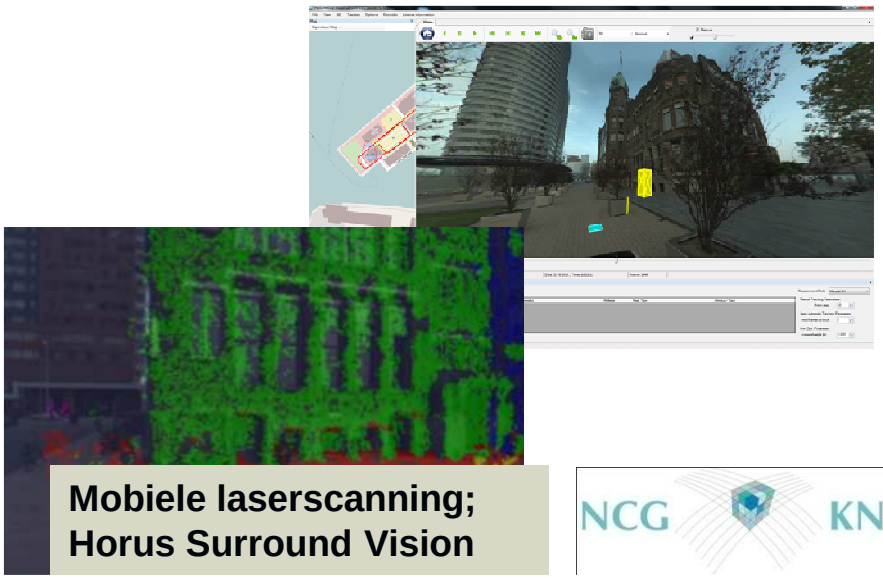
NCG KNAW

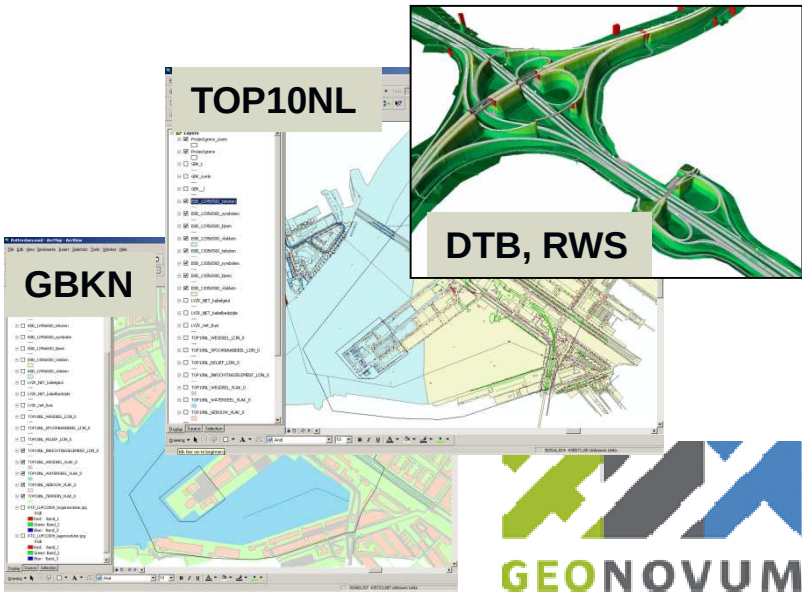
GEONOVUM

Data sets available in test area (1/2)







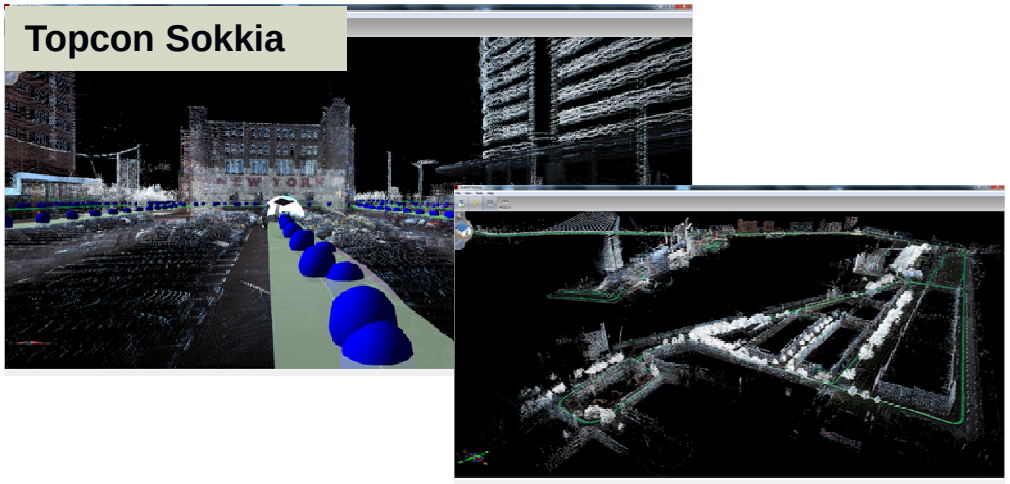


NCG KNAW

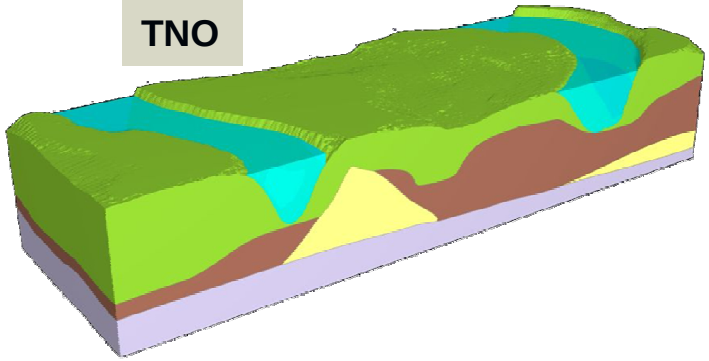
GEONOVUM

Data sets available in test area (2/2)

