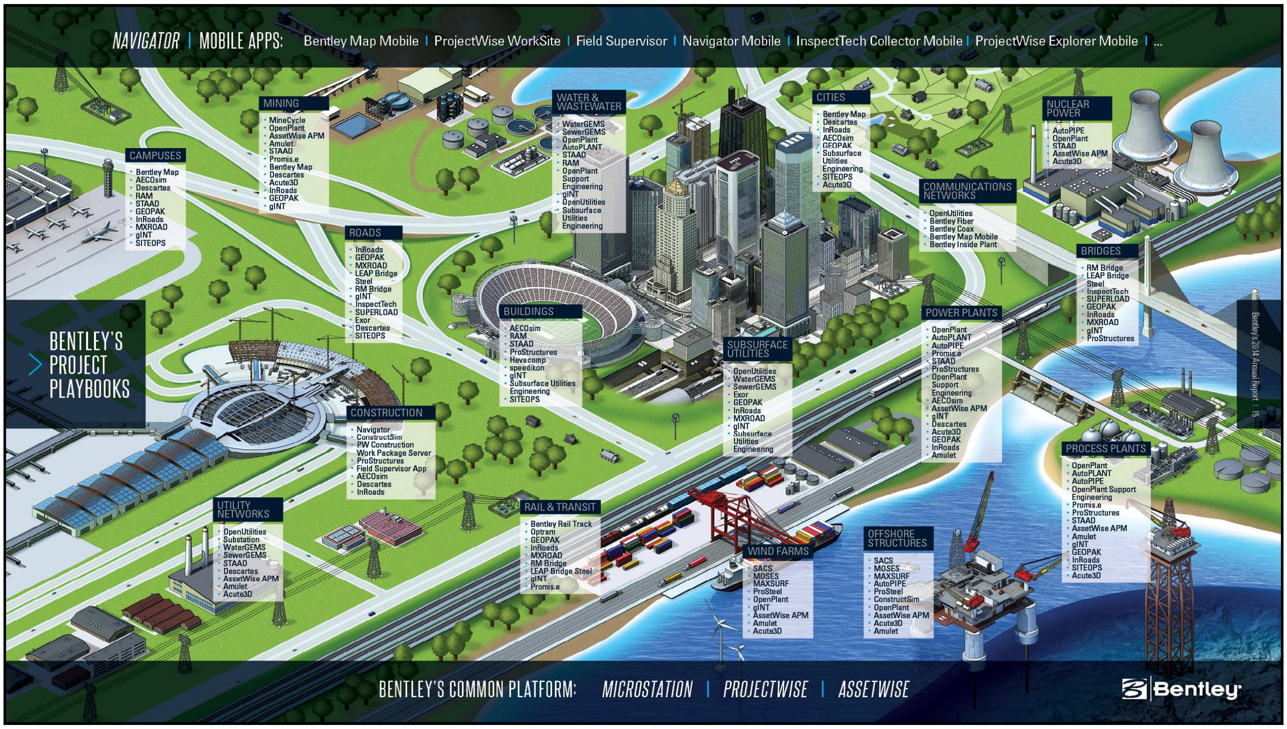
Going Digital to Advance the 2030 Sustainable Development Agenda
迈向数字化助力2030年可持续发展议程

杨春强 Alex Yang
Bentley 软件（北京）有限公司

Bentley
Advancing Infrastructure

Bentley's mission is to provide ***innovative software and services*** for the enterprises and professionals who ***design, build, and operate*** the world's infrastructure – sustaining the global economy and environment for ***improved quality of life***.

Bentley的使命是致力于向全球可持续发展基础设施领域的设计师、建造者及运营管理人员提供创新性的软件和服务，以提高他们的工作质量和效率。


NAVIGATOR | MOBILE APPS: Bentley Map Mobile | ProjectWise WorkSite | Field Supervisor | Navigator Mobile | InspectTech Collector Mobile | ProjectWise Explorer Mobile | ...
CAMPUSES
Bentley Map
AECOsim
Descartes
RAM
STAAD
GEOPAK
InRoads
MXROAD
gINT
SITEOPS
MINING
MineCycle
OpenPlant
AssetWise APM
Amulet
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Promis.e
Bentley Map
Descartes
Acute3D
InRoads
GEOPAK
gINT
WATER & WASTEWATER
WaterGEMS
SewerGEMS
OpenPlant
AutoPLANT
STAAD
RAM
OpenPlant Support Engineering
gINT
OpenUtilities
Subsurface Utilities Engineering
CITIES
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InRoads
AECOsim
GEOPAK
Subsurface Utilities Engineering
SITEOPS
Acute3D
NUCLEAR POWER
AutoPIPE
OpenPlant
STAAD
AssetWise APM
Acute3D
COMMUNICATIONS NETWORKS
OpenUtilities
Bentley Fiber
Bentley Coax
Bentley Map Mobile
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ROADS
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BENTLEY'S PROJECT PLAYBOOKS
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OpenUtilities
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Acute3D
GEOPAK
InRoads
Amulet
Bentley's 2014 Annual Report | 15
CONSTRUCTION
Navigator
ConstructSim
PW Construction Work Package Server
ProStructures
Field Supervisor App
AECOsim
Descartes
InRoads
PROCESS PLANTS
OpenPlant
AutoPLANT
AutoPIPE
OpenPlant Support Engineering
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STAAD
AssetWise APM
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GEOPAK
InRoads
SITEOPS
Acute3D
UTILITY NETWORKS
OpenUtilities
Substation
WaterGEMS
SewerGEMS
STAAD
Descartes
AssetWise APM
Amulet
Acute3D
RAIL & TRANSIT
Bentley Rail Track
Optram
GEOPAK
InRoads
MXROAD
RM Bridge
LEAP Bridge Steel
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WIND FARMS
SACS
MOSES
MAXSURF
ProSteel
OpenPlant
gINT
AssetWise APM
Amulet
Acute3D
OFFSHORE STRUCTURES
SACS
MOSES
MAXSURF
AutoPIPE
ProSteel
ConstructSim
OpenPlant
AssetWise APM
Acute3D
Amulet
BENTLEY'S COMMON PLATFORM: MICROSTATION | PROJECTWISE | ASSETWISE
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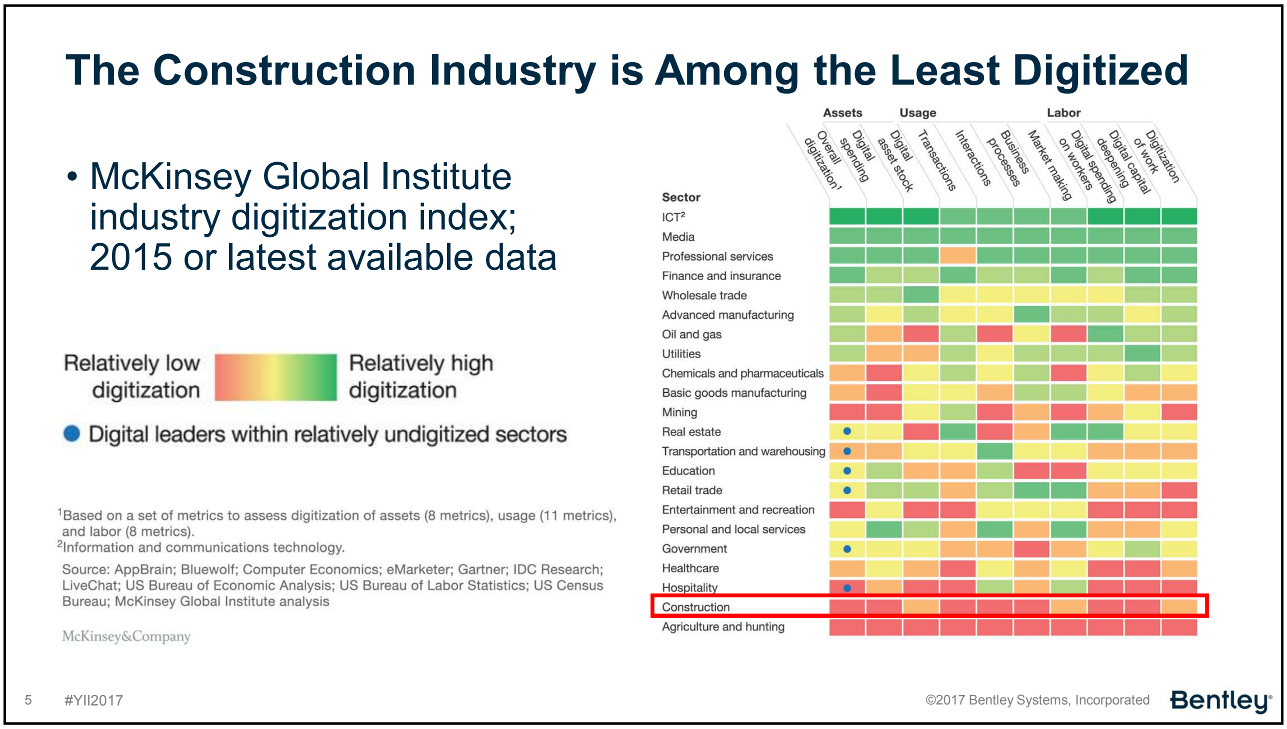
2030 Sustainable Development Agenda 《2030年可持续发展议程》

- It was officially launched in January 1, 2016. The New Agenda calls on all countries to act now to achieve 17 sustainable development goals over the next 15 years.
- It was adopted at the seventieth session of the United Nations General Assembly in 2016.
- 于2016年在联合国大会第七十届会议上通过。
- 于2016年1月1日正式启动。新议程呼吁各国现在就采取行动，为今后15年实现17项可持续发展目标而努力。

- 目标6.为所有人提供水和环境卫生并对其进行可持续管理
- 目标7.确保人人获得负担得起的、可靠和可持续的现代能源
- 目标9.建造具备抵御灾害能力的基础设施，促进具有包容性的可持续工业化，推动创新
- 目标11.建设包容、安全、有抵御灾害能力和可持续的城市和人类住区
- 目标13.采取紧急行动应对气候变化及其影响*
- 目标14.保护和可持续利用海洋和海洋资源以促进可持续发展



The Construction Industry is Among the Least Digitized

- McKinsey Global Institute industry digitization index; 2015 or latest available data

[1] Based on a set of metrics to assess digitization of assets (8 metrics), usage (11 metrics), and labor (8 metrics).
[2] Information and communications technology.

