KEYREGISTRY OF THE SUBSURFACE OF THE NETHERLANDS

FROM INNOVATIE TO IMPLEMENTATION „IN TENEBRIS LUCENS"

InfraTech2019

FUTURE PROOF

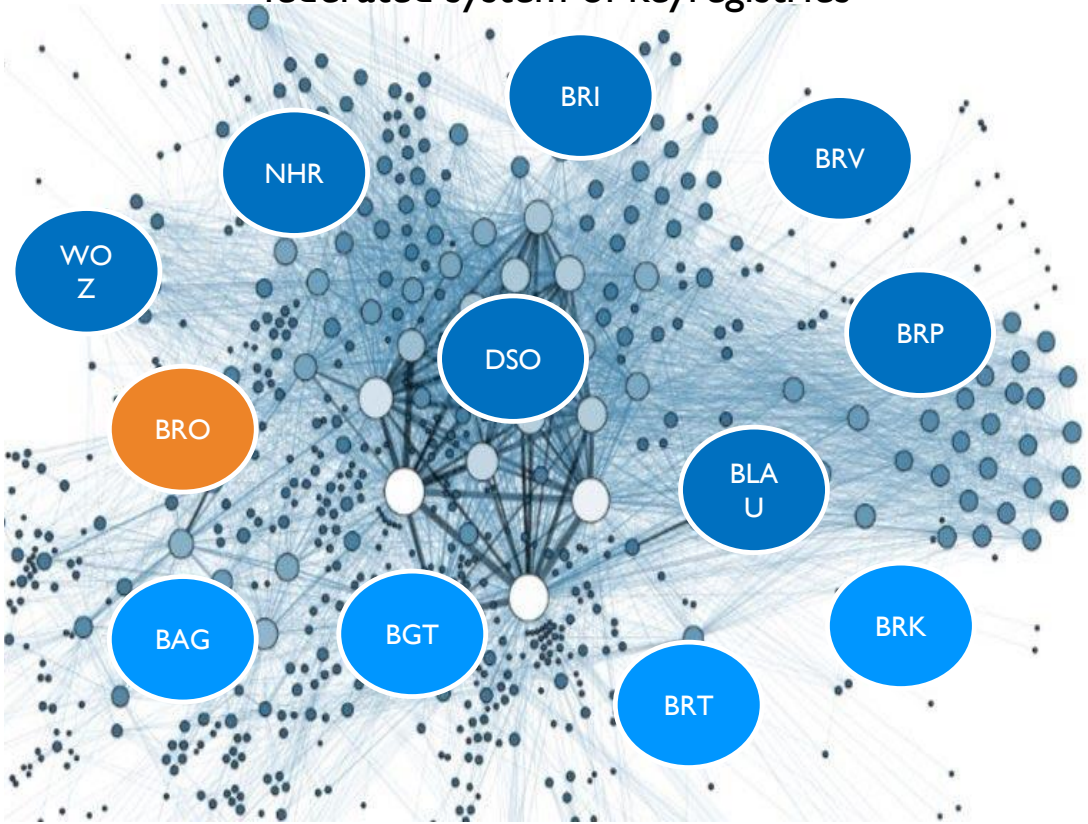
Winnaar InfraTech Innovatieprijs 2019

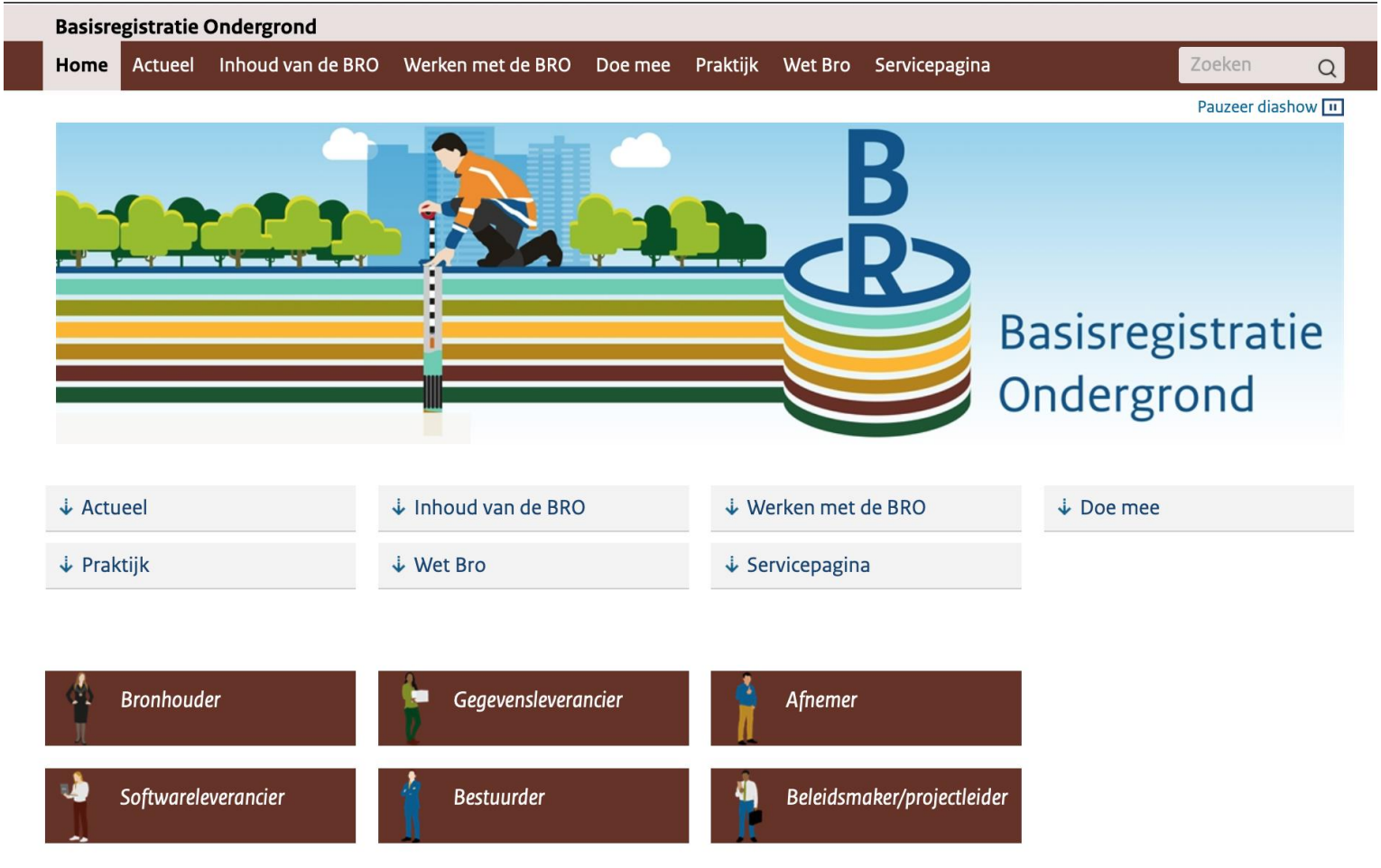
DATA DRIVEN POLICY MAKING

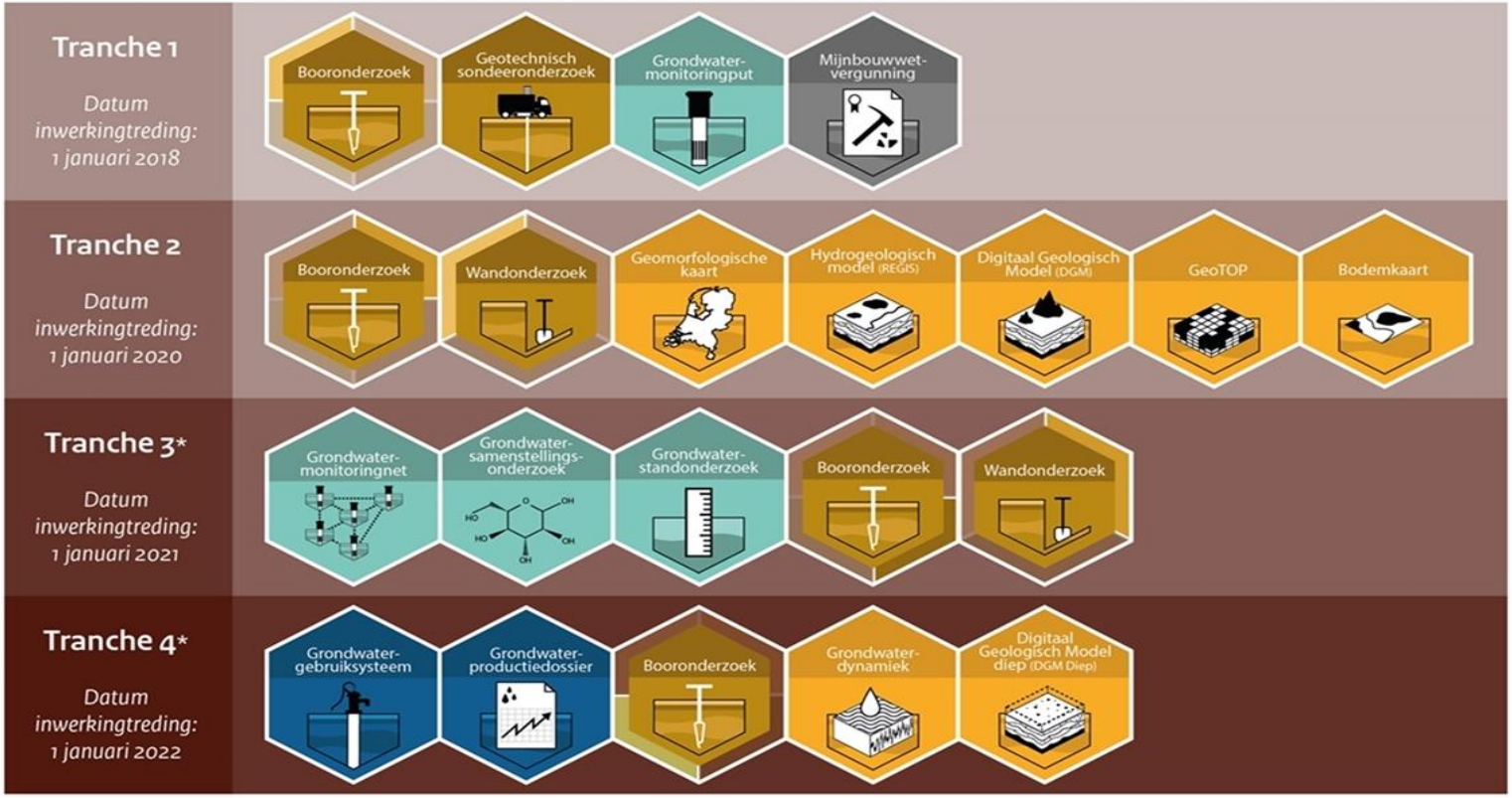
WHAT MAKES IT WORK?

Geo-Informatie Policy NL

federated system of keyregistries



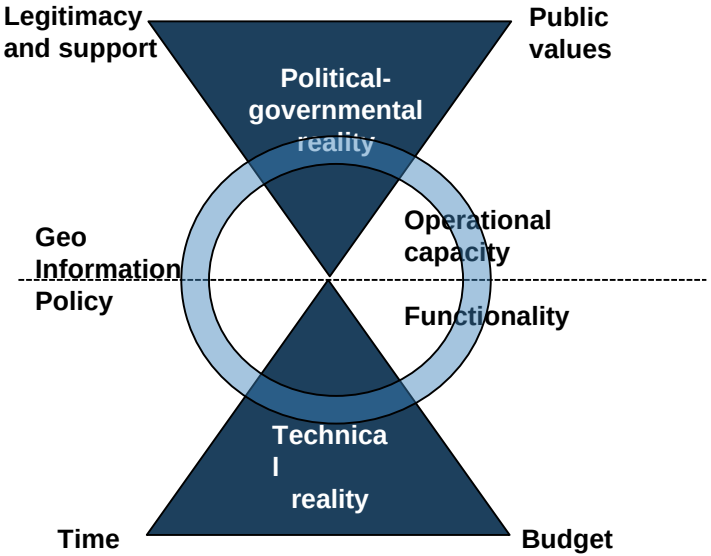

Basisregistratie Ondergrond
Home
Actueel
Inhoud van de BRO
Werken met de BRO
Doe mee
Praktijk
Wet Bro
Servicepagina
Zoeken
Pauzeer diashow
Basisregistratie Ondergrond
Actueel
Inhoud van de BRO
Werken met de BRO
Doe mee
Praktijk
Wet Bro
Servicepagina
Bronhouder
Gegevensleverancier
Afnemer
Softwareleverancier
Bestuurder
Beleidsmaker/projectleider



*De inhoud van deze tranches is nog onderwerp van onderzoek. Besluitvorming vindt plaats in de programmastuurgroep.