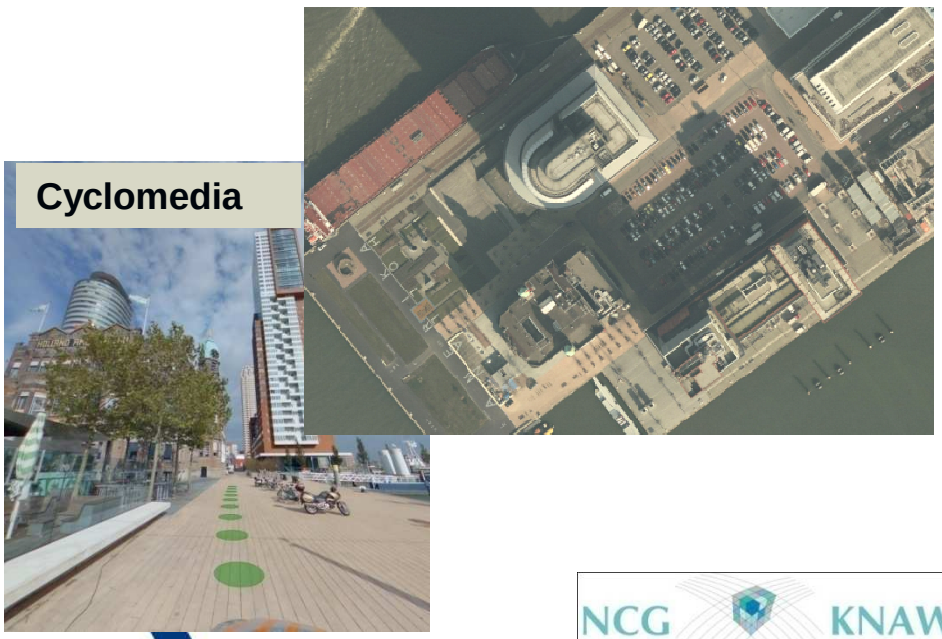
Topcon Sokkia



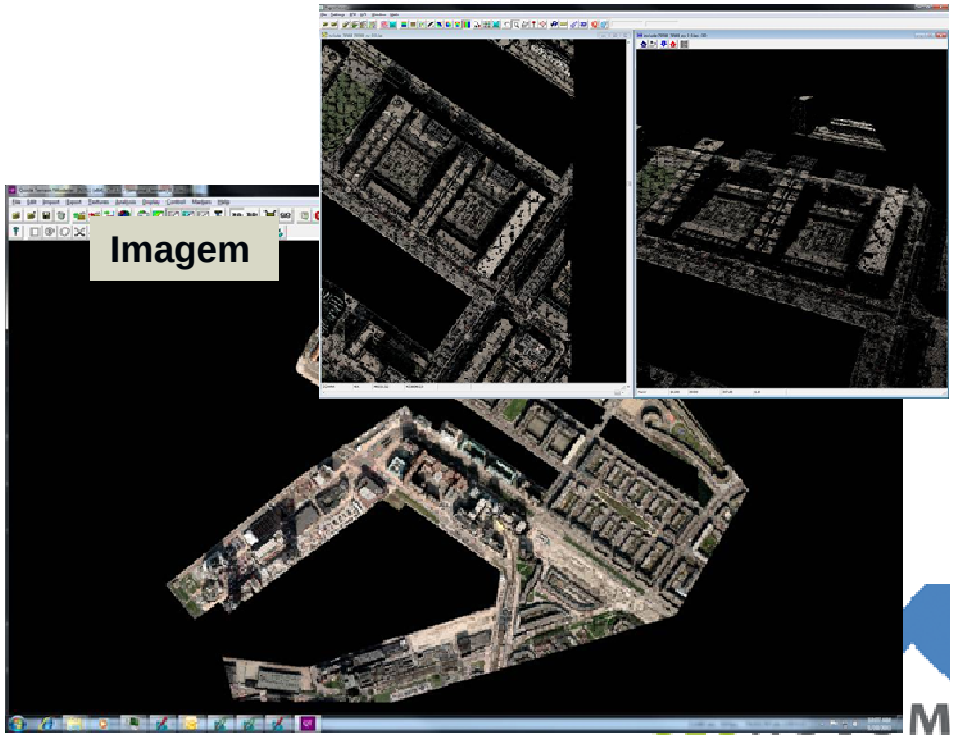
TNO



Cyclomedia



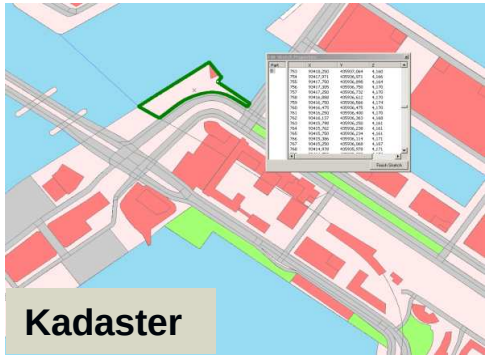
Imagem



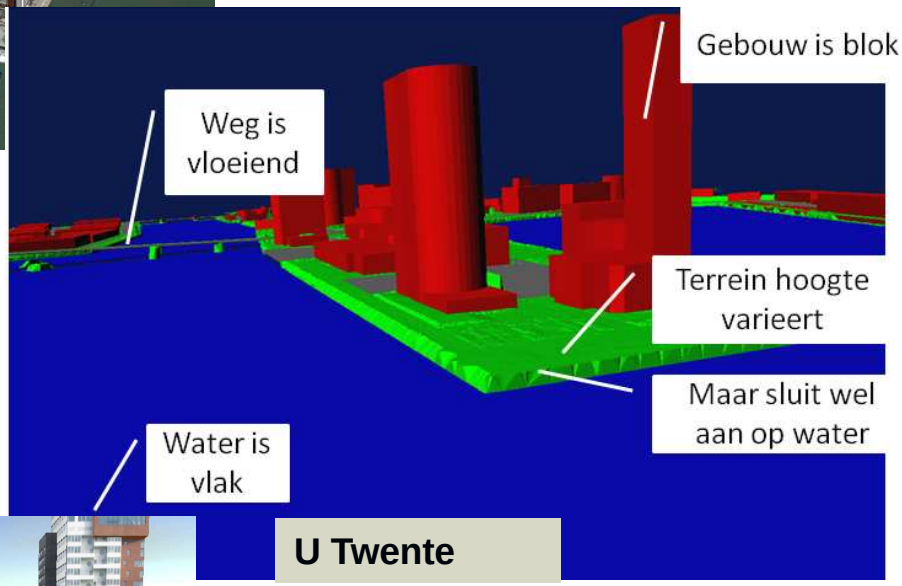
NCG KNAW

Data processed to 3D models (1/2)