Source: AppBrain; Bluewolf; Computer Economics; eMarketer; Gartner; IDC Research; LiveChat; US Bureau of Economic Analysis; US Bureau of Labor Statistics; US Census Bureau; McKinsey Global Institute analysis

McKinsey&Company

GOING DIGITAL
THE MILLENNIALS
THE DIGITAL GENERATION
THE CONNECTED TEAM

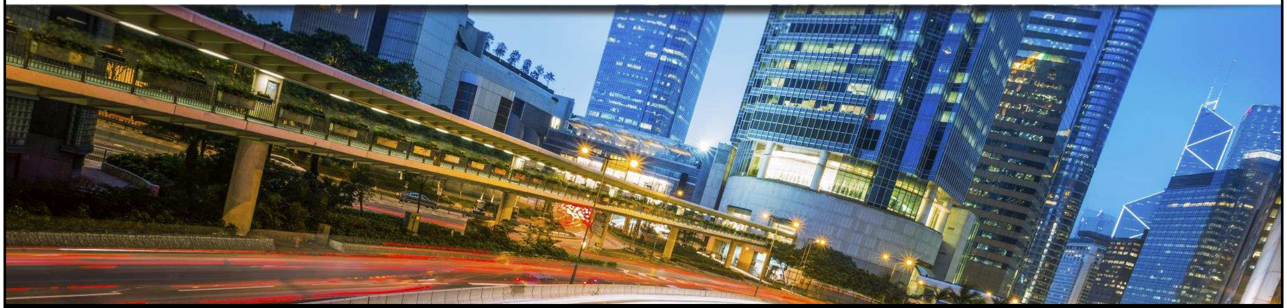
Data comes from many sources

CROWDSOURCING
CROWD
PROJECT
CROWDSOURCED
INDIVIDUALS
INTERNET
PARTICIPATION
MAINTENANCE RECORD
DATE
BY
Emergency Operations Plan
MindSphere
RIGHT SIDE VIEW
SOUTH SIDE VIEW
LOWER LEVEL PLAN
FIRST FLOOR PLAN

Some of the Challenges

- Data Overload
- Finding the right data
- Data Completeness / Quality
- Getting access is not always easy (IP, terms of use)
- Government agencies are not always the first to implement novel solutions
- Security Concerns
- ‘Silo’ mentality

- 数据过载
- 寻找正确的数据
- 数据完整性/质量
- 获取访问并不总是容易的（IP，使用条款）
- 政府机构并不总是第一个实施新解决方案的机构。
- 安全问题
- “孤岛”思维



Going Digital Use Cases

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Goal 6

Ensure access to water and sanitation for all
为所有人提供水和环境卫生并对其进行可持续管理

Selected Targets

- By 2030, **achieve access to adequate and equitable sanitation** and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
- 到2030年，实现人人享有适当和公平的卫生设施和卫生，并结束公开排便，特别注意妇女和女孩以及处境脆弱的妇女的需要。
- By 2030, **improve water quality by** reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, **halving the proportion of untreated wastewater** and substantially increasing recycling and safe reuse globally
- 到2030年，通过减少污染、消除倾倒和尽量减少有害化学品和材料的排放、将未经处理的废水的比例减少一半、以及大幅度增加全球再循环和安全再利用来改善水质。

6
CLEAN WATER
AND SANITATION

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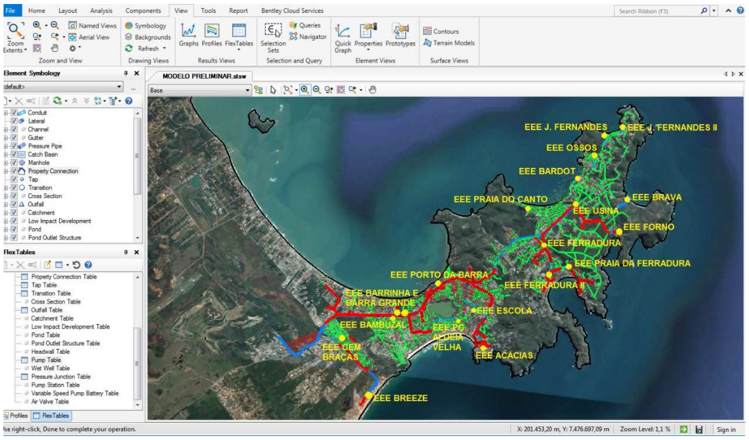
MODELO PRELIMINAR.stsw
Element Symbology
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EEE J. FERNANDES II
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EEE USINA
EEE FORNO
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EEE PRAIA DA FERRADURA
EEE PORTO DA BARRA
EEE BARRINHA E BARRA GRANDE
EEE FERRADURA II
EEE ESCOLA
EEE BAMBUZAL
EEE PC ALDEIA VELHA
EEE CEM BRAÇAS
EEE ACÁCIAS
EEE BREEZE

Prolagos AEGEA
Sewerage Master Plan 2041

Problem

- Only 76% of residents have access to sewage collection and treatment 只污水管网仅覆盖了76%的居民
- Decontamination of the Araruama lagoon 阿拉鲁马泻湖的净化

Master Plan Results

- Reduction of 60% investment from previous studies 较之前的研究减少60%的投资
- Reduced energy consumption due to 35% decrease in volume treated in wastewater plants and 20% efficiency gains of pumping systems
- 由于在污水处理厂处理量减少35%和20%泵站效率的提升，从而降低了能耗
- Untreated discharges reduced by 6 million cubic meters
- 减少600万立方米未经处理的污水排放

Technology Utilized

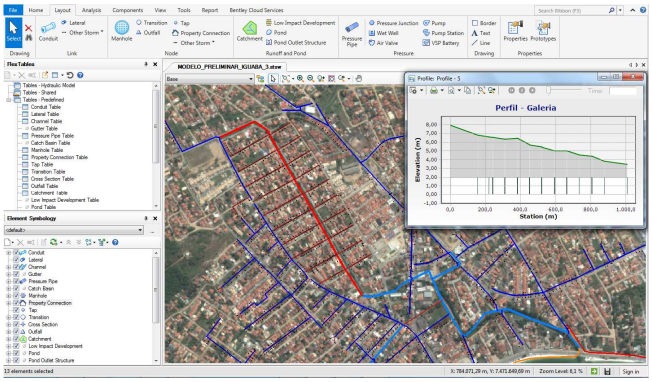
- GIS
- Water and Sewer Numerical Models

Prolagos AEGEA Sewerage Master Plan 2041

*“Geospatial modeling technology can really make a difference in the **optimization of investments** bridging the existing gap in sewage infrastructure, thus promoting social inclusion and **increasing people’s living standards.**”*

基于地理信息的建模技术在优化投资方面确实能够发挥作用，弥补现有污水基础设施的差距，从而促进社会融合，提高人们的生活水平。

- Wagner Oliveira de Carvalho, Senior Project Manager, Prolagos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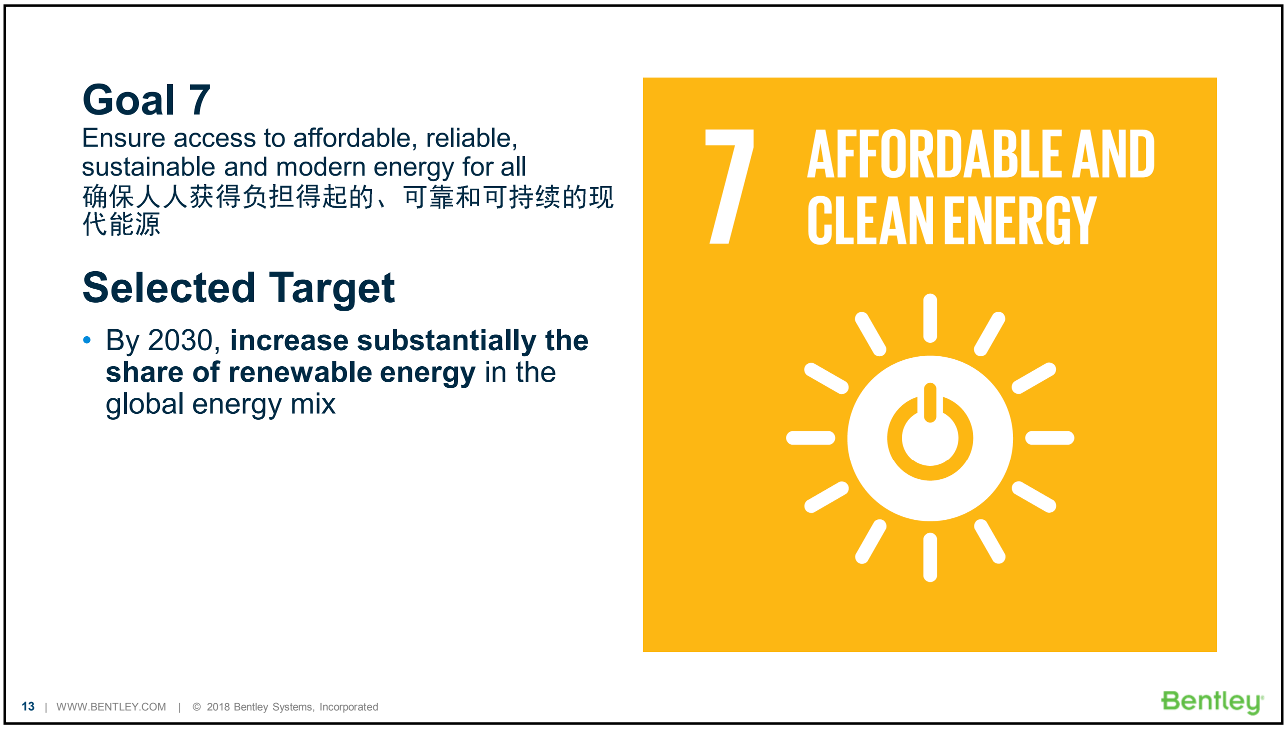
Station (m)
FlexTables
Element Symbology



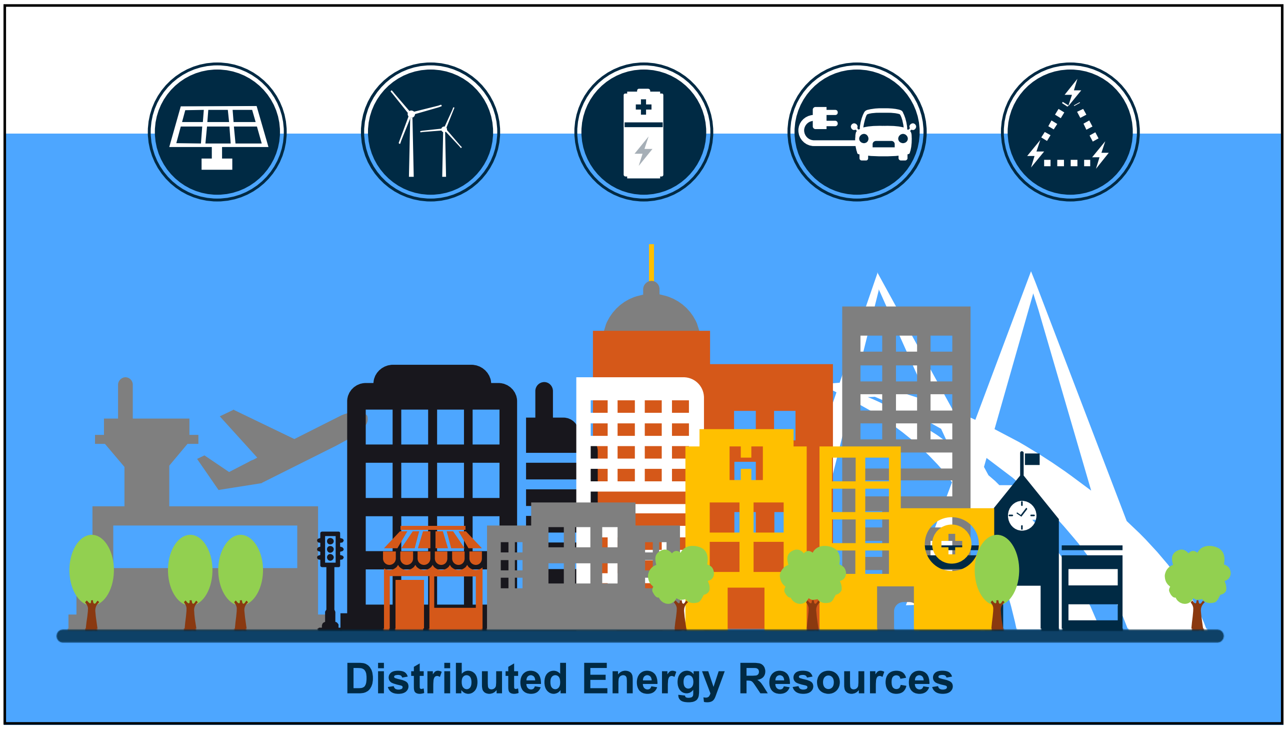
Goal 7

Ensure access to affordable, reliable, sustainable and modern energy for all
确保人人获得负担得起的、可靠和可持续的现代能源

Selected Target

- By 2030, **increase substantially the share of renewable energy** in the global energy mix