Perspective for action Climate Change: "Uncertainty as a challenge”

Scientific Council for Government Policy - Precautionary principle and responsibilities regarding physical safety



National spatial planning policy of the Netherlands

with high regional and local impact

The Netherlands is working on 4 major tasks

- Climate adaption & Energy transition
- Strong and Climate proof Cities and Regions
- Sustainable Economic Growth
- Circulair Agriculture and vital rural areas

Perspective for action: "Uncertainty as a challenge”

Scientific Council for Government Policy - Precautionary principle and responsibilities regarding physical safety

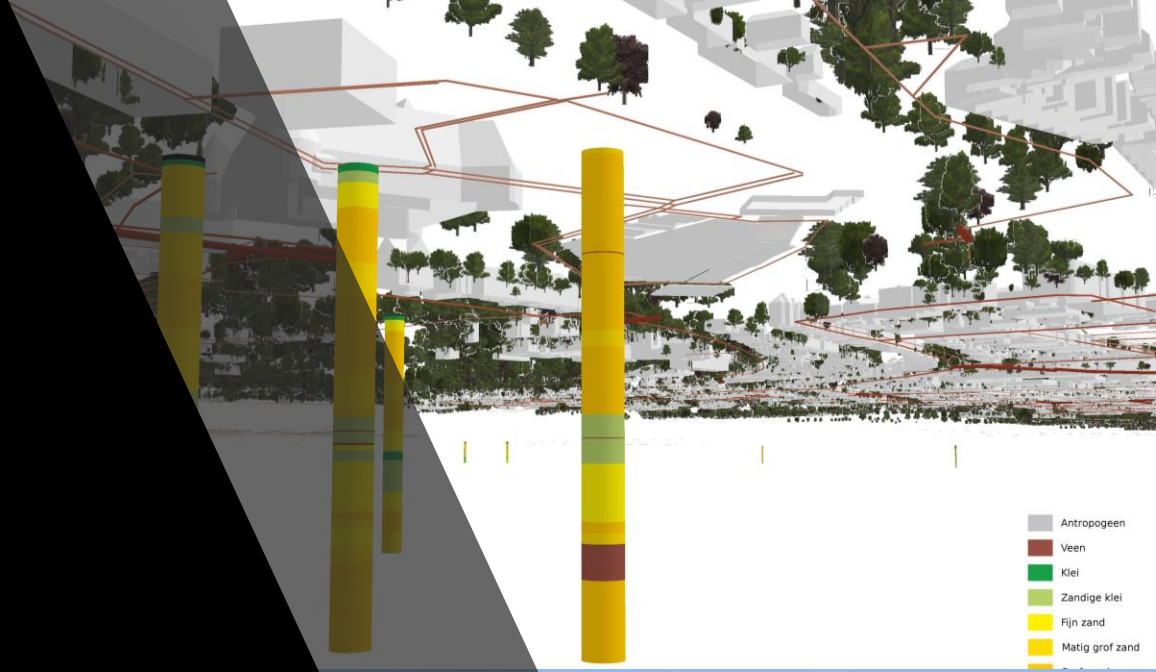


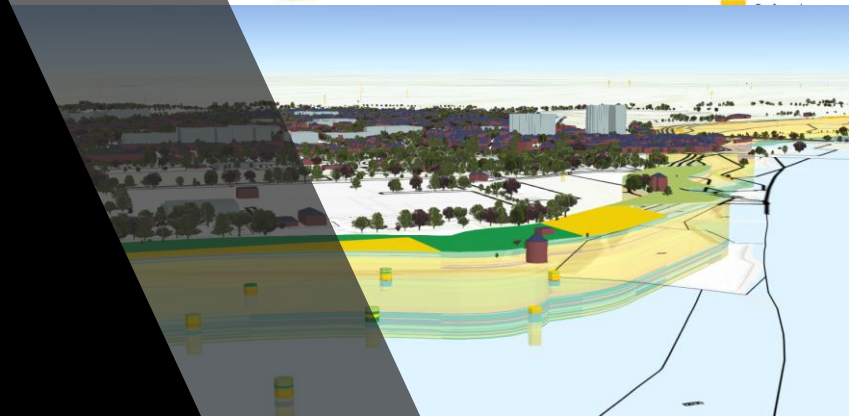



Regional Energy Transion Strategies 2018 - 2019

- RES Friesland - Ternaard/Wierum + 18 dorpen: energieneutraal 2025
- RES Twente – (ultra) diepe geothermie in Twente
- RES Goeree-Overflakkee– Getijde energie centrale Brouwersdam
- RES Groningen – Hoogkerk woonopgave voormalig
- RES Noord-Holland Zuid– Amstelstad
- RES Prov Utrecht– Nieuwegein en Veenendaal woonopgave
- RES Midden Holland– Monitor Het Groene Hart

INTEGRATED SPATIAL PLANNING





Digital Twin

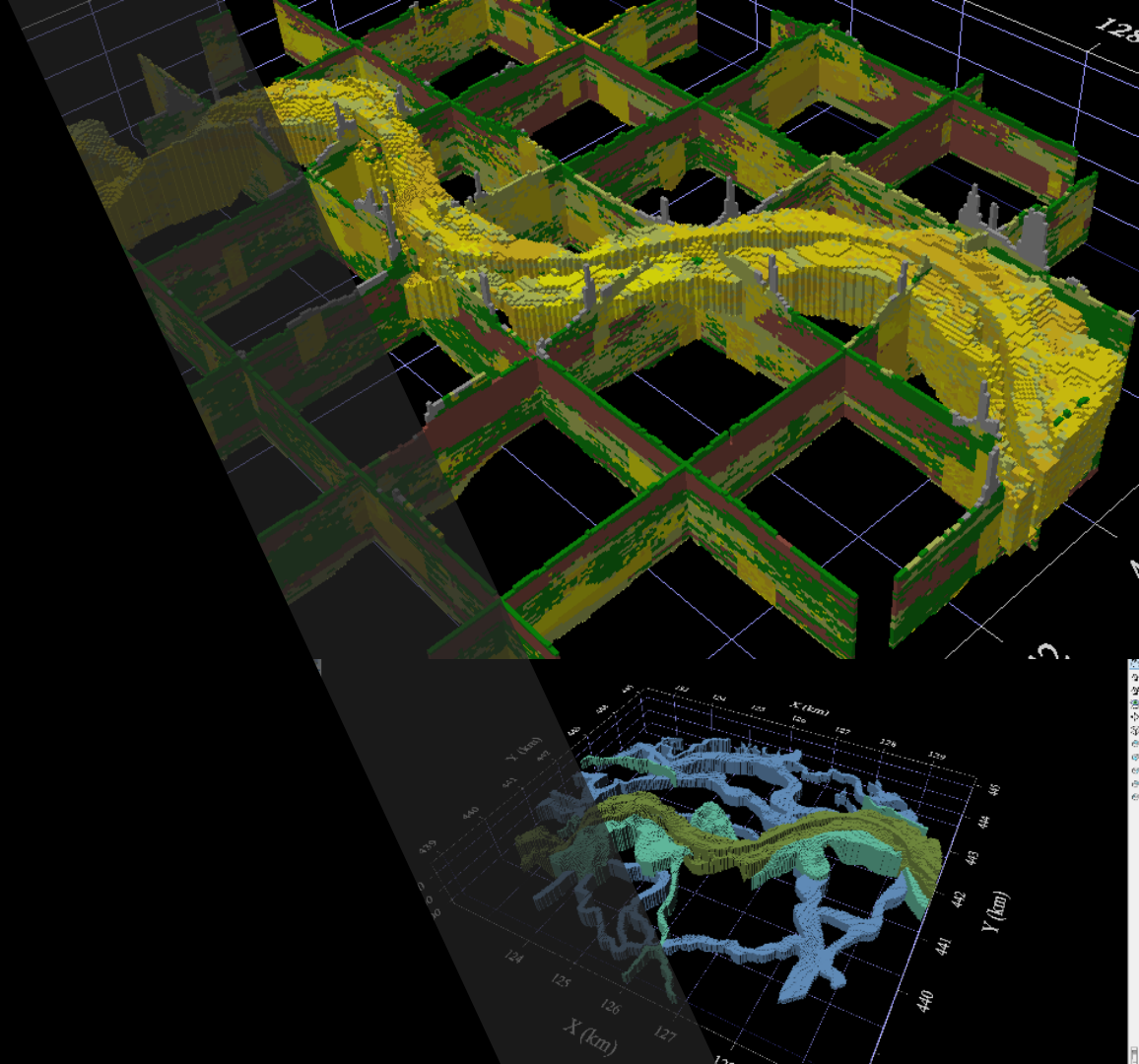
Met de BRO op zoek naar het “risico-DNA” van de Lekdijk

Project Sterke Lekdijk en de Basisregistratie Ondergrond (BRO)

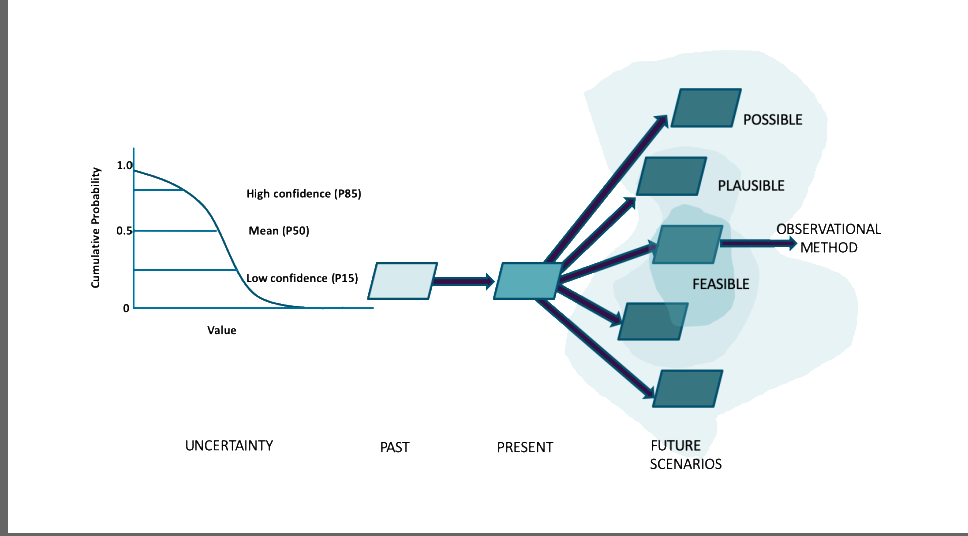
Meerwaarde van de BRO

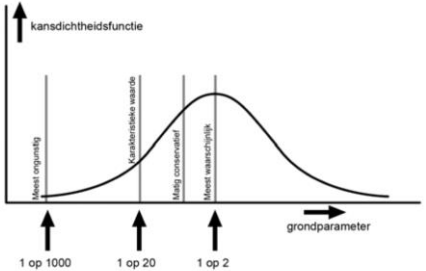
Alle beschikbare ondergrondgegevens bij elkaar brengen en inzichtelijk in 3D visualiseren genereert waardevolle inzichten.
Openbare authentieke gegevens van de [illegible] opgeslagen en beschikbaar gesteld in de Basisregistratie Ondergrond (BRO). De BRO kan in elke fase van een infrastructureel project op plan-