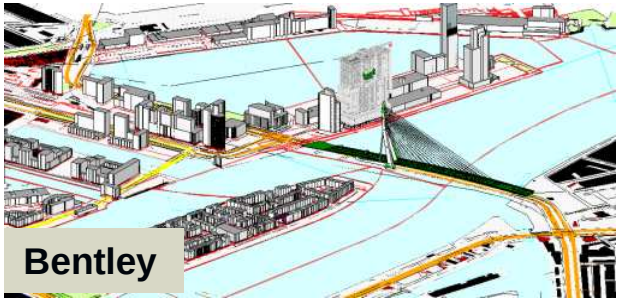
Bentley



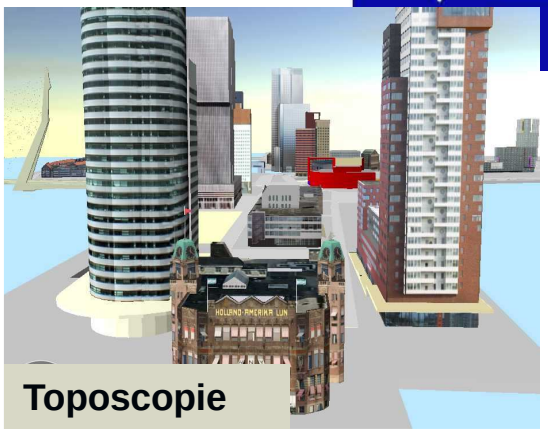
Kadaster



U Twente



Bentley



Toposcopie

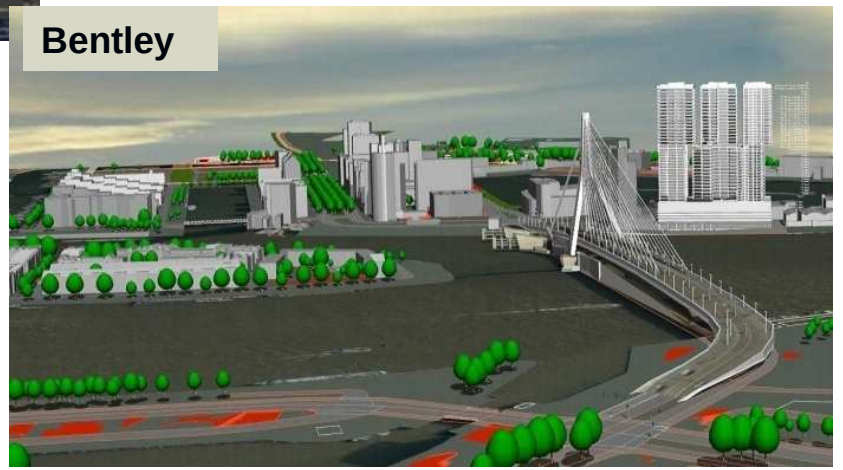
IT-Pro people

NCG KNAW

Data processed to 3D models (2/2)

iDelft

Toposcopie



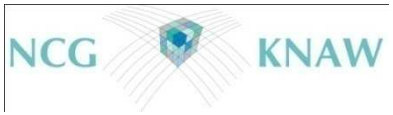
Bentley

Gemeente Rotterdam

GEONOVUM

Activity 2:
3D Standaard NL

Leader: Marcel Reuvers, Geonovum



1. Comparison of 3D standards

Table 2: Comparison of 3D standards

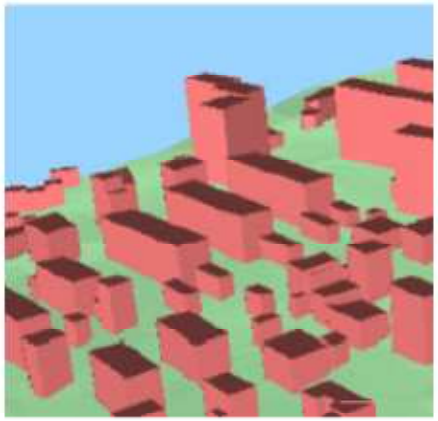
Standard/Criterion	DXF	SHP	VRML	X3D	KML	Collada	IFC	CityGML	3D PDF
Geometry	++	+	++	++	+	++	++	+	++
Topology	-	-	0	0	-	+	+	+	-
Texture	-	-	++	++	0	++	-	+	+
LOD	-	-	+	+	-	-	-	+	-
Objects	0	+	+	+	-	-	+	+	+
Semantic	+	+	0	0	0	0	++	++	+
Attributes	-	+	0	0	0	-	+	+	+
XML based	-	-	-	+	-	-	+	+	-
Web	-	-	+	++	++	+	-	+	0
Georef.	+	+	-	+	+	-	-	+	+
Acceptance	++	++	++	0	++	+	0	+	++

CityGML implementation profile for 3D large scale topography

- CityGML:
  - OGC standard for 3D geoinformation modelling
    - Thematic and Geometry
- 3D standard NL: integrats CityGML and 2D information model
  - reuse valuable concepts of domain model
- Standard integrates 2D, 2.5D and 3D representations of objects

