TRANSFORMATION CHALLENGES IN CITIES

3DEXPERIENCE platform use cases for cities and territories

DASSAULT SYSTEMES

Cities & Public Services

RESILIENT URBAN FUTURE

From the communities we live in, to the places where we work and the ways we get around, the built environment has a profound impact on our physical health, mental wellbeing and economic opportunities – as well as the sustainability of the natural environment.

Sustainable urban development has entered a new era, impacted by demographic and regulatory pressures, climate change and a new scale of difficult-to-predict short and long-term mega trends and challenges. Cities and territories are in fact now driving the global sustainability agenda and in so doing, have to satisfy fast evolving citizen expectations for a better quality of life with more resilient, digital and attractive cities. Success depends on their ability to overcome transformation challenges.

New digital technologies are empowering cities to define the best policies for a more sustainable, inclusive and citizen-centric future.

Faster access to reliable and timely data, virtual twins and collaborative platforms make it possible to implicate multiple stakeholders and reconcile their interests while mitigating emerging risks from climate, health, safety and security. As budgetary pressure increases on cities, they must simulate, plan, forecast and test efficient solutions more accurately, cost-effectively and faster than before.

By connecting the ecosystem and fostering collaborative working across multiple stakeholders, cities can optimize infrastructure and resources while reducing their environmental footprint and CO_2 emissions. They can focus on improving health, safety and environmental impacts for their citizens and engage them proactively.

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WHY VIRTUAL TWIN OF CITIES?

Cities are systems of systems, making them the most complex systems to make sense of. New digital technologies are creating a bridge to understand this complexity and empower cities to define the best policies for a more sustainable, inclusive and citizen-centric future.

It all starts with targeting city transformation challenges such as urban development, energy efficiency and sustainability, to name a few. As a next step, and to comprehend the day-to-day challenges, cities deploy data collection systems and sensor technology to aggregate data. These data then become an actionable source of information and knowledge through analysis, visualization, modelling and simulation.

The objective is to build resilient cities through collaborative, participatory, and innovative methods with the use of inclusive, smart and connected digital tools. Creating "smart cities" is not the goal, it is the mean and tool to reach the cities' objectives such as resilience. Using smart technologies is not just about plugging digital interfaces into traditional infrastructures or streamlining city operations. It is about analyzing and rethinking what has been done, staying informed about the current state of all urban systems and developments, and defining data-driven urban strategies and policies to deliver better quality life for citizens while controlling high costs.

This involves accessing data in different forms and sharing it in one place to foster collaboration across multiple stakeholders such as architects, urban planners, local authorities, businesses, and citizens. Collaborative processes based on data, information and knowledge helps stakeholders gain a better understanding of city transformation challenges. The result is less inaccuracies and costly mistakes, better planning, better responses and more effective implementation. In short, it consequently translates in the design, construction and management of sustainable and resilient cities.

This is where Dassault Systèmes' virtual twin technology comes into its own. It gathers and organizes consistent and comprehensive sets of data to analyze, visualize and simulate any situation, leveraging data from all departments and governmental agencies as well as private third parties. It provides a collaborative, common and secured workplace where all stakeholders can access a holistic view of the entire city ecosystem to ensure informed decision-making.

Today, digital twin technology and the 3DEXPERIENCE platform make it possible for cities to think as ecosystem rather separate entities and improve communication and services for the citizens. Cities and territories now have at their fingertips powerful tools to identify and simulate issues earlier, faster and more cost-effectively. Subsequently, they can plan and adjust the right responses to meet and even exceed citizen expectations.

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CITIES TRANSFORMATION CHALLENGES

Today, more than half of the world's population lives in cities, reaching 70% by the middle of the century (sources: UN Dispatch). As the city develops into humanity's predominant living and working environment, improving urban areas and achieving resilience has become a priority.

Rapid urbanization and urban population growth is only one of multiple interconnected and interdependent mega trends affecting cities. Other mega trends affecting cities include: climate change and resource scarcity, energy transition, technology advances and digitalization, demographic and social changes, shift in governance, and economic disparity. These challenges affect different cities in diverse ways depending on geographic and cultural context, forcing transformation in a day-to-day basis.

City transformation challenges are driving a shift in responsibilities and pressure from national governments to cities, states and territories. Today calls for strong local governance that strikes the right balance between short and long-term priorities.

For instance, sustainable urban development has entered a new era, impacted by demographic and regulatory pressures, climate change, and a new scale of difficult-to-predict short and long-term risks. Cities are now driving the global sustainability agenda and in so doing, have to satisfy fast evolving citizen expectations for a better life with more resilient, digital and attractive cities.

Success in achieving a climate resilient city depends on their ability to overcome two critical issues: how to reduce CO_2 emissions and the consumption of natural resources.

The Cities & Public Services team at Dassault Systèmes has mapped in 6 categories existing transformation challenges for cities. These categories are:

(1) Urban strategies and planning, (2) land use governance and management, (3) mobility and urban infrastructure, (4) energy use and efficiency, (5) climate change and sustainability, and (6) crisis anticipation and management.

In this document, each category includes different uses cases with specific examples on how the 3DEXPERIENCE platform has been effective in answering pressing questions related to cities and territories challenges, using modelling, analysis and simulation. The examples also show the potential of the platform in representing a holistic view of the entire city ecosystem to ensure informed decision-making.

To deep-dive in these categories and use cases, explore the document with the table of content on the right.

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URBAN STRATEGIES AND PLANNING

1 Urban strategies

The definition of a city wide strategic plan that unifies diagnoses, specifies public and private actions and establishes a coherent mobilization framework of different sectors and stakeholders. The creation of scenarios as future alternatives of urban systems becomes the canvas for decision-makers to select a model or vision for the city and create a strategic plan.

More information

2 Urban planning

The design, planning and development of urban areas to respond to citizens needs and transformation challenges. Different stakeholders and experts are involved including architects, engineers, economists, sociologists, and more. Urban planning is typically used as part of a larger city plan, and should tie back to the city's vision and strategic plan.

More information

3 Project orchestration

The execution and development of a specific urban area after the urban planning phase. The scale of intervention is usually between a small urban area to a very specific building envelop. The execution includes the collaboration between different development sectors such as engineering, architecture, construction and project management.

More information

4 Development and construction

The design, planning and construction of building structures. The process starts on the design table of an architect and goes through different stages including the definition of design and technical plans (2D and 3D), the construction and execution, to the final delivery of the project. All the process based on building policies define in the urban planning process.

More information

Cities & Public Services

URBAN STRATEGIES AND PLANNING
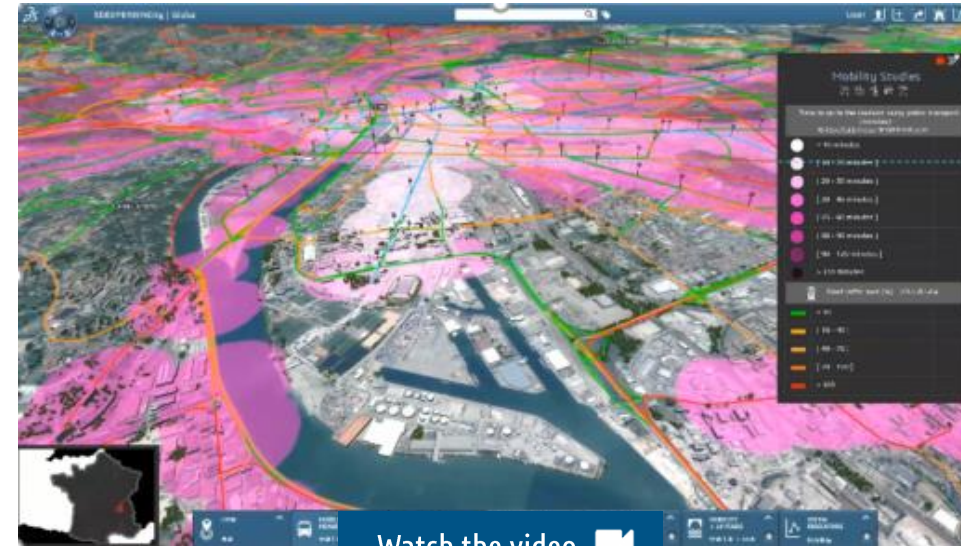
1 **Urban strategies**

Objective:

Providing a holistic view by mapping different urban systems in the city in a multidisciplinary approach engaging a diversity of players. This mapping and visualization in different scales offers a space for stakeholders to discuss future urban strategies for the territory.

Description:

The video shows different possibilities to analyze and overlap different urban systems to enable multi-scale urban analysis. The model leverages georeferenced information and 3D modeling to provide a systemic approach superposing current situation and future projects.

Potential benefits:

This holistic view of the city with the current situation and future projects allows planners and policy makers to analyze the city as a system and discuss current and future urban strategies to better plan the urban ecosystem and make data-driven urban policies.

Watch the video 🎥

Lyon, France (more precise – the meaning) e.g. planning for new metro line

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

URBAN STRATEGIES AND PLANNING

2 **Urban planning**

Watch the video 🎥

Ginza, Japan
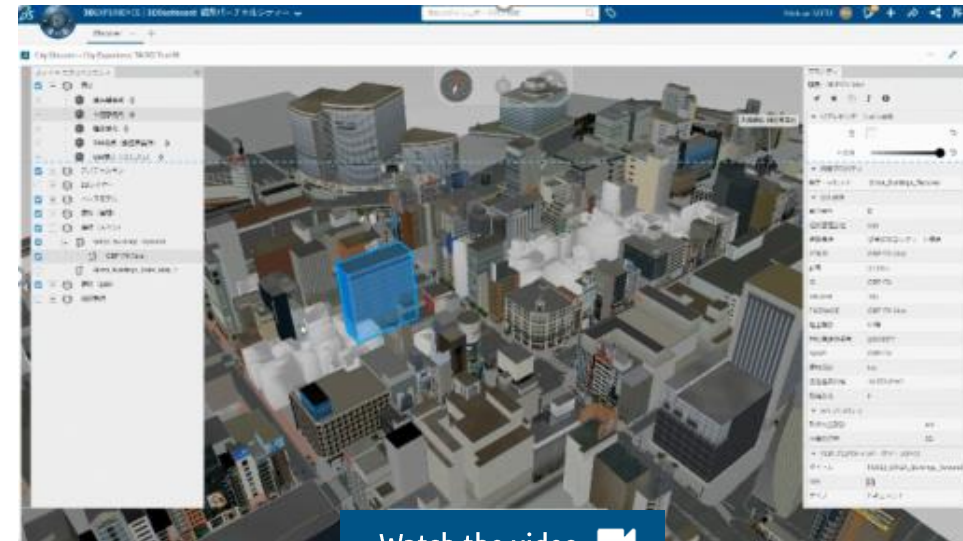**Virtual city**

Objective:

Giving tools to urban planners to have a clear understanding of specific urban areas and the impact of potential projects. The platform provides different type of spatial and environmental simulations, helping urban planners take data-driven decisions.

Description:

The example displays a 3D environment with different types of spatial and environmental simulation and analysis: visualization of statistical data ad attributes (heat map), visual impact analysis, sunshine and shadow simulation and the visualization of underground structures.

Potential benefits:

This multi-approach of a given territory offers a wide array of simulations and visualizations for city planners to better understand the territory so that they can better respond to citizens, spatial and environmental needs and plan in a systematic way.

3DExperience solutions:

o Urban Transformation
o Data-Driven Public Policies

Cities & Public Services

URBAN STRATEGIES AND PLANNING

**3** **Project orchestration**

Objective:

Offering a common platform where all stakeholders can work on development projects and have access to the same information. The 3DExperience platform provides powerful collaborative tools for people to manage multiple projects at the same time in an efficient way.

Description:

The 3DS dashboard functionalities are displayed, from user profiles to the different communities one can use. It shows a project from its planning stage to its final design. Tasks can be assigned and people can follow their advancements.

Potential benefits:

Using a common collaborative environment with these functionalities foster productivity by increasing transparency and limiting loss of information. It helps managers keeping track of projects and communicate with all stakeholders involved including engineering, architecture, construction and project management.

Watch the video 📹
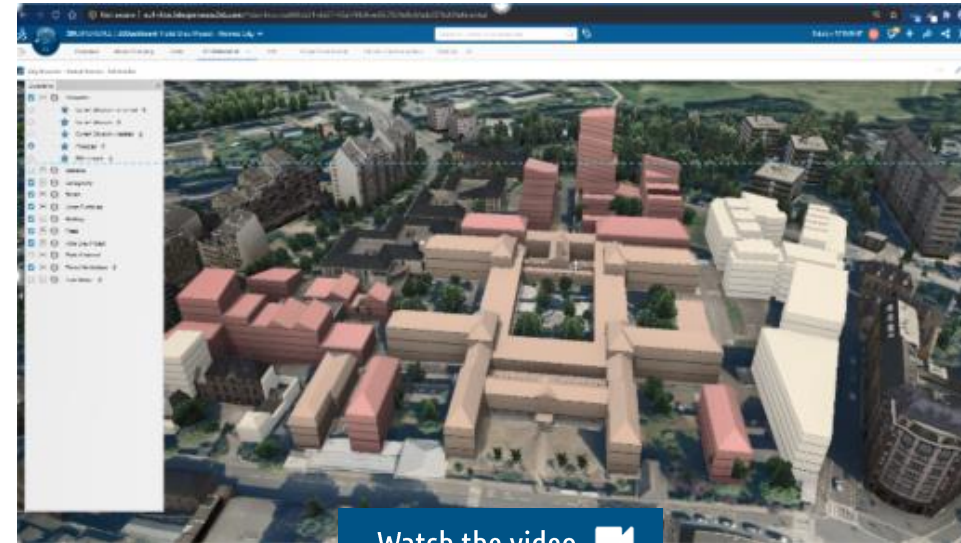
Rennes, France
Hotel Dieu

3DExperience solutions:

o Urban Transformation

DASSAULT SYSTEMES

URBAN STRATEGIES AND PLANNING

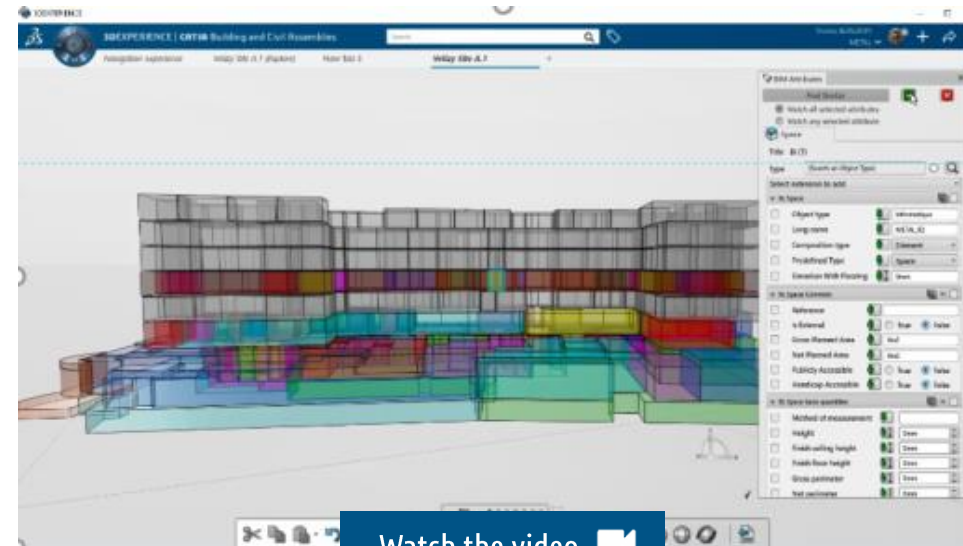**④ Development and construction**

Objective:

Modeling and visualizing buildings with BIM attributes and with the surroundings. All information is captured in the platform providing a common data environment that includes different Levels of Detail (LoD) and extraction of individual systems of the building.

Description:

The platform can capture and visualized BIM data from a simple building envelop to detailed information about specific systems inside the building. All different attributes are shown by clicking on a specific element or structure.

Potential benefits:

The 3DExperience platform offers the possibility to integrate buildings designed on BIM into a comprehensive digital twin environment. Planners and developers can benefit from the visualization, modelling and collaboration capabilities of the platform while working inside a digital twin environment. This is facilitating continuity from planning to construction and ultimately to operations.

Watch the video 🎥

Metal building, 3DS campus

3DExperience solutions:

o Urban Transformation
o Integrated Build Environment

Cities & Public Services

LAND USE AND ASSET MANAGEMENT

1 Land use planning and management

Land use planning is the process of regulating the use of land by a public authority. Land use planning contributes to: orienting the location of economic and social activities, indicate areas to remain protected, show areas exposed to natural hazards, identify sustainable productive and extractive activities, and indicate the areas that require land adaptation or recovery.

More Information

3 Public asset management

Public asset management is the process to plan, manage, maintain, and recover all public assets owned by local governments and cities. Public assets owned by local governments include: schools, public offices, and community centers, health care facilities, government office, public housing, waterworks and sewer systems, roads and bridges, etc...

More information

2 Public patrimony and landmarks

In most cases, the city administration is responsible for the protection, maintenance and management of the public heritage buildings and monuments in the city. These are public patrimony and landmarks that are protected by local, national and/or international public policies. The maintenance and management of these sites depends on the preservation of process and data.

More information

DASSAULT SYSTEMES

LAND USE GOVERNANCE AND MANAGEMENT

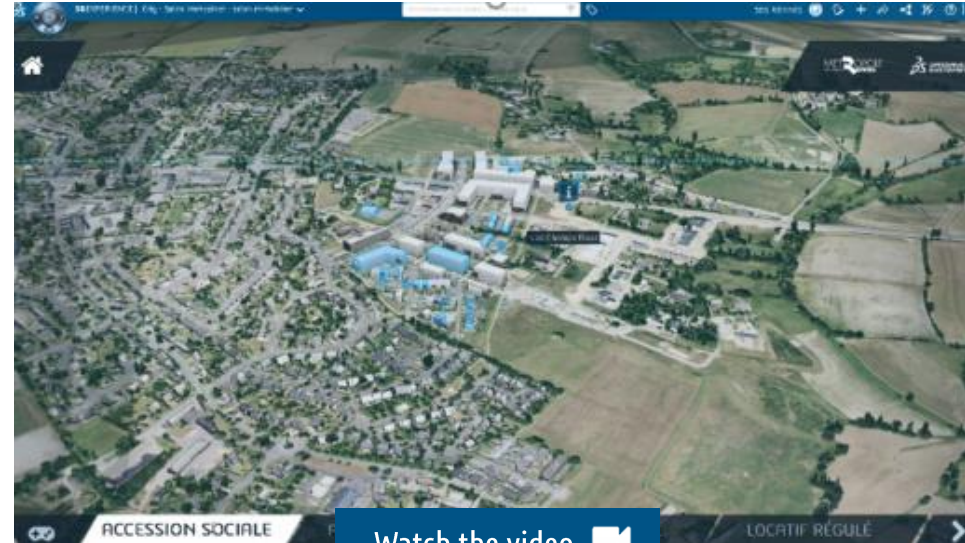**(2)** **Land use management**

Objective:

Visualizing and 3D modelling different types of buildings based on the land use and building attributes. An interactive environment where planners and managers can access georeferenced data on public housing.

Description:

The examples shows a 3D representation of housing stock of a specific territory. The model contains precise information about the different types of housing, differentiating them accordingly (e.g. social housing, regular housing, etc...).

Potential benefits:

The 3D urban environment with differentiation of building types offers a holistic view of the housing situation in a specific area and can help the city administrators make changes and improvements on public housing depending on demand and supply.

Watch the video 🎥

Rennes, France
Land use management

3DExperience solutions:

- o Urban Transformation
- o Data-Driven Public Policies

Cities & Public Services

LAND USE GOVERNANCE AND MANAGEMENT

1 **Public patrimony and landmarks**

Objective:

Providing a 3D realistic view of landmarks, public patrimony and heritage buildings to offer visual content for local public actors to share with citizens, businesses and other public national and international authorities.

Description:

This video displays a simulation of a pedestrian area downtown. It shows pedestrians routs, shops and the urban fabric. With the use of computer graphics, the 3D model of the city shows a Level of Detail (LoD) 4 of exiting buildings.

Potential benefits:

A realistic 3D model of the city with human scale views brings an interesting tool to the city and local authorities to showcase downtown areas, public patrimony and landmarks in an effort to promote a city's attractiveness for tourism, business and to its own citizens.

Watch the video 🎥

Rennes, France
Virtual tour of the city

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

Cities & Public Services

LAND USE GOVERNANCE AND MANAGEMENT

3 **Public asset management**

Objective:

Providing an inventory on public assets from GIS data and building attributes, and a collaborative platform for public administrators to better monitor the state of public buildings and conduct renovation and/or demolishing projects if needed.

Description:

This example presents a collaborative platform with a 3D environment and mapping of public buildings. Each building is labeled and visualized based on attributes taken from various data sources. Specific data of the current state of public buildings is organized and analyzed.

Potential benefits:

By having a public asset inventory, city authorities can then better plan, manage, maintain, and recover all those assets. Visualizing all attribute data in a single digital environment facilitates stakeholders collaboration and ultimately reduces costs and increases efficiency in building conservation projects.

Watch the video

Le Havre, France
Public asset management (Partnership with OXAND)

3DExperience solutions:

o Urban Transformation
o Data-Driven Public Policies

Cities & Public Services

MOBILITY AND URBAN INFRASTRUCTURE

1 Walkability

Planning paths for citizens to access different amenities in the city by foot. It is based on the idea that urban public spaces should be more than just vehicle transportation corridors. As an alternative, they should be livable spaces that serve a variety of uses and transportation modes and reduce motor vehicles.

More information

3 Urban Public transport

Urban transit, mass transit or public transportation include systems that are available for use by all citizens and operate on fixed routes and with fixed schedules and includes: bus, light rail transit, metro, regional rail systems. The planning of these systems is essential in road planning and infrastructure.

More information

5 Urban Traffic simulation

Traffic simulation is the mathematical modeling of transportation systems through the application of computer software. These models help to understand the effects of transport systems have on traffic volume and traffic flow under different circumstances.

More information

2 Urban Cycling

Urban cycling, or utility cycling, comprehends any cycling done as a mean of transport and individual mobility in a city. It serves as an alternative to motor vehicles, walking and public transportation in the city. The city may provide cycling paths to ensure a safer option for cyclers. The designing and planning of these paths has become an essential element in roads planning.

More information

4 Urban Infrastructure

The essential elements of the urban infrastructure include: streets and boulevards, mass public transit, sewage systems, and the provision of gas, water, and electricity. The infrastructure systems become a circulatory system designed to move people and material products rapidly and efficiently, both above - and belowground. The optimal planning of this systems is crucial.

More information (road infrastructure)   *More Information (5G infrastructure)*

DASSAULT SYSTEMES

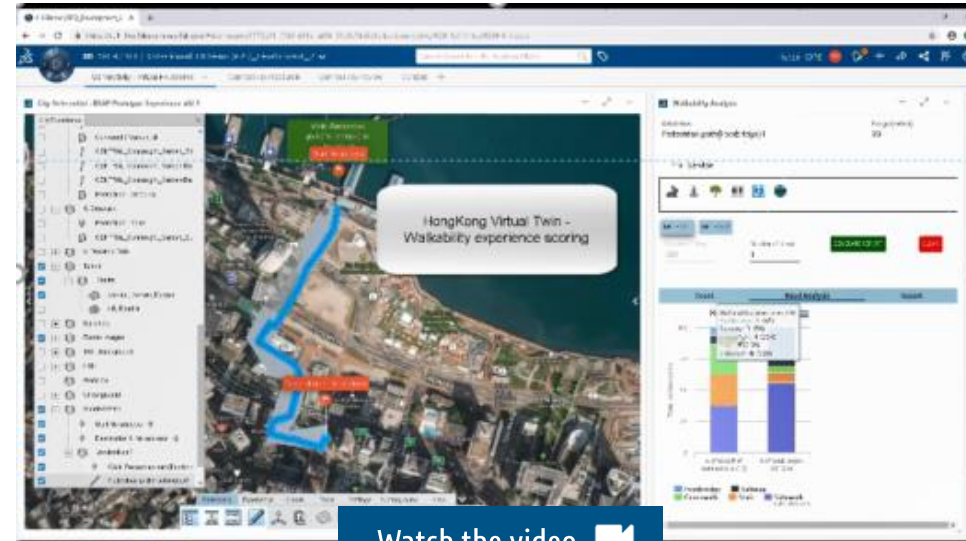# MOBILITY AND URBAN INFRASTRUCTURE

1 **Walkability**

Objective:

Providing city planners with a 3D environment and information about existing and potential pedestrian routs and paths in the city. Overlapping other type of information such as urban equipment to have a holistic view of the pedestrian experience.

Description:

The display of pedestrian routs and paths in the city. Visualize, design and plan pedestrian paths based on other mobility systems, public spaces and the urban fabric. The possibility to add urban elements such as benches to improve walkability experience. This video also shows pedestrian flow simulation as an option.

Potential benefits:

This overview of a city's walkability allows public actors to have a better understanding of what should be put in place and what type of infrastructure is missing. Improving the walkability of a city is crucial as walking decreases air pollution and traffic, improves physical condition and social interactions and hence makes a city more resilient.

Watch the video ▣

Hong Kong, China
Walkability

3DExperience solutions:

o Urban Transformation

MOBILITY AND URBAN INFRASTRUCTURE

2 Urban cycling

Objective:

Providing city planners and mobility experts with a 3D environment where they can upload and visualize useful and reliable information about the different mobility options with a deep dive into cycling paths and infrastructure.

Description:

This example shows the digital twin of a territory representing information about cycling paths and connecting them to other mobility access, such as bus stops, bike sharing spots and obstacles of bike lanes.

Potential benefits:

With this digital environment and spatial representation of mobility infrastructures, the users can design and build bike lanes that respond to the urban fabric and to citizens' needs. The model can support planning by anticipating constraints based on the current state.

Watch the video

Singapore
Urban cycling paths, Virtual Singapore (website)

3DExperience solutions:

o Urban Transformation

MOBILITY AND URBAN INFRASTRUCTURE

3 **Urban public transport**

Objective:

Giving city planners, mobility leaders and their contractors a common referential with visualization and modelling capabilities to design and plan infrastructure projects altogether and respond to mobility challenges of a given territory.

Description:

The example shows the conception of a new metro line on the 3DExperience platform where stakeholders visualize mobility data, design the metro line route and train station, and simulate how such new infrastructures would impact the neighborhoods.

Potential benefits:

This platform allows to gain in efficiency, as key stakeholders can collaborate, plan projects based on mobility data, and better respond to citizens' mobility needs. This leads to tailored-made mobility and urban infrastructure, improving citizens quality of life.

Watch the video 📹

Rennes, France
Public transport planning

3DExperience solutions:

o Urban Transformation
o Data-Driven Public Policies

Cities & Public Services

MOBILITY AND URBAN INFRASTRUCTURE

4 **Road infrastructure**

Objective:

Providing a large set of 2D and 3D tools for planners, engineers and managers to model, plan and discuss road infrastructure projects around the city from the ideation , the impact study to its delivery and communication to citizens.

Description:

The example shows how the 3DExperience platform can accompany public actors with different modelling, visualization and communication tools to ideate, communication, and road infrastructure deliver a project.

Potential benefits:

Supporting road infrastructure projects with 2D and 3D tools can help public actors better apprehend all the stages of such a project, from the ideation to its communication. It also fosters efficiency and transparency during the building process.

Watch the video 🎥

Jaipur, India
Infrastructure planning

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

DASSAULT SYSTEMES

MOBILITY AND URBAN INFRASTRUCTURE

4 5G infrastructure

Objective:

Providing public operators, planers, city connectivity leaders with georeferenced information of antennas points in the city and coverage of 4G and 5G. The platform has the capability to simulate the reach of the coverage in the city and visualise it in a 3D environment.

Description:

2D and 3D mapping of 5G coverage of these networks. The example also shows the location of 5G antennas, 5G bus stops and other 5G sites with the simulation of 5G waves dispersion.

Potential benefits:

Thanks to those functionalities, 5G signal can be can visualised and the coverage improved even before the infrastructures rollout. The impact on the territory can be simulated, while having all this information on a common referential to ease decisions and communication on a highly technical topic.

Watch the video

Paris, France
5G simulation

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

Cities & Public Services

MOBILITY AND URBAN INFRASTRUCTURE

4 Urban Traffic simulation

Objective:

Simulations supporting design and deployment of urban transformation projects and resilience planning of a city such as repurposing one lane to High Occupancy Vehicles (HOV). This demo, built on the Paris Périphérique (Ring Road) between Porte Maillot and Porte de la Chapelle, is a partnership between DASSAULT SYSTEMES and PTV Group

Description:

The ambition is to demonstrate that such decisions made by local authorities can be science-based, by building a triple simulation – traffic, pollution and noise - and bringing them in the context of a city Virtual Twin. All stakeholders involved in such projects (city officials, urban planners, etc...) can collaborate directly on the 3DEXPERIENCE platform and implement action plans (embedded task and project planning, ideation funnel, as well as other collaboration tools).

Potential benefits:

Once the city decision makers have visualized all the simulation results, they can collaborate - both with internal and external stakeholders -, put in place incentives or take mitigation measures and communicate. Explaining the rationale for an urban transformation project using the virtual twin (MOD-SIM) is an extremely powerful way to build consensus on science-based scenarios.

Watch the video ◼

Paris, France
Urban traffic simulation, collaboration with PTV

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

Cities & Public Services

ENERGY USE AND EFFICIENCY

1 Energy efficiency in buildings

An energy efficient building creates comfortable living conditions with the least possible amount of energy consumption. To make a building energy efficient, planners and designers need to consider the building's entire lifecycle, from the design to the construction process, going into the operation cycle and until the demolition. Data analysis and simulation are key to ensure and plan the optimal efficiency of the building.

More Information

2 Energy consumption and zoning

The current energy distribution infrastructure in many urban areas cannot support anticipated future energy use or would require significant retrofitting. Understanding the dynamics of geospatial energy use is an important tool for the cities. An energy consumption digital twin is a valuable tool for determining policies for implementing energy efficiency and renewable energy programs.

More information

Cities & Public Services

ENERGY USE AND EFFICIENCY

1 **Energy efficiency in buildings**

Objective:

Providing a 3D model of a building and leverage a LoD 4 to simulate the energy consumption in building from heating and cooling central systems and potential exposure of sunlight throughout a specific day.

Description:

The building is modeled with interior specifications and details to run and display a simulation on the effect of heating and cooling systems in different rooms. There is a solar exposure simulation that can show how the radiation of the sun can also affect the heating of the interior.

Potential benefits:

A precise simulation of the effect on heating and cooling systems with output data can help engineers and planners to regulate these systems in a building, a campus or a whole neighborhood depending of the day of the year, the outside temperature and the radiation coming from the sun from different facades.

Watch the video 🎥

Building efficiency simulation

3DExperience solutions:

o Urban Transformation

Cities & Public Services

ENERGY USE AND EFFICIENCY

2 **Energy consumption and zoning**

Objective:

Mapping, classifying and modelling buildings based on their level of energy performance to inform cities and territorial authorities on energy consumption by buildings, urban blocks and neighbourhoods in a city.

Description:

Digital twin of a territory where buildings are classified in categories and subcategories based on their energy consumption, their type (individual or collective housing), and the administration (landlords or tenants). The less energy-efficient zones are then identified.

Potential benefits:

Thanks to these classifications, city can anticipate energy consumption by urban area and type of building and understand the relationship of the different types of building and the energy efficiency. This is a valuable decision making tool and renewable energy programs enabler.

Watch the video ▶
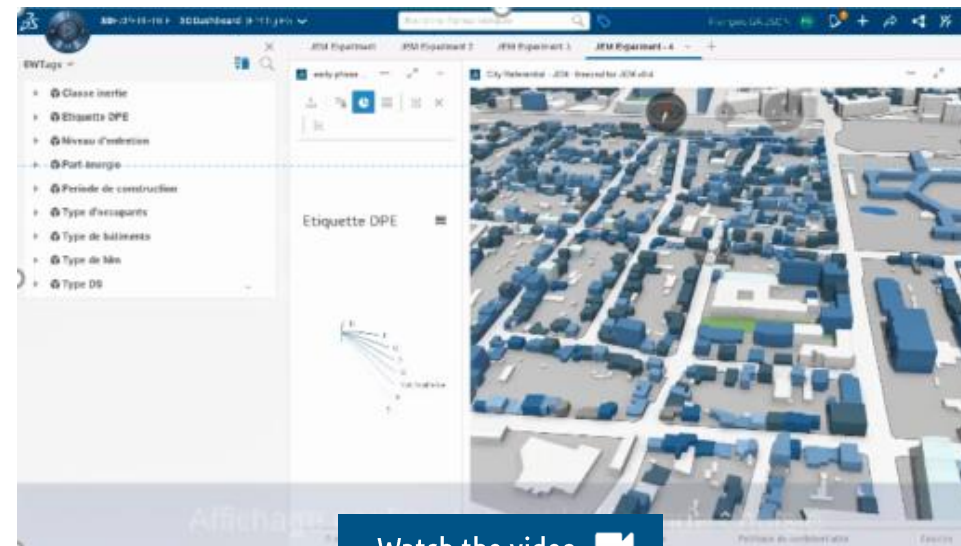
Rennes, France
Urban scale energy consumption

3DExperience solutions:

o Urban Transformation
o Data-Driven Public Policies

Cities & Public Services

ADAPT AND MITIGATE TO CLIMATE CHANGE

1 Urban flooding

Flooding is one of the main risks caused by climate change resulting in significant social and economic negative impact for cities. Cities are vulnerable to flooding not only because of their proximity to natural water sources, but also due to failing in integrating water systems into urban space. Modeling and simulating potential risks of flooding is part of risk management.

More information

3 Urban heat Islands

Structures such as buildings and streets absorb and re-emit the sun's heat more than natural systems. Therefore, urban areas become "islands" of higher temperatures. The heat island effect will strengthen in the future due to urban population growth and climate change. With the right sets of data, it is possible to visualize, simulate and predict to inform better future decisions.

More information (1)   *More information (2)*

2 Air and noise pollution

Air pollution and excessive noise harm our health and our environment. In Cities, air pollution comes mainly from vehicle combustion and industrial activities. Noise levels are mainly a result of increasing traffic volumes and intensifying industrial and recreational activities. Being able to analysis, simulate and predict these levels will support future decision-making.

More information (air)   *More information (noise)*
More information (air)

CLIMATE CHANGE AND SUSTAINABILITY