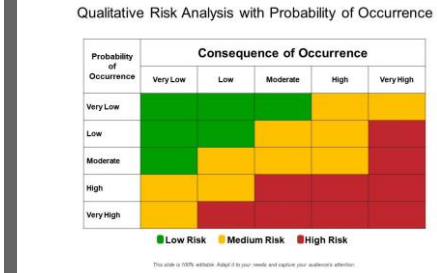
SUBSURFACE GEOLOGICAL MODELS

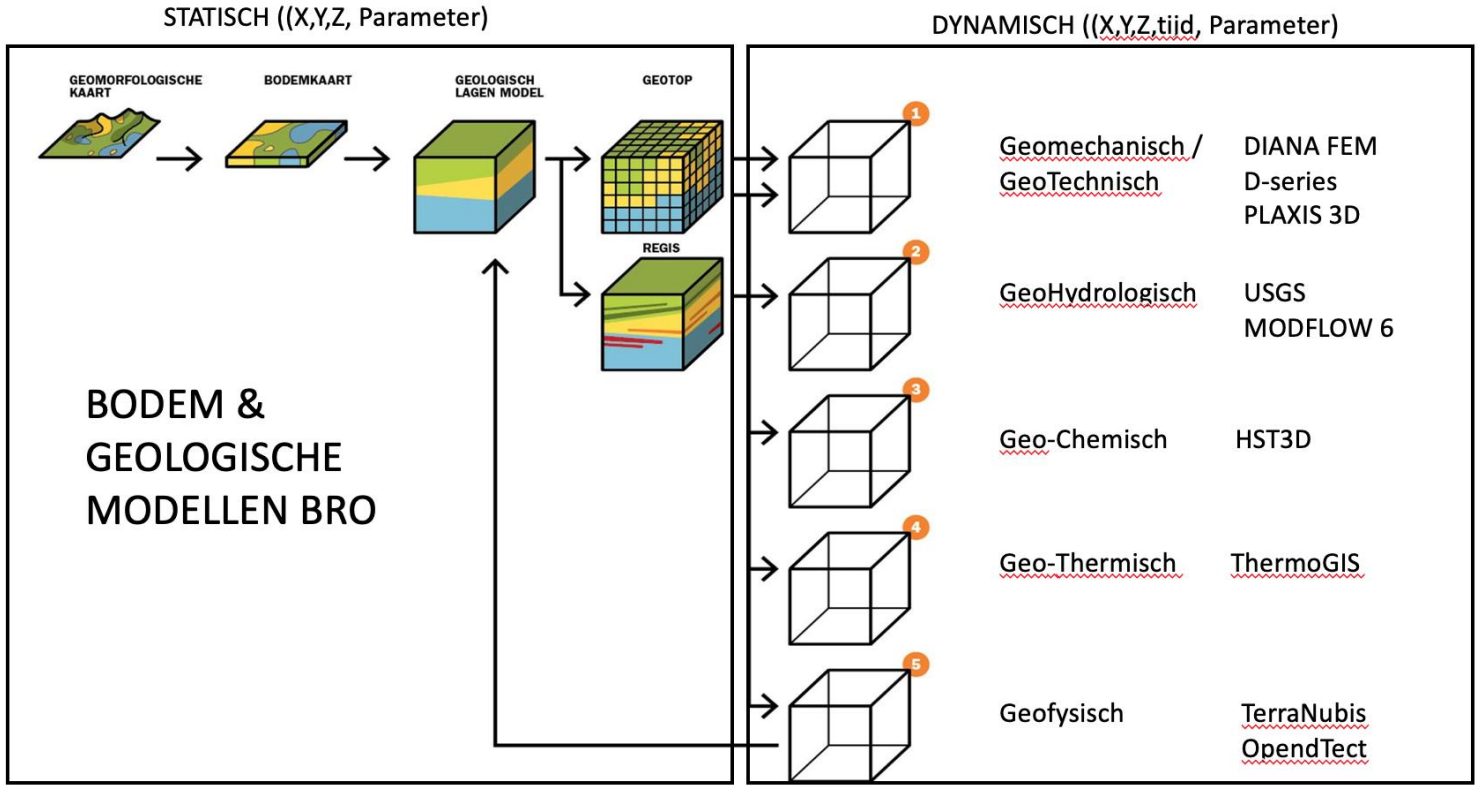


UNCERTAINTY AS A CHALLENGE & RISK MANAGEMENT

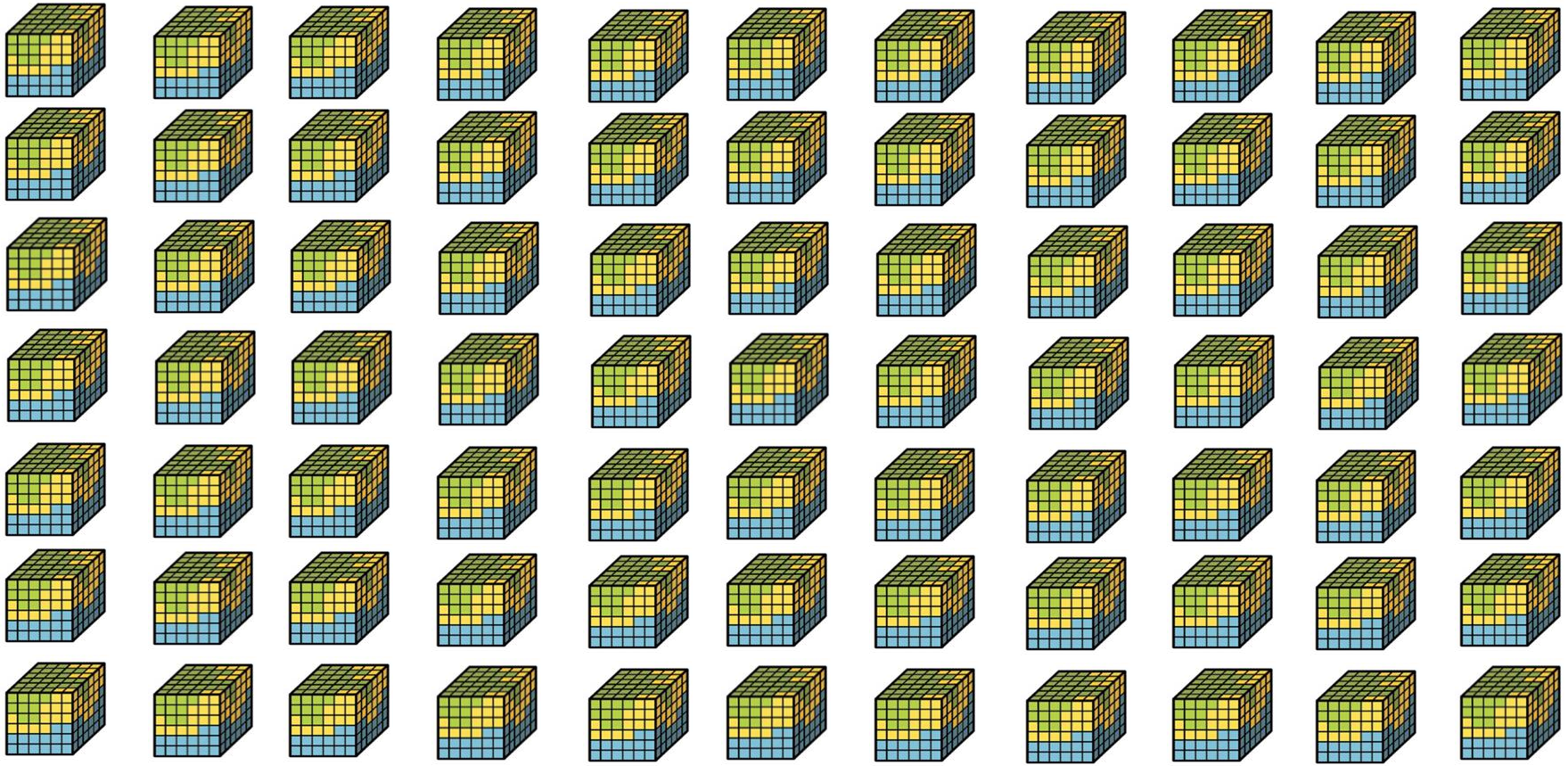


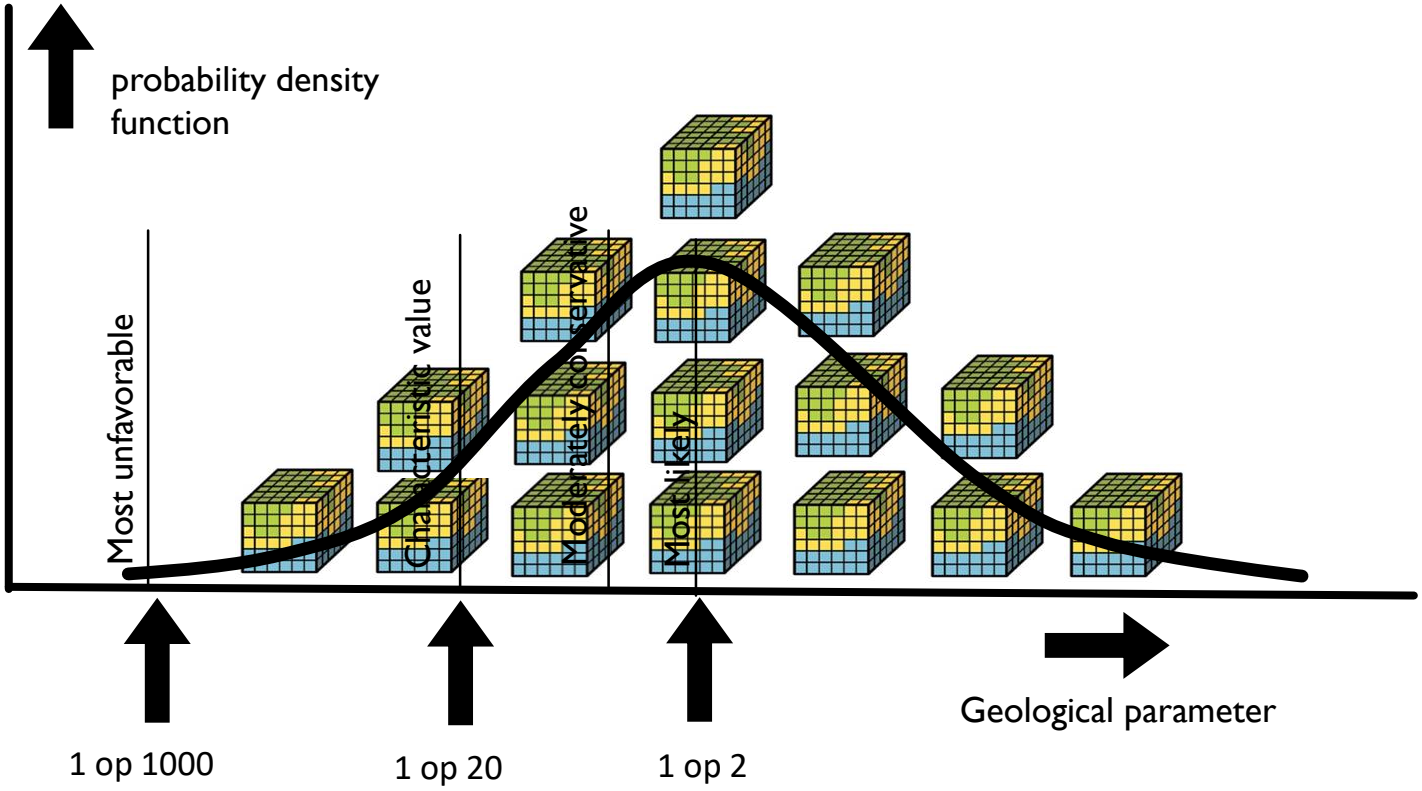




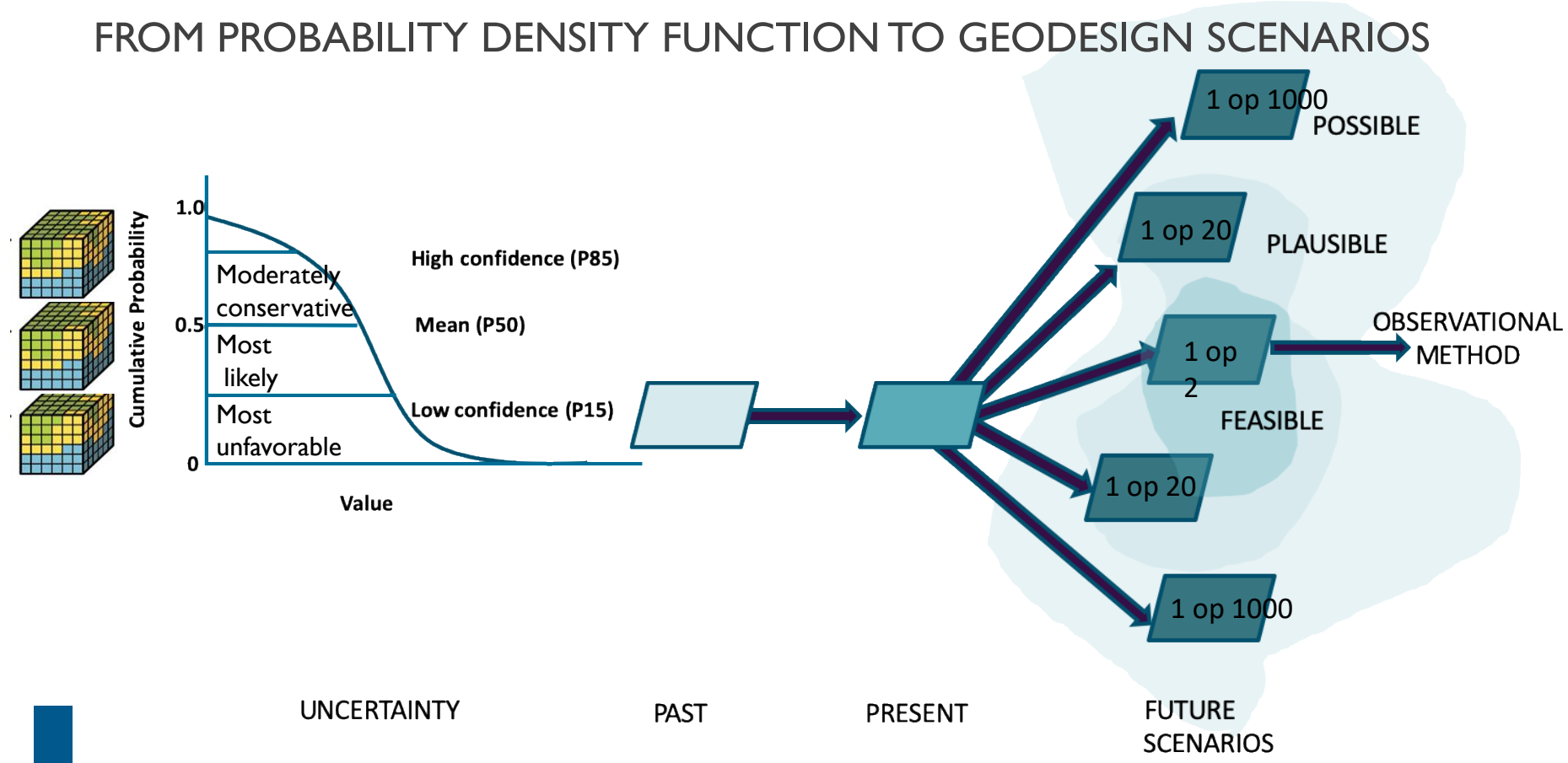

STATISCH ((X,Y,Z, Parameter)
DYNAMISCH ((X,Y,Z,tijd, Parameter)
GEOMORFOLOGISCHE KAART
BODEMKAART
GEOLOGISCH LAGEN MODEL
GEOTOP
REGIS
BODEM & GEOLOGISCHE MODELLEN BRO
1
2
3
4
5
Geomechanisch / GeoTechnisch
DIANA FEM
D-series
PLAXIS 3D
GeoHydrologisch
USGS
MODFLOW 6
Geo-Chemisch
HST3D
Geo-Thermisch
ThermoGIS
Geofysisch
TerraNubis
OpendTect