CityGML: LOD concept

LOD0



LOD1

LOD2

LOD3

LOD4

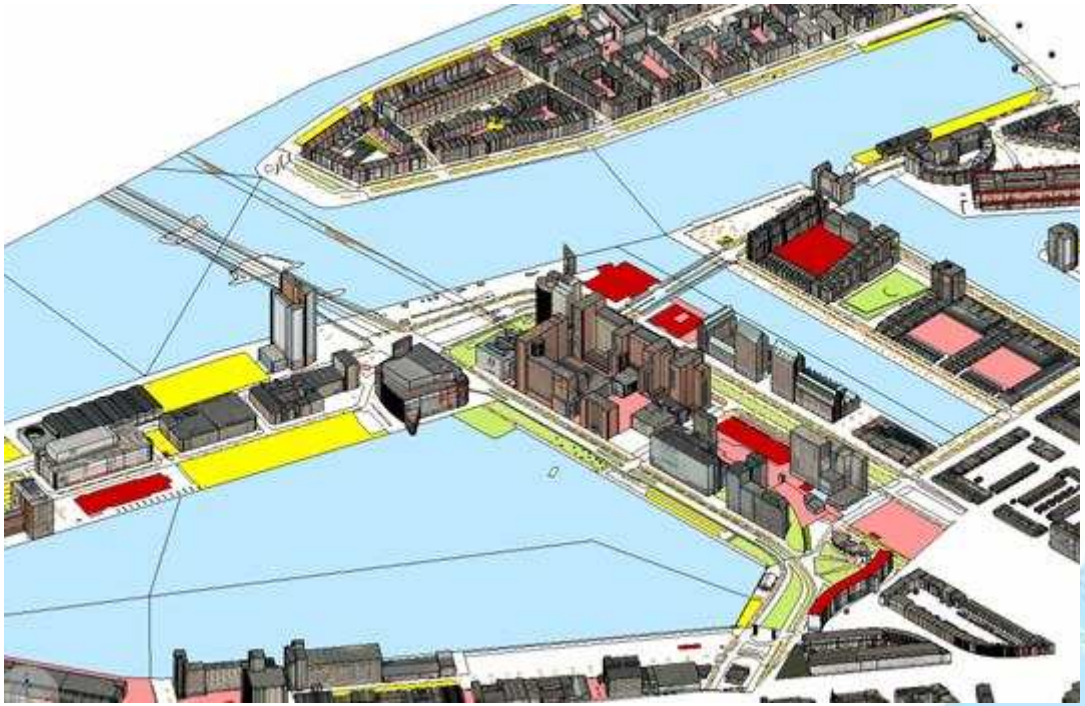
OGC, 2008

NCG KNAW

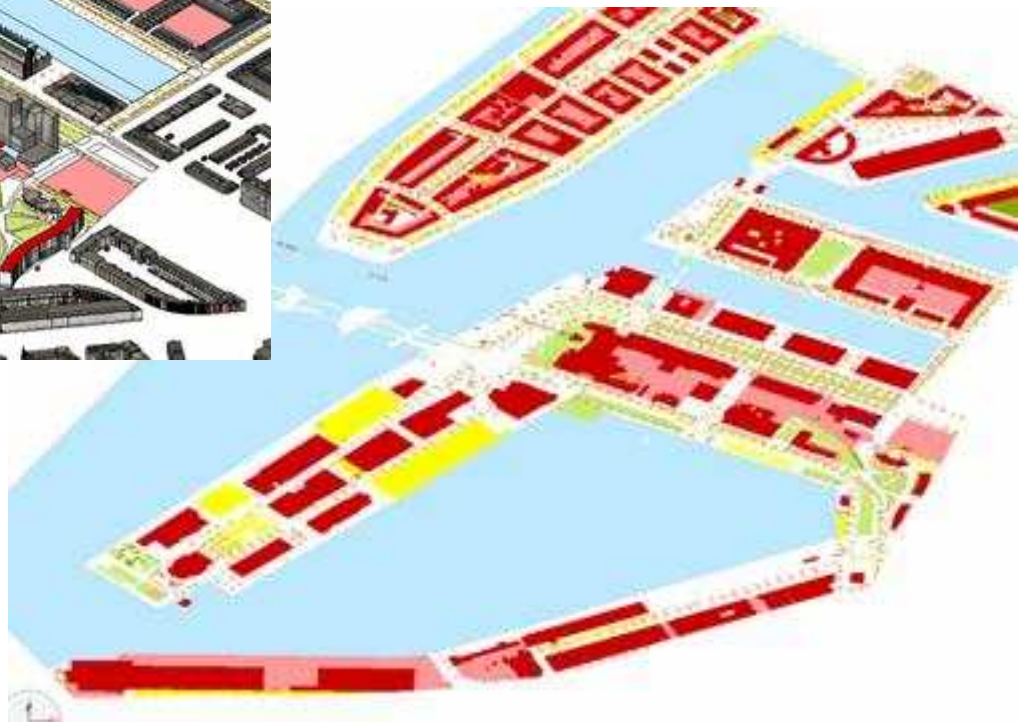
GEONOVUM

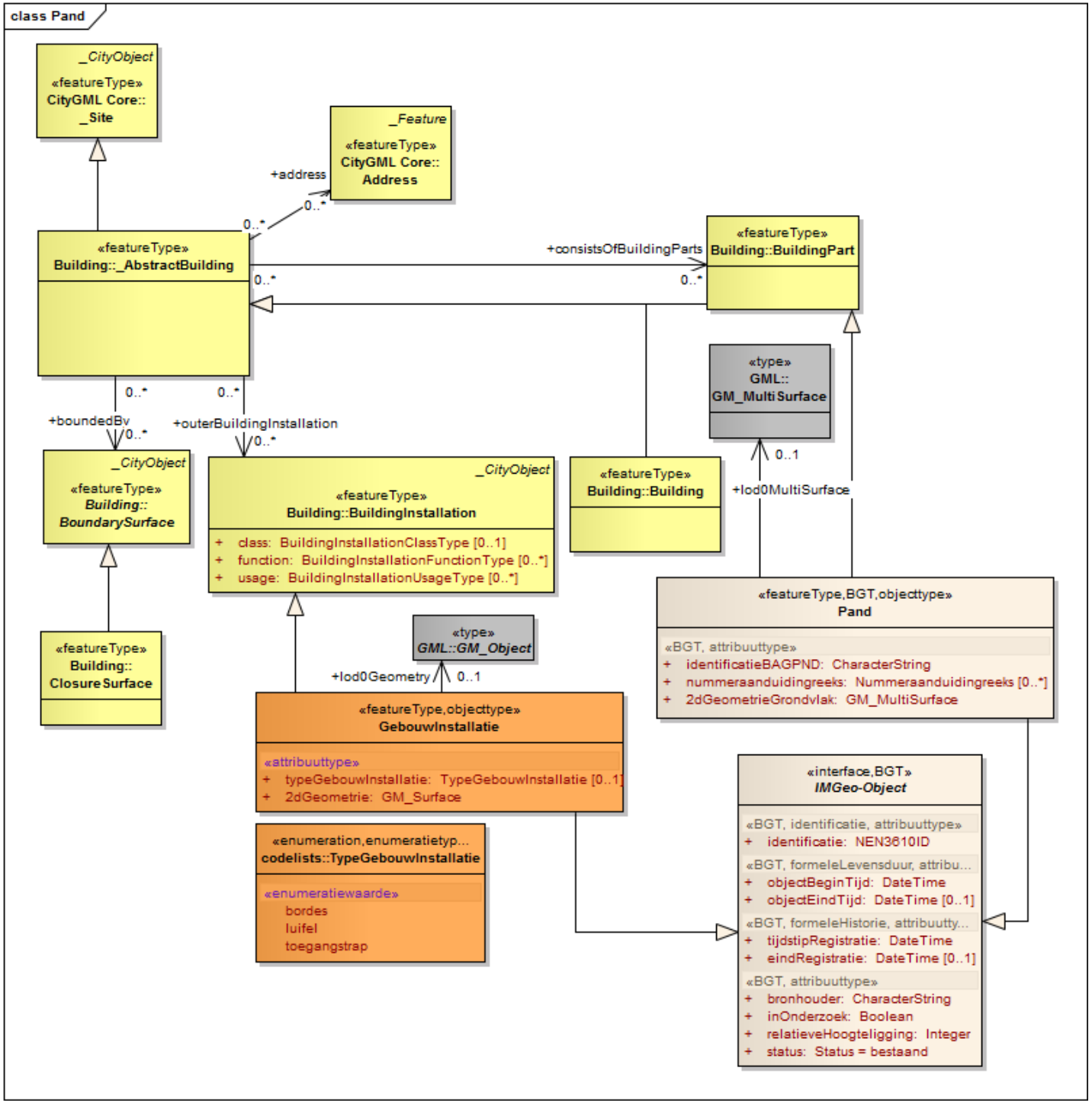
Examples of implementation

LOD0 and LOD2



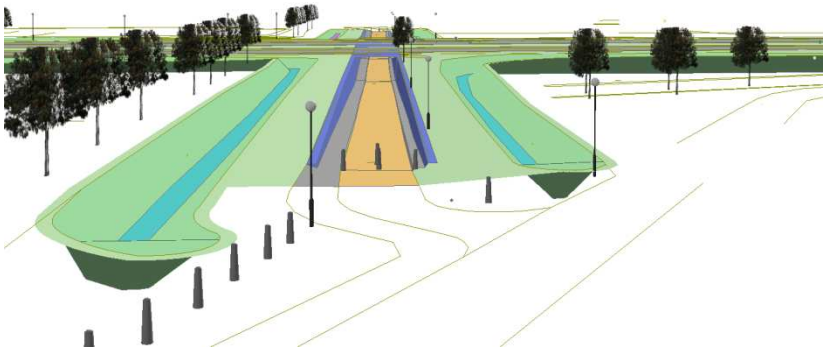
2D LOD

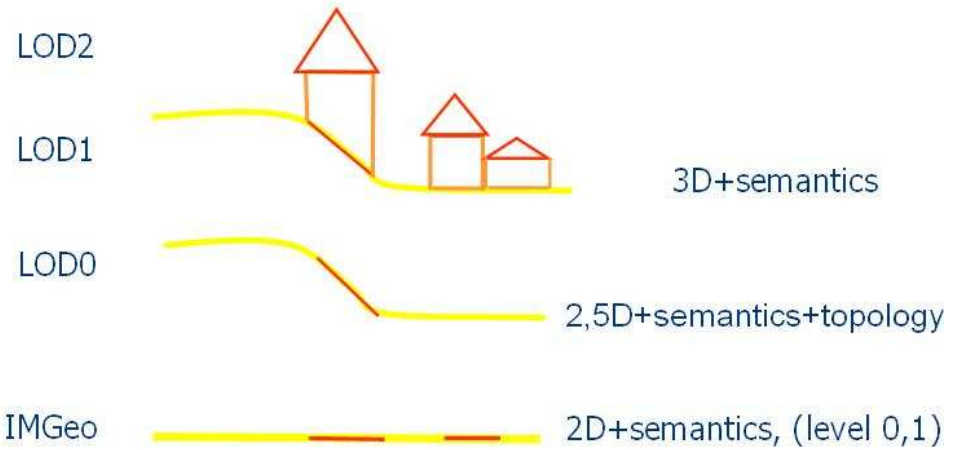



class Pand
_CityObject
«featureType»
CityGML Core::
_Site
_Feature
«featureType»
CityGML Core::
Address
+address
0..*
0..*
«featureType»
Building::_AbstractBuilding
+consistsOfBuildingParts
«featureType»
Building::BuildingPart
0..*
0..*
«type»
GML::
GM_MultiSurface
0..1
+lod0MultiSurface
0..*
0..*
+boundedBy
0..*
+outerBuildingInstallation
0..*
_CityObject
«featureType»
Building::
BoundarySurface
_CityObject
«featureType»
Building::BuildingInstallation
+ class: BuildingInstallationClassType [0..1]
+ function: BuildingInstallationFunctionType [0..*]
+ usage: BuildingInstallationUsageType [0..*]
«featureType»
Building::Building
«featureType,BGT,objecttype»
Pand
«BGT, attribuuttype»
+ identificatieBAGPND: CharacterString
+ nummeraanduidingreeks: Nummeraanduidingreeks [0..*]
+ 2dGeometrieGrondvlak: GM_MultiSurface
«featureType»
Building::
ClosureSurface
«type»
GML::GM_Object
+lod0Geometry
0..1
«featureType,objecttype»
GebouwInstallatie
«attribuuttype»