7
AFFORDABLE AND CLEAN ENERGY



Distributed Energy Resources

Goal 9

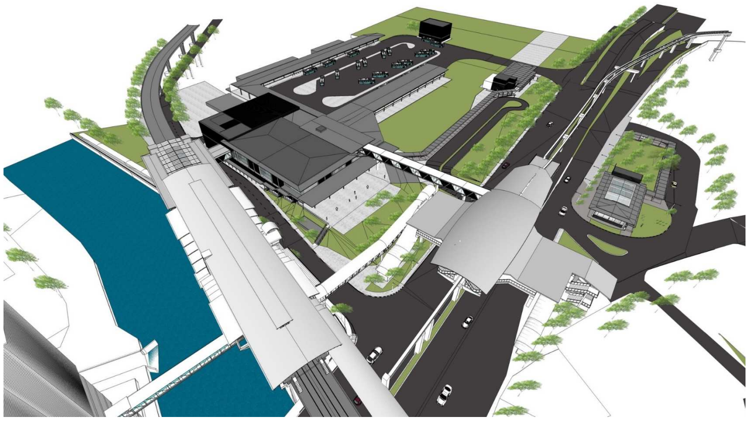
Build resilient infrastructure, promote sustainable industrialization and foster innovation
建造具备抵御灾害能力的基础设施，促进具有包容性的可持续工业化，推动创新

9
INDUSTRY, INNOVATION AND INFRASTRUCTURE

Selected Targets

- **Develop quality, reliable, sustainable and resilient infrastructure**, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
- 发展优质、可靠、可持续和有弹性的基础设施，包括区域和跨境基础设施，以支持经济发展和人类福祉，重点放在所有人承担得起和公平上

BIM Application：Transform from traditional 2D planning to 3D planning



KVMRT Sungai Buloh-Serdang-Putrajaya (SSP) Line

Problem

- Achieve BIM Level 2 mandate
- Leverage PAS 1192 workflows
- Deliver digital as-built information to operations

Outcomes

- Increased trust and acceptance of data
- Reduced rework and improved collaboration
- Central model for all stored in cloud provisioned Common Data Environment

Technology Utilized

- Information Modeling and Visualization
- Engineering Collaboration Platform
- Asset Lifecycle Information Management
- Reality Modeling
- Structural Numerical Models

KVMRT Sungai Buloh-Serdang-Putrajaya (SSP) Line

> *‘The [common data environment] provides a **seamless solution** for MRT Corporation in our BIM workflow and **sharing of projection information through the entire project lifecycle**.’*
>
> *Poh Seng Tiok*
> *Director, Planning & Design*
> *MRT Corporation Sdn Bhd*

Goal 11

Make cities inclusive, safe, resilient and sustainable

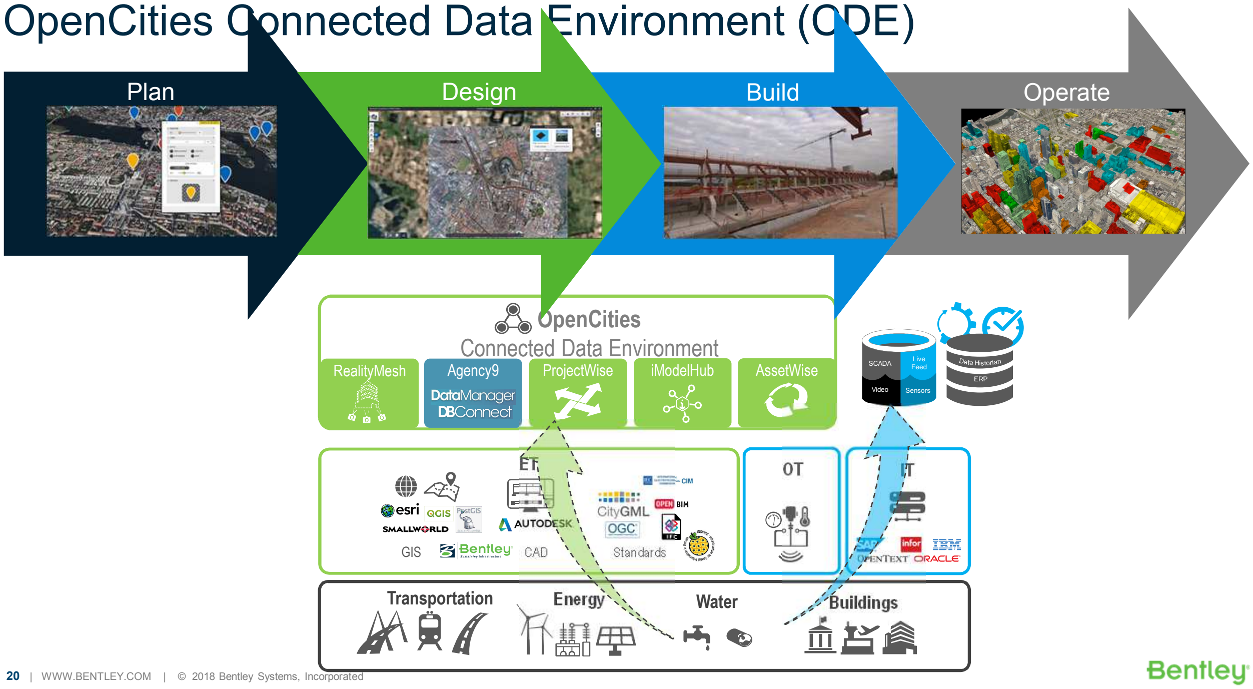
建设包容、安全、有抵御灾害能力和可持续的城市和人类住区

Selected Targets

- By 2030, significantly reduce the number of deaths and the number of people affected and **substantially decrease the direct economic losses** relative to global gross domestic product **caused by disasters**, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations。
- 到2030年，显著减少死亡人数和受影响人数，并大大减少与包括水灾在内的灾害造成的全球国内生产总值有关的直接经济损失，重点是保护穷人和弱势群体。

11
SUSTAINABLE CITIES AND COMMUNITIES

OpenCities Connected Data Environment (CDE)

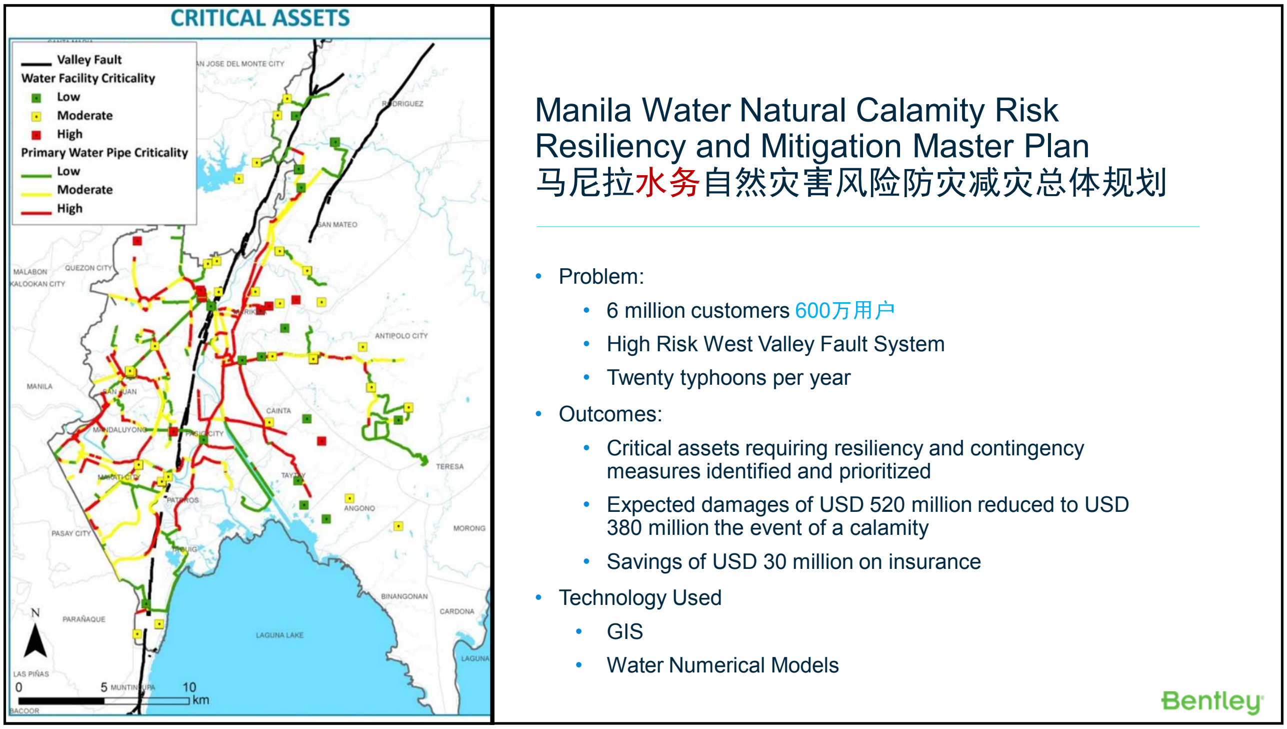

Plan
Design
Build
Operate
OpenCities
Connected Data Environment
RealityMesh
Agency9
DataManager
DBConnect
ProjectWise
iModelHub
AssetWise
SCADA
Live Feed
Video
Sensors
Data Historian
ERP
ET
esri
QGIS
PostGIS
SMALLWORLD
GIS
Bentley
AUTODESK
CAD
CIM
CityGML
OGC
OPEN BIM
IFC
INSPIRE
Standards
OT
IT
SAP
infor
IBM
OPENTEXT
ORACLE
Transportation
Energy
Water
Buildings

Technology Innovations for Digital Cities
Reality Modeling & OpenFlows FLOOD

The Year in INFRASTRUCTURE 2018 Conference

Presented by the Bentley Institute

Bentley Institute


CRITICAL ASSETS
Valley Fault
Water Facility Criticality
Low
Moderate
High
Primary Water Pipe Criticality
Low
Moderate
High
SAN JOSE DEL MONTE CITY
RODRIGUEZ
SAN MATEO
MALABON
QUEZON CITY
KALOOKAN CITY
ANTIPOLO CITY
MANILA
SAN JUAN
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PASIG CITY
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TAYTAY
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Manila Water Natural Calamity Risk Resiliency and Mitigation Master Plan
马尼拉水务自然灾害风险防灾减灾总体规划

- Problem:
  - 6 million customers 600万用户
  - High Risk West Valley Fault System
  - Twenty typhoons per year
- Outcomes:
  - Critical assets requiring resiliency and contingency measures identified and prioritized
  - Expected damages of USD 520 million reduced to USD 380 million the event of a calamity
  - Savings of USD 30 million on insurance
- Technology Used
  - GIS
  - Water Numerical Models

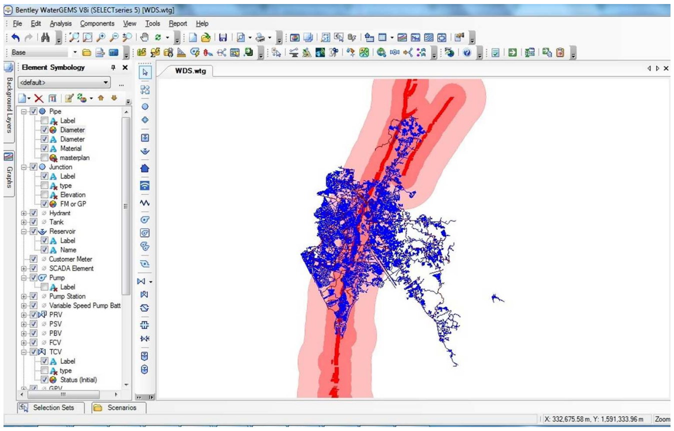
Bentley

Manila Water Natural Calamity Risk Resiliency and Mitigation Master Plan
马尼拉水务自然灾害风险防灾减灾总体规划

*"… [technology] **helped** Manila Water **minimize** the amount of its **investment** while **maximizing** the **resiliency and contingency** of its facilities, both being highly beneficial to the customers it serves."*

这项技术帮助马尼拉水务最大限度地减少投资，同时最大限度地提高其设施的弹性和应急性，这对它所服务的客户都是非常有益的

- Diogenes Adelbert Voltaire B. Evangelista, Water System Analysis and Planning Engineer, Manila Water Company


Bentley WaterGEMS V8i (SELECTseries 5) [WDS.wtg]
File Edit Analysis Components View Tools Report Help
Base
Element Symbology
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Diameter
Diameter
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Tank
Reservoir
Label
Name
Customer Meter
SCADA Element
Pump
Label
Pump Station
Variable Speed Pump Batt
PRV
PSV
PBV
FCV
TCV
Label
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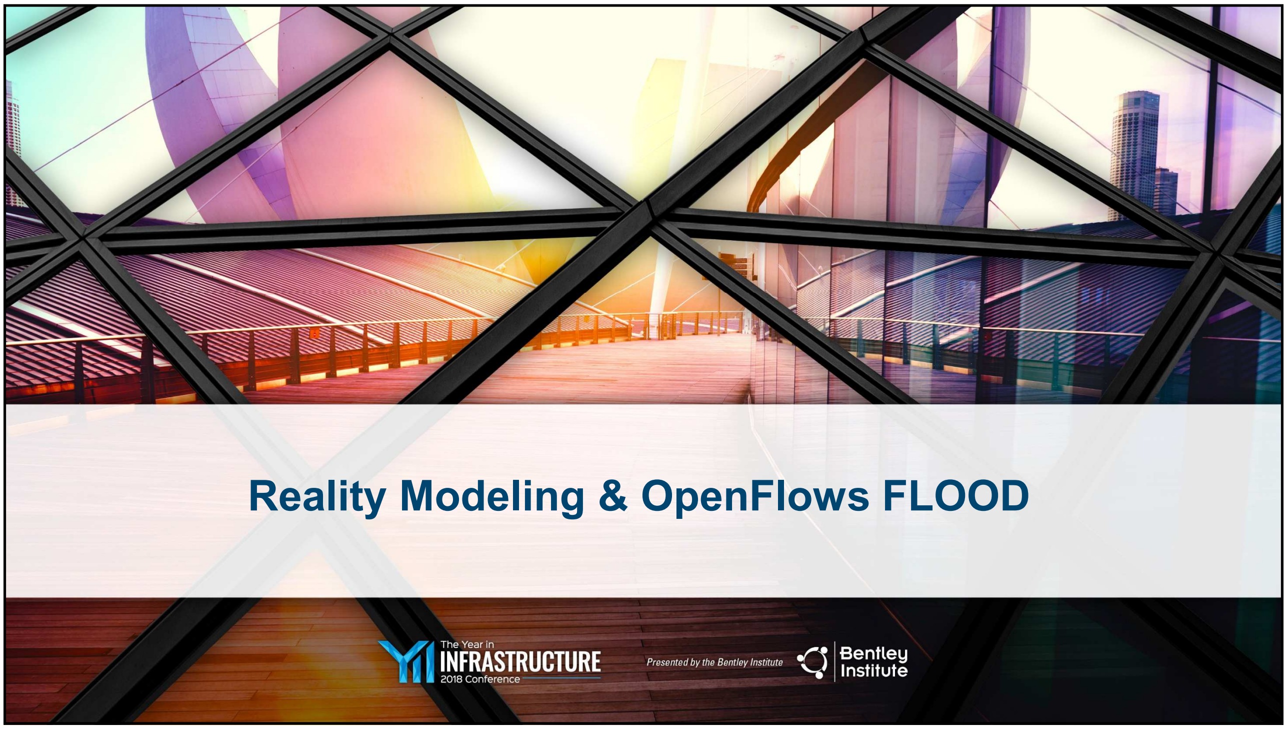
Graphs
Selection Sets
Scenarios
WDS.wtg
X: 332,675.58 m, Y: 1,591,333.96 m
Zoom



Reality Modeling & OpenFlows FLOOD

The Year in INFRASTRUCTURE 2018 Conference

Presented by the Bentley Institute

Bentley Institute

Context

- Floods are one of the most destructive natural hazard
- 洪水是最具破坏性的自然灾害之一

- Global Floods affect approximately 250 million people and caused USD 40 billion in losses (OECD 2016)
- 全球洪灾影响约2亿5000万人，造成损失400亿美元

- Global Floods are 4 times higher than in the 80’s (EASAC 2013)
- 全球洪水比80年代高出4倍

Context

- Reality Modeling -> Real-world imagery for infrastructure projects.

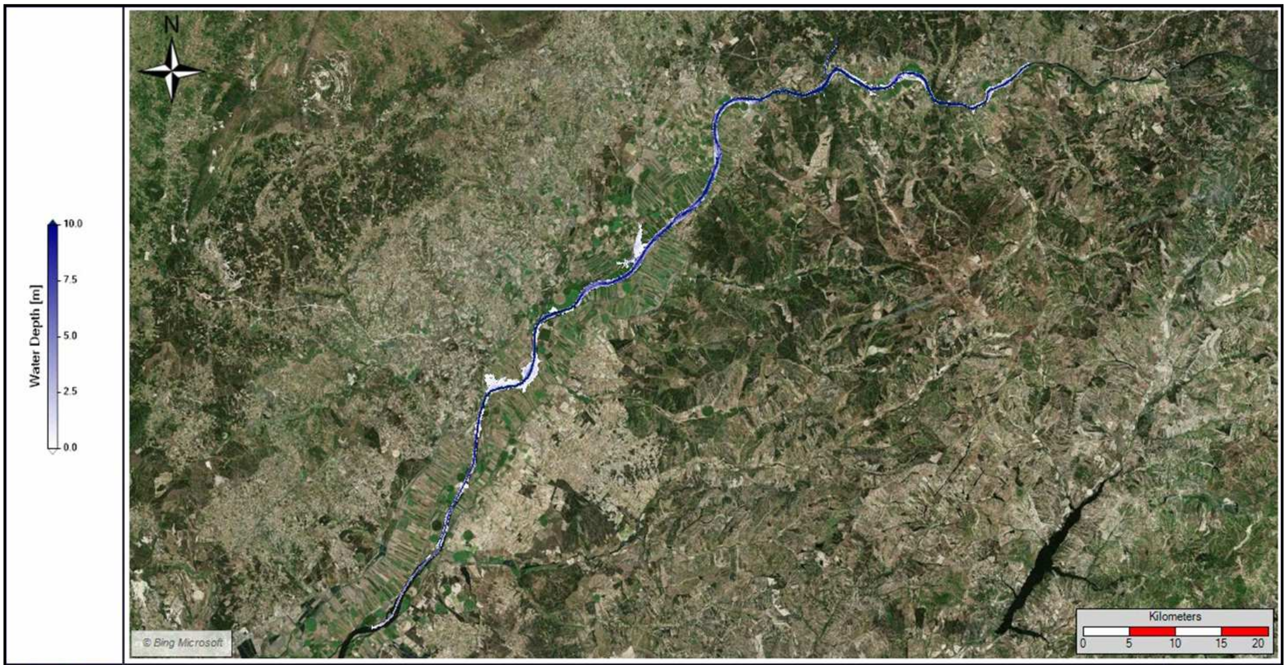
- OpenFlows FLOOD -> Flood Risk Assessment and Mitigation
- 洪水风险评估和减灾

- Reality Modeling with OpenFlows FLOOD is ***an innovative approach*** for Flood Risk Assessment and Mitigation

Reality Modeling
Bringing real-world imagery to your infrastructure projects
ContextCapture
Create 3D models from simple photographs
Bentley OpenFlows FLOOD
Flood Risk Assessment and Mitigation

Content

- Context – Floods and Reality Modeling
- OpenFlows FLOOD – How it Works
- OpenFlows FLOOD – Flood Risk Assessment 洪水风险评估
- OpenFlows FLOOD – Flood Risk Mitigation 洪水风险减灾
- Outlook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Water Depth [m]
10.0
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2.5
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© Bing Microsoft
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Tagus River
Simulation of a flood event with a return period of 20 years

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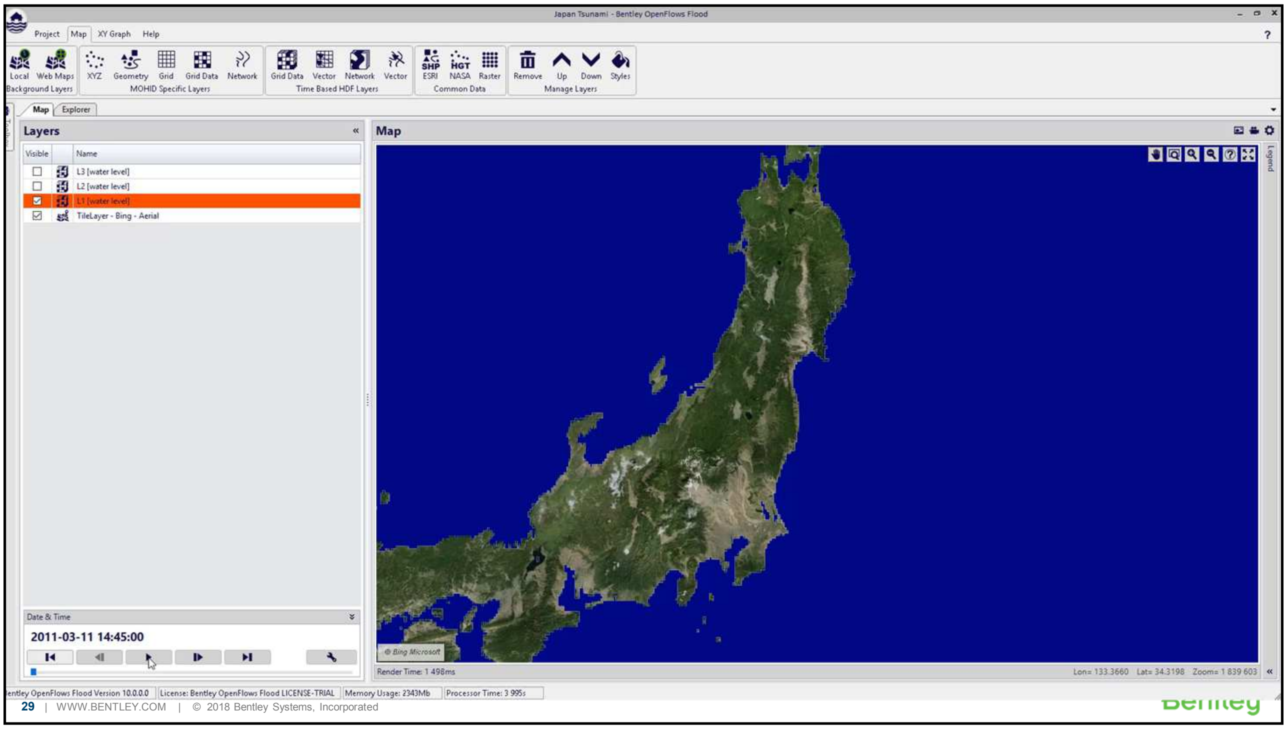

Japan Tsunami - Bentley OpenFlows Flood

Visible		Name
☐		L3 [water level]
☐		L2 [water level]
☑		L1 [water level]
☑		TileLayer - Bing - Aerial

Date & Time

2011-03-11 14:45:00

Render Time: 1 498ms

Lon= 133.3660 Lat= 34.3198 Zoom= 1 839 603

entley OpenFlows Flood Version 10.0.0.0 | License: Bentley OpenFlows Flood LICENSE-TRIAL | Memory Usage: 2343Mb | Processor Time: 3 995s

Project
Map
XY Graph
Help
Local
Web Maps
Background Layers
XYZ
Geometry
Grid
Grid Data
Network
MOHID Specific Layers
Grid Data
Vector
Network
Vector
Time Based HDF Layers
ESRI
NASA
Raster
Common Data
Remove
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Styles
Manage Layers
Map
Explorer
Layers
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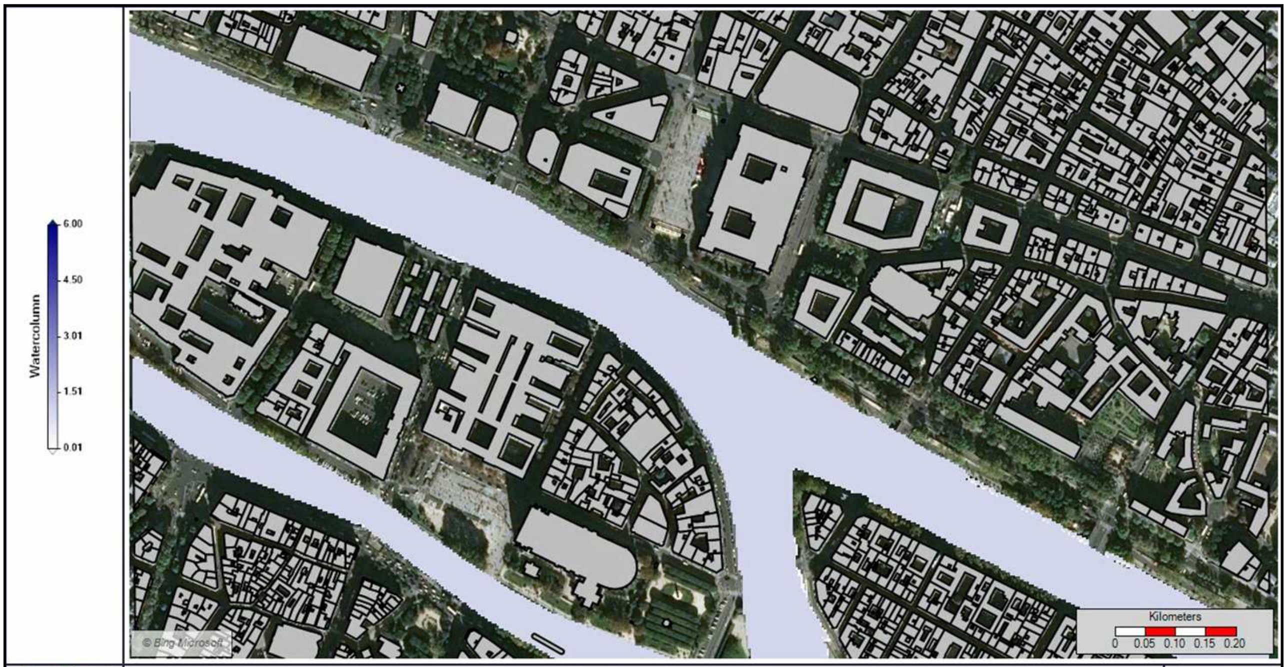
Legend
© Bing Microsoft



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© Bing Microsoft
Kilometers
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0.20

OpenFlows Flood

Demonstration of Capabilities
Extreme Flood Event in the Center of Paris

0 days
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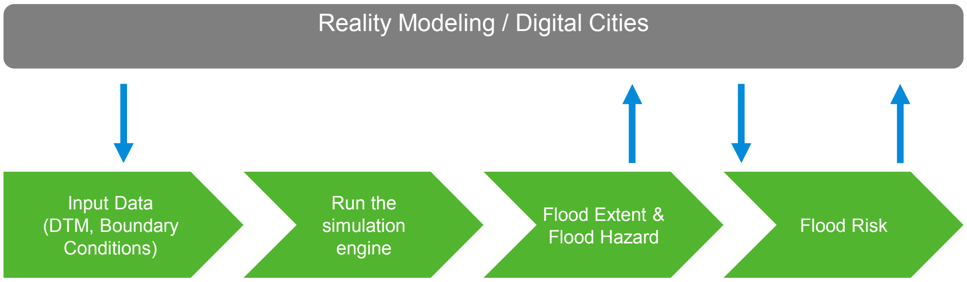
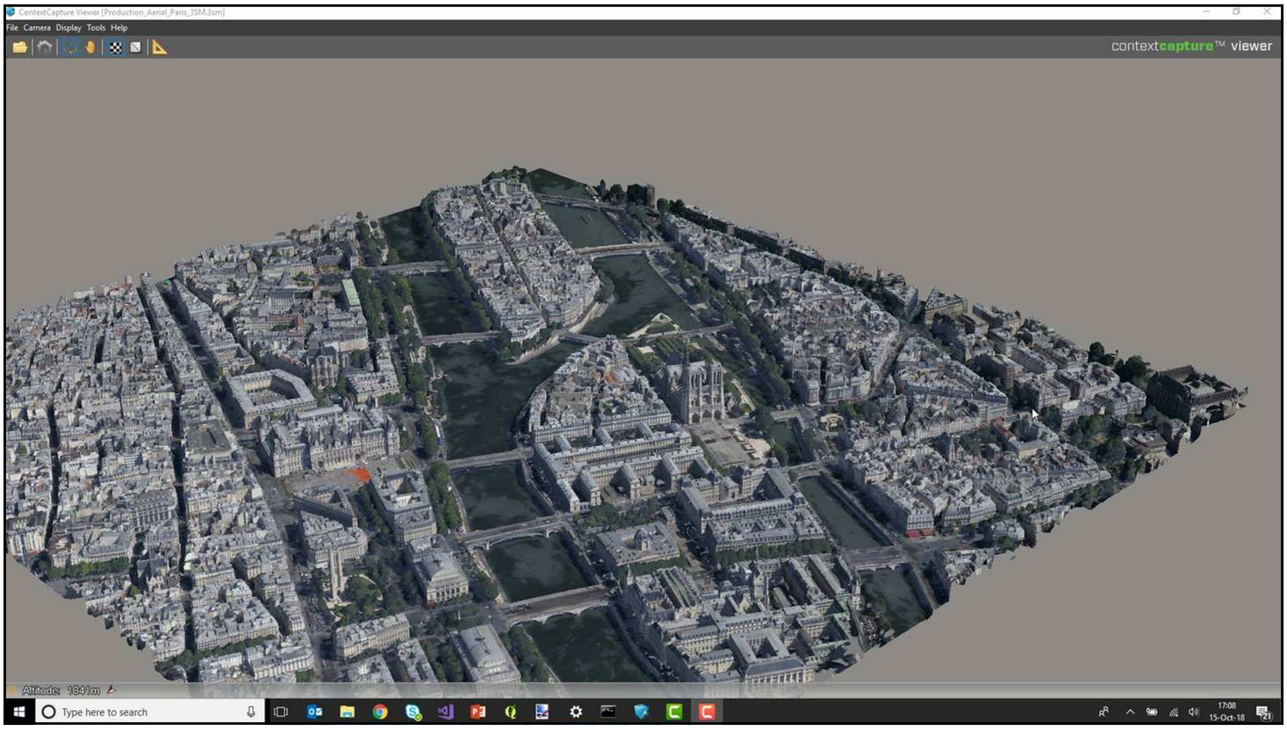
Content

- Context – Floods and Reality Modeling
- OpenFlows FLOOD – How it Works
- OpenFlows FLOOD – Flood Risk Assessment
- OpenFlows FLOOD – Flood Risk Mitigation
- Outlook

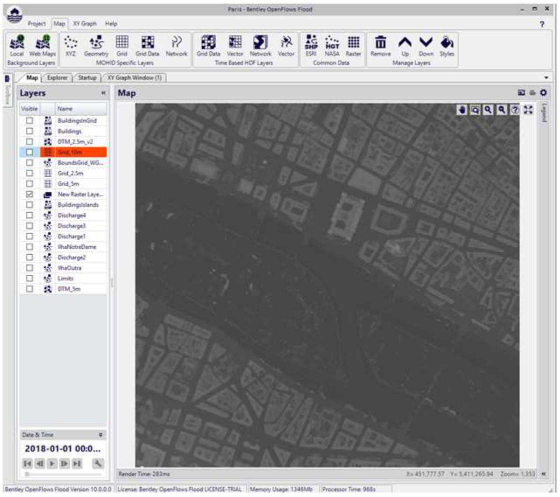
OpenFlows FLOOD – How it Works


Reality Modeling / Digital Cities
Input Data (DTM, Boundary Conditions)
Run the simulation engine
Flood Extent & Flood Hazard
Flood Risk


ContextCapture Viewer [Production_Aerial_Paris_3SM.3sm]
File Camera Display Tools Help
contextcapture™ viewer
Altitude: 1041m
Type here to search
17:08
15-Oct-18

OpenFlows FLOOD – ContextCapture to Flood Model

- Import Data from ContextCapture 将实景模型导入进OF中


Paris - Bentley OpenFlows Flood
Project Map XY Graph Help
Local Web Maps
Background Layers
XYZ Geometry Grid Grid Data Network
MOHID Specific Layers
Grid Data Vector Network Vector
Time Based HDF Layers
ESRI NASA Raster
Common Data
Remove Up Down Styles
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Map Explorer Startup XY Graph Window (1)
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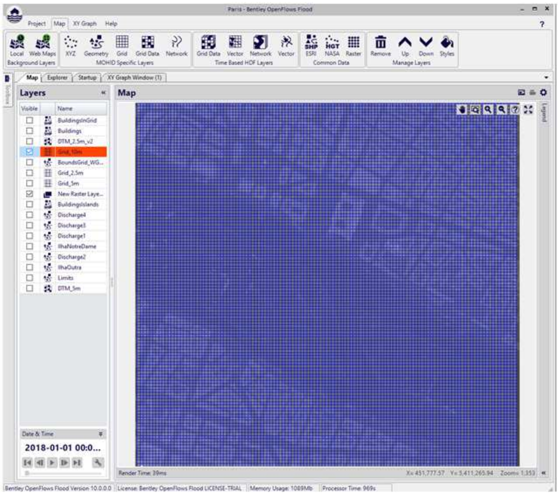
☐ DTM_2.5m_v2
☐ Grid_10m
☐ BoundsGrid_WG...
☐ Grid_2.5m
☐ Grid_5m
☑ New Raster Laye...
☐ BuildingsIslands
☐ Discharge4
☐ Discharge3
☐ Discharge1
☐ IlhaNotreDame
☐ Discharge2
☐ IlhaOutra
☐ Limits
☐ DTM_5m
Date & Time
2018-01-01 00:0...
Legend

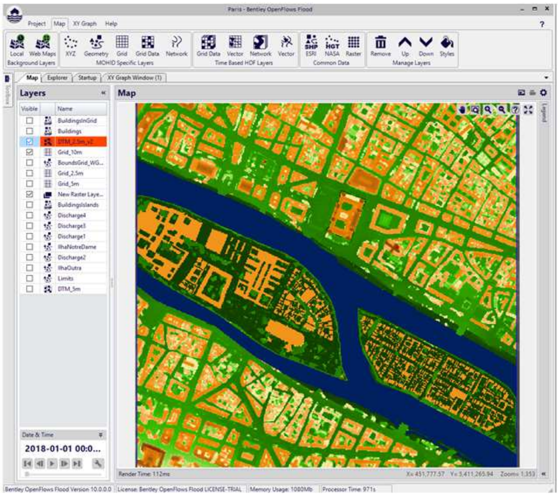
OpenFlows FLOOD – ContextCapture to Flood Model

- Import Data from ContextCapture
- Create Computational Grid 建立计算网格


Paris - Bentley OpenFlows Flood
Project
Map
XY Graph
Help
Local
Web Maps
Background Layers
XYZ
Geometry
Grid
Grid Data
Network
MOHID Specific Layers
Grid Data
Vector
Network
Vector
Time Based HDF Layers
ESRI
NASA
Raster
Common Data
Remove
Up
Down
Styles
Manage Layers
Map
Explorer
Startup
XY Graph Window (1)
Layers
Visible
Name
☐ BuildingsInGrid
☐ Buildings
☐ DTM_2.5m_v2
☑ Grid_10m
☐ BoundsGrid_WG...
☐ Grid_2.5m
☐ Grid_5m
☑ New Raster Laye...
☐ BuildingsIslands
☐ Discharge4
☐ Discharge3
☐ Discharge1
☐ IlhaNotreDame
☐ Discharge2
☐ IlhaOutra
☐ Limits
☐ DTM_5m
Map
Legend
Date & Time
2018-01-01 00:0...
Render Time: 39ms
X= 451,777.57 Y= 5,411,265.94 Zoom= 1,353
Bentley OpenFlows Flood Version 10.0.0.0
License: Bentley OpenFlows Flood LICENSE-TRIAL
Memory Usage: 1089Mb
Processor Time: 969s

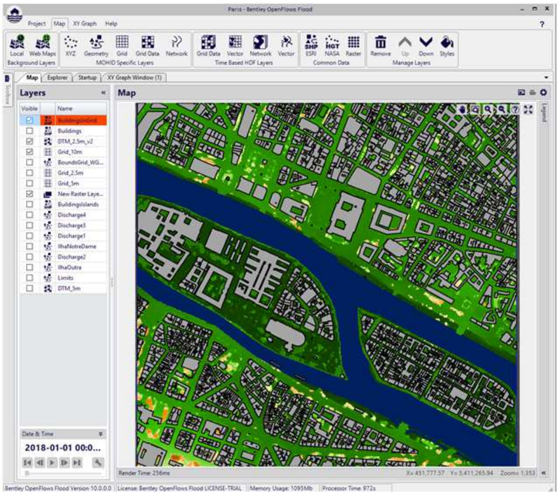
OpenFlows FLOOD – ContextCapture to Flood Model

- Import Data from ContextCapture
- Create Computational Grid
- Create Digital Terrain Model 创建地形模型


Paris - Bentley OpenFlows Flood
Project
Map
XY Graph
Help
Local
Web Maps
Background Layers
XYZ
Geometry
Grid
Grid Data
Network
MOHID Specific Layers
Grid Data
Vector
Network
Vector
Time Based HDF Layers
ESRI
NASA
Raster
Common Data
Remove
Up
Down
Styles
Manage Layers
Map
Explorer
Startup
XY Graph Window (1)
Layers
Visible
Name
☐ BuildingsInGrid
☐ Buildings
☑ DTM_2.5m_v2
☑ Grid_10m
☐ BoundsGrid_WG...
☐ Grid_2.5m
☐ Grid_5m
☑ New Raster Laye...
☐ BuildingsIslands
☐ Discharge4
☐ Discharge3
☐ Discharge1
☐ IlhaNotreDame
☐ Discharge2
☐ IlhaOutra
☐ Limits
☐ DTM_5m
Map
Legend
Date & Time
2018-01-01 00:0...
Render Time: 112ms
X= 451,777.57 Y= 5,411,265.94 Zoom= 1,353
Bentley OpenFlows Flood Version 10.0.0.0
License: Bentley OpenFlows Flood LICENSE-TRIAL
Memory Usage: 1080Mb
Processor Time: 971s

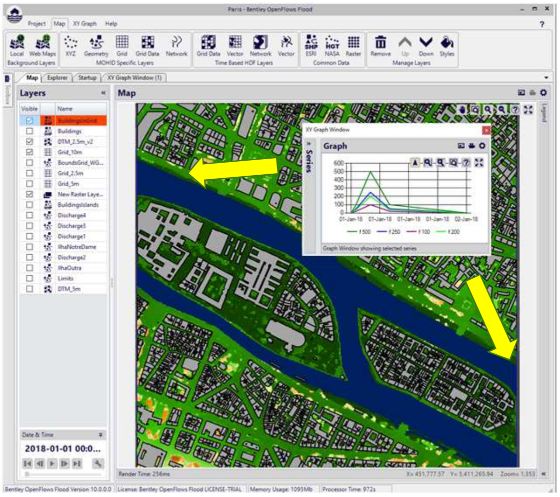
OpenFlows FLOOD – ContextCapture to Flood Model

- Import Data from ContextCapture
- Create Computational Grid
- Create Digital Terrain Model
- Overlay with Additional Information 添加其他信息


Paris - Bentley OpenFlows Flood
Project
Map
XY Graph
Help
Background Layers
MOHID Specific Layers
Time Based HDF Layers
Common Data
Manage Layers
Layers
Map
Visible
Name
BuildingsGrid
Buildings
DTM_2.5m_v2
Grid_10m
BoundsGrid_WG...
Grid_2.5m
Grid_5m
New Raster Laye...
BuildingsIslands
Discharge4
Discharge3
Discharge1
IlhaNotreDame
Discharge2
IlhaOutra
Limits
DTM_5m
Date & Time
2018-01-01 00:0...

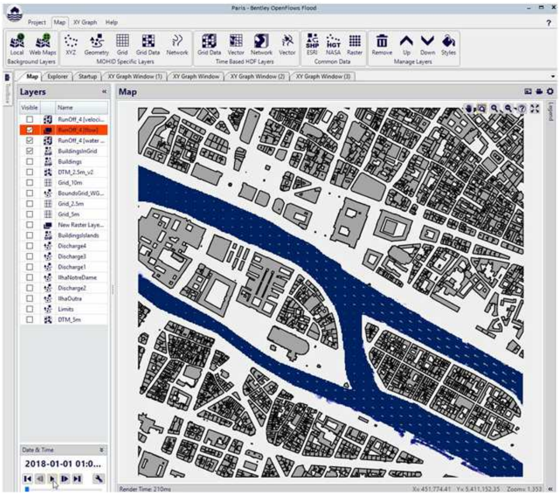
OpenFlows FLOOD – ContextCapture to Flood Model

- Import Data from ContextCapture
- Create Computational Grid
- Create Digital Terrain Model
- Overlay with Additional Information
- Define Boundary Conditions 定义边界条件


Paris - Bentley OpenFlows Flood
Layers
Map
XY Graph Window
Graph
Series
Graph Window showing selected series
Date & Time
2018-01-01 00:0...

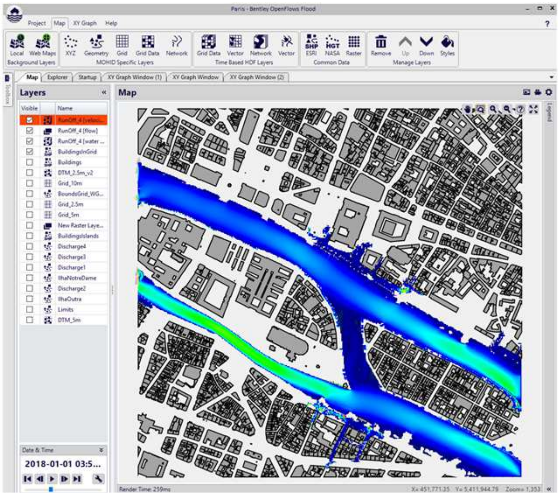
OpenFlows FLOOD – Explore Results

- View Results in the form of animated map
- 在动画地图中查看结果


Paris - Bentley OpenFlows Flood
Project
Map
XY Graph
Help
Layers
Map
Date & Time
2018-01-01 01:0...

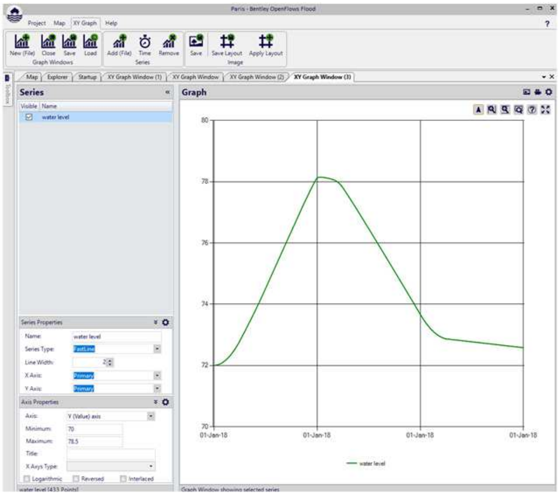
OpenFlows FLOOD – Explore Results

- View Results in form of animated map
- Display different properties…
  - water column, velocity, etc
- Display different properties…
  - 水柱、速度等


Paris - Bentley OpenFlows Flood
Project
Map
XY Graph
Help
Layers
Map
Date & Time
2018-01-01 03:5...

OpenFlows FLOOD – Explore Results

- View Results in form of animated map
- Display different properties…
  - water column, velocity, etc
- … in different formats
  - Maps, graphs


Paris - Bentley OpenFlows Flood
Project
Map
XY Graph
Help
New (File)
Close
Save
Load
Graph Windows
Add (File)
Time
Remove
Series
Save
Save Layout
Apply Layout
Image
Map
Explorer
Startup
XY Graph Window (1)
XY Graph Window
XY Graph Window (2)
XY Graph Window (3)
Toolbox
Series
Visible
Name
water level
Graph
80
78
76
74
72
70
01-Jan-18
01-Jan-18
01-Jan-18
01-Jan-18
water level
Series Properties
Axis Properties
Title:
X Axys Type:
Logarithmic
Reversed
Interlaced

Name: water level
Series Type: FastLine
Line Width: 2
X Axis: Primary
Y Axis: Primary

Axis: Y (Value) axis
Minimum: 70
Maximum: 78.5

water level [433 Points]

Graph Window showing selected series

Content

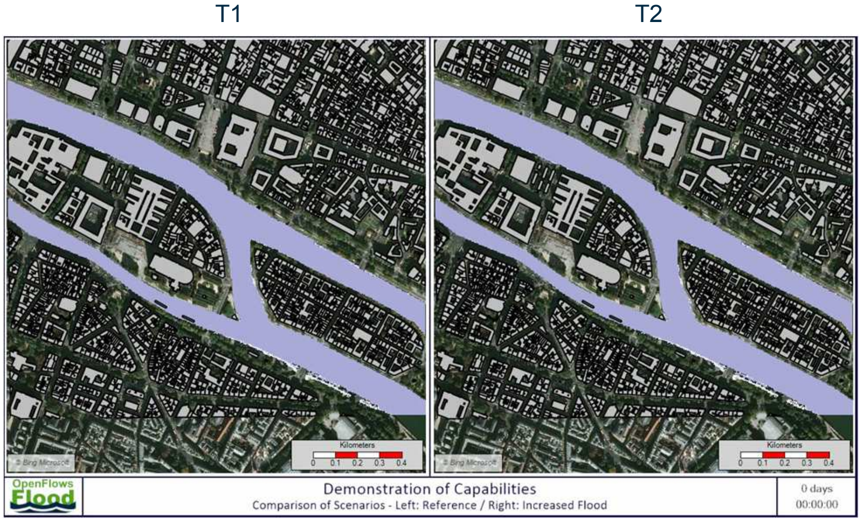
- Context – Floods and Reality Modeling
- OpenFlows FLOOD – How it Works
- OpenFlows FLOOD – Flood Risk Assessment 洪水风险评估
- OpenFlows FLOOD – Flood Risk Mitigation 洪水风险减灾
- Outlook

Flood Risk Assessment

- **Flood risk** is **defined** as the **probability** that **floods** of a given magnitude and a given **loss** will occur within a given **time span**.
- 洪水风险被定义为在给定时间跨度内发生给定大小和给定损失的洪水的可能性
- T1
  - Input Data (DTM, Boundary Conditions)
  - Run the simulation engine
  - Flood Extent & Flood Hazard
  - Flood Risk
- T2
  - Input Data (DTM, Boundary Conditions)
  - Run the simulation engine
  - Flood Extent & Flood Hazard
  - Flood Risk

OpenFlows FLOOD – Flood Risk Assessment

- Comparison of Scenarios
- 情景比较

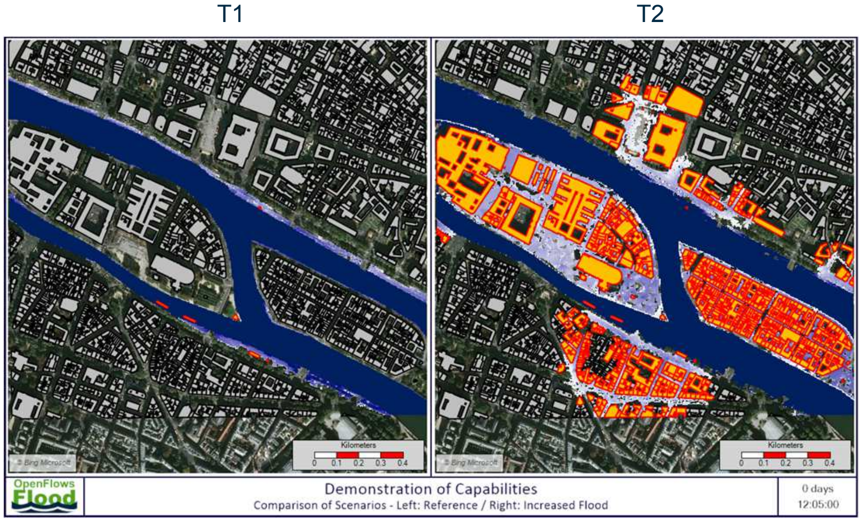


Demonstration of Capabilities
Comparison of Scenarios - Left: Reference / Right: Increased Flood

0 days
00:00:00

OpenFlows FLOOD – Flood Risk Assessment

- Comparison of Scenarios
- 情景比较
- Analysis of Losses
- 损失分析


T1
T2
© Bing Microsoft
Kilometers
0 0.1 0.2 0.3 0.4
OpenFlows Flood
0 days
12:05:00

Demonstration of Capabilities
Comparison of Scenarios - Left: Reference / Right: Increased Flood

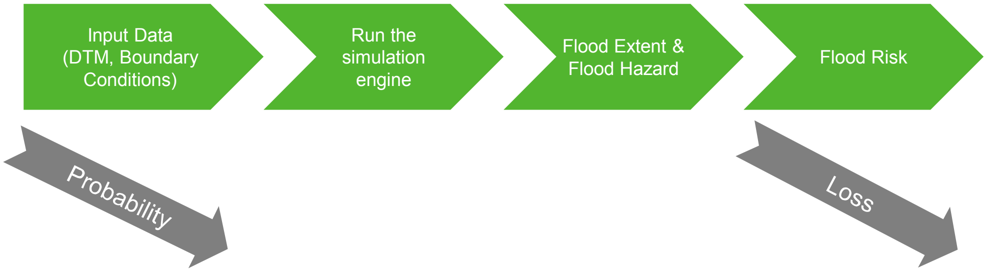
---

Content

- Context – Floods and Reality Modeling
- OpenFlows FLOOD – How it Works
- OpenFlows FLOOD – Flood Risk Assessment 洪水风险评估
- OpenFlows FLOOD – Flood Risk Mitigation 洪水风险减灾
- Outlook

Flood Risk Mitigation

- **Flood risk** is **defined** as the **probability** that **floods** of a given magnitude and a given **loss** will occur within a given time span.
- 洪水风险被定义为在给定时间跨度内发生给定大小和给定损失的洪水的可能性



Input Data (DTM, Boundary Conditions)

Run the simulation engine

Flood Extent & Flood Hazard

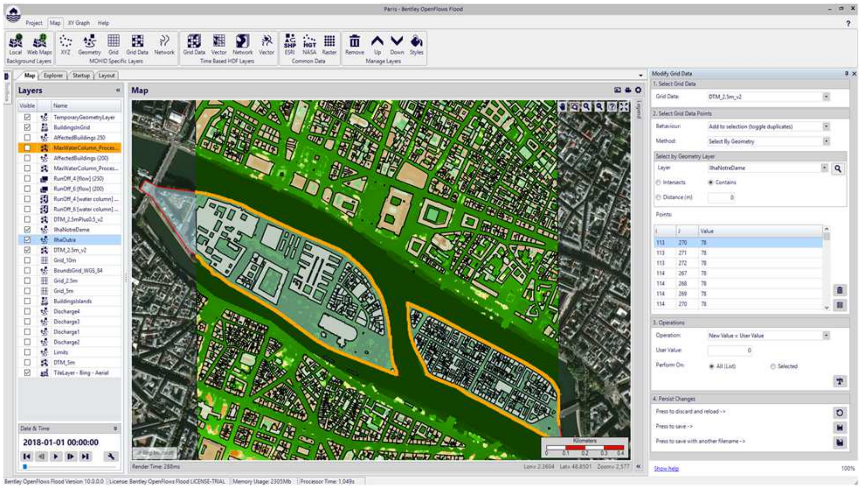
Flood Risk

Probability

Loss

OpenFlows FLOOD – Flood Risk Mitigation

- Implement Mitigation Measures
- 洪水减灾的措施



Modify Grid Data

1. Select Grid Data

Grid Data: DTM_2.5m_v2

2. Select Grid Data Points

Behaviour: Add to selection (toggle duplicates)

Method: Select By Geometry

Select by Geometry Layer

Layer: IlhaNotreDame

○ Intersects ● Contains

○ Distance (m) 0

Points:

I	J	Value
113	270	78
113	271	78
113	272	78
114	267	78
114	268	78
114	269	78
114	270	78

3. Operations

Operation: New Value = User Value

User Value: 0

Perform On: ● All (List) ○ Selected

4. Persist Changes

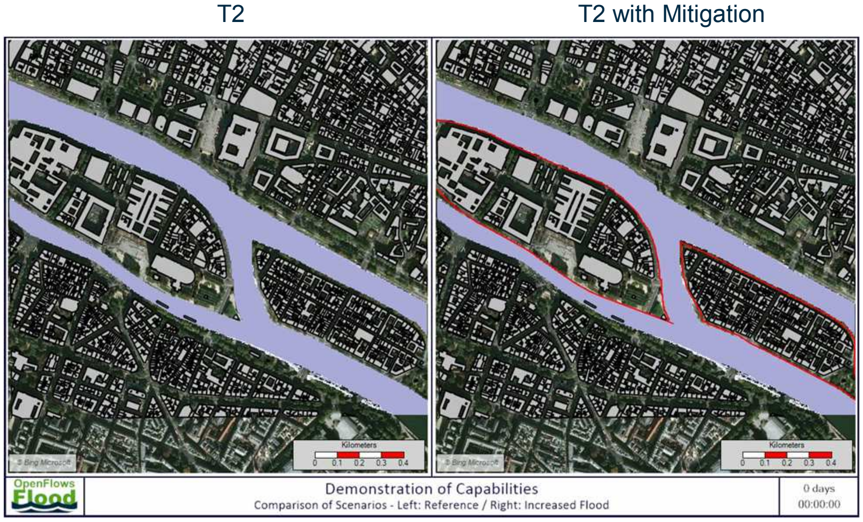
Press to discard and reload ->

Press to save ->

Press to save with another filename ->

OpenFlows FLOOD – Flood Risk Mitigation

- Implement Mitigation Measures
- Comparison of Scenarios

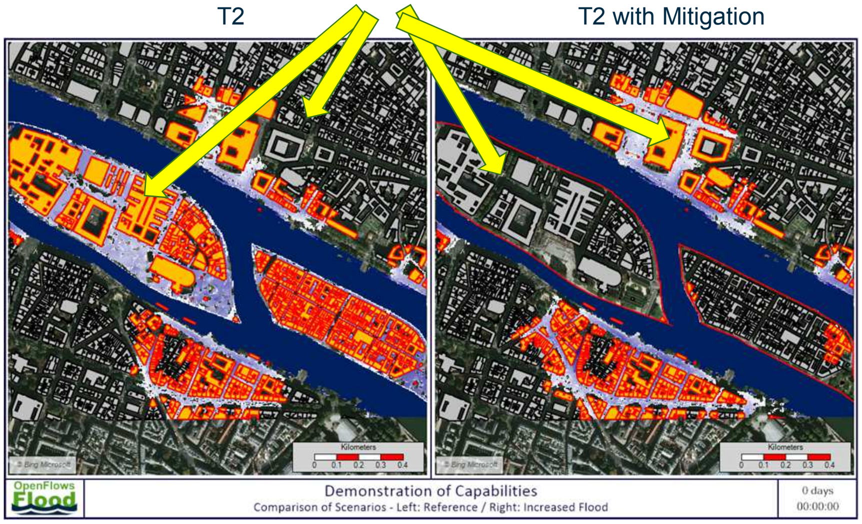

T2

T2 with Mitigation

Kilometers
0 0.1 0.2 0.3 0.4
OpenFlows Flood
Demonstration of Capabilities
Comparison of Scenarios - Left: Reference / Right: Increased Flood
0 days
00:00:00

OpenFlows FLOOD – Flood Risk Mitigation

- Implement Mitigation Measures
- Comparison of Scenarios


T2

T2 with Mitigation

Kilometers
0 0.1 0.2 0.3 0.4
OpenFlows Flood
Demonstration of Capabilities
Comparison of Scenarios - Left: Reference / Right: Increased Flood
0 days
00:00:00

Content

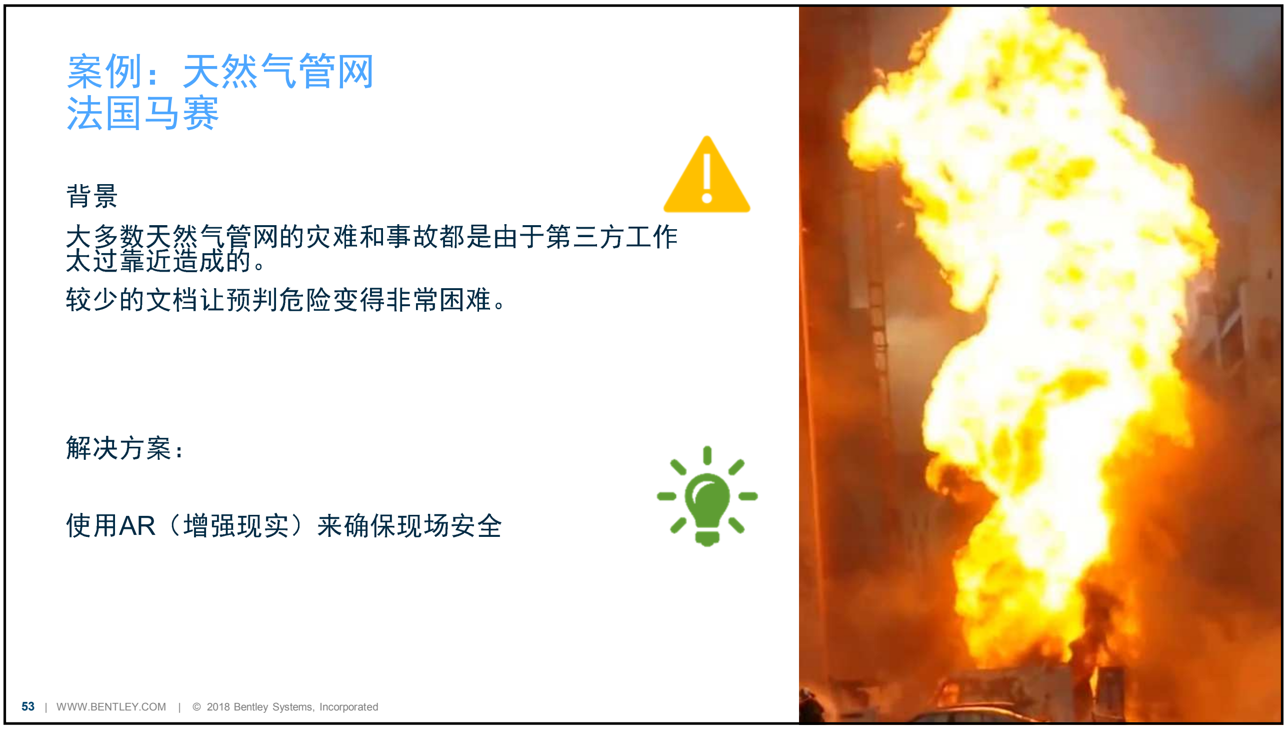
- Context – Floods and Digital Cities
- OpenFlows FLOOD – How it Works
- OpenFlows FLOOD – Flood Risk Assessment
- OpenFlows FLOOD – Flood Risk Mitigation
- Outlook & Conclusions

Outlook and Conclusion

- OpenFlows FLOOD, together with ContextCapture, is ***an innovative approach*** to quickly make ***accurate flood risk assessments***
- 用OpenFlows Flood, 连同ContextCapture,是一个创新的方法,能够快速准确的评估洪水风险

- Models from OpenFlows FLOOD can be operated by Bentley's ***ACTION Server*** for ***Flood Early Warning***
- Openflows Flood导出的模型可以用Bentley的Action Server和 洪水早期预警系统来运行

- Integration with ***LumenRT*** for enhanced visualization is in advanced state of development
- 与LumenRT的集成可以更强化直观的展示



案例：天然气管网
法国马赛

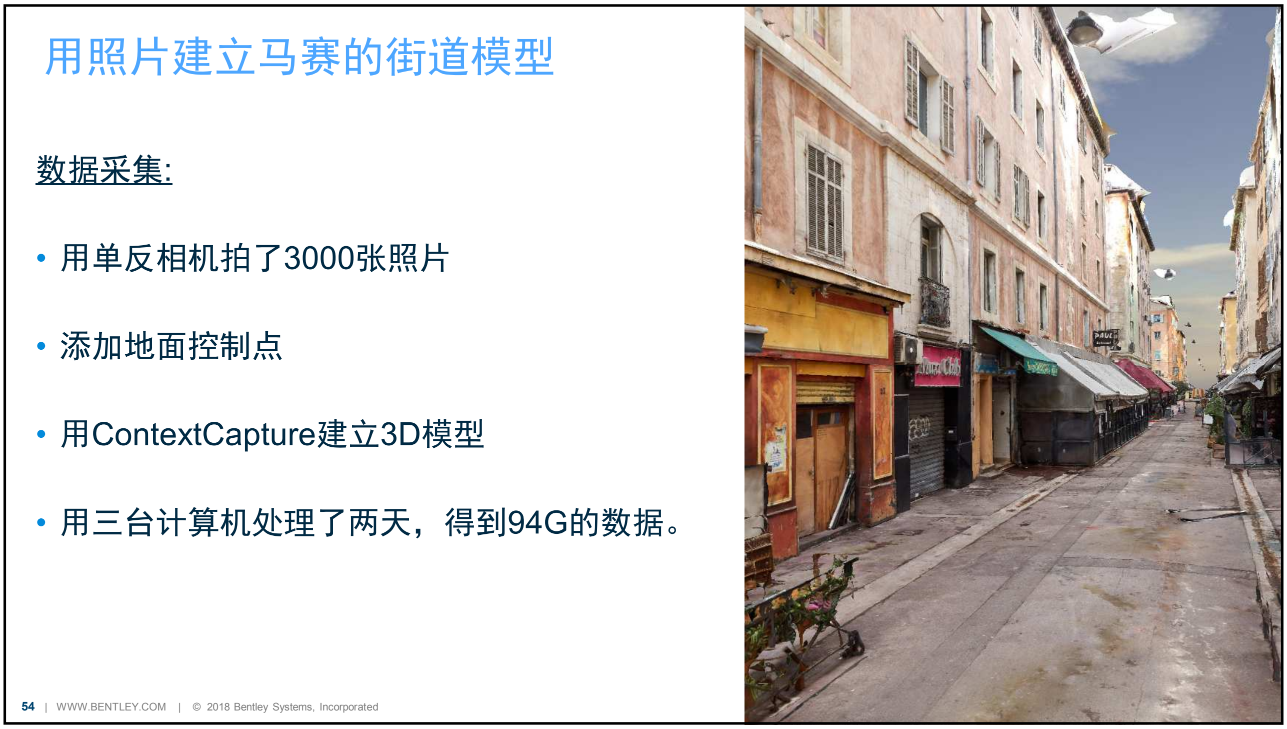
背景

大多数天然气管网的灾难和事故都是由于第三方工作太过靠近造成的。

较少的文档让预判危险变得非常困难。

解决方案：

使用AR（增强现实）来确保现场安全



用照片建立马赛的街道模型

数据采集:

- 用单反相机拍了3000张照片
- 添加地面控制点
- 用ContextCapture建立3D模型
- 用三台计算机处理了两天，得到94G的数据。

带坐标参数的实景模型

+

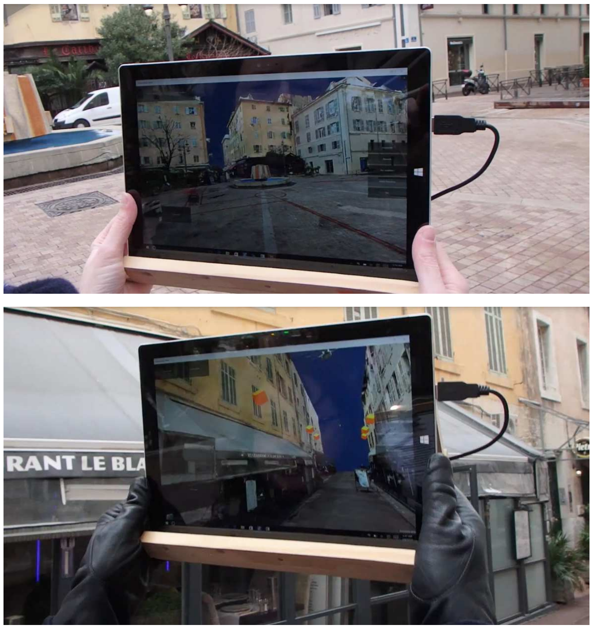
带坐标的天然气管网模型

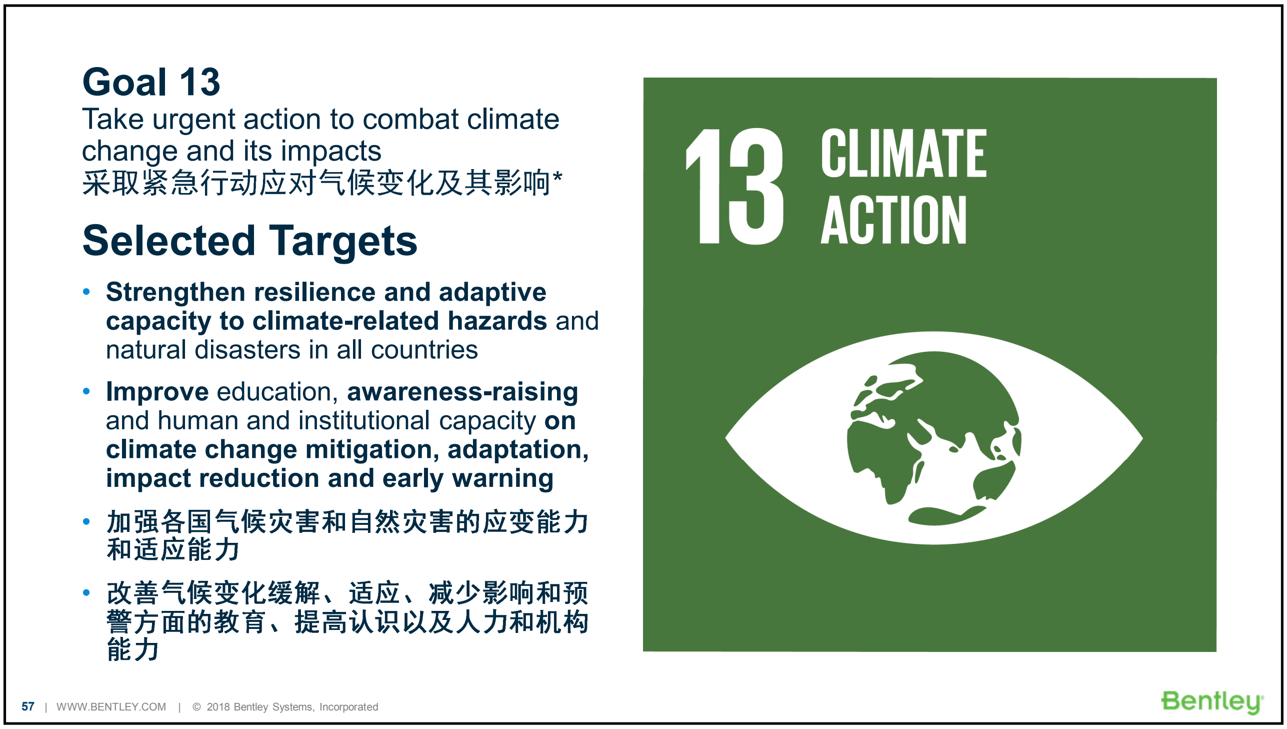
+

内置GPS的ipad

⇩

增强现实模型AR





Goal 13

Take urgent action to combat climate change and its impacts
采取紧急行动应对气候变化及其影响*

Selected Targets

- **Strengthen resilience and adaptive capacity to climate-related hazards** and natural disasters in all countries
- **Improve** education, **awareness-raising** and human and institutional capacity **on climate change mitigation, adaptation, impact reduction and early warning**
- **加强各国气候灾害和自然灾害的应变能力和适应能力**
- **改善气候变化缓解、适应、减少影响和预警方面的教育、提高认识以及人力和机构能力**

Sea Level Rise Simulation (courtesy City of Helsinki)

Going Digital can be an enabler for achieving the 2030 Sustainable Development Agenda and support development for all

数字化可以为实现2030年可持续发展议程提供强大助力

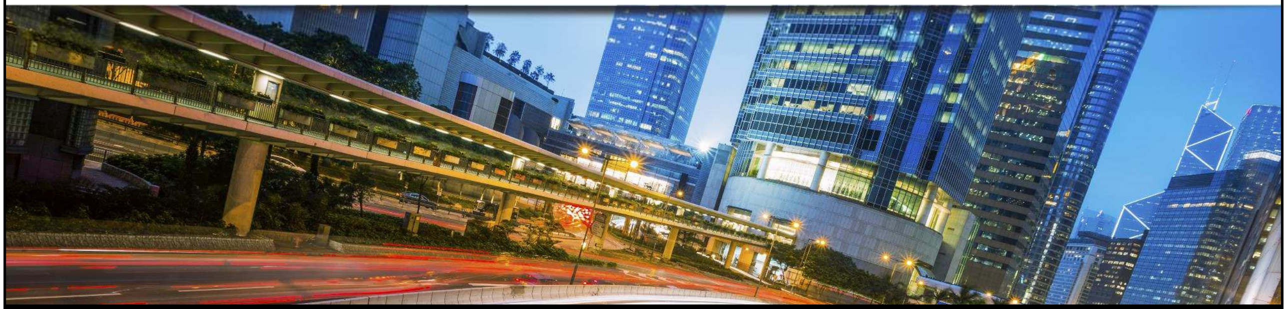
SUSTAINABLE
DEVELOPMENT
GOALS
17 GOALS TO TRANSFORM OUR WORLD

Thank You !

杨春强
实景建模QQ群2：701703553
13910207378
alex.yang@bentley.com

杨春强
北京 海淀

扫一扫上面的二维码图案，加我微信



Questions?

Thank you!

Bentley
Advancing Infrastructure