Anlægschef, Havnebygmester

Hans Vasehus

By & Havn

GSV
Mennesker før maskiner

Lynetteholm

Hans Vasehus, Havnebygmester og Anlægschef, By & Havn
FREMTIDENS BYGGERI 7. oktober 2019

BY&HAVN

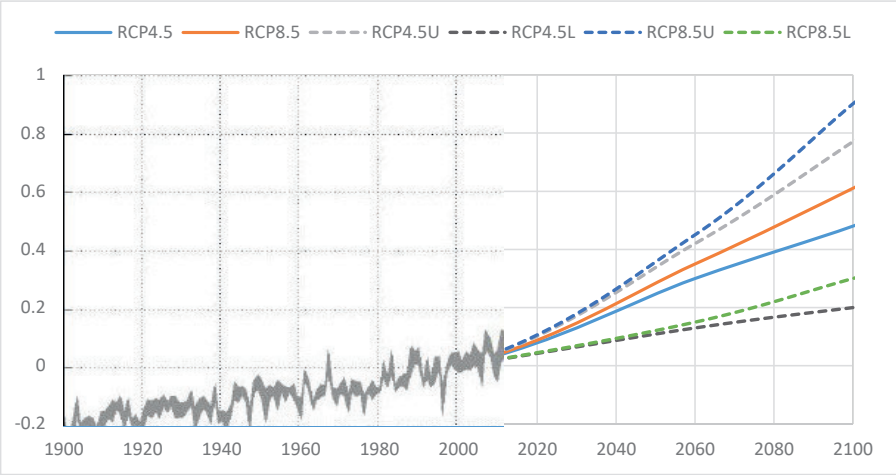
Klimaændringer frem mod år 2100

- Havspejlet stiger
- Stormintensiteten ændres måske også

Forudsigelser om fremtidig havspejlstigning er behæftet med stor usikkerhed

© DHI

Fortid og fremtid - IPCC (2013)



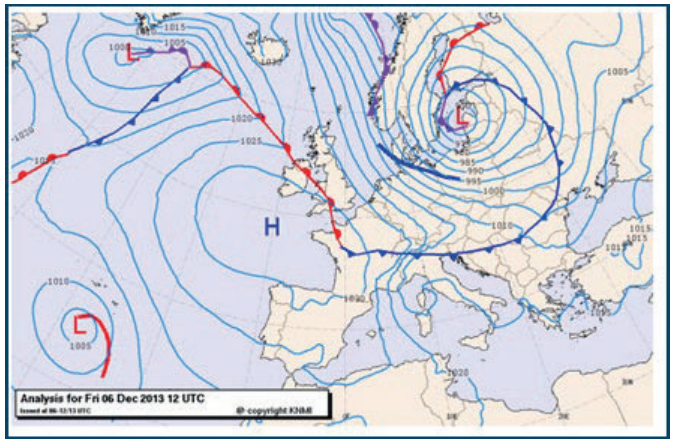
=> Langtidsplanlægning er blevet endnu mere vigtig, men også sværere!

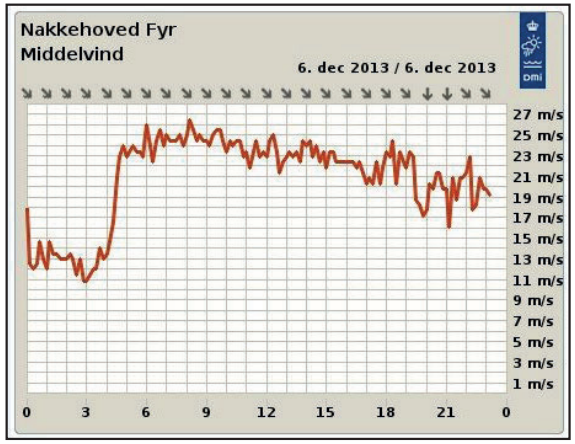
Scenarie	Strålingseffekt	Drivhusgas koncentration	Århundredets temperaturforøgelse	Trend efter år 2100
RCP8.5	8.5 W/m^2 i år 2100	1370 ppm CO_2 ækvivalenter	4.5 °C	Stigende
RCP4.5	4.5 W/m^2 i år 2100	650 ppm CO_2 ækvivalenter	1.7 °C	Stabiliseret

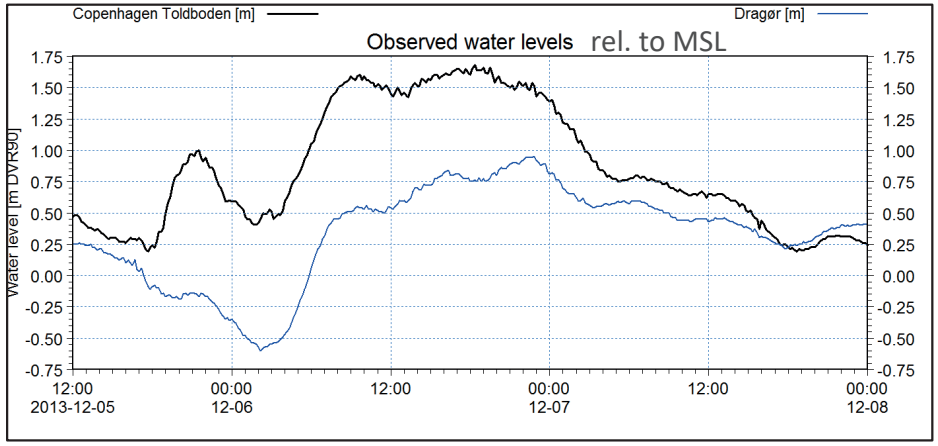
BY&HAVN

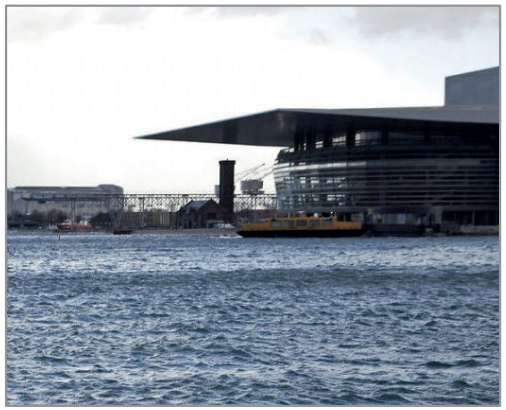
© DHI

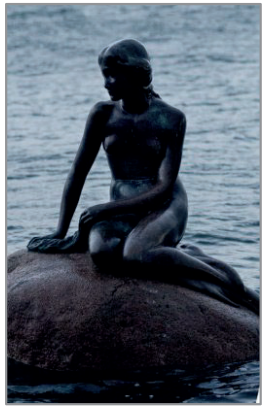
Stormen Bodil i december 2013







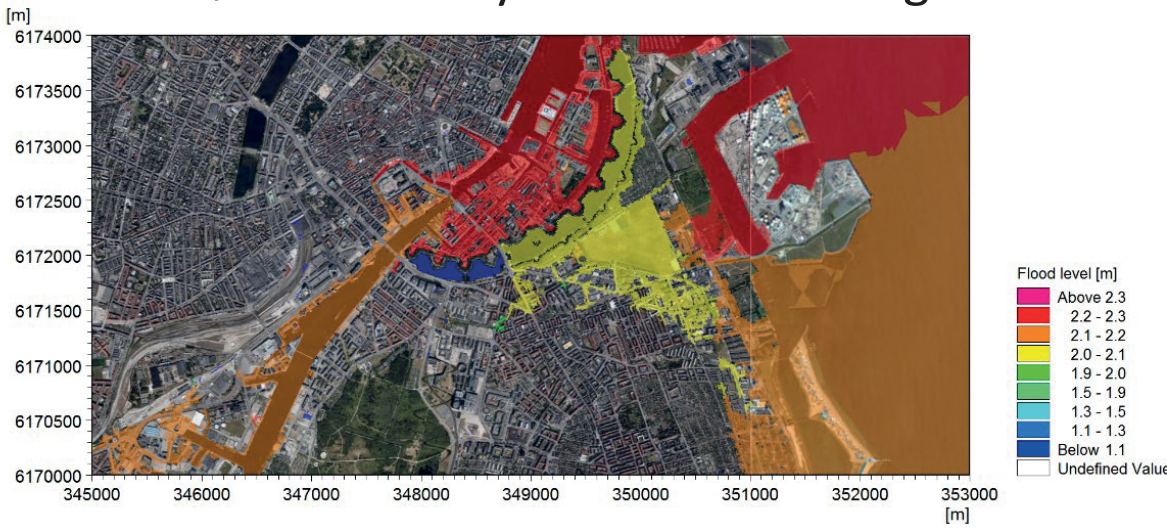




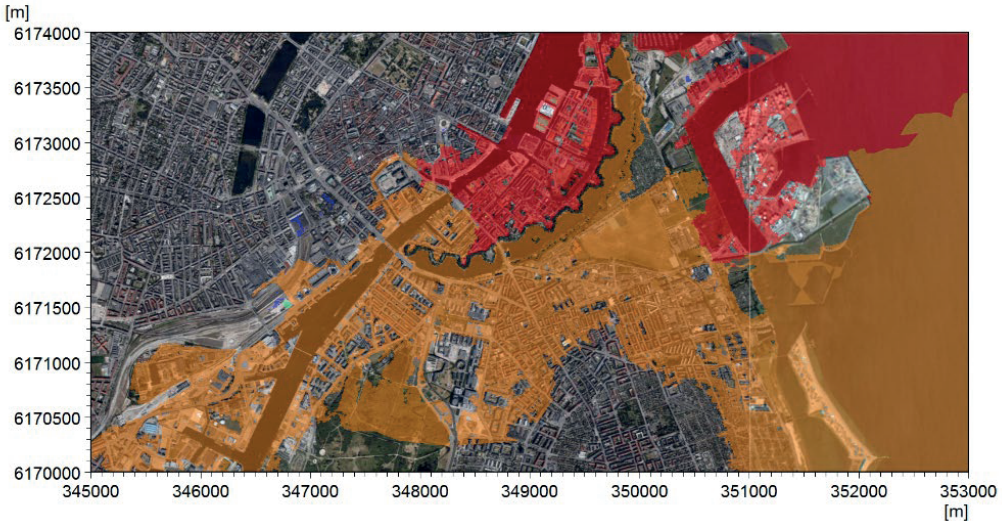
© DHI

København

Bodil +0,7m:
Oversvømmelse - dynamisk simulering



Bodil +1m:
Oversvømmelse - dynamisk simulering



En ændring på 0,3m gør en enorm forskel!

vde

5

tå

ST&HAVN

Udformning af Lynetteholm

- I principaftalen indgået mellem Københavns Kommune og Staten 5. oktober 2018 nævnes fire formål:
  - Klimasikring
  - Areal til byudvikling
  - Udbygning af og bidrag til infrastruktur
  - Behov for deponering af jord

- Afgrænsningen fra principaftalen er et godt udgangspunkt for etablering af ny ø i Københavns Havn.

Estimeret proces- og tidsplan

2019-2020

VVM-undersøgelse

- Forundersøgelse om placering og afgrænsning af ø
- To offentlige høringer
- Miljøkonsekvensrapport
- Forundersøgelse af Østlig Ringvej
- Forundersøgelse af metrobetjening
- Finansiel analyse mv.
- Dannelse af selskab

2021-2023

Anlæg af Jorddepot

- Myndighedsgodkendelse af VVM / (anlægslov)
- Anlæg af jordepotfaciliteter, landanlæg og indfatning af Lynetteholm
- VVM-proces for Østlig Ringvej og metrobetjening
- Påbegyndelse af jordopfyldning med ren og forurenet jord

Ca. 2024-2035

Anlæg af infrastruktur – byplanlægning

- Konkurrencer om overordnet strukturplan og masterplaner for delområder
- Kommuneplanrammer
- Lokalplaner for første delområder og placering af parker, strand og kanaler
- Fortsat jordopfyldning
- Anlæg af Østlig Ringvej
- Anlæg af metrobetjening

Ca. 2035-2070

Byudvikling og etablering af boliger

- Metro og Østlig Ringvej er etableret
- Byudvikling med etablering af boliger mv.
- Jordopfyldning forventes fortsat frem til 2060 - 2070

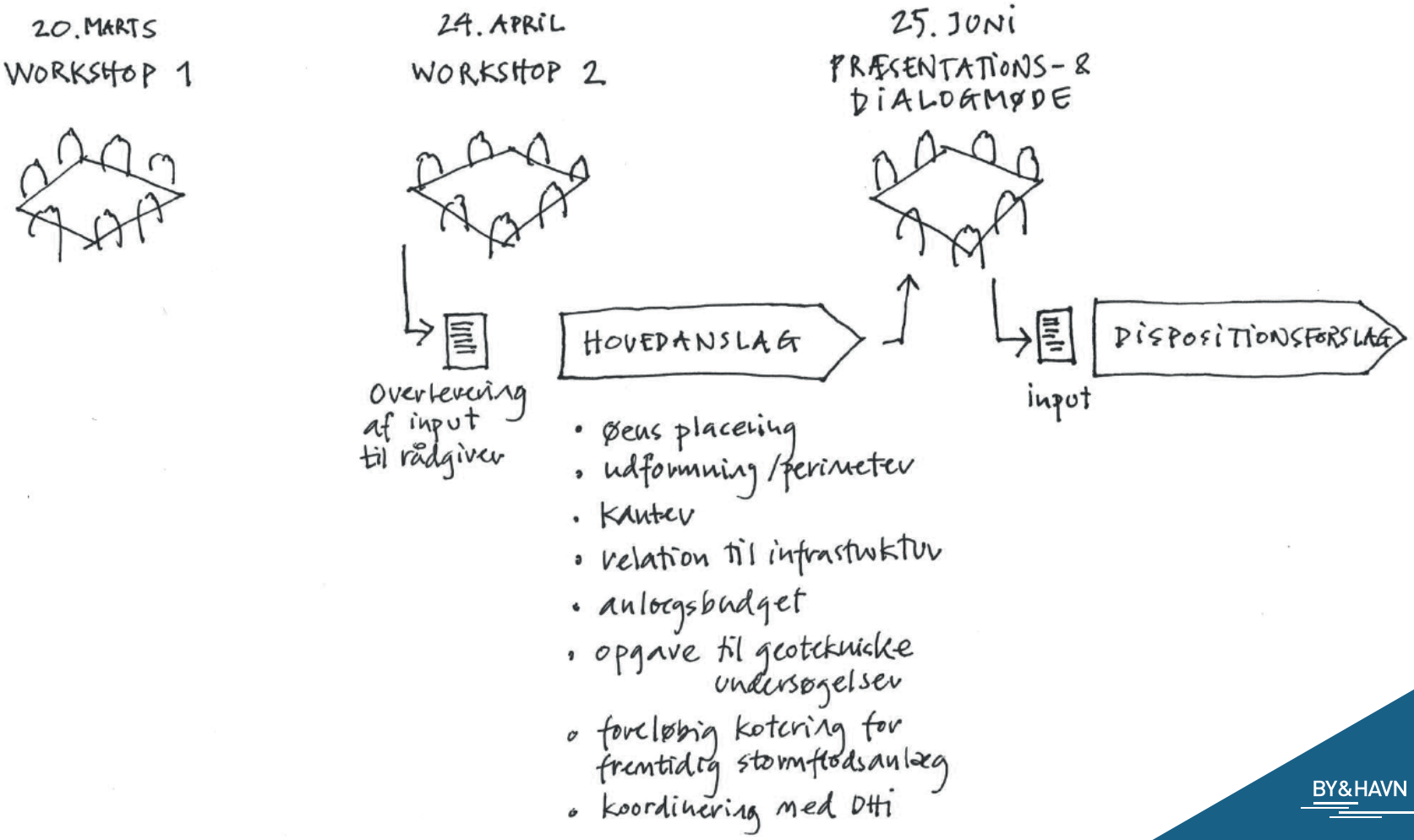
BY&HAVN

Forundersøgelse: Hvilke hensyn har vi belyst?

- Arkitektur
- Marin natur
- Bølge- og strømforhold
- Infrastruktur

BY&HAVN

Arbejdsproces



BY&HAVN

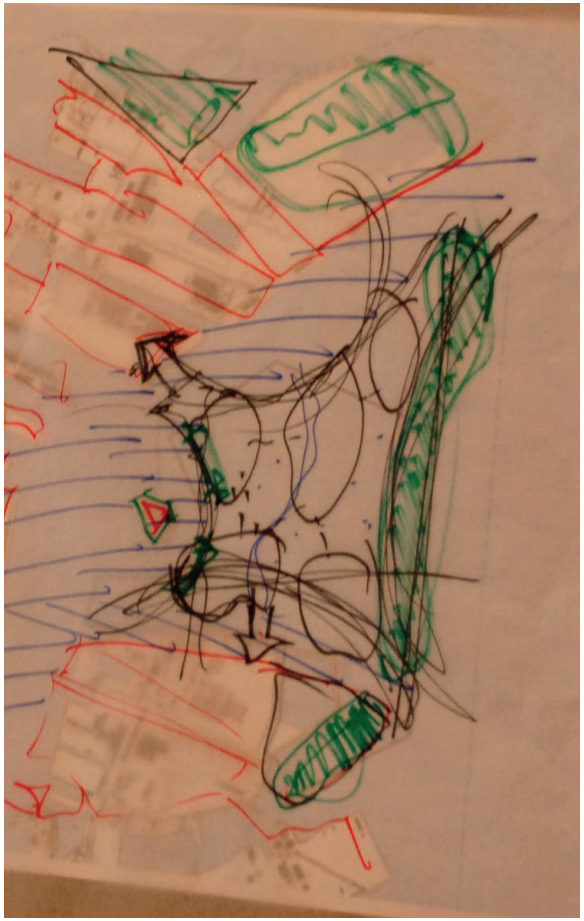
Overlevering fra workshops

”Hovedgreb skal ses i sammenhæng med landskabstræk fra Ydre Nordhavn og Amager Standpark

”Etabler et stort grønt træk på østsiden af øen

”Skab afstand til Trekroner og Refshaleøen

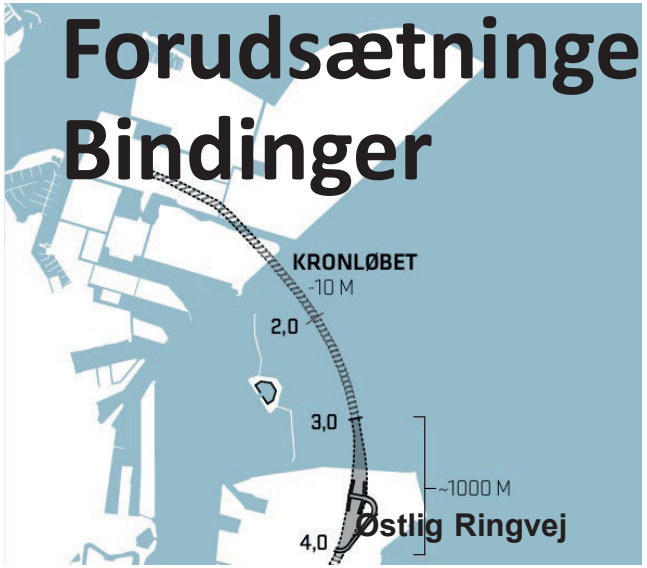
”Lad kanten mod øst være ”flosset” med f.eks. små strande i indre laguner



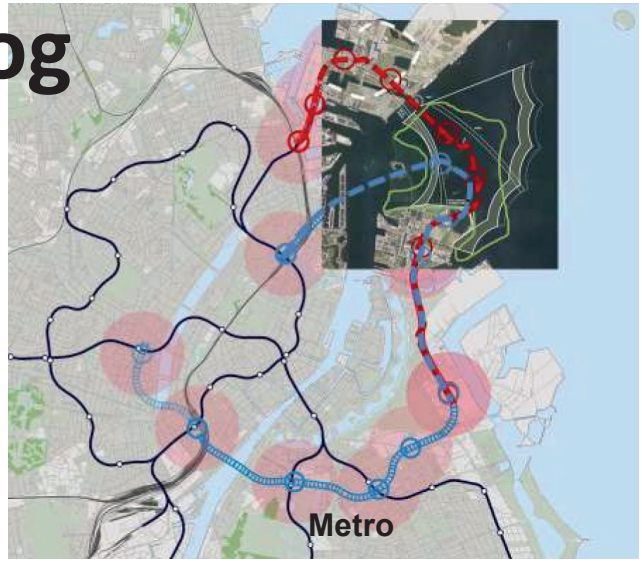
”Den samlede vision og øens hovedgreb bør tage udgangs-punkt i klimaudfor-dringer og storm-

”Lad øen koble sig på Refshaleøen og til Nordhavn ved dokporten

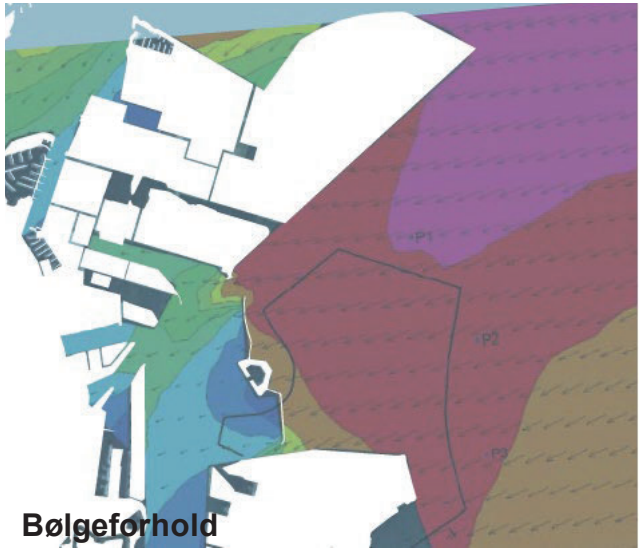
Forudsætninger og Bindinger



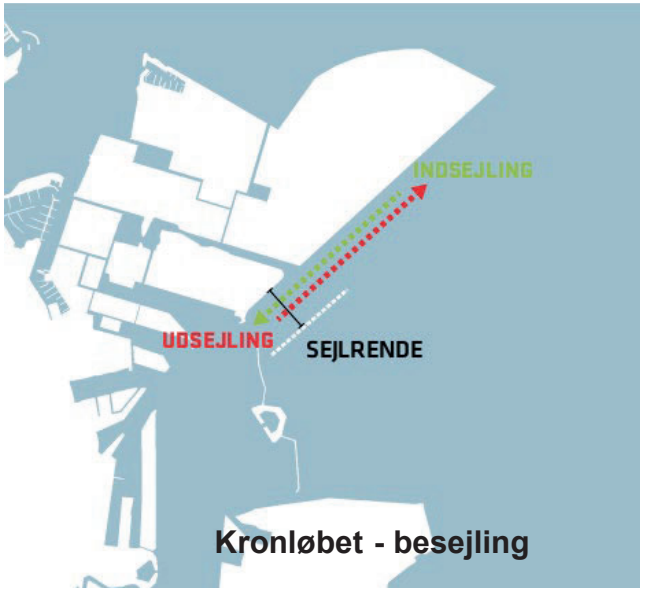
Østlig Ringvej



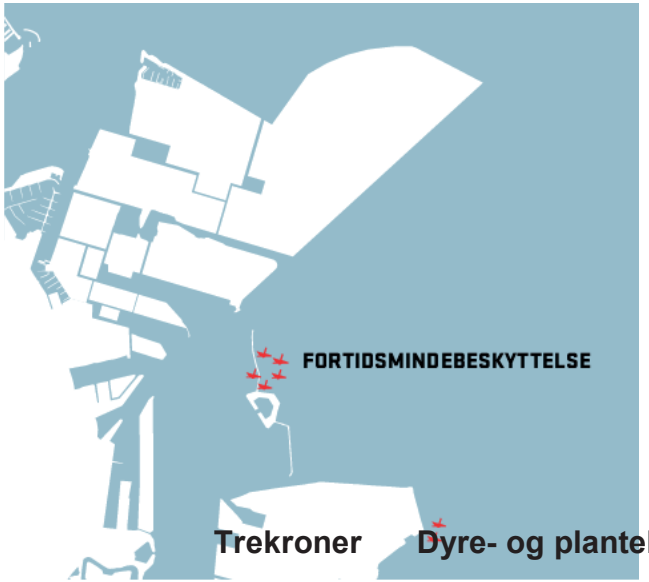
Metro



Bølgeforhold



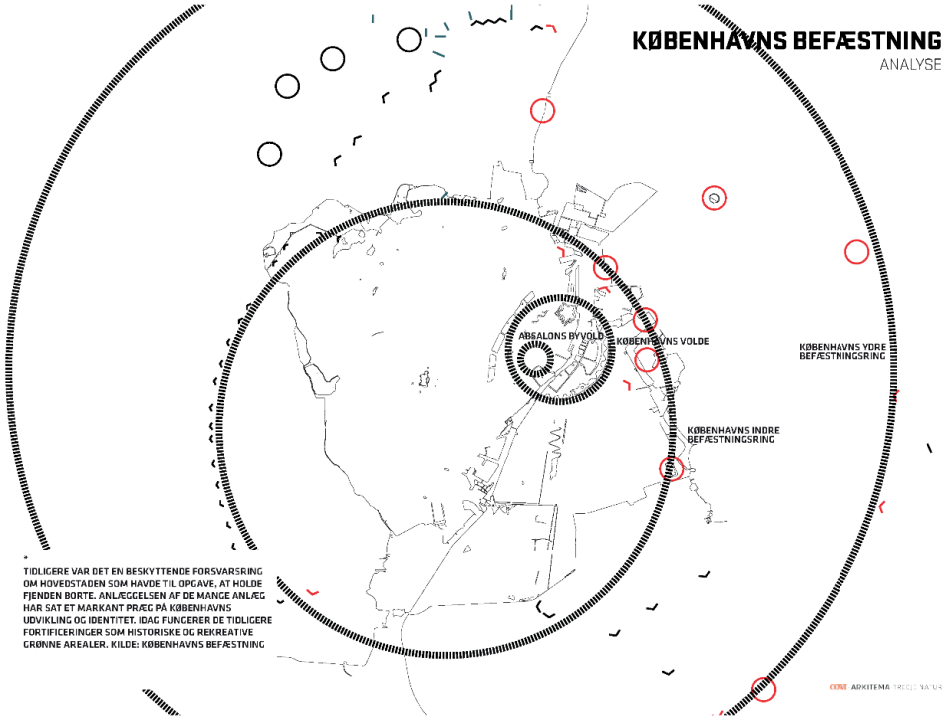
Kronløbet - besejling

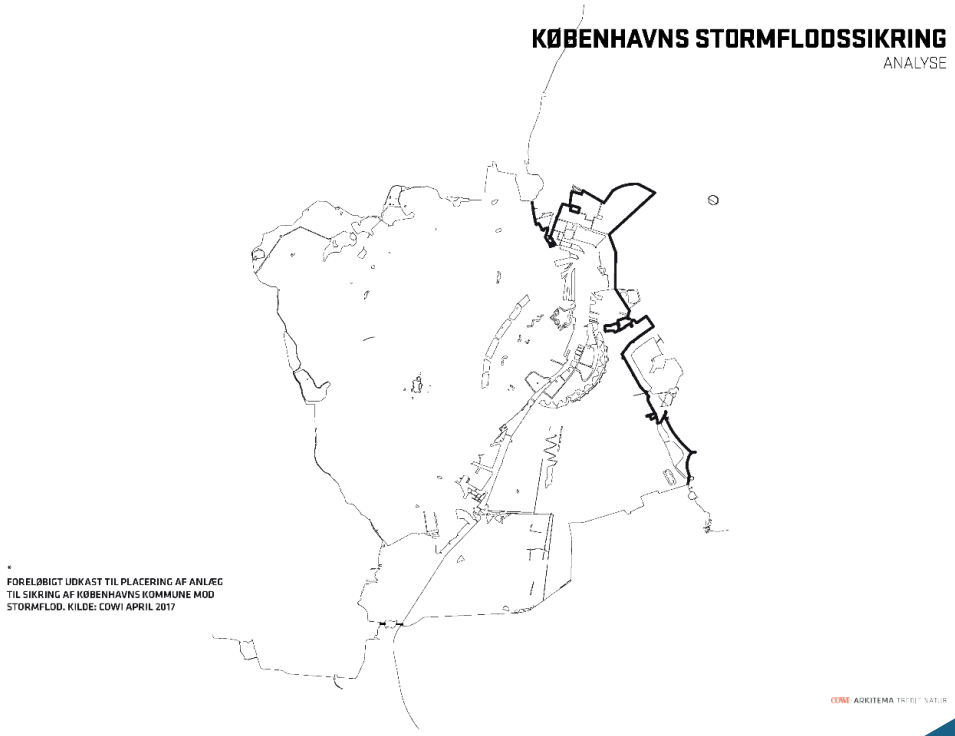


Trekroner

Dyre- og planteliv på havbunden

Gamle og nye udfordringer





BY&HAVN

Havnerummets indre og ydre afgrænsning

BY&HAVN

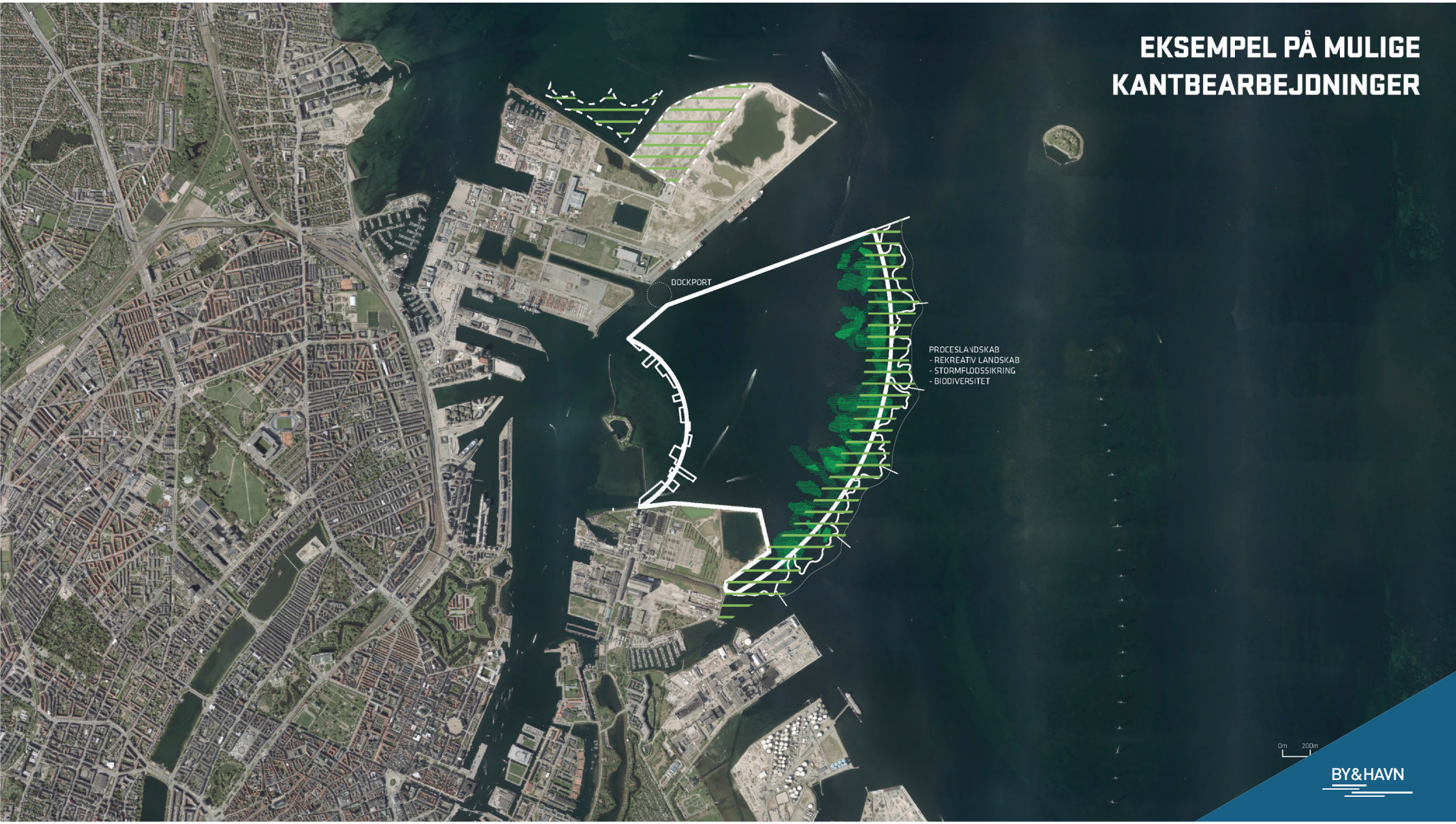
FORSLAG

BY&HAVN

PROCESLANDSKAB OG EVT. KANALER

BY&HAVN

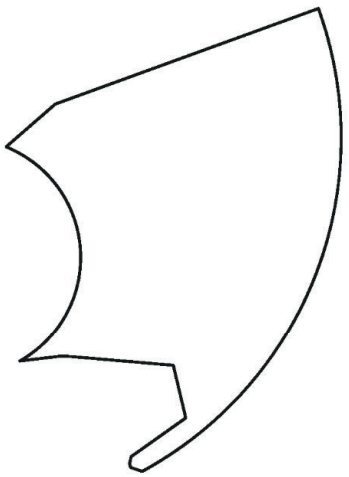
EKSEMPEL PÅ MULIGE KANTBEARBEJDNINGER



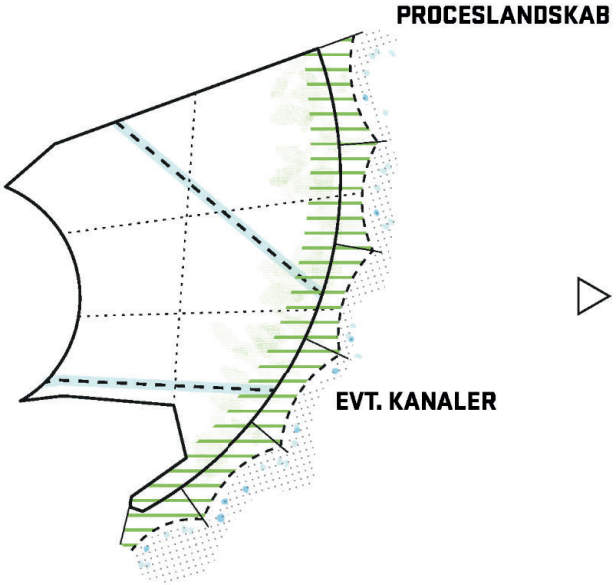
BY&HAVN

FASEINDDELING

1. JORDDEPOT



2. STRUKTURPLAN + FØRSTE MASTERPLANER



3. BEBYGGELSER + ØVRIGE MASTERPLANER

ÅR 2021 - 2023

- JORDOPFYLD STARTER
- ETABLERING AF PERIMETER

ÅR 2024 - 2035

- FORTSAT JORDOPFYLD
- STRUKTURPLAN UDARBEJDES
- BYGGEMODNING
- METROSTATIONER OG ØSTLIG RINGVEJ ER FASTLAGT

ÅR 2036 - 2070

- FORTSAT JORDOPFYLD
- MASTERPLANER UDARBEJDES
- BYGGESTART

BY&HAVN

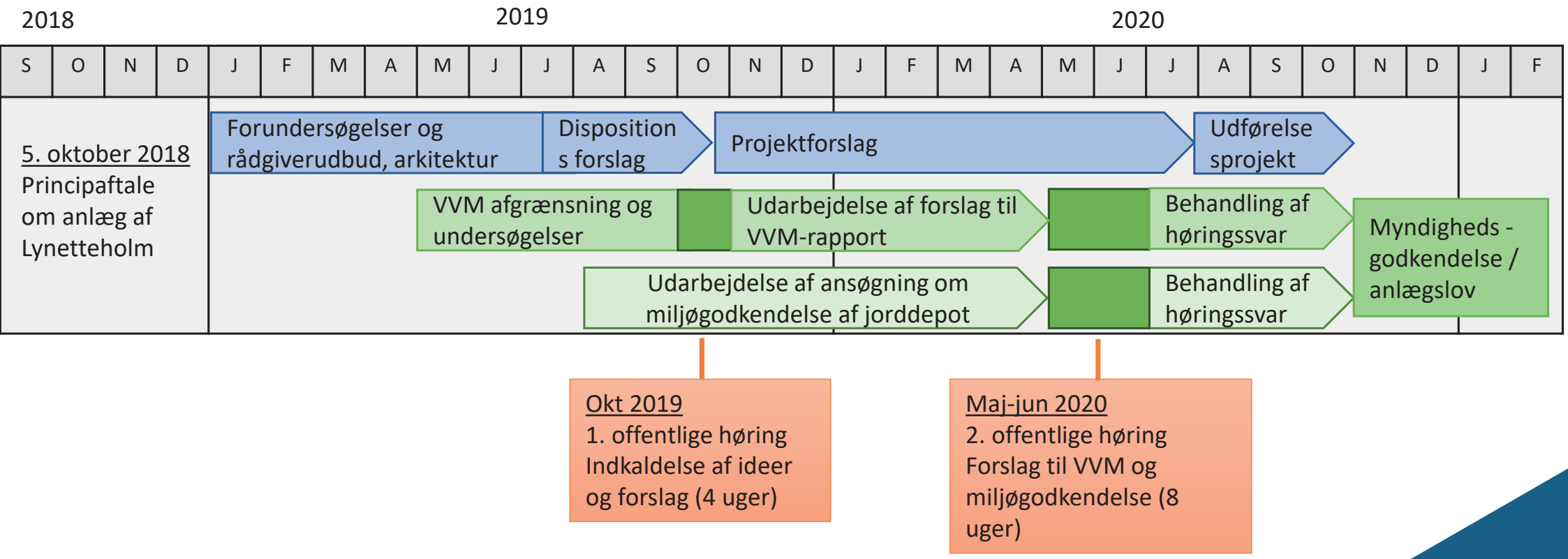
FORSLAG OG PRINCIPAFTALE

BY&HAVN

Nøgletal

FORELØBIG ANLÆGSOVERSLAG		Skitse fra principaftalen	Hovedforslag
Alle priser er eksklusiv moms			
Total areal*	**[ha]**	190	282
Indbygningsvolumen	**[mio m³]**	24	41
Længde af ydre perimeter	**[km]**	7,5	8,6
Brutto byggeomkostning	**[mia DKK]**	1,3	1,5
Netto indtægt (1m3 =100 DKK/m³)	**[mia DKK]**	2,3	4,1
Indtægt/udgift (plus >1)	**[-]**	1,9	2,7

BY&HAVN



Okt 2019
1. offentlige høring
Indkaldelse af ideer og forslag (4 uger)

Maj-jun 2020
2. offentlige høring
Forslag til VVM og miljøgodkendelse (8 uger)

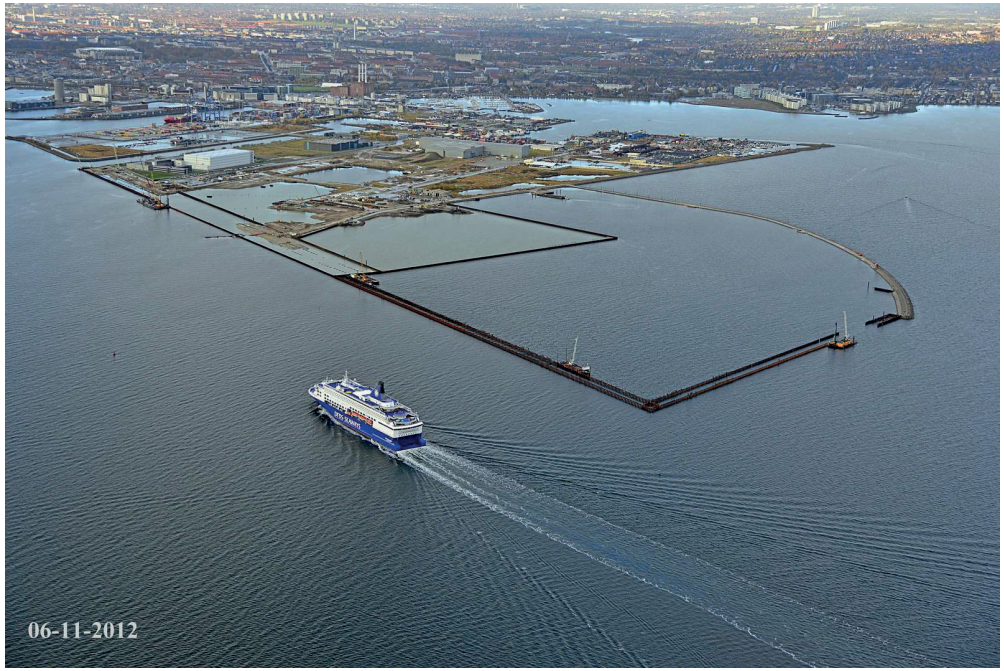
BY&HAVN

Opfyldningstid anslået til ca. 30 - 40 år.

Etablering af depoter til hhv. forurenet og ren jord.

Hensyn:

- Adgangsforhold fra Refshaleøen.
- Forurenet jord kræver særlig beskyttelse og tætte indfatninger.
- Geotekniske forhold.
- Indfatning
    - Forurenet jord - > tætte indfatninger
    - Ren jord -> flere mulige indfatningsløsninger



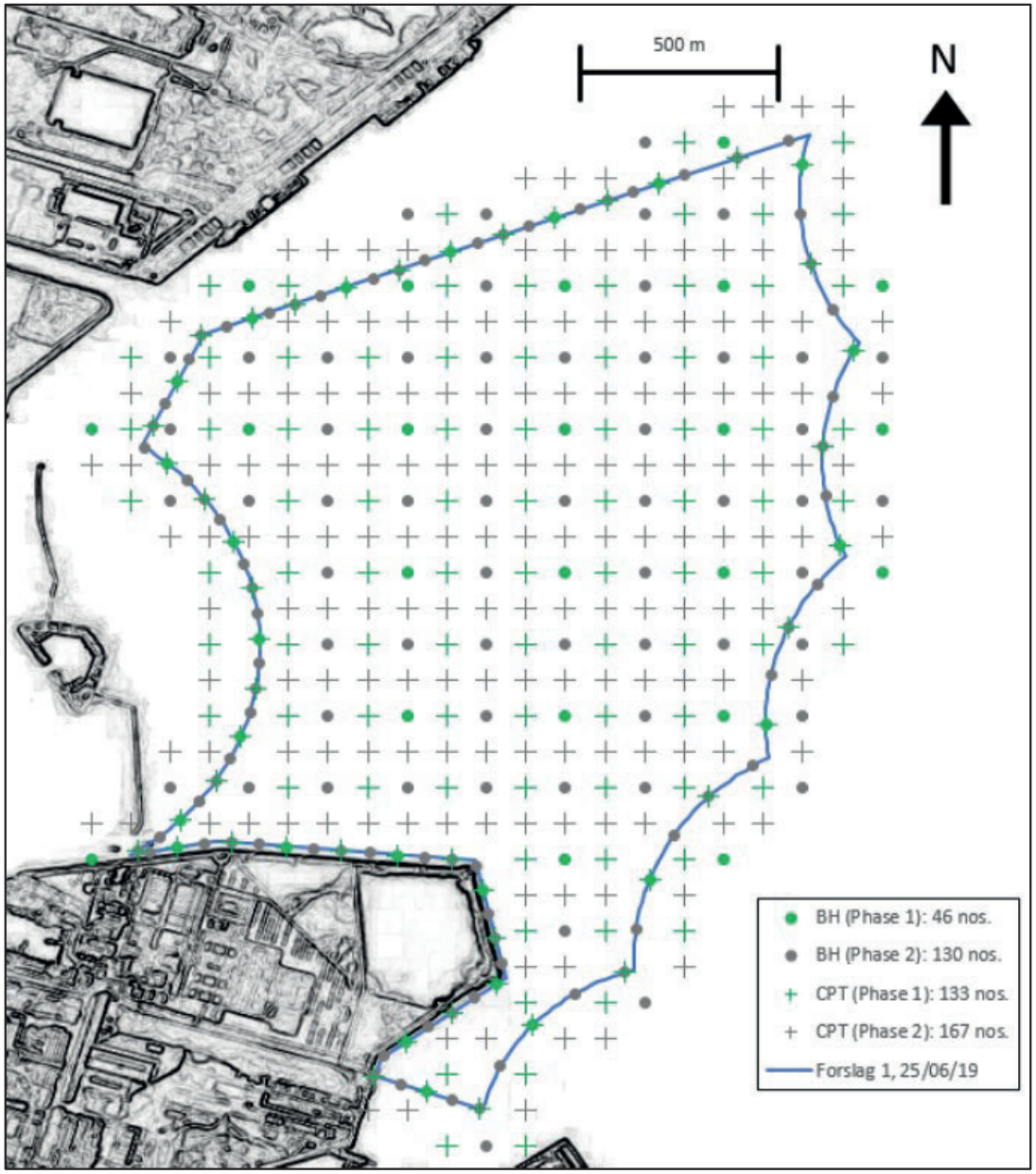
BY&HAVN

Tabel 1 *Nøgletal for fase 1*

	Number of tests	Tentative test length [m]
Boreholes	**46**	**431**
To top of limestone	28	181
5 m into limestone	16	213
10 m into limestone	2	36
CPTu	**133**	**882**
To top of limestone	133	882

Tabel 2 *Nøgletal for fase 2*

	Number of tests	Tentative test length [m]
Boreholes	**130**	**1220**
To top of limestone	75	462
5 m into limestone	51	685
10 m into limestone	4	73
CPTu	**167**	**968**
To top of limestone	167	968



Fremtidens Byggeri

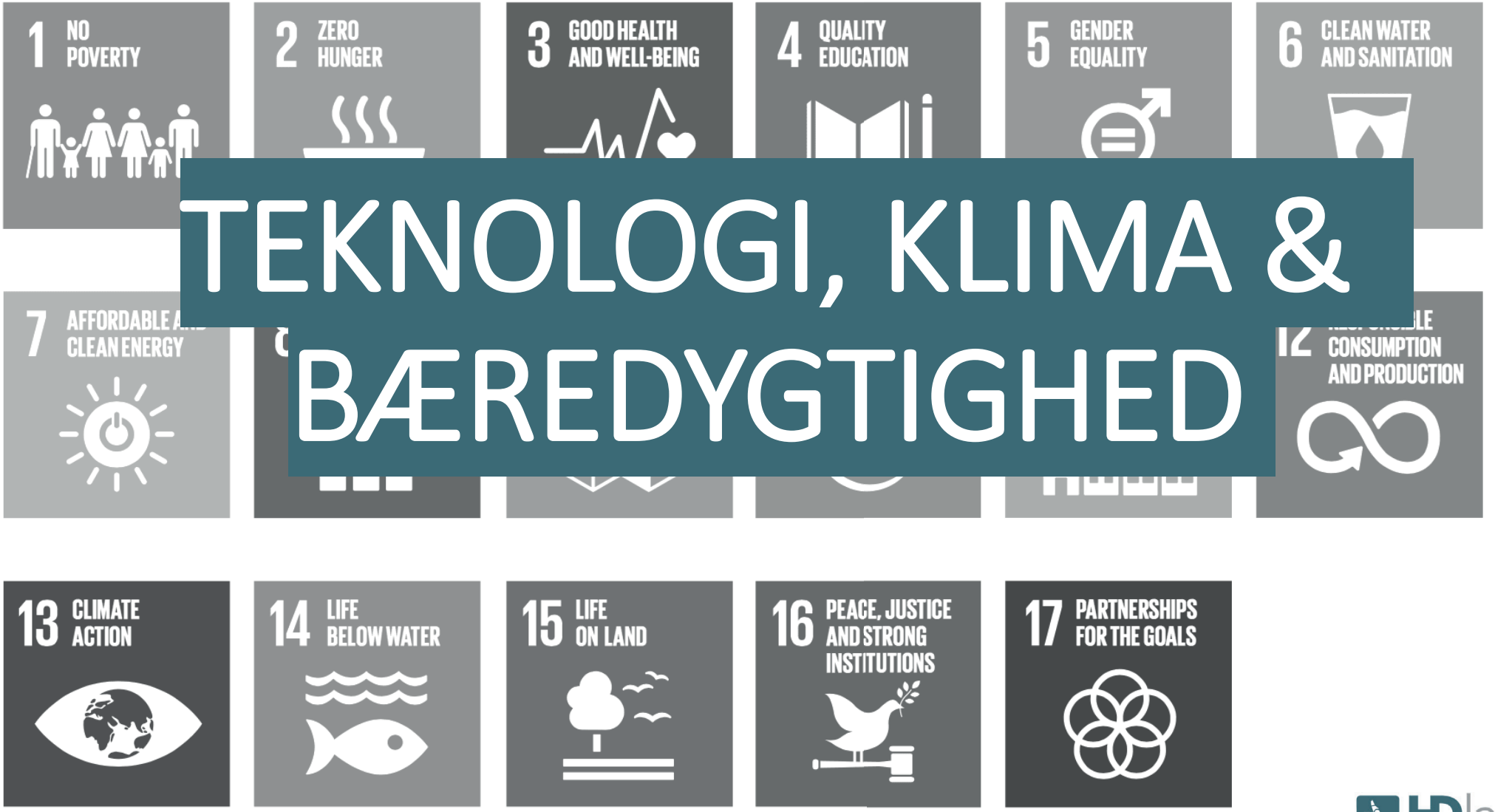
GSV
Mennesker før maskiner

CEO Niels W. Falk

HD Lab

GSV
Mennesker før maskiner

TEKNOLOGI, KLIMA & BÆREDYGTIGHED

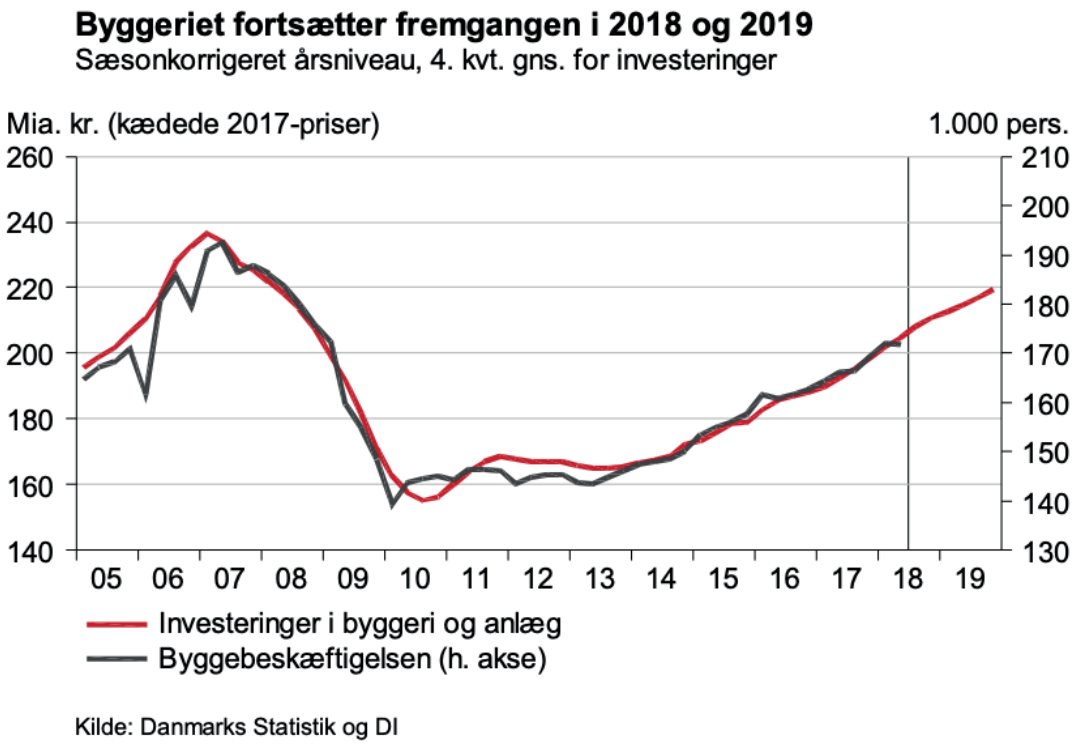


HDlab

KAN TEKNOLOGI GØR BYGGERIET GRØNNERE?

Bæredygtighed og tech er ikke altid super super simpelt…

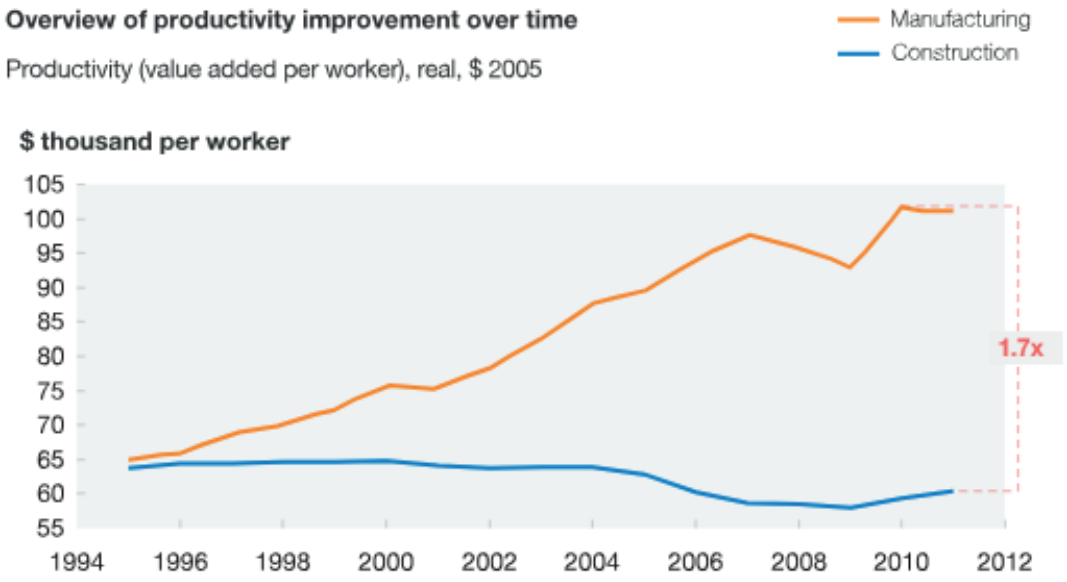
HDlab



Der er vækst i branchen, men mangel på arbejdskraft og materialer

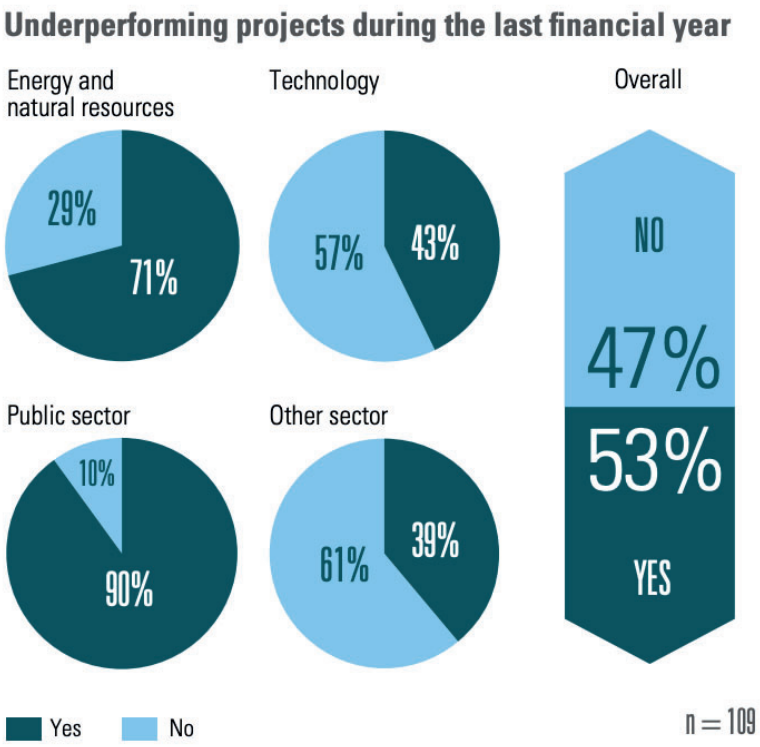
HDlab

Produktiviten er ikke vokset i byggebranchen



Source: Expert interviews; IHS Global Insight (Belgium, France, Germany, Italy, Spain, United Kingdom, United States); World Input-Output Database

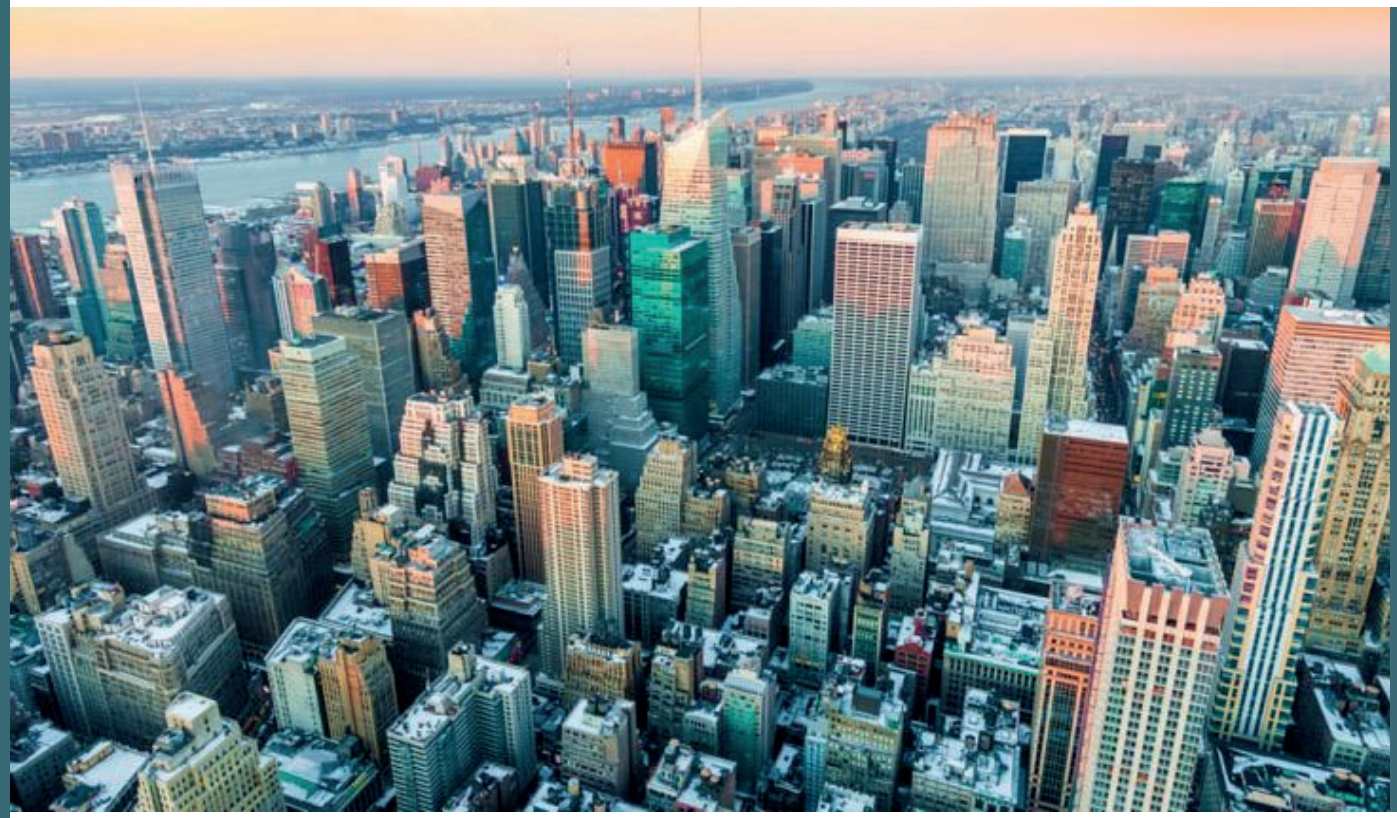
HDlab



Source: KPMG International, 2015

Byggeprojekter er risikable

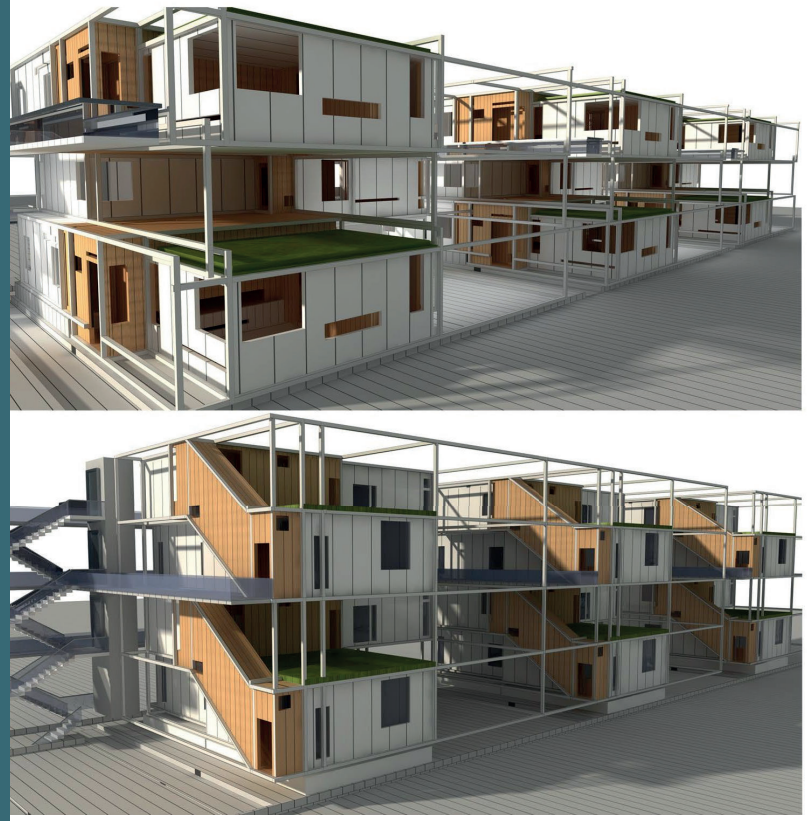
HDlab

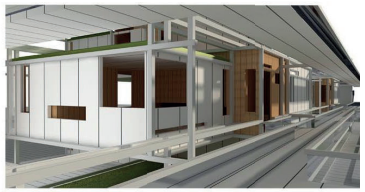


Verdens største forekomst af kobber er på Manhattan

HDlab

Design for Disassembly





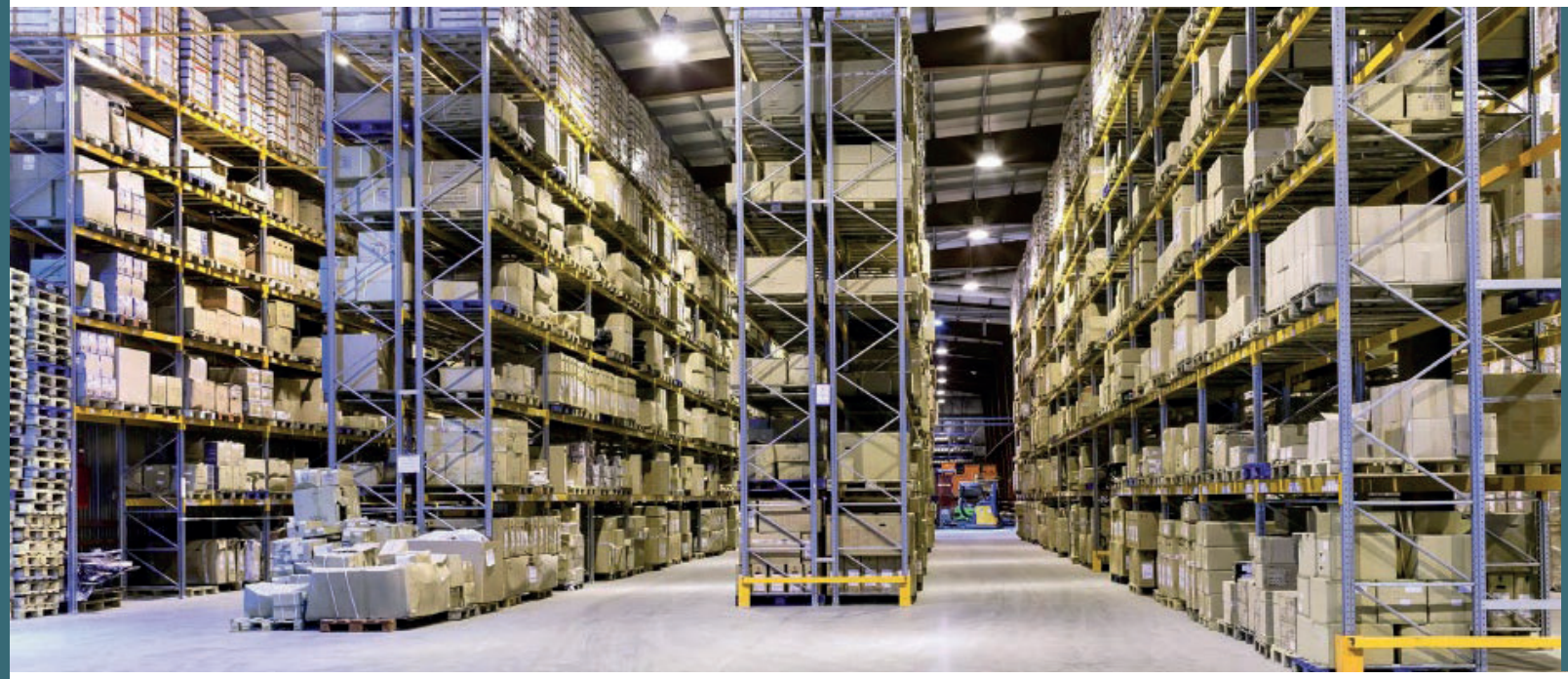
HDlab

Utilizationrate på maskiner på ca 12%

HDlab

Autonomous machines og deleøkonomi

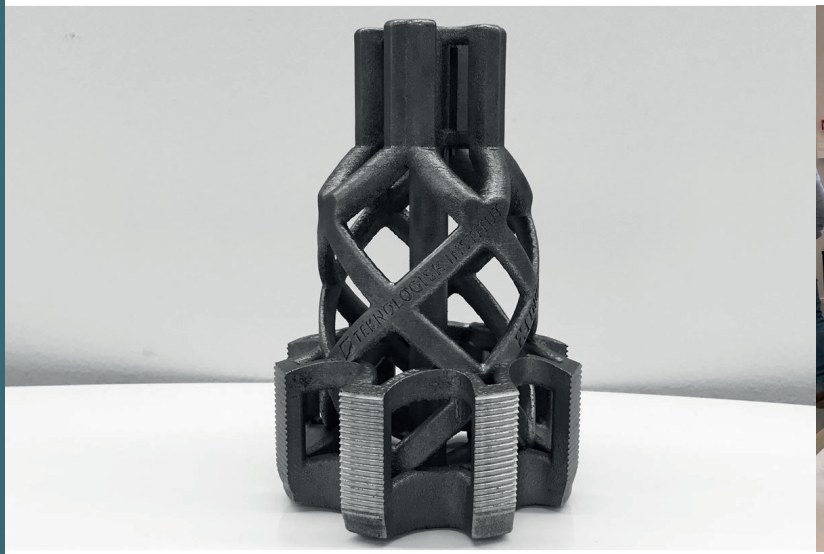
HDlab

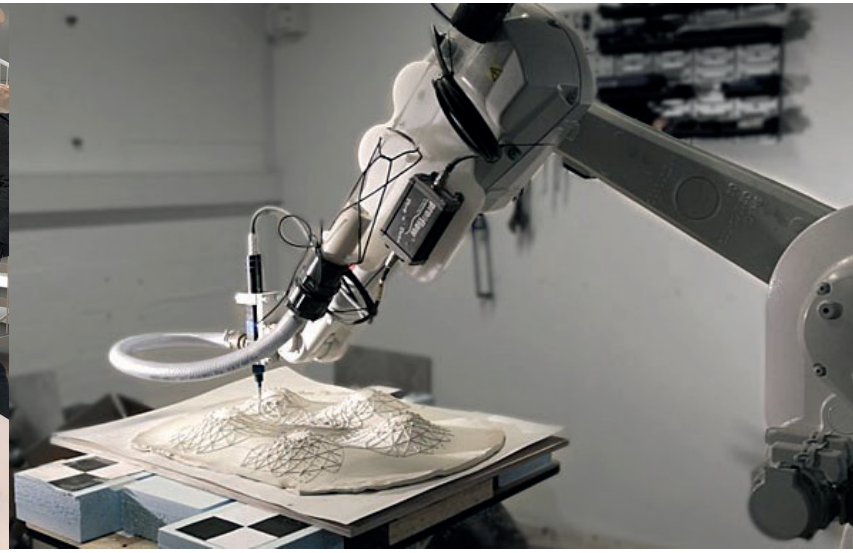


Mindre end 30% af producerede reservedel anvendes

HDlab

Additive manufactoring





Presset på de gule maskiner…

The construction industry accounts for about 20% of global emissions

UN17 Sustainability Goals

EU2030 Goals -40% CO2

Circular Construction

WORLD GREEN BUILDING COUNCIL

Regional agendas, requirements and legislation

Global Climate Agreements

70%
CO2 reduction in transportation

EU Directive 2016/1628 repeals 97/68/EC for non-road mobile machinery

New limits for non-road set by January 1st 2019

Construction is responsiable for 40% of energy use in production eg cement, iron and aluminium – targets set to reduce with 15%

Stakeholder and NGO call to action to reduce CO2

Demands and requirements on projects and from clients

Municipals and authorities

Emission levels are set locally to ensure reduction and minimize pollution

Investors and shareholders

Inventory, CSR and sustainability reporting and initiatives

Clients and owners

Certifications LEED, BREEAM, Swan/ECO-flower, DGNB, Active house – all LCA/LCC require emission actions in execution

Prequalification and tender requirements

The effect for construction equipment

Producers and users

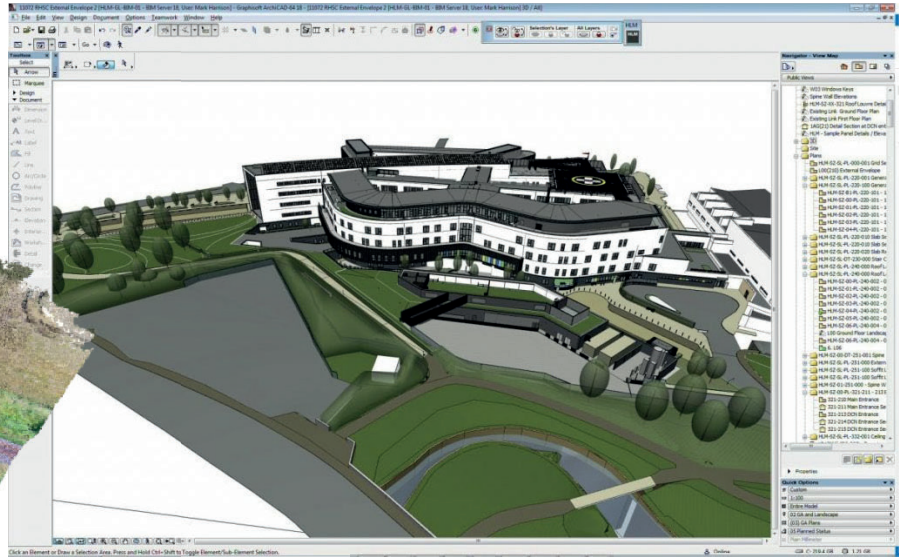
Construction equipment that emits less CO2, NOx, CO and HC

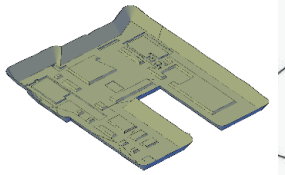
More productive equipment, that is operational shorter time

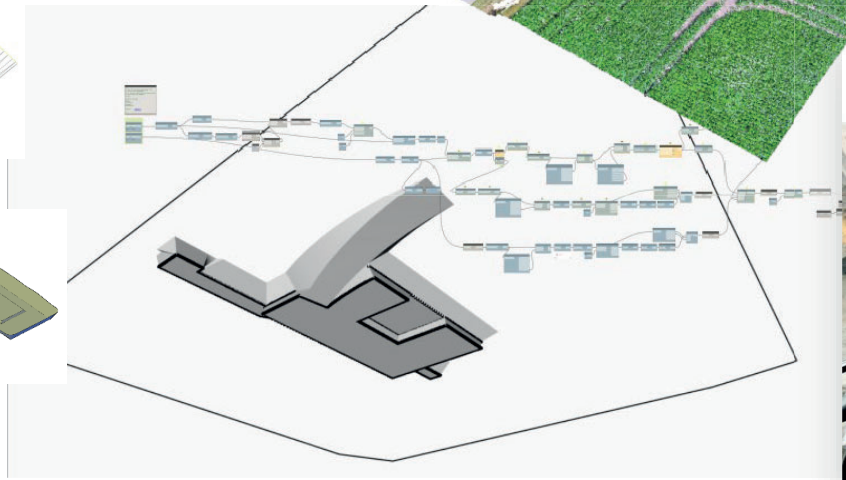
Machinery produced with different lifespan and production pollution foot print in life cycle

HDlab

Maskinstyring

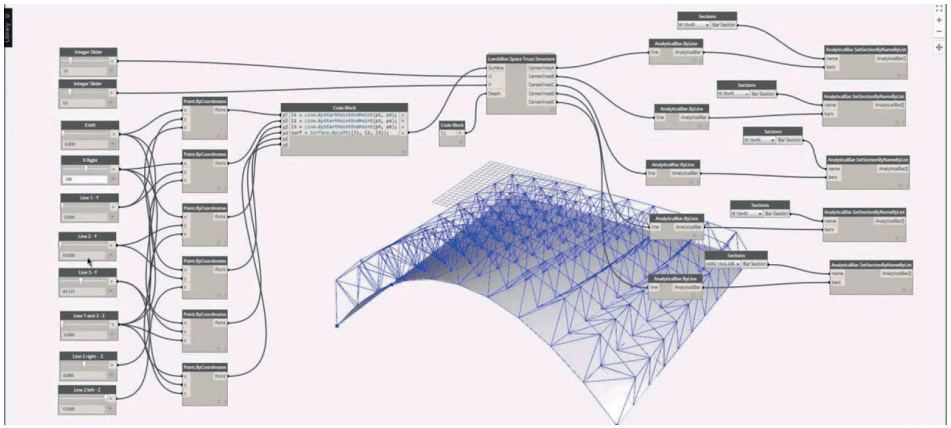


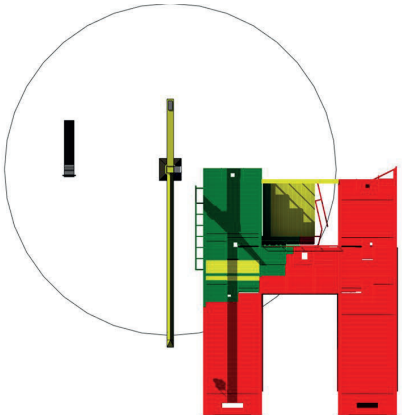


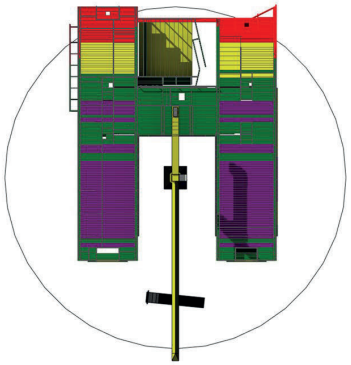


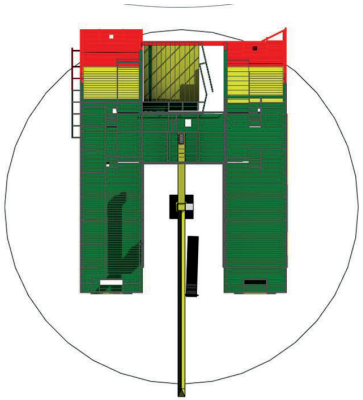
HDlab

Computational BIM and generative design

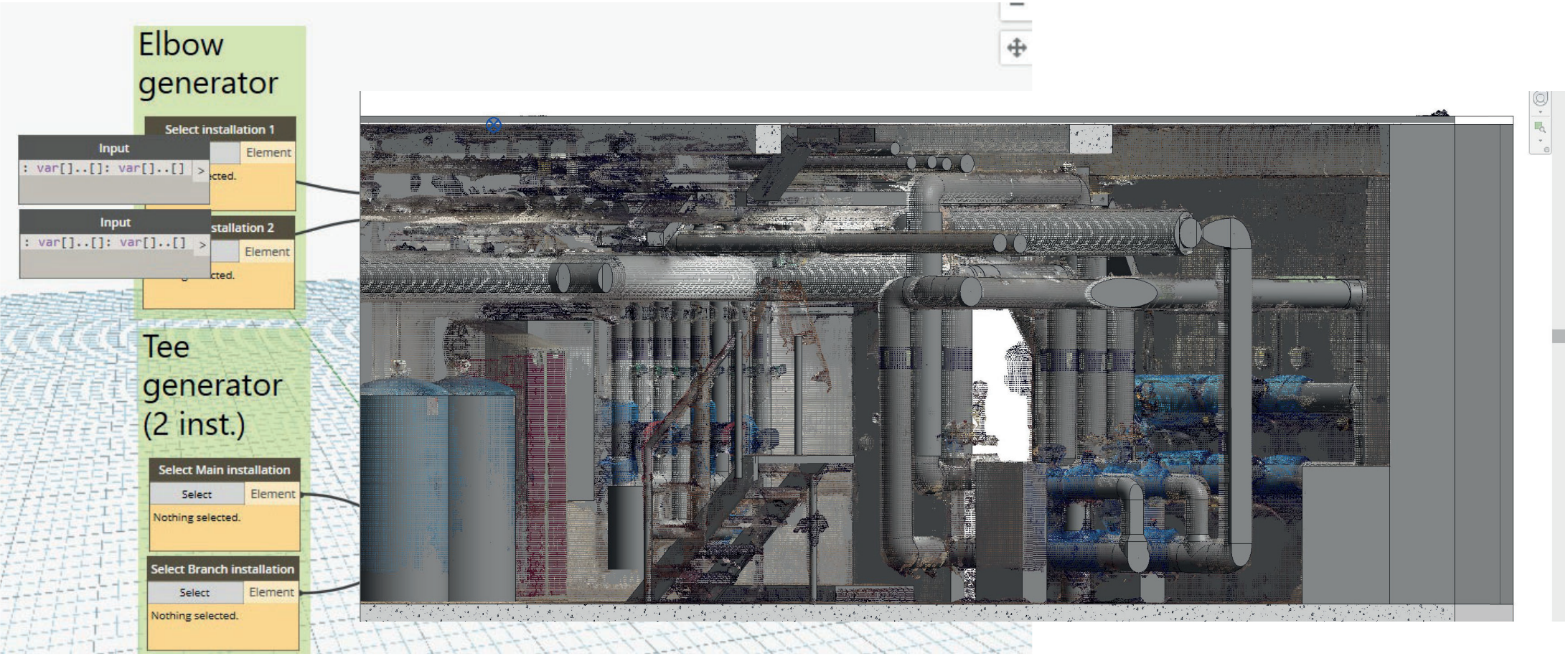


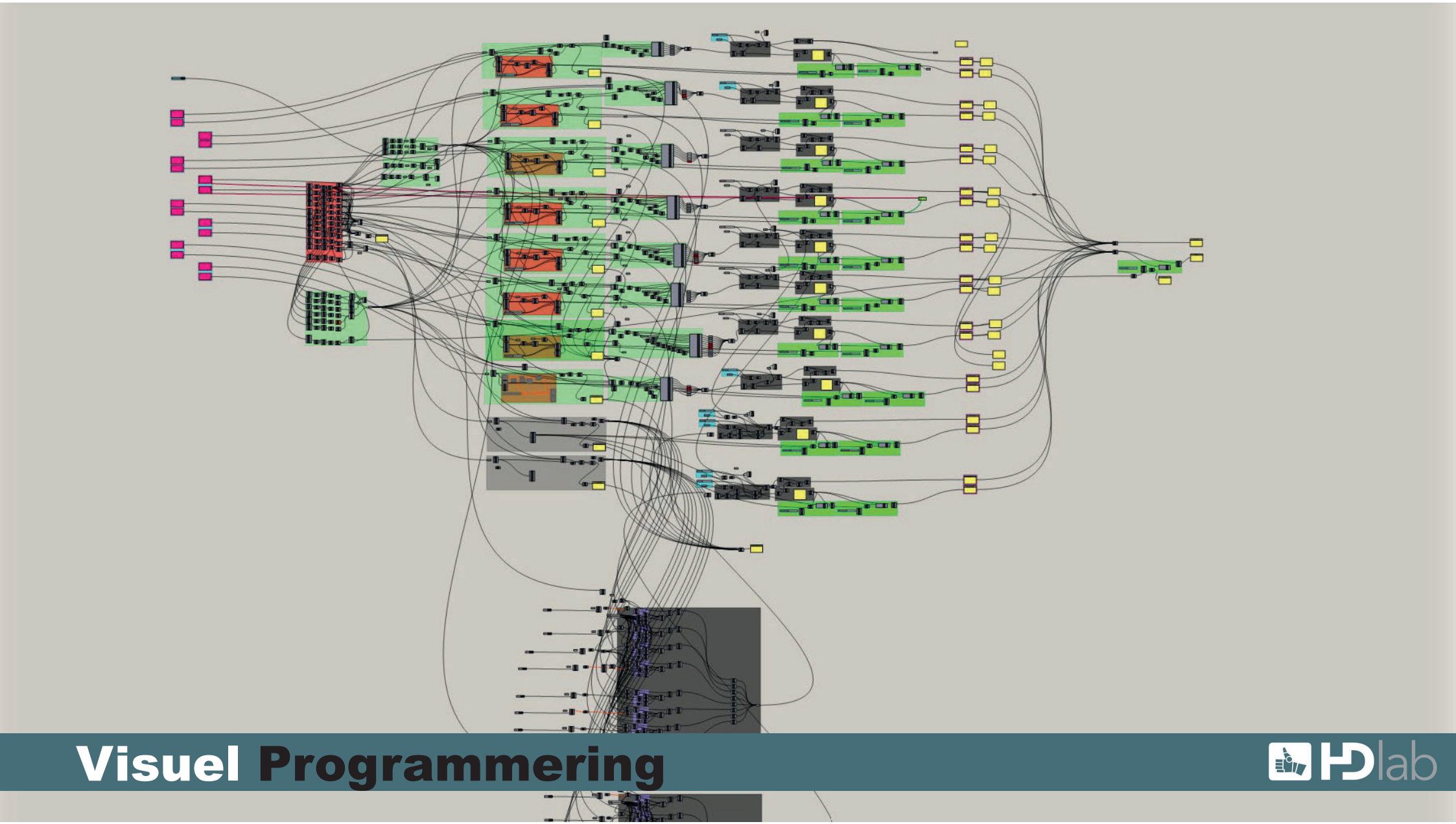






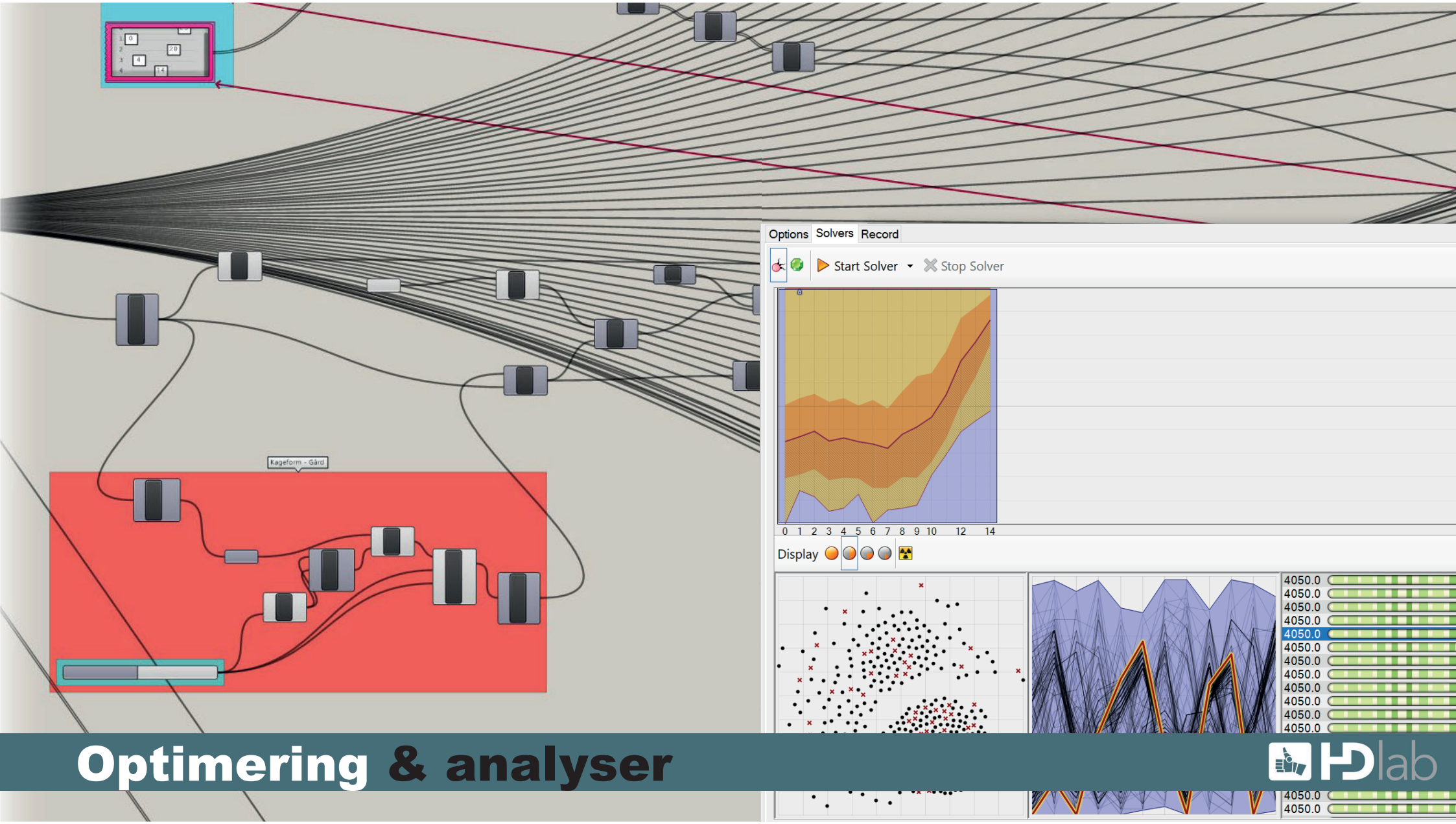
Automated Modellering





Visuel Programmering

HDlab

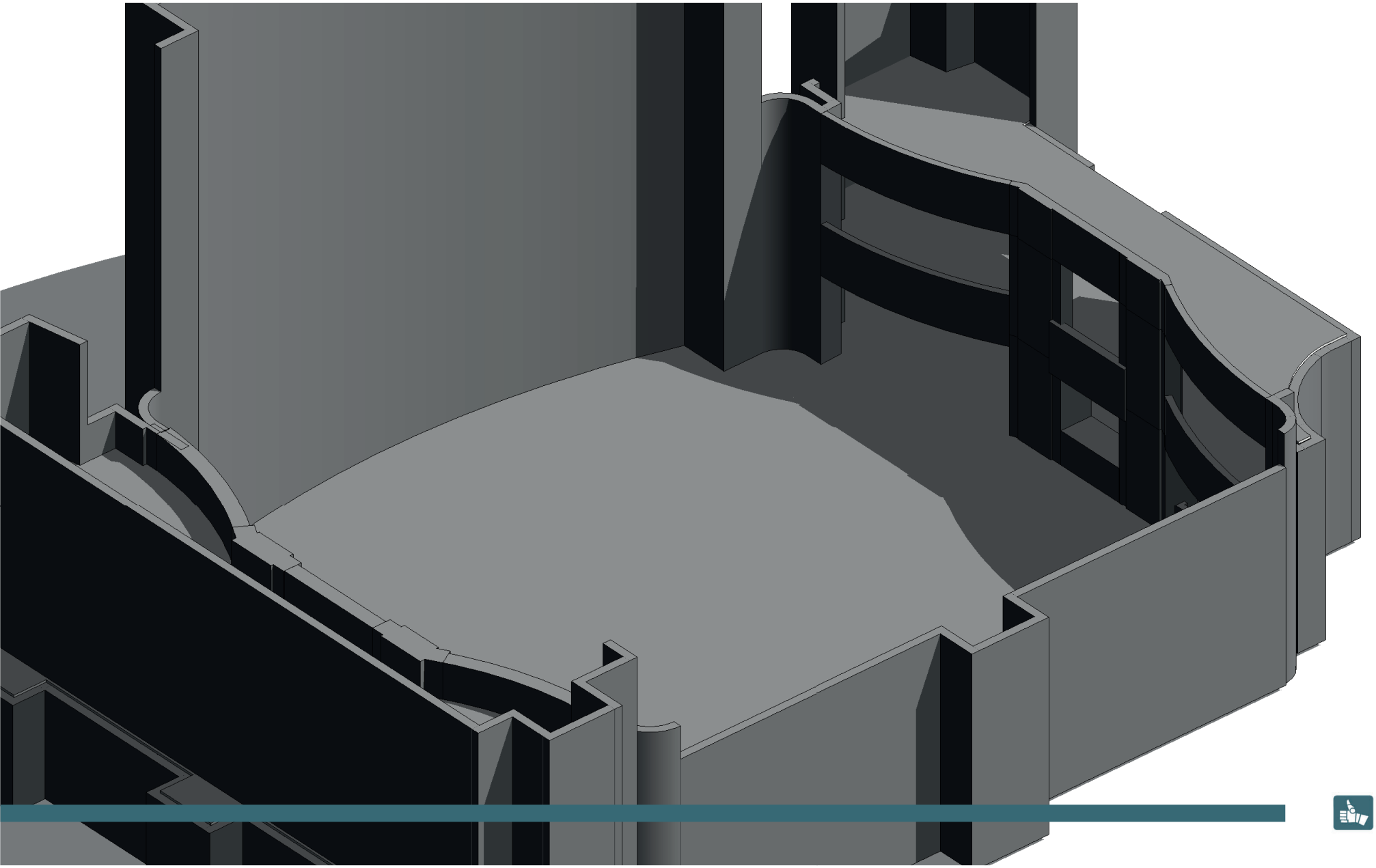


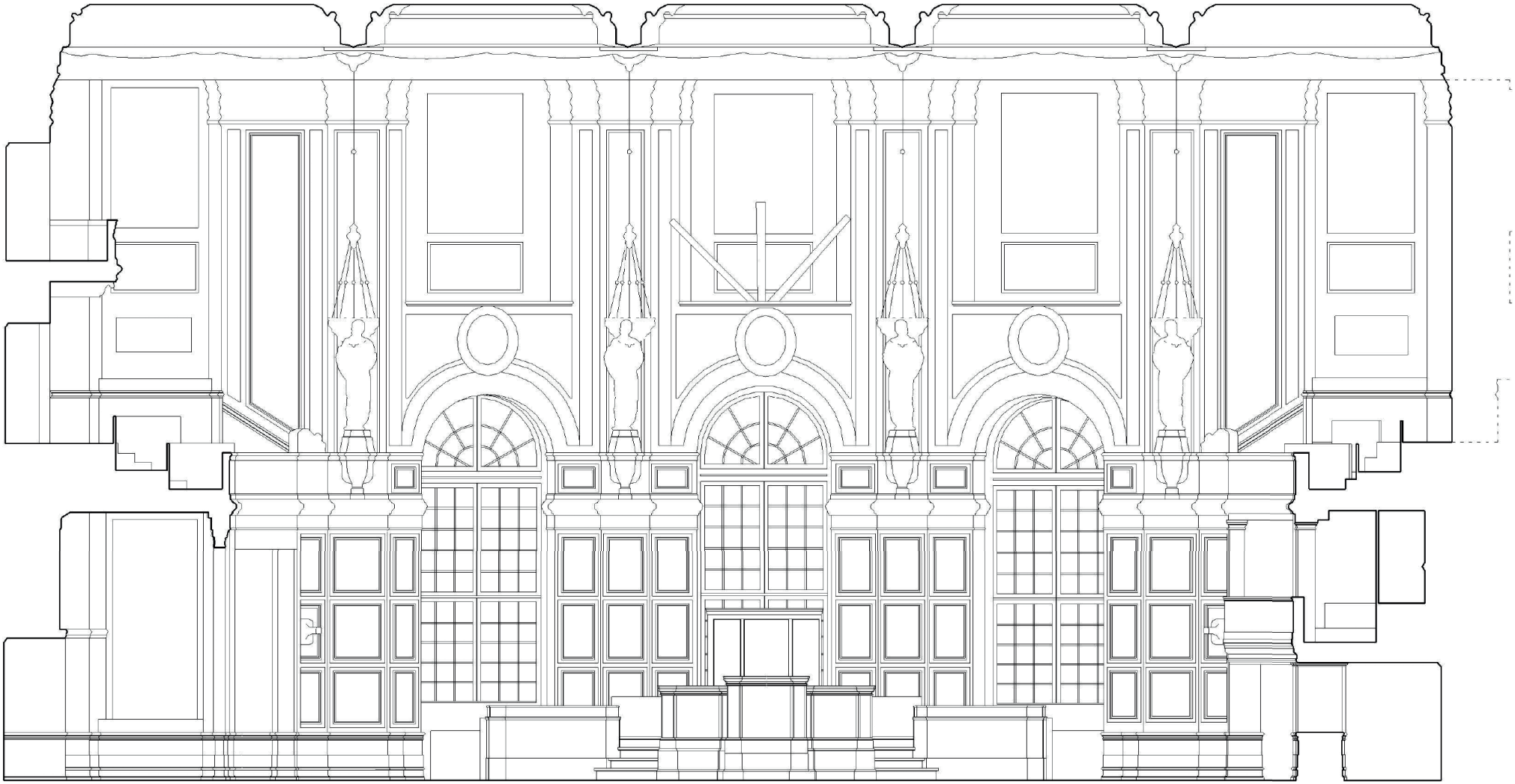
Optimering & analyser

HDlab

HDlab
Help | Terms

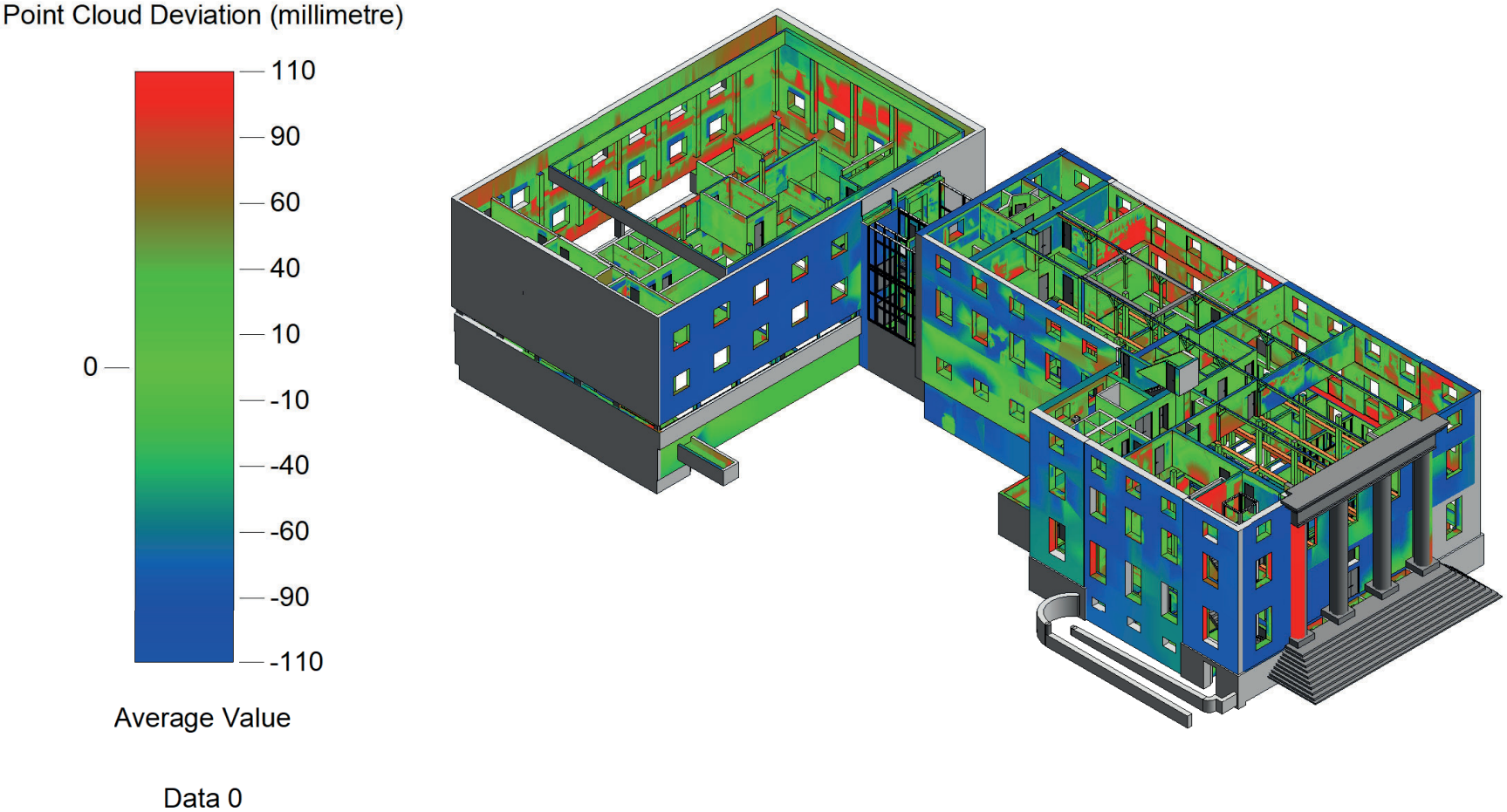
100%
66%
33%
0.527 m
2.395 m
2.398 m
6.120 m
0.825 m
10.573 m
TYPE in a new distance or use TAB to edit other dimensions.
Limit Box
Reset
Pick
Options
Cancel
-4.454 m
HDlab





0 1 2 3 4 5 6 7 8 9 10 meter

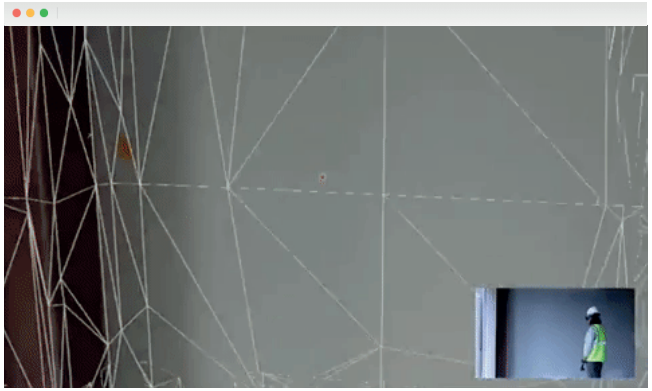
HDlab


Point Cloud Deviation (millimetre)
110
90
60
40
10
0
-10
-40
-60
-90
-110
Average Value
Data 0

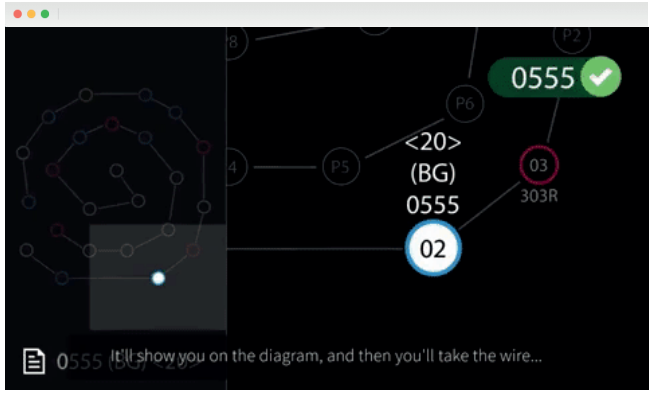
Virtual / Augmented / Mixed Reality

Materiale lånt fra DAQRI

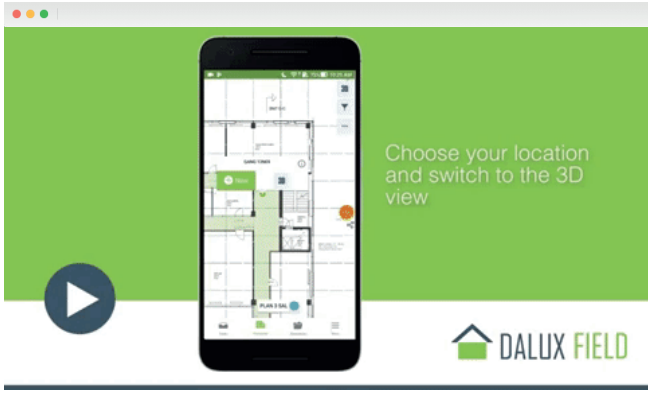
Materiale lånt fra RealWear



Materiale lånt fra Microsoft + Trimble



Materiale lånt fra Google / X + Boeing

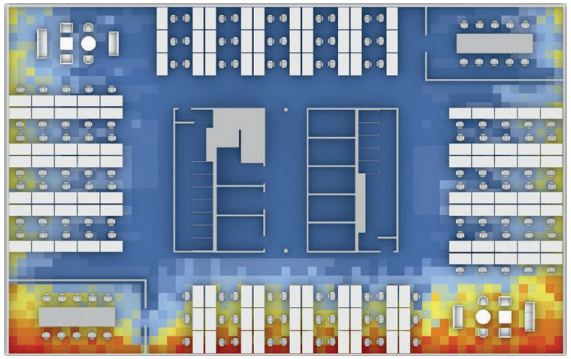


Materiale lånt fra Dalux

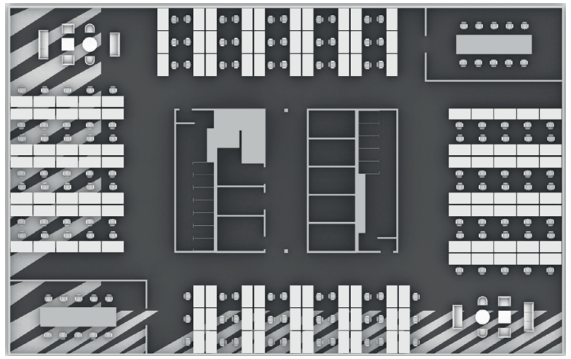
Materiale lånt fra Oculus

HDlab

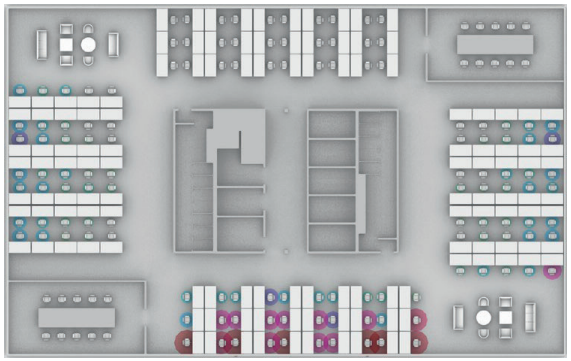
Analysis



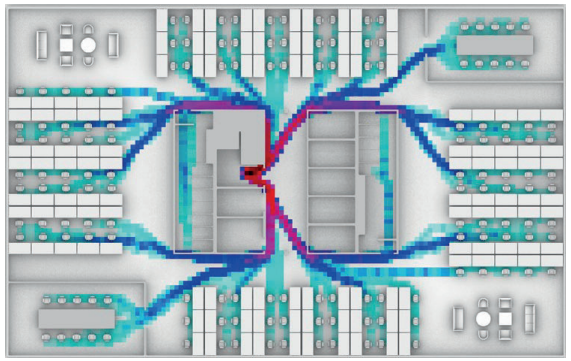
Solar



Shadows

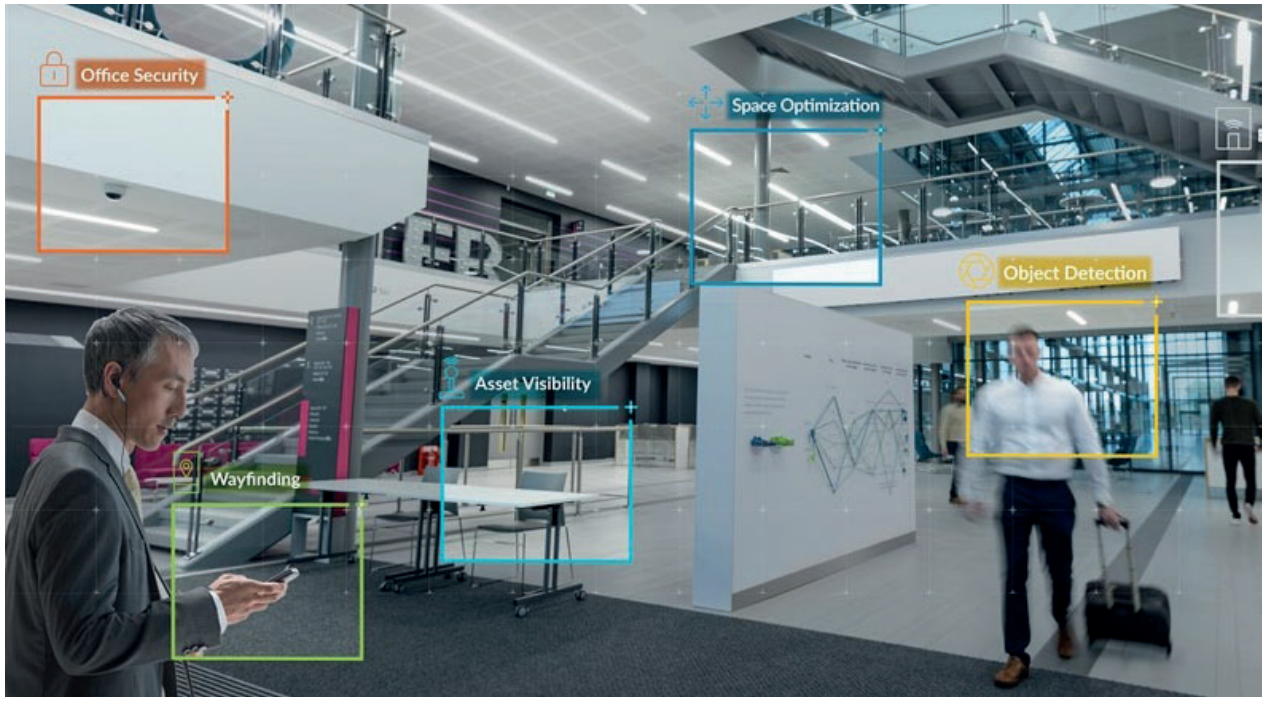


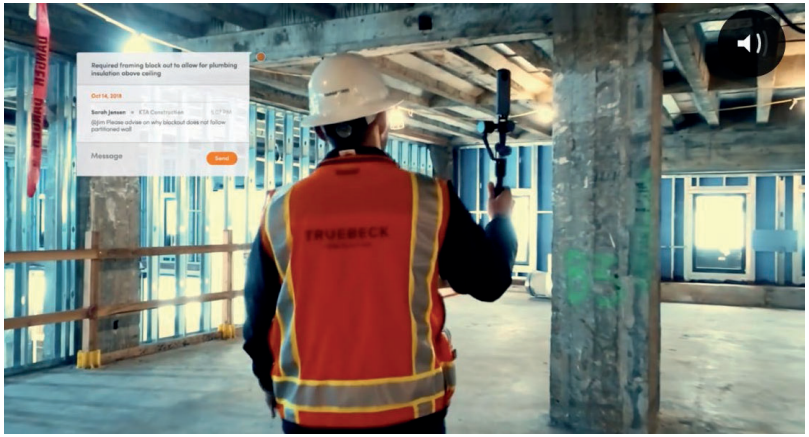
Daylight



Fire Escape Plan

IOT, sensorer og kamerarer

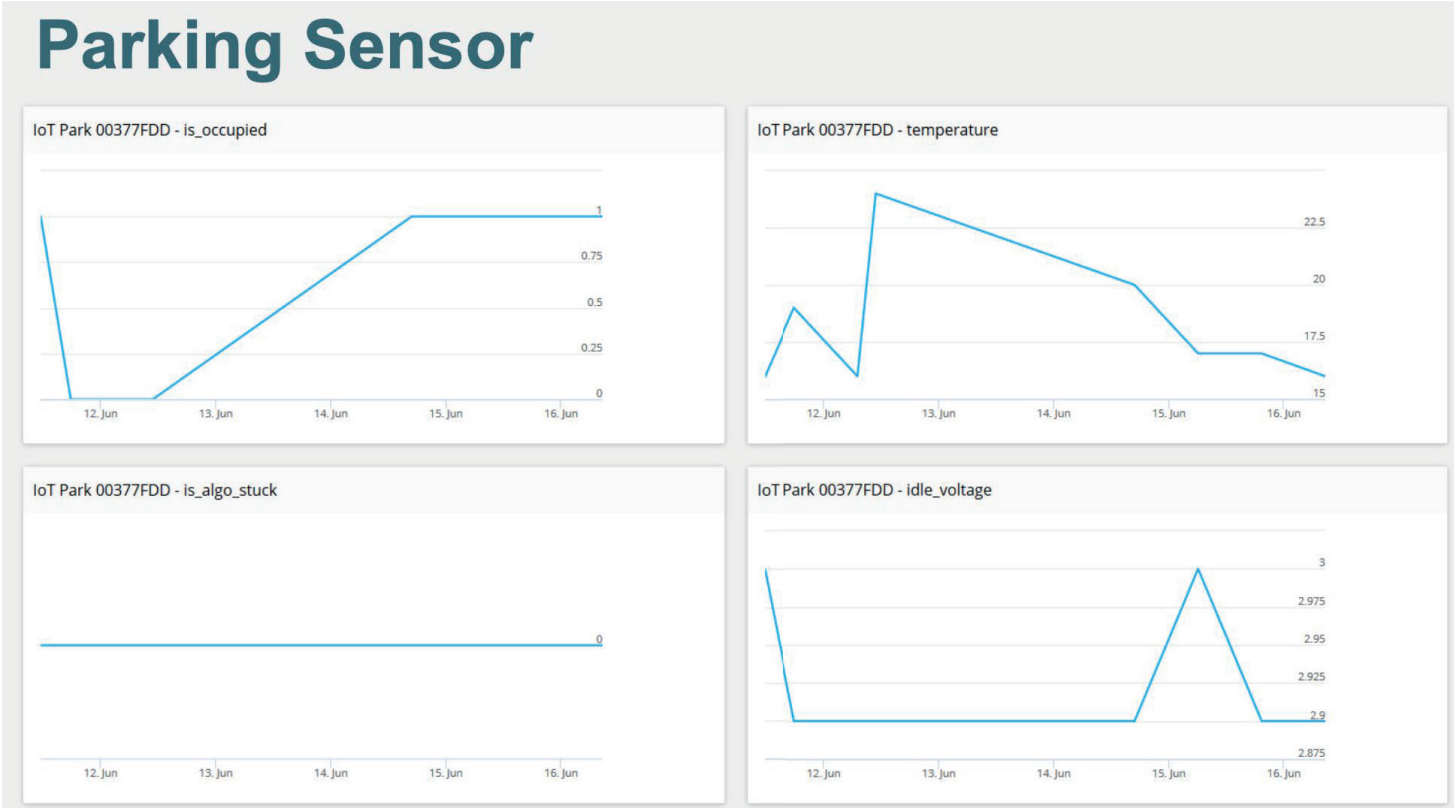




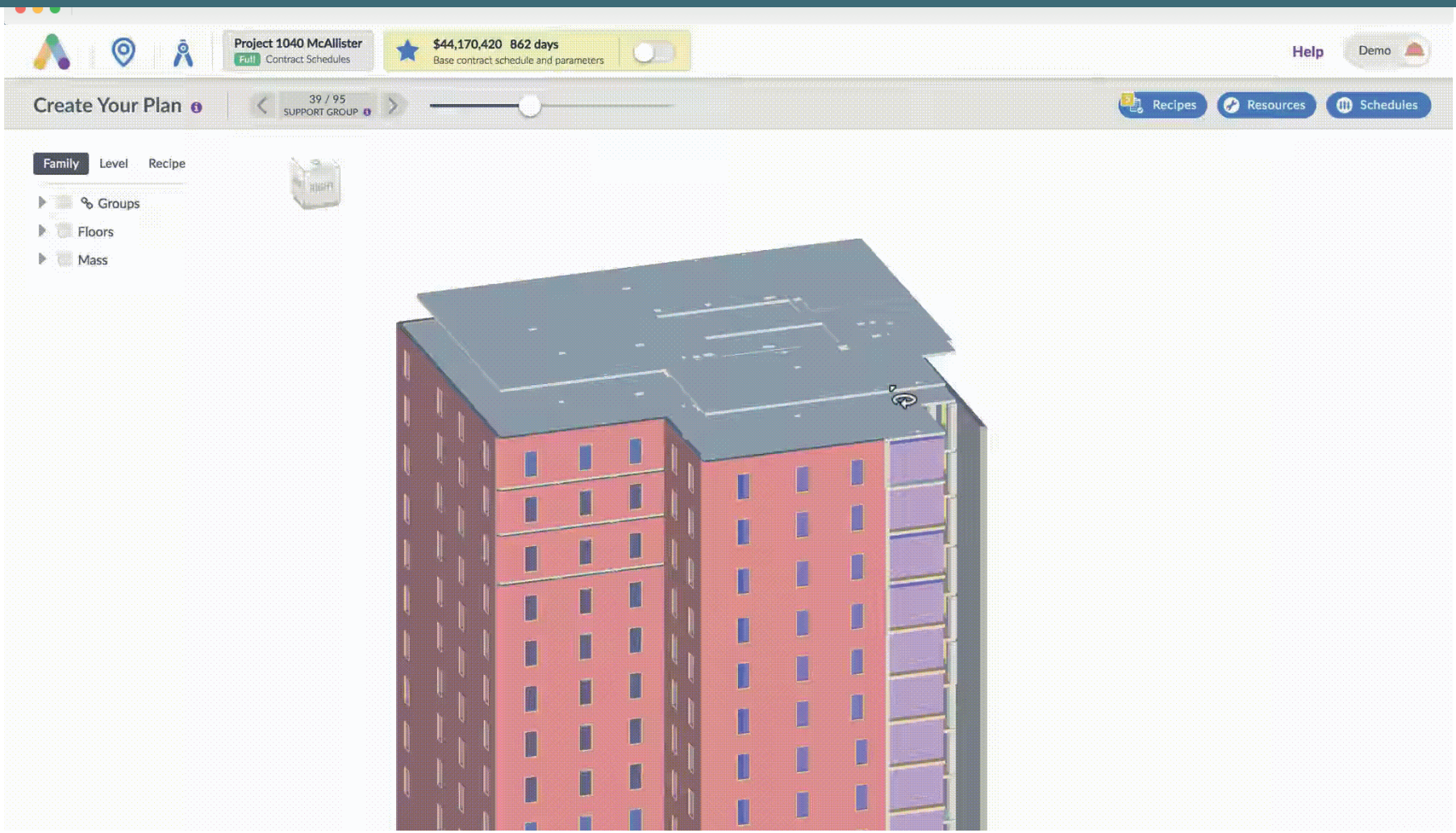
HDlab

Kommende teknologier - Digital Twin

IOT og sensorer

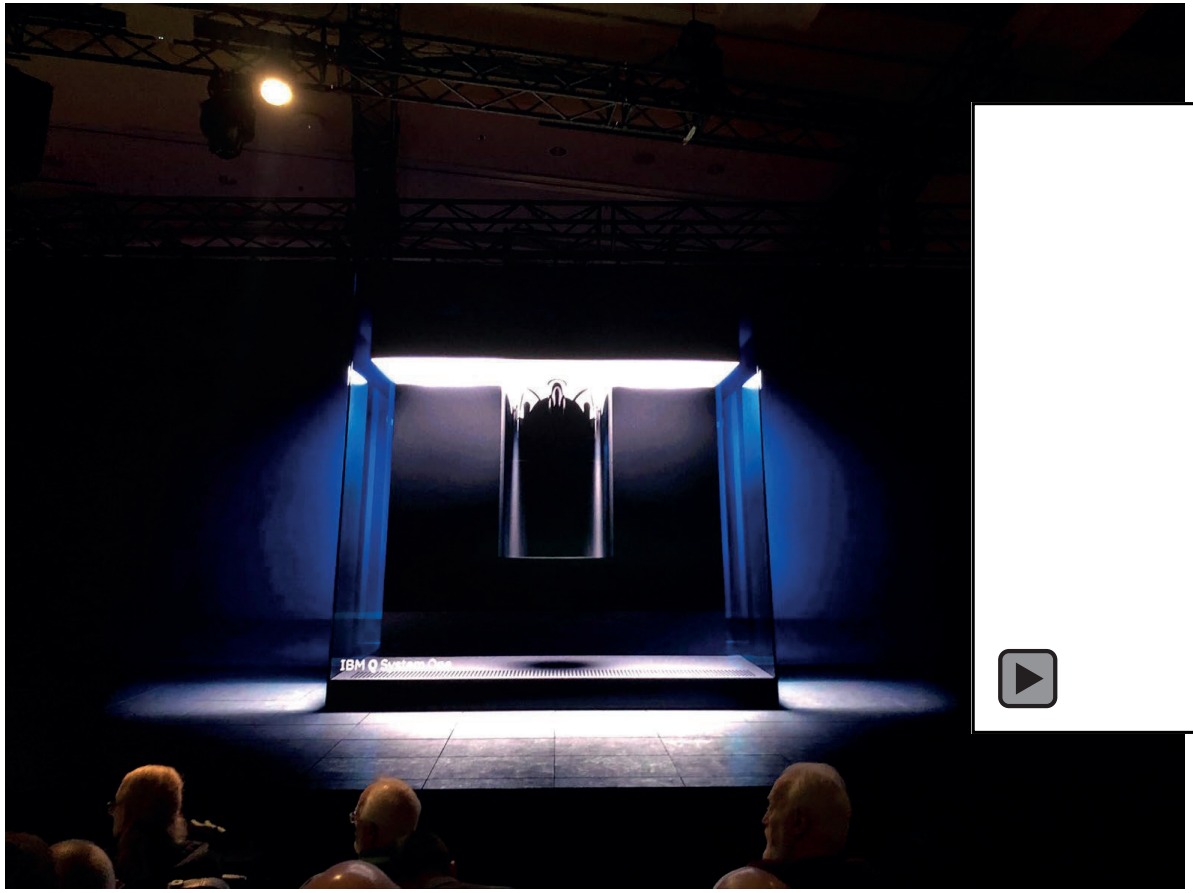


Kommende teknologier - AI

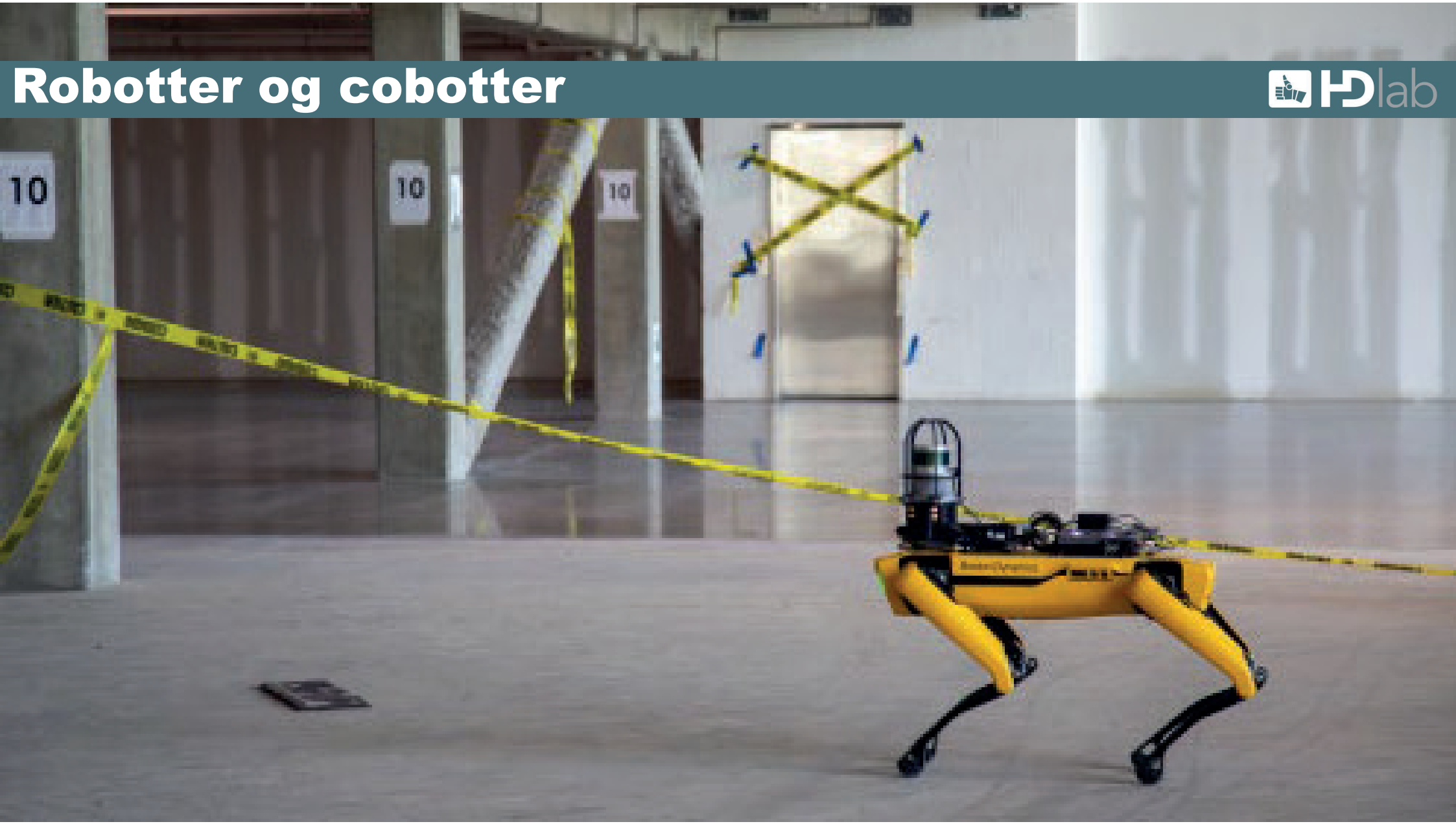


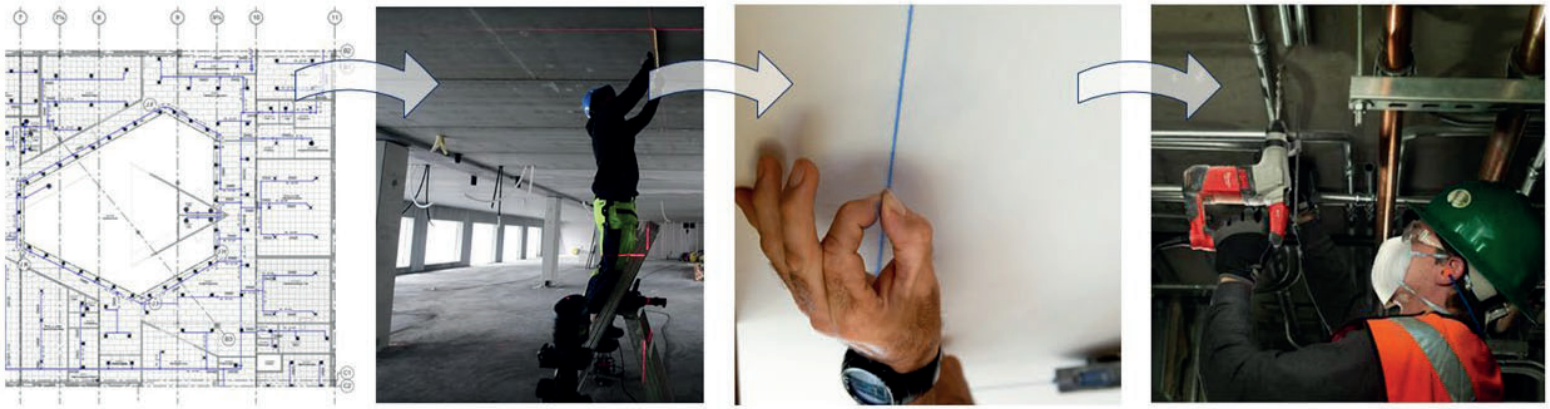
HDlab

Quantum Computing

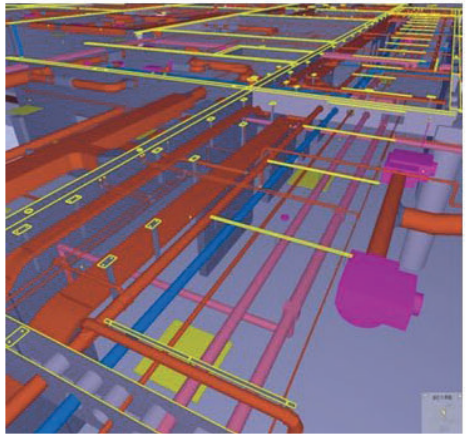


Robotter og cobotter





Robots, Cobots and Exoskeletons



HDlab

Byggepladsrobotter

Materiale lånt fra DJI

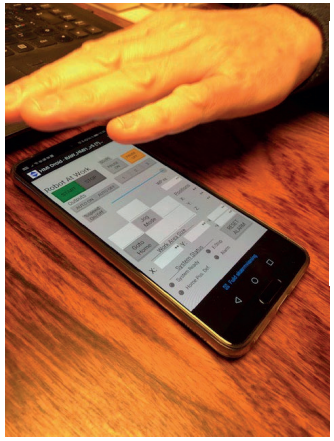
Materiale lånt fra Construction Robotics

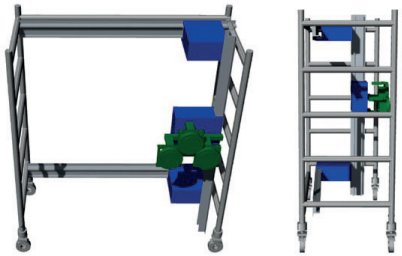
Materiale lånt fra tmsuk

Materiale lånt fra nLink

HDlab

HD Lab | Robotter





HDlab

HD Lab | Exoskeletter

HDlab

Men hvor kommer teknologien fra?

Fremtidens Byggeri

GSV
Mennesker før maskiner