+ typeGebouwInstallatie: TypeGebouwInstallatie [0..1]
+ 2dGeometrie: GM_Surface
«interface,BGT»
IMGeo-Object
«BGT, identificatie, attribuuttype»
+ identificatie: NEN3610ID
«BGT, formeleLevensduur, attribu...
+ objectBeginTijd: DateTime
+ objectEindTijd: DateTime [0..1]
«BGT, formeleHistorie, attribuutty...
+ tijdstipRegistratie: DateTime
+ eindRegistratie: DateTime [0..1]
«BGT, attribuuttype»
+ bronhouder: CharacterString
+ inOnderzoek: Boolean
+ relatieveHoogteligging: Integer
+ status: Status = bestaand
«enumeration,enumeratietyp...
codelists::TypeGebouwInstallatie
«enumeratiewaarde»
bordes
luifel
toegangstrap

National 3D/2D standard

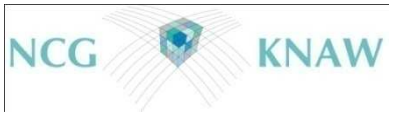
- Currently in public consultation
- Expected to become formal standard in 2 months
- Unique achievement:
  - Nation wide 3D standard compliant to national + international standard





Activity 3
Design and development of 3D Testbed

Leader: Edward Verbree, TUD



Activity 3D Testbed

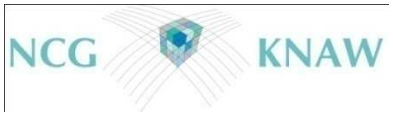
- Open research environment for testing and experiments
  1. Many (very large) 3D data sets
  2. CityGML database implementation
- Lots of experiences with CityGML:
  - Generation/conversion
  - Viewers
  - Validation (schema & geometry)
  - Support by GIS-Vendors
- Cookbook for CityGML database implementation

NCG KNAW

GEONOVUM

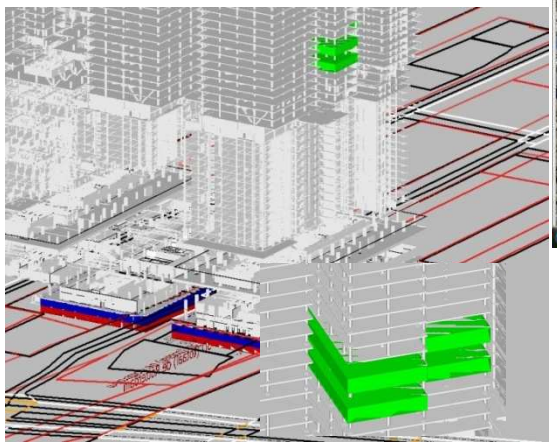
Activity 4:
3D Use cases: definition and execution

Leader: Rick Klooster, Municipality Apeldoorn

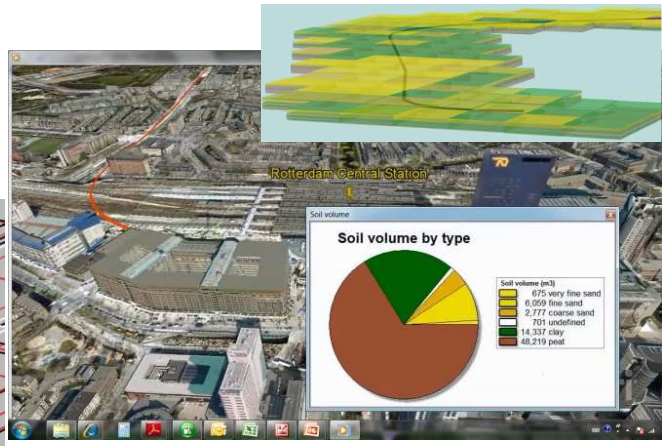


Use cases 1/2

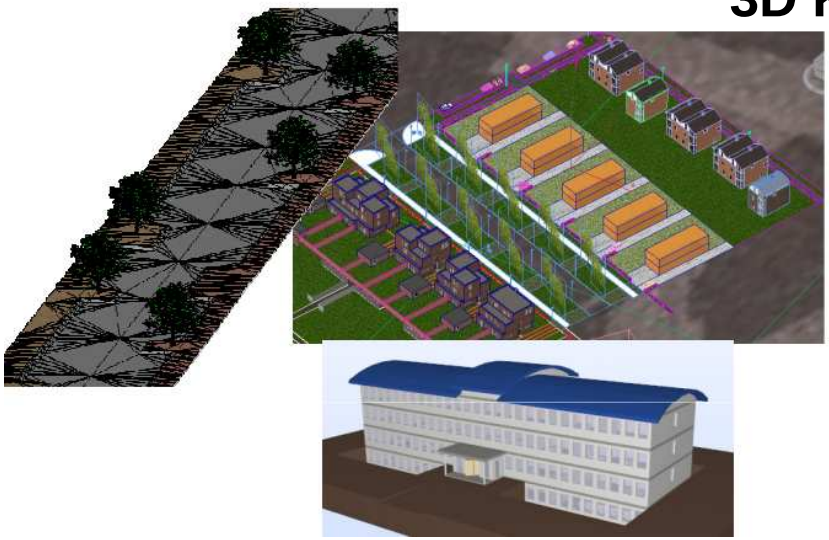
By Municipality Rotterdam



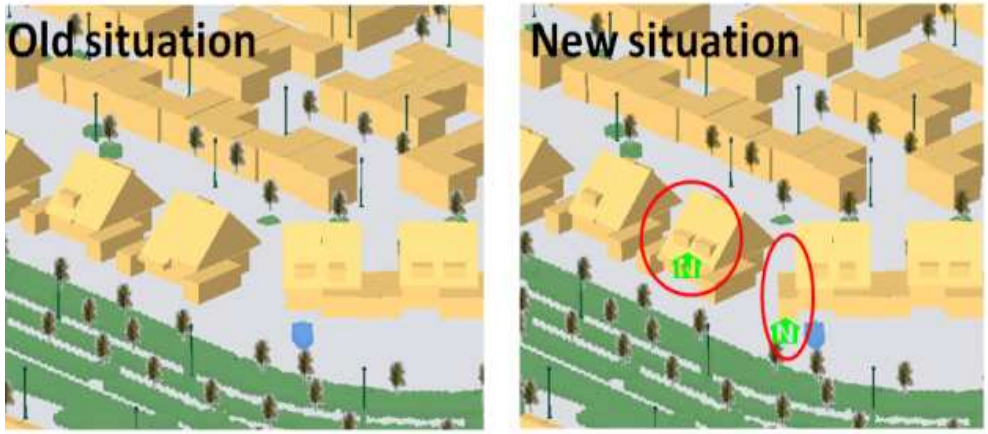
3D Kadaster



Esri, TNO



3D in Spatial Planning

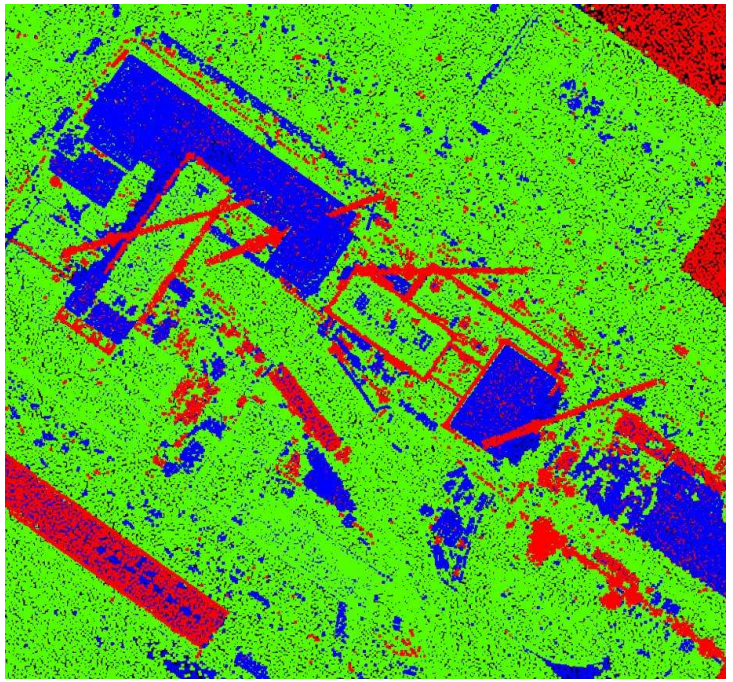


Mutation detection

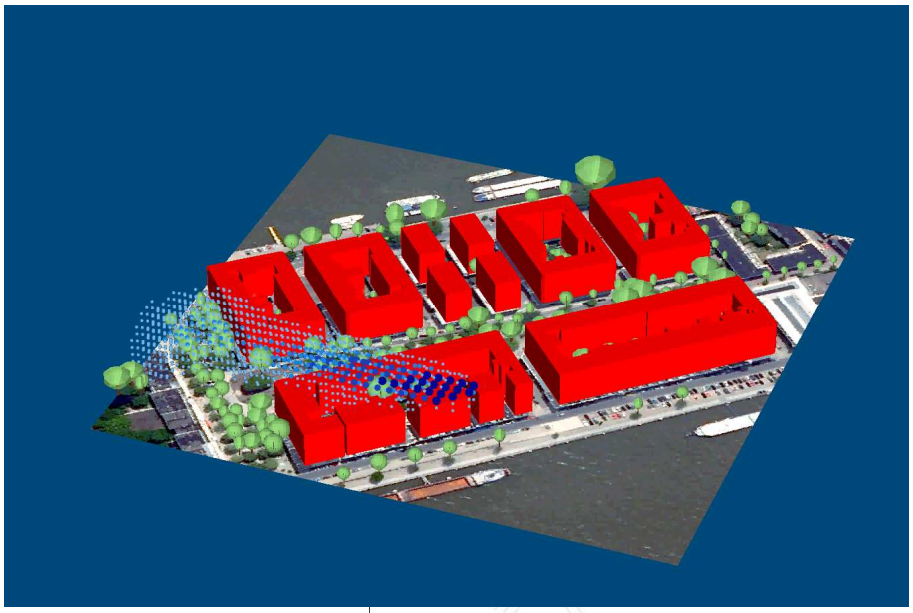
Use cases 2/2

Detection of trees from Laserscan data, Alterra

Mutation detection, U Twente

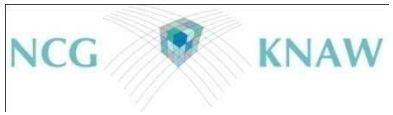


Interactive airstream simulation, Alterra



GEONOVUM

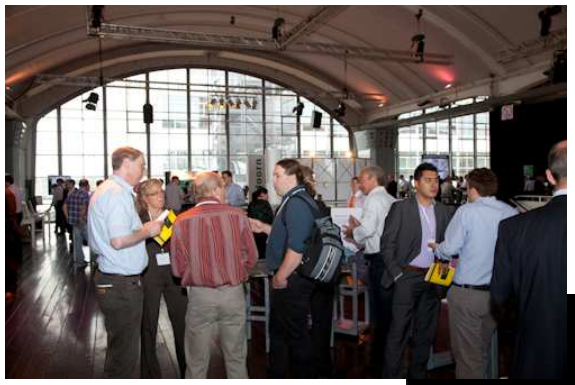
Use case demo’s available an Youtube




YouTube
Zoeken
Bladeren
TUDelft Cloudviewer: Kop van Zuid, Rotterdam
DelftGraphics
2 video's
Abonneren
TUDelft
graphics.tudelft.nl
3D Pilot | Bomen in 3D GIS
GeoReport
202 video's
Abonneren
BOMEN IN 3D
0:04 / 2:49
360p
3D Pilot | Interactieve luchtstroommodellering
Integratie van voxels (3D grids) met 3D geo-objecten in 3D GIS
Rotterdam Central Station
Soil volume by type
1:34 / 1:44
ntrale aanpak van 3D City GIS
uimtelijke ontwerpprocessen
CityGML
3D GEO
CIVIEL
BOUW
3D Pilot | M
0:13 / 1:16
3D Pilot | Presentatie van eigendommen in 3D in PDF formaat met Acrobat
0:42 / 0:42

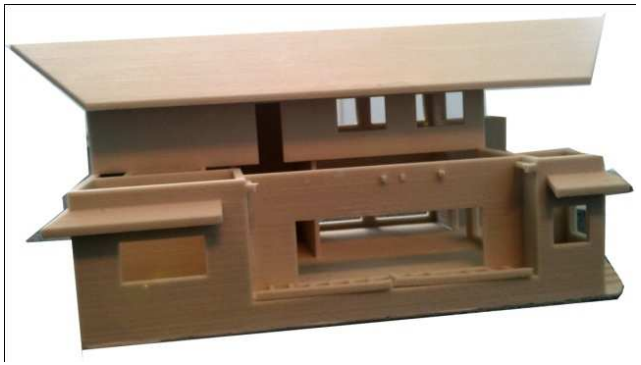
Closing symposium on 16th of June, 2011

- To inform wider public about achievements
- Almost 400 people attended
- Rotterdam launched their 3D model (CityGML) as open data: http://www.rotterdam.nl/links_rotterdam_3d



OGC 3D award voor 3D Pilot NL

- “a good signal to others who may be hesitating and haven't looked at CityGML in detail before”.



NCG KNAW

GEONOVUM

Global results of 3D Pilot

- Innovations
- Insight (described in 5 final reports):
  - From “3D is nice and promising, but I do not know how” to “focused 3D ambitions”
- Powerful informal network organisation (supported by social media)
- (Inter)nationally known (collaboration with OGC)

- 3D/2D standard based on CityGML

- Yes we can, but how

NCG KNAW

GEONOVUM

Next steps

- Actions to be taken within daily processes of governmental organisations:
  - 3D TOP10NL (Kadaster; ITC)
  - SIG 3D (with Germany)
    - formal collaboration with OGC
  - 3D extension in other information models
- Follow up pilot

NCG KNAW

GEONOVUM

Follow up pilot

- Planned for sept 2011-June 2012
- Goal: further support 3D implementation in NL
- About 120 participants have subscribed

NCG KNAW

GEONOVUM

Follow-up pilot:
Six activities with focus on implementation

1. Creation example data IMGeo-CityGML, all LOD's
2. Design/development 3D validator
3. Create standard tendering documents
4. Describe a standard approach for 3D data management, integrated with other base datasets
5. Collect 3D killer applications in a book
6. Integration CityGML/BIM/IMGeo

NCG KNAW

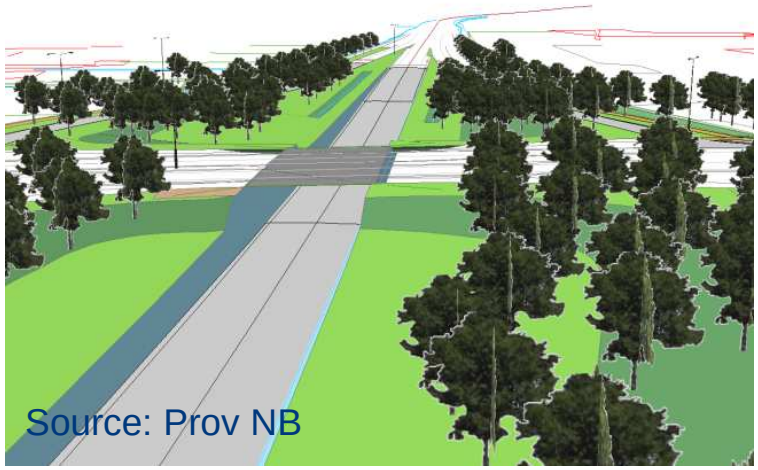
GEONOVUM

Conclusion for a 3D SDI

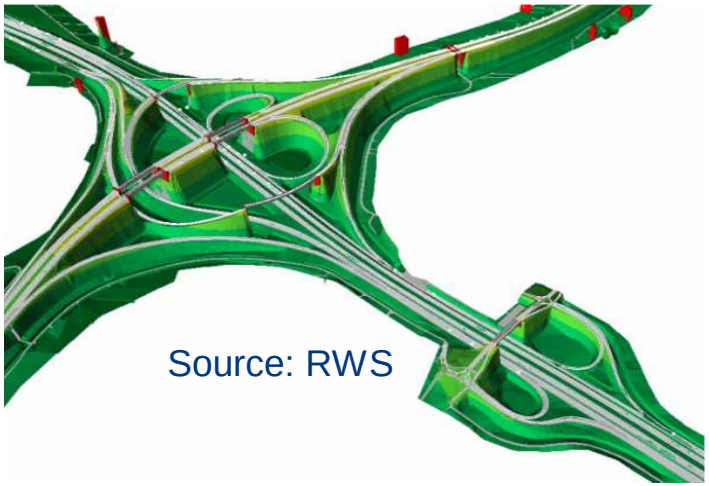
- 3D standard: key element for 3D SDI
- Many stakeholders needed for acceptance
  - Both participants and public
- 3D geo-information is anchored in 2D standardisation framework
  - Valuable concepts of domain models are reused
  - 2D and 3D acquisition, maintenance, update, modelling, dissemination etc are integrated
- Community driven

NCG KNAW

GEONOVUM

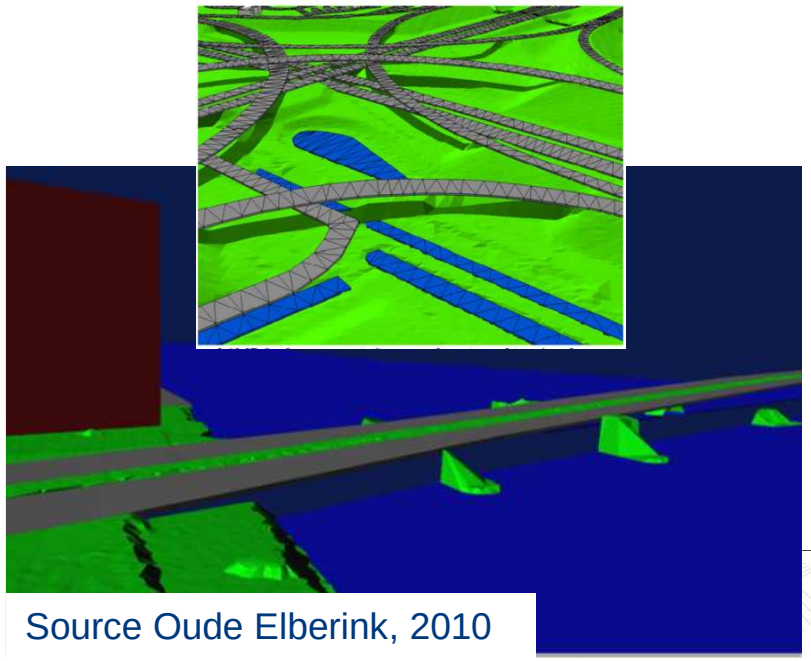


Source: Prov NB

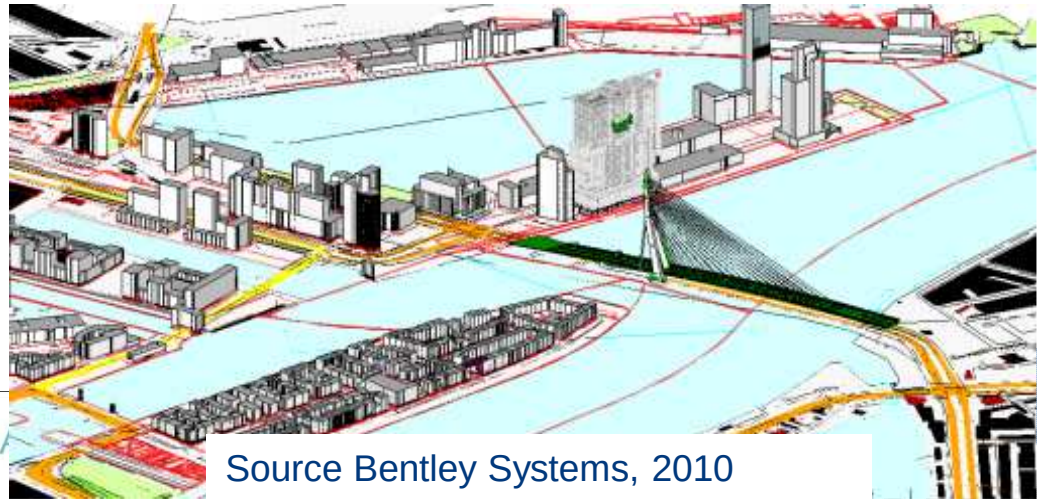


Source: RWS

Questions?



Source Oude Elberink, 2010



Source Bentley Systems, 2010