GEOLOGY OF THE SUBSURFACE
3D STOCHASTIC LITHOLOGICAL MODELS




probability density function
Most unfavorable
Characteristic value
Moderately conservative
Most likely
1 op 1000
1 op 20
1 op 2
Geological parameter

FROM PROBABILITY DENSITY FUNCTION TO GEODESIGN SCENARIOS

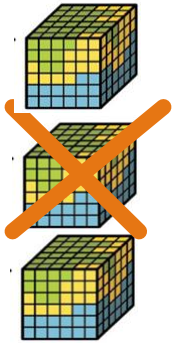


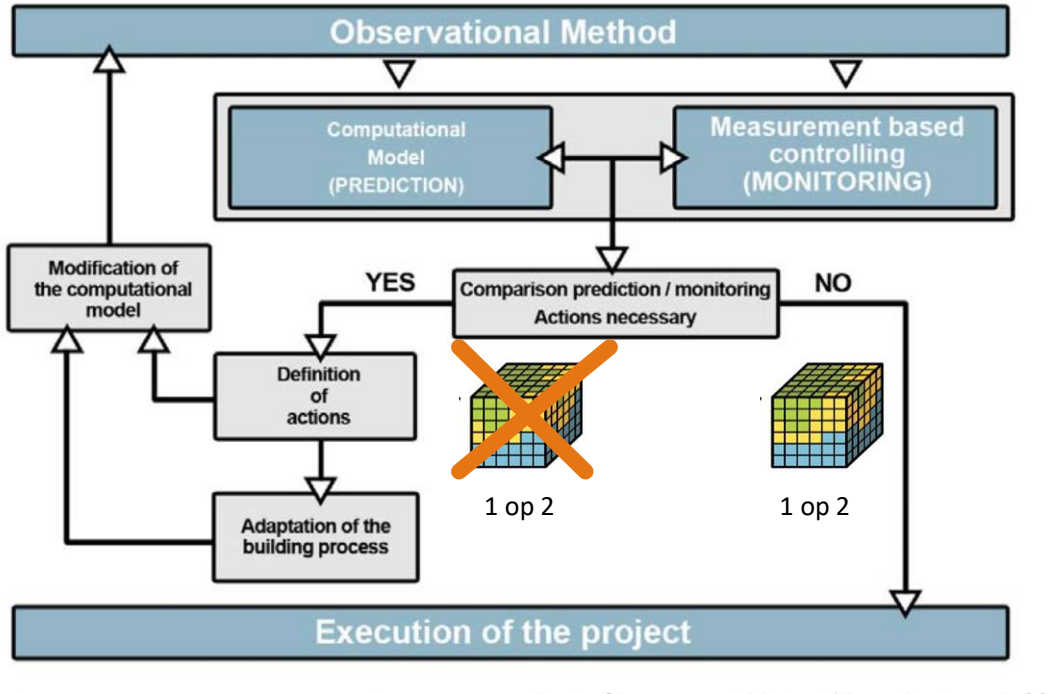
TEST OF SELECTED SCENARIO OBSERVATIONAL METHOD

1 op 20

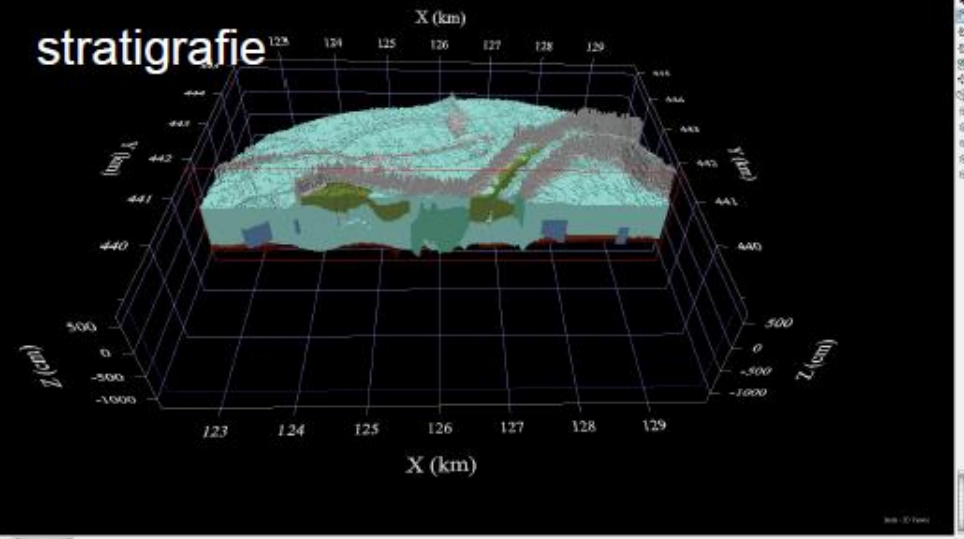
1 op 2

1 op 1000

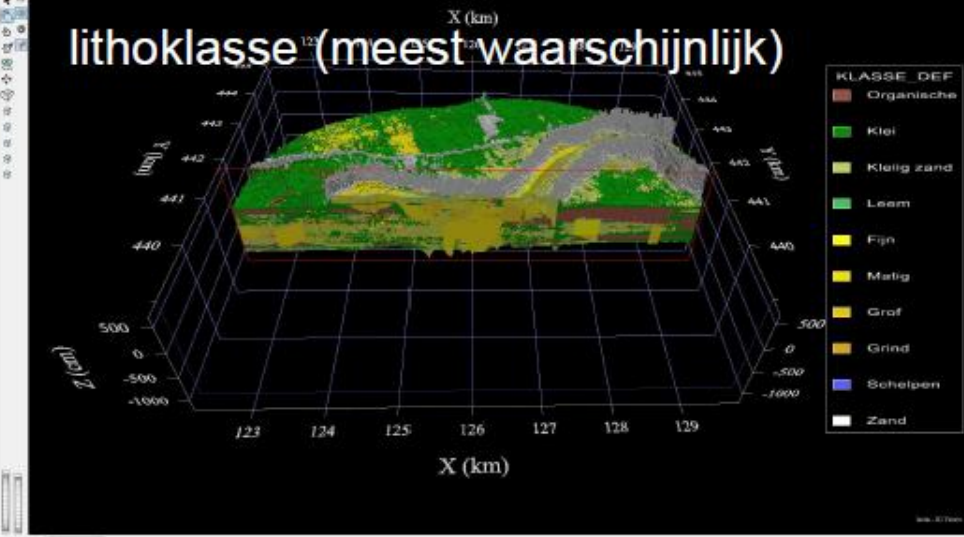




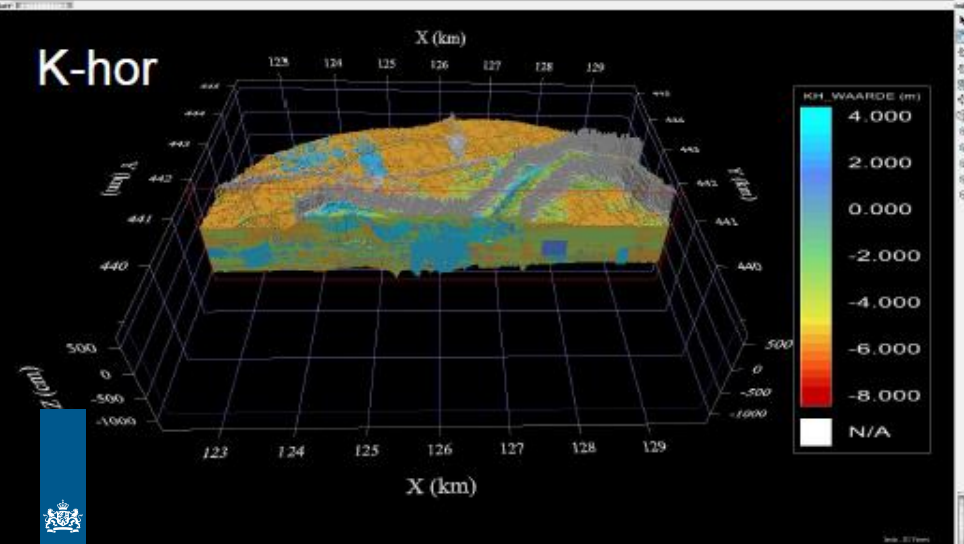
stratigrafie



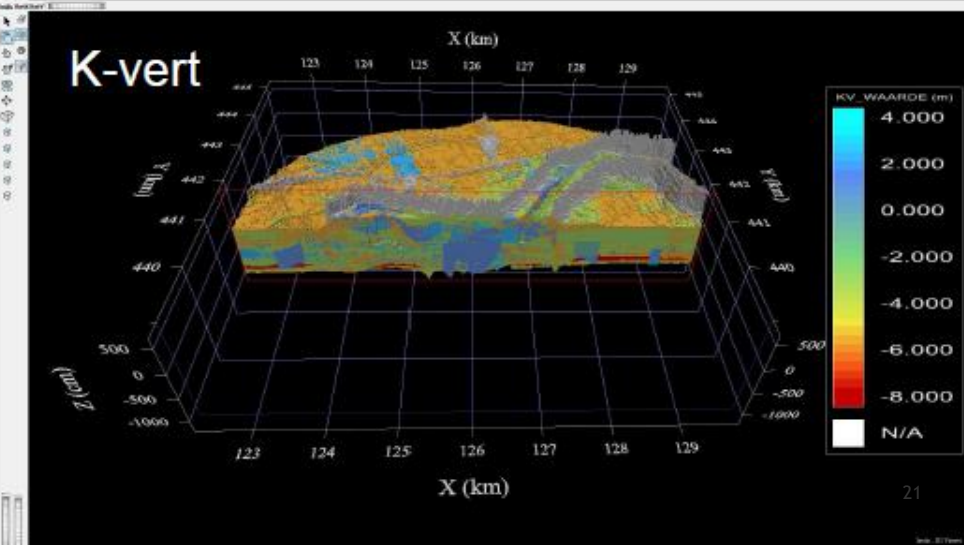
lithoklasse (meest waarschijnlijk)



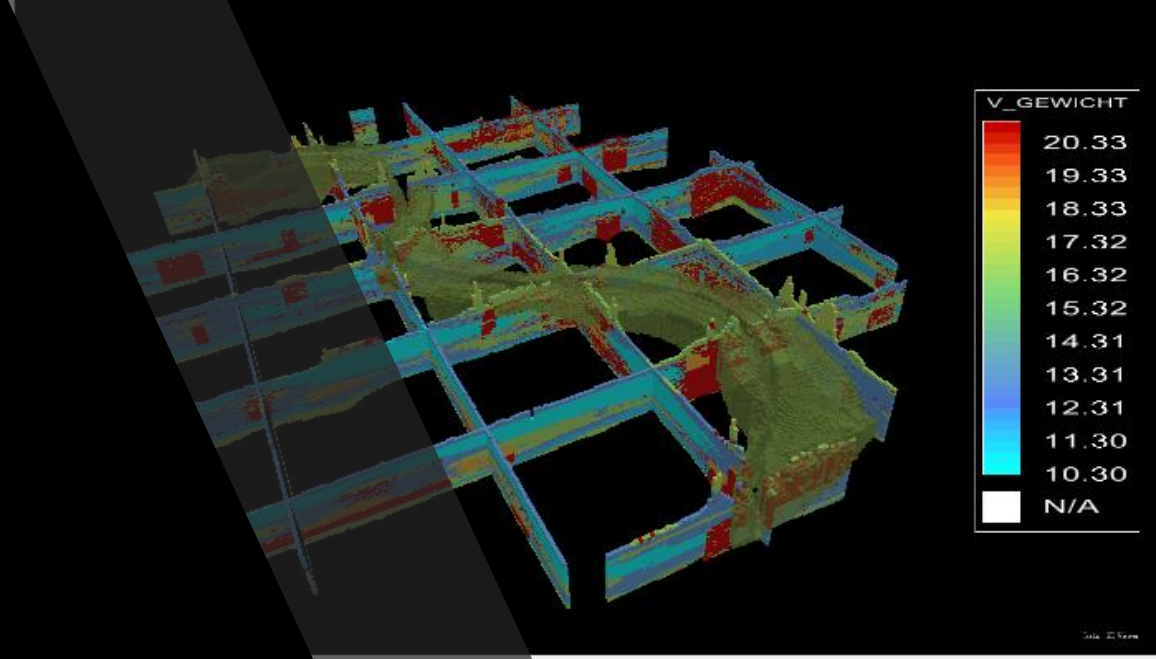
K-hor

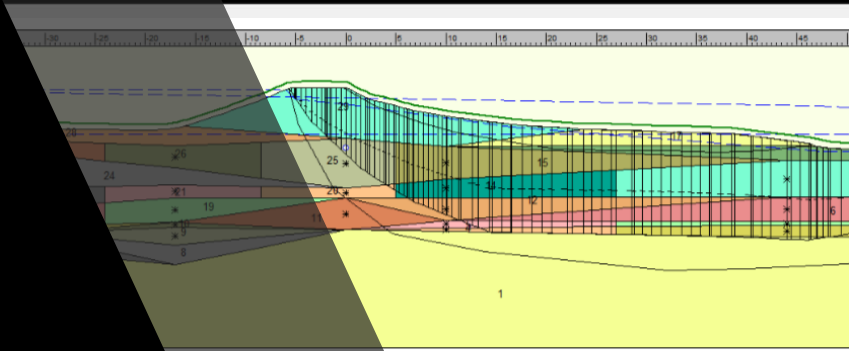


K-vert

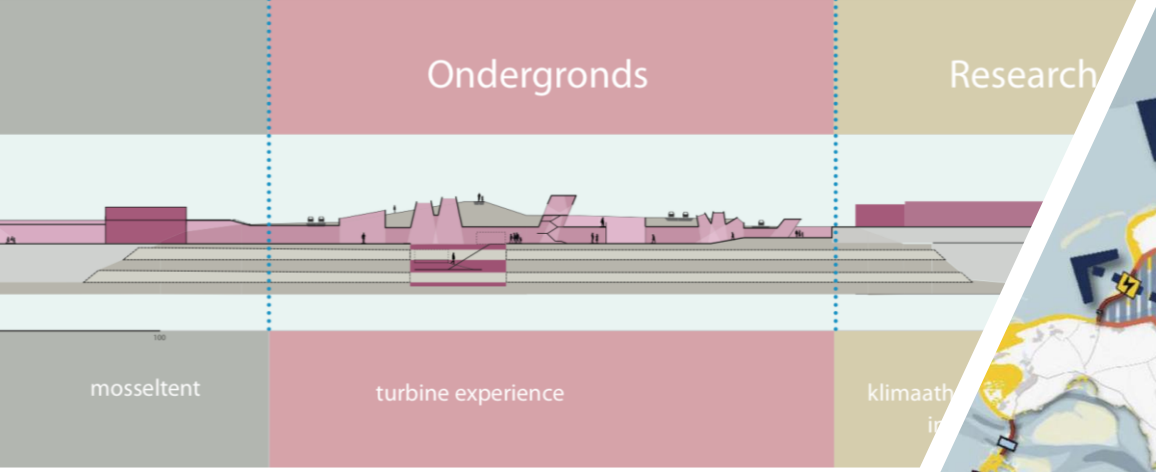


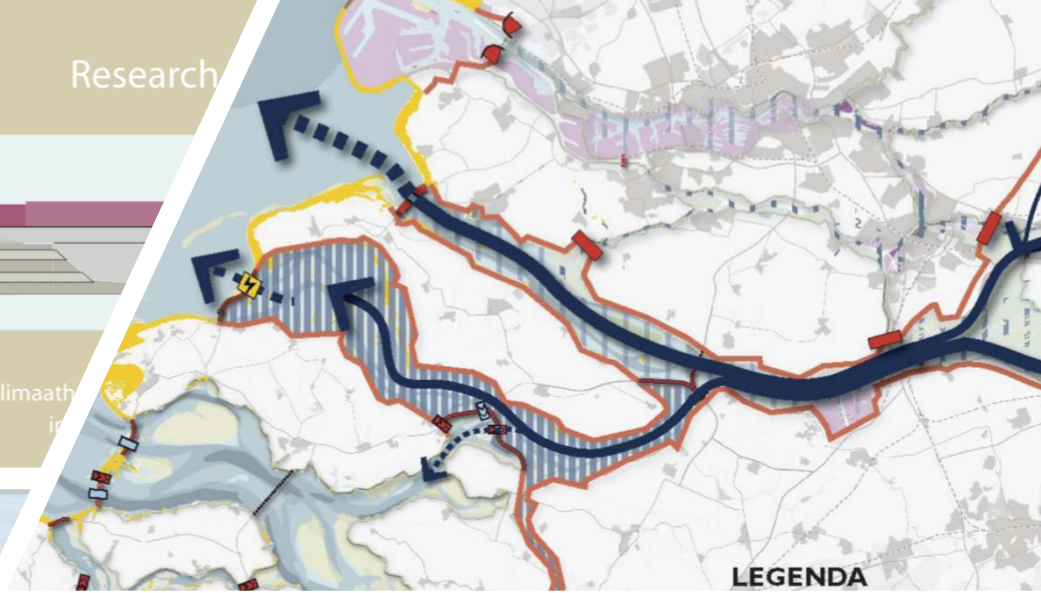
SUBSURFACE GEOTECHNICAL MODELS

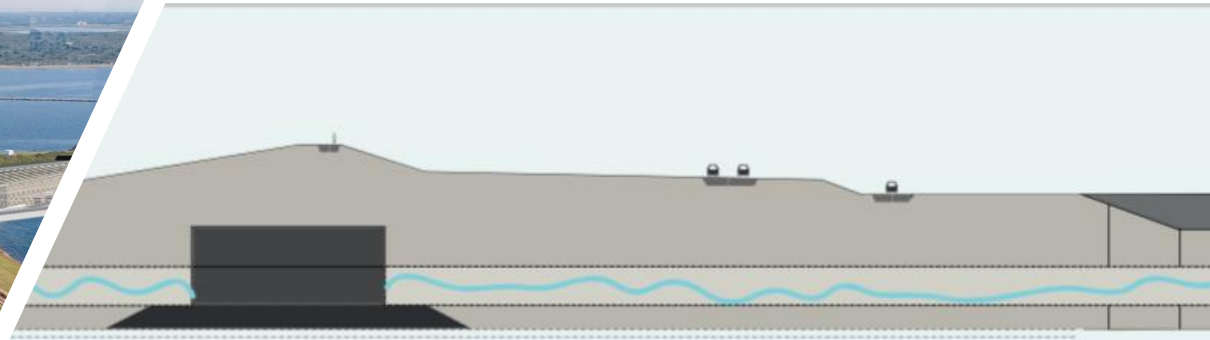




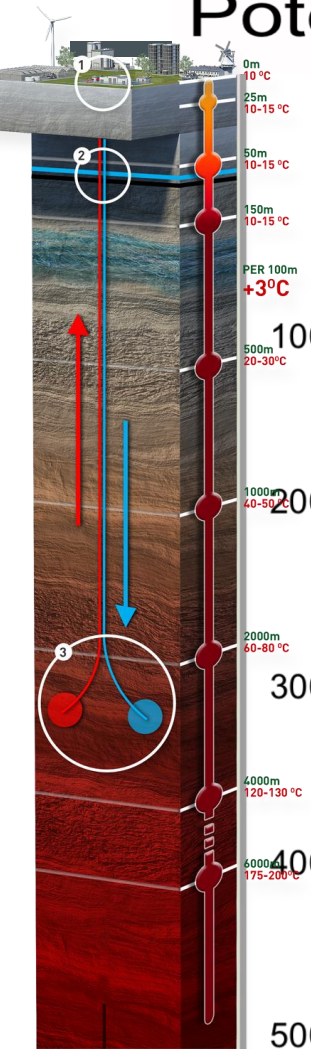
Bron: Lieven

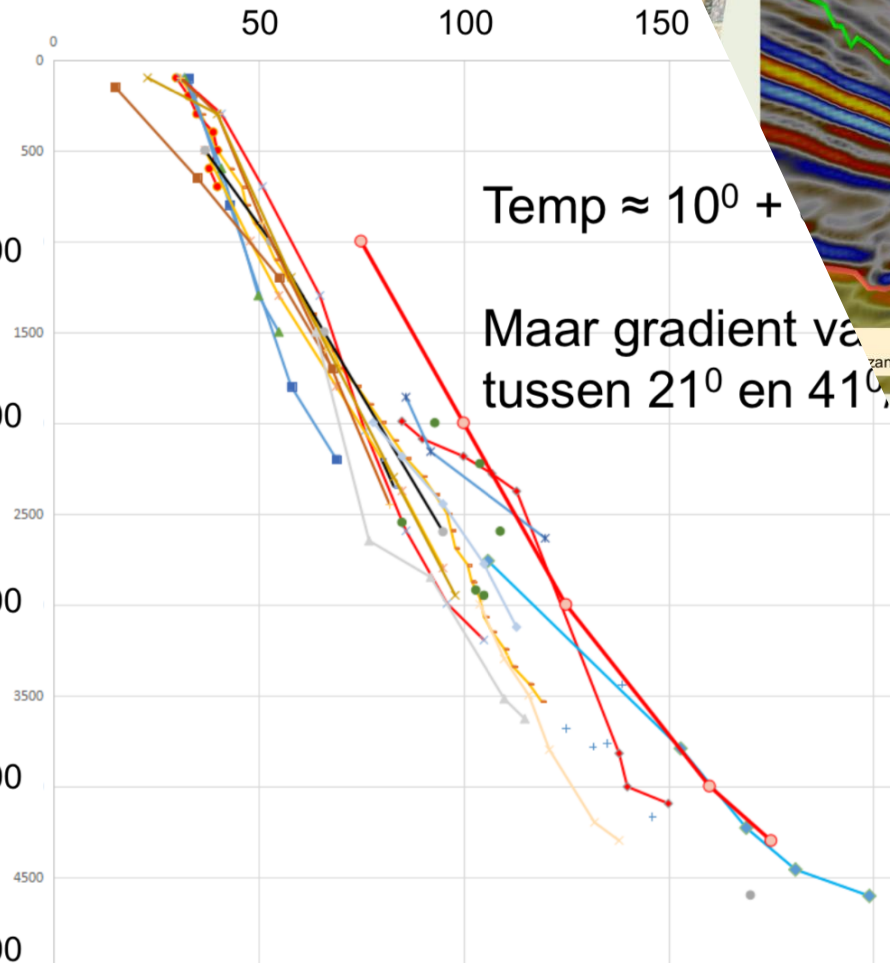

Ondergronds
Research
mosseltent
turbine experience


LEGENDA



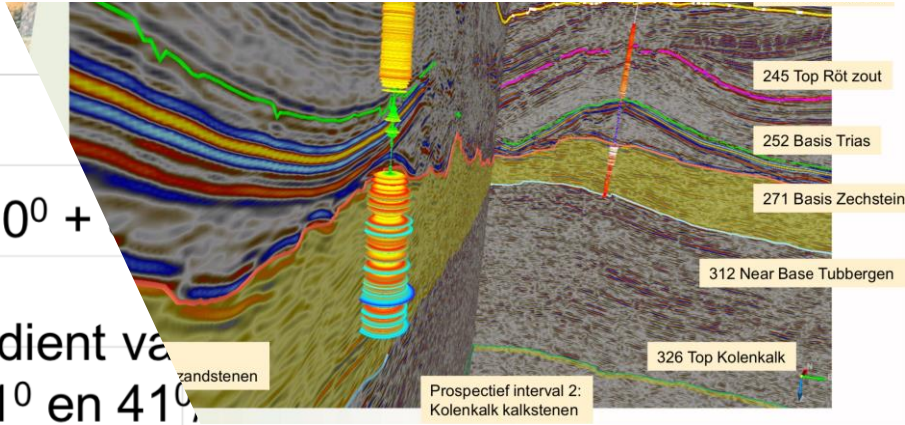
Potentie voor (ultra) diepe geothermie in Twente

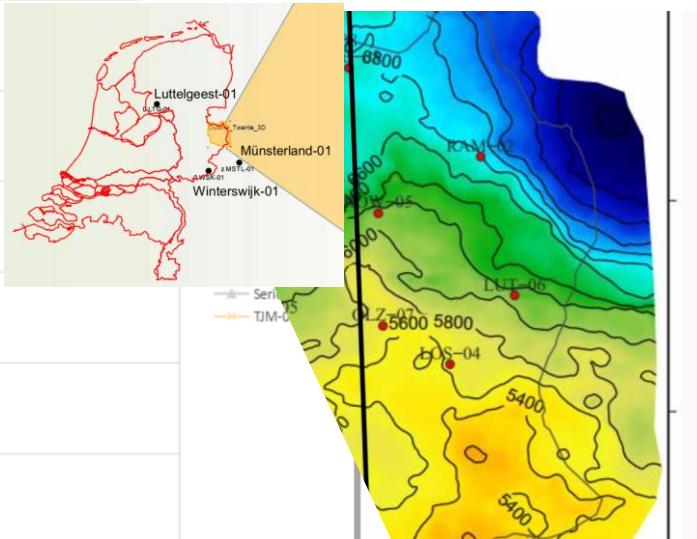




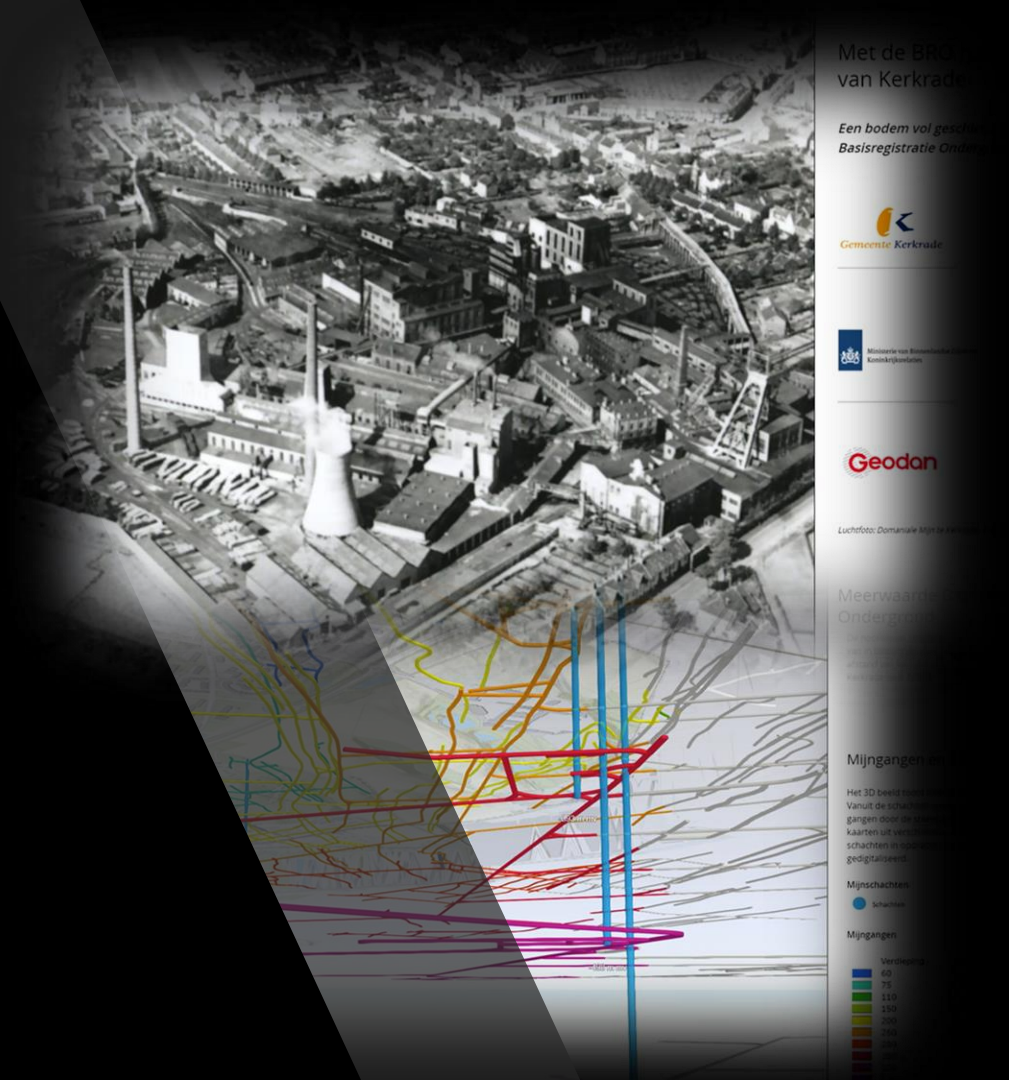
Temp ≈ 10^0 +

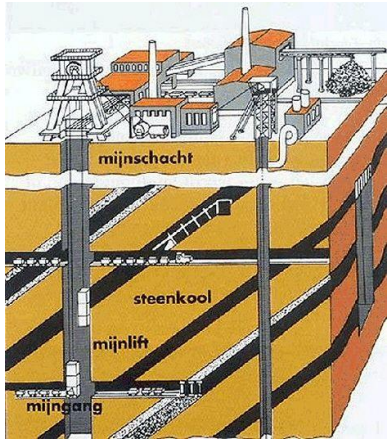
Maar gradient va
tussen 21^0 en 41^0

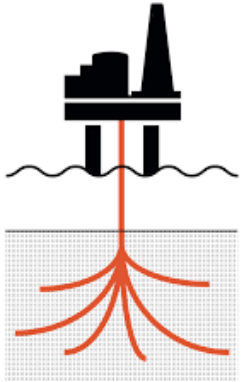


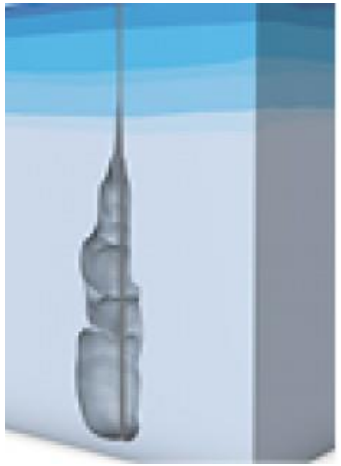


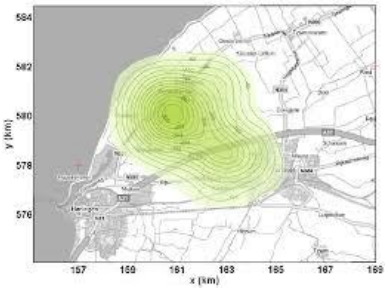
SUBSURFACE INFRASTRUCTURE MINING ACT OF THE NETHERLANDS







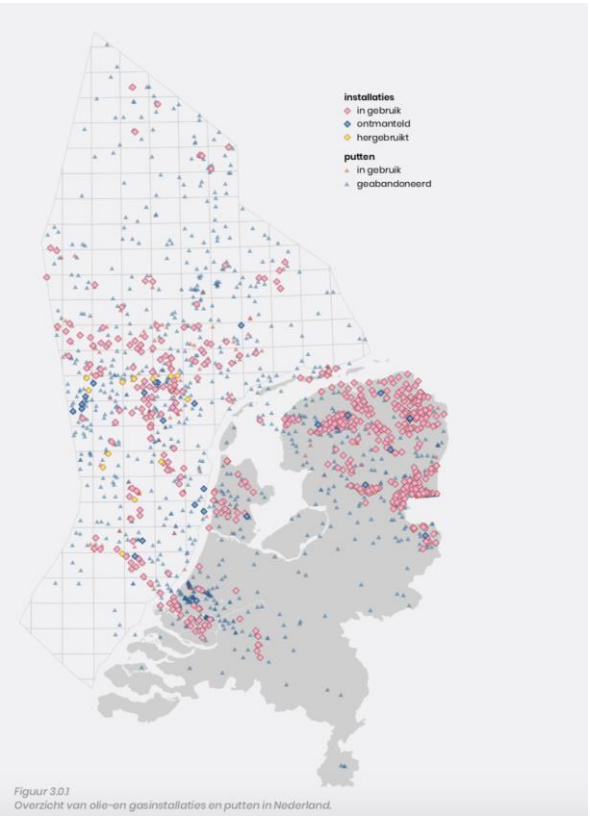




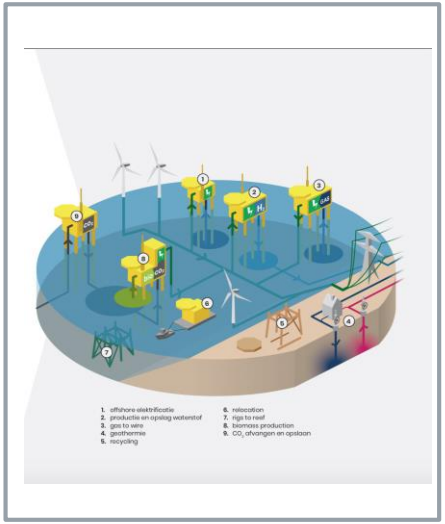
INTEGRATED SPATIAL PLANNING

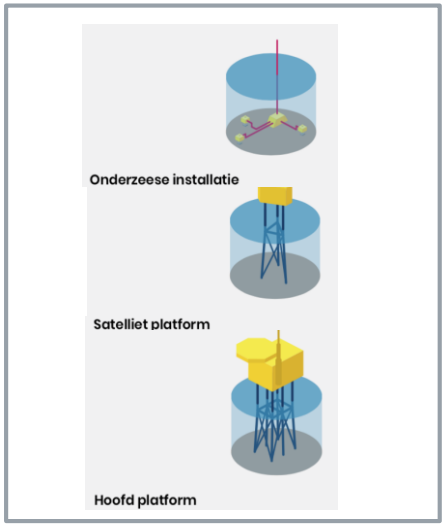
IMPACT SUBSURFACE MINING INFRASTRUCTURE ON THE SURFACE

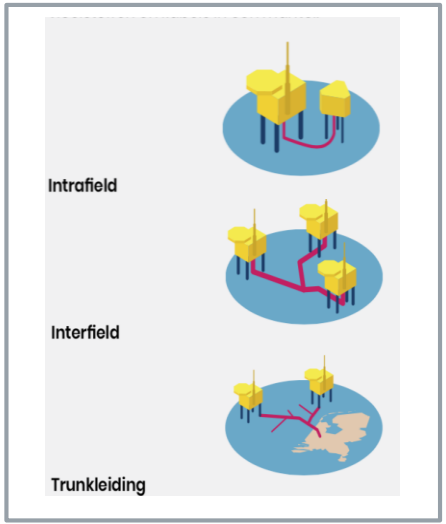
MASTERPLAN NORTH SEA

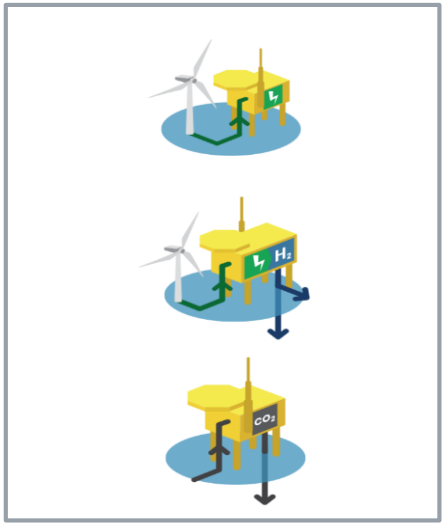


Figuur 3.0.1
Overzicht van olie-en gasinstallaties en putten in Nederland.



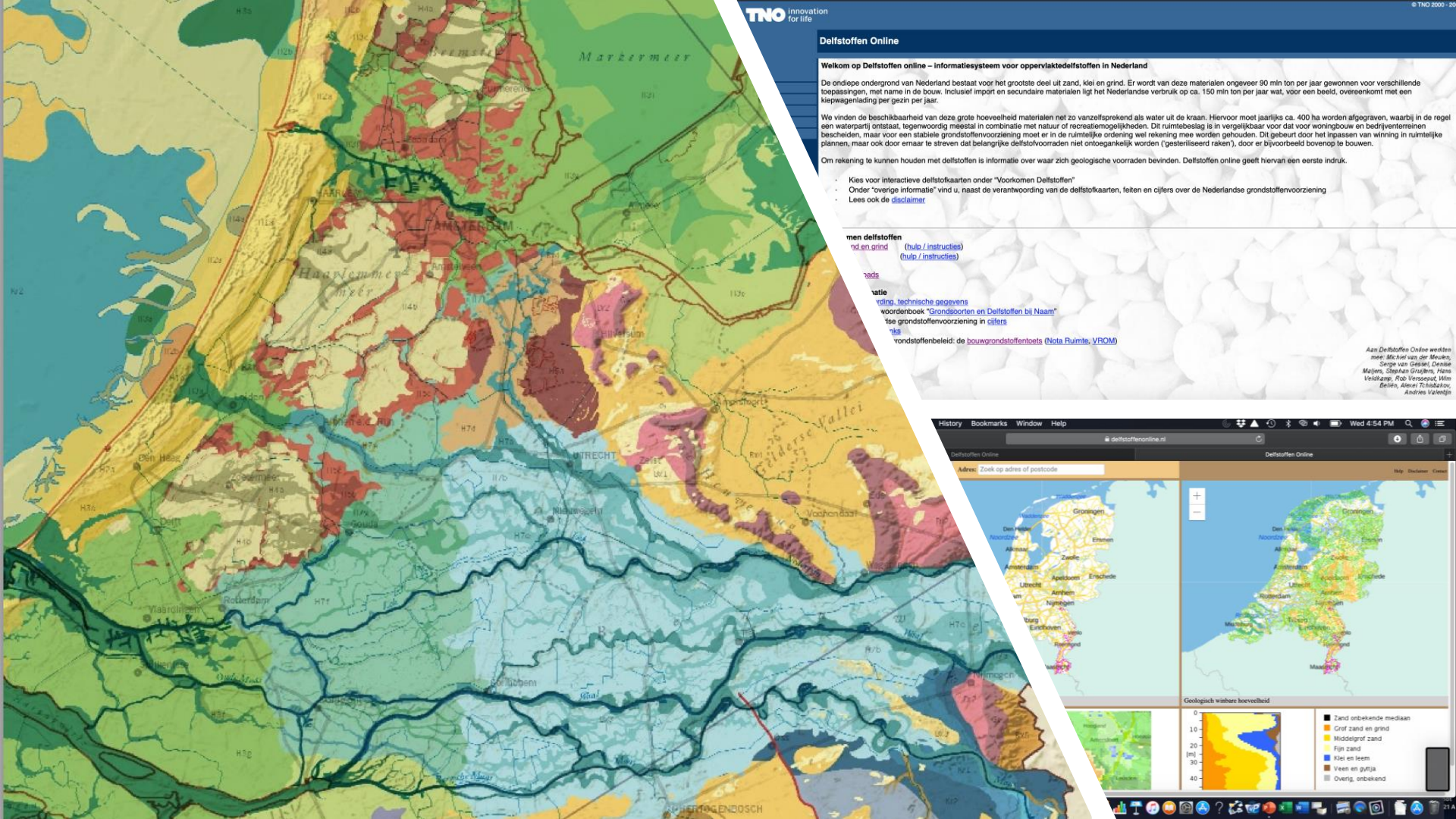






INTEGRATED SPATIAL PLANNING

NORTH SEA REGIONAL ENERGY TRANSITION STRATEGY (RES)


TNO innovation for life
Delfstoffen Online
Welkom op Delfstoffen online – informatiesysteem voor oppervlaktedelfstoffen in Nederland
De ondiepe ondergrond van Nederland bestaat voor het grootste deel uit zand, klei en grind. Er wordt van deze materialen ongeveer 90 mln ton per jaar gewonnen voor verschillende toepassingen, met name in de bouw. Inclusief import en secundaire materialen ligt het Nederlandse verbruik op ca. 150 mln ton per jaar wat, voor een beeld, overeenkomt met een kiepwagenlading per gezin per jaar.
We vinden de beschikbaarheid van deze grote hoeveelheid materialen net zo vanzelfsprekend als water uit de kraan. Hiervoor moet jaarlijks ca. 400 ha worden afgegraven, waarbij in de regel een waterpartij ontstaat, tegenwoordig meestal in combinatie met natuur of recreatiemogelijkheden. Dit ruimtebeslag is in vergelijkbaar voor dat voor woningbouw en bedrijventerreinen bescheiden, maar voor een stabiele grondstoffenvoorziening moet er in de ruimtelijke ordening wel rekening mee worden gehouden. Dit gebeurt door het inpassen van winning in ruimtelijke plannen, maar ook door ernaar te streven dat belangrijke delfstofvoorraden niet ontoegankelijk worden ('gesteriliseerd raken'), door er bijvoorbeeld bovenop te bouwen.
Om rekening te kunnen houden met delfstoffen is informatie over waar zich geologische voorraden bevinden. Delfstoffen online geeft hiervan een eerste indruk.
Kies voor interactieve delfstofkaarten onder "Voorkomen Delfstoffen"
Onder "overige informatie" vind u, naast de verantwoording van de delfstofkaarten, feiten en cijfers over de Nederlandse grondstoffenvoorziening
Lees ook de disclaimer
Aan Delfstoffen Online werkten mee: Michiel van der Meulen, Serge van Gessel, Denise Maljers, Stephan Gruijters, Hans Veldkamp, Rob Verseput, Wim Beliën, Alexei Tchistiakov, Andries Valentijn
Delfstoffen Online
Adres: Zoek op adres of postcode
Geologisch winbare hoeveelheid
Zand onbekende mediaan
Grof zand en grind
Middelgrof zand
Fijn zand
Klei en leem
Veen en gyttja
Overig, onbekend

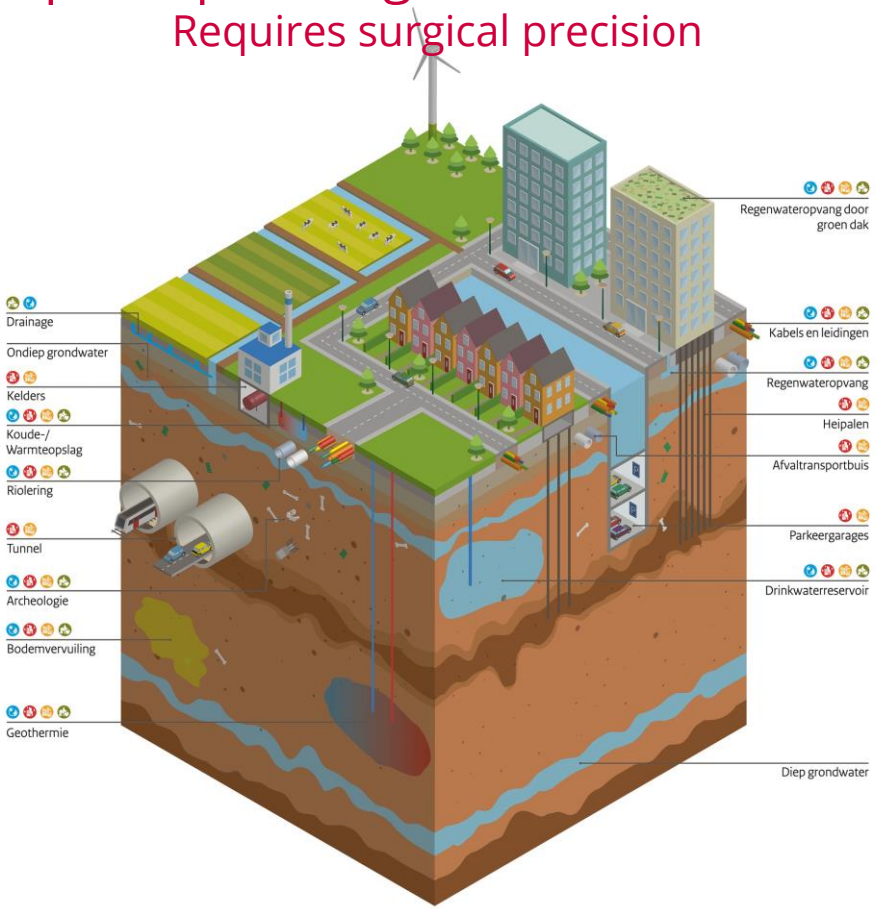
PARTICIPATIVE SPATIAL PLANNING & GEODESIGN

Spatial planning of the subsurface

Requires surgical precision

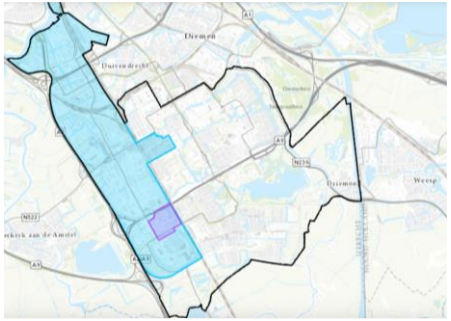
The Netherlands is working on 4 major tasks

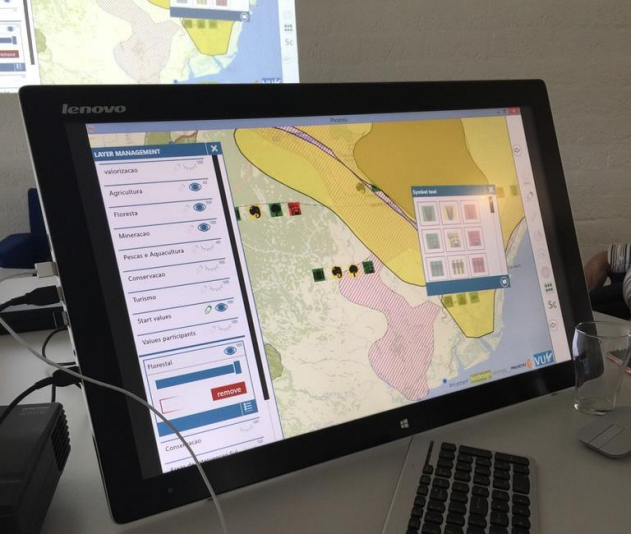
- Climate adaption & Energietransition
- Strong and Climate proof Cities and Regions
- Sustainable Economic Growth
- Circulair Agriculture and vital rural areas

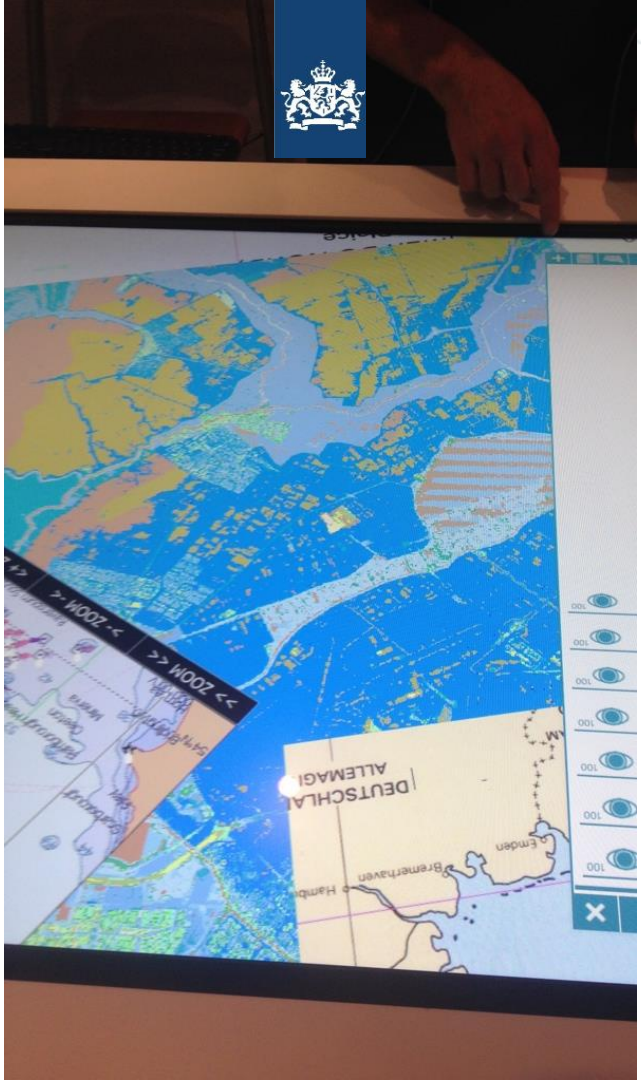


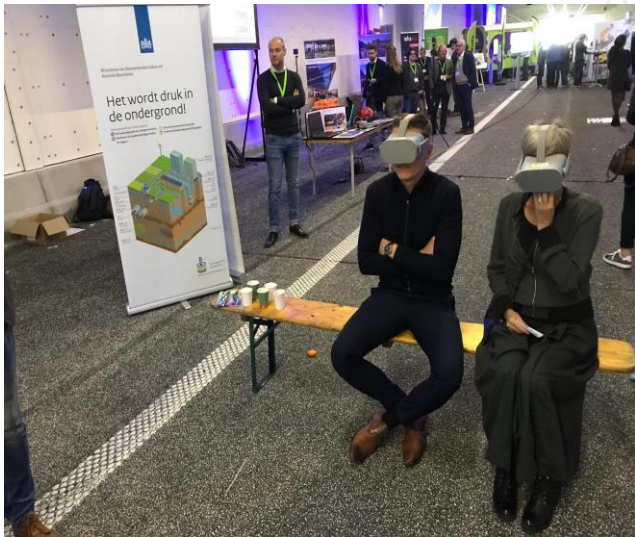
Home

POC Amstelstad demo




lenovo
LAYER MANAGEMENT
valorizacao
Agricultura
Floresta
Mineracao
Pescas e Aquacultura
Conservacao
Turismo
Start values
Values participants
Florestal
remove


>> ZOOM <<
>> ZOOM <<


Het wordt druk in de ondergrond!

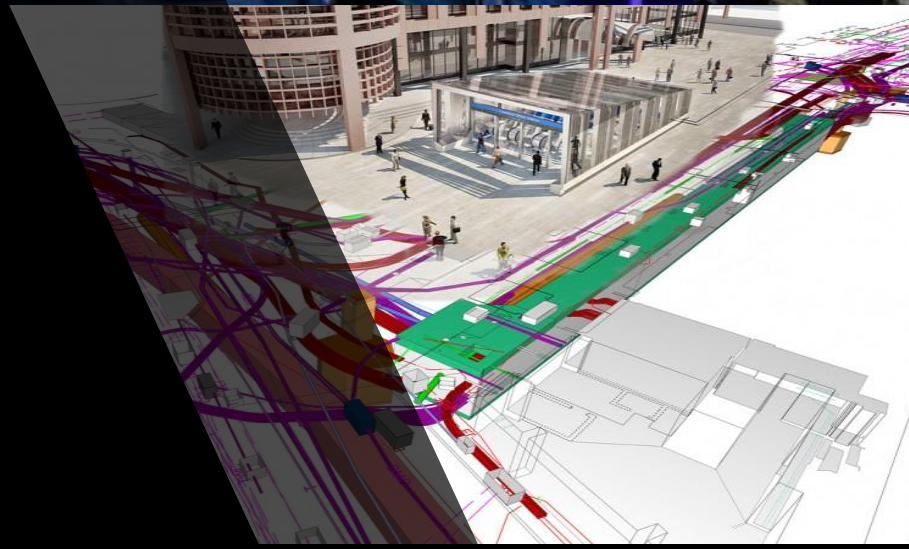
Visualisation instruments 3D GIS/BIM/GEO-Model

AR – AUGMENTED	Unity	multidisciplinary team
VR – AUGMENTED - interactief	Unity	GIS specialist Civil Engineer
VR – AUGMENTED - passief	ArcGis / Unity	General Public
Touch table- interactief	ArcGis Online	Participative decision-making
Mobile Device – interactief / passief	ArcGis Story Map	Decision maker General Public
Desk top – interactief / passief	ArcGis / BIM	GIS specialist

AR – AUGMENTED

URBAN PLANNERS:

“SURGEONS OF THE SMART CITIES”



DIGITAL TWIN OF SMART CITY INSTRUMENT FOR:

“TESTING AND PRACTICE BEFORE IMPLEMENTING…”

CLIMATE ADAPTATION STRATEGY

REAL TIME MONITORING

SMART CITIES DASHBOARD

- GROUNDWATER DIVERS
- SALTWATCHERS
- GEOPHONES
- TILTMETERS
- PRESSURESENSORS
- SOUND VELOCITY SENSOR
- SEDIMENT SENSOR

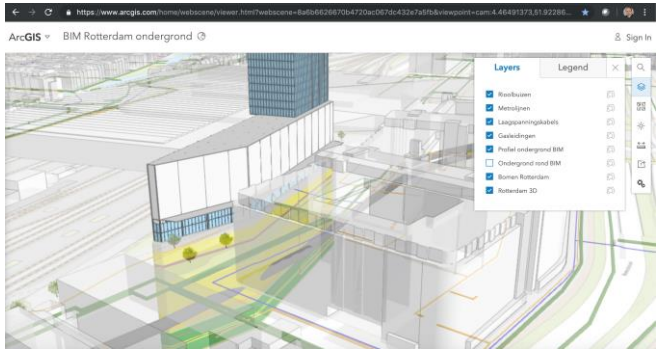
BRO 3D Webservices en Software Service Industry

Open data policy – From Innovation to Implementation by "Equal Level of playing field"

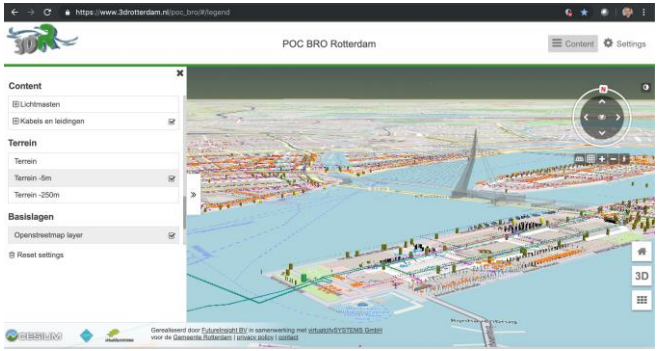
ArcGIS® Pro

GeoWeb

python



esri Nederland
THE SCIENCE OF WHERE



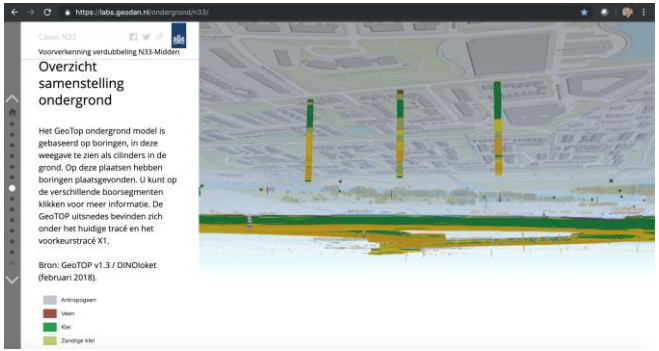
FUTURE INSIGHT

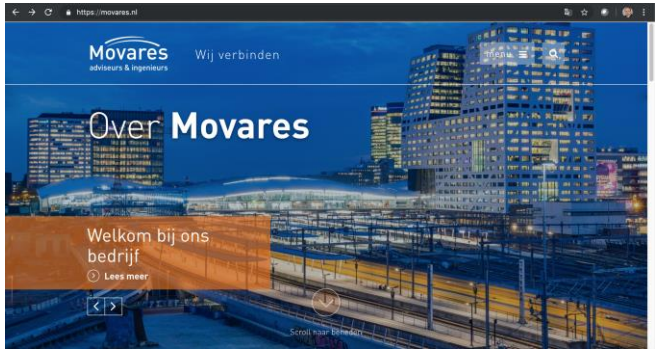
OL3-Cesium
Third dimension for OpenLayers

virtualcitySYSTEMS

ArcGIS® Pro

unity

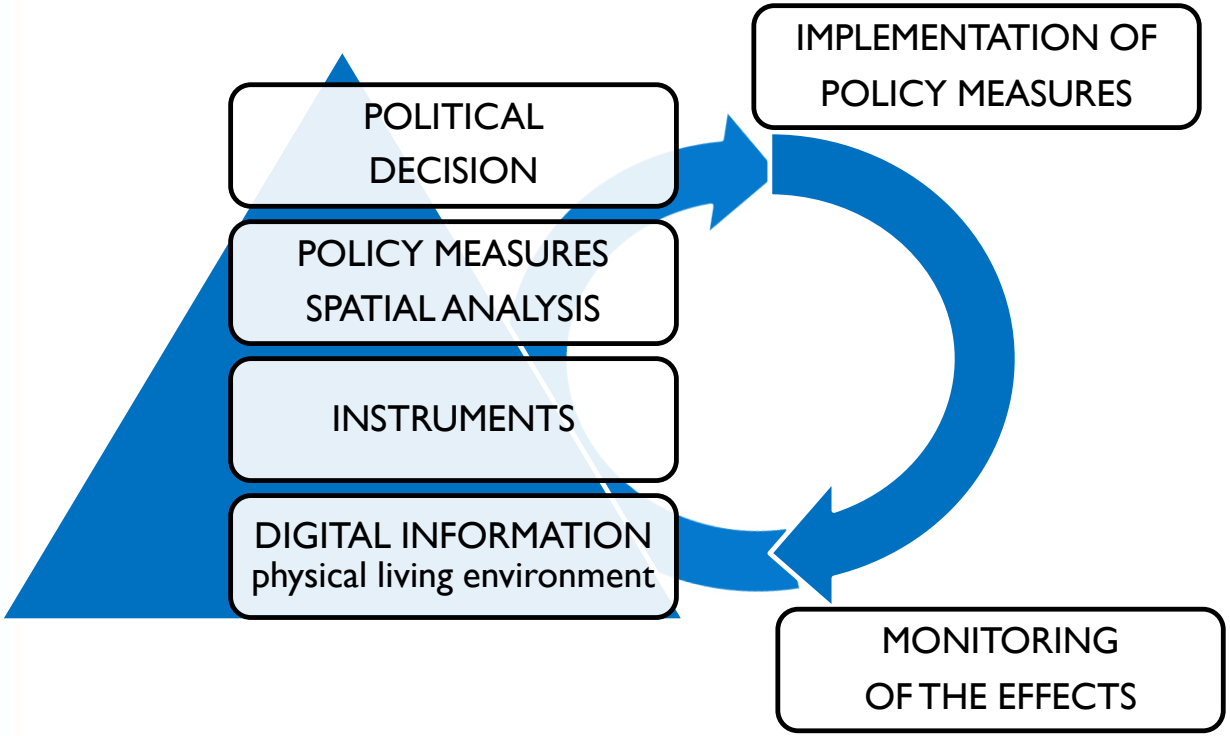




FAME

unity

DATA DRIVEN WORK IN THE POLICY CYCLE



Ministerie van Binnenlandse Zaken en Koninkrijksrelaties

hoogheemraadschap Hollands Noorderkwartier

Geological Survey of the Netherlands

Universiteit Utrecht

Rijkswaterstaat
Ministerie van Verkeer en Waterstaat

“THE NEXT BIG THING WILL BE A LOT OF SMALL THINGS”

INGENIEUR-ARCHITECT JOACHIM DECLERCK VAN ARCHITECTURE WORKROOM BRUSSELS (AWB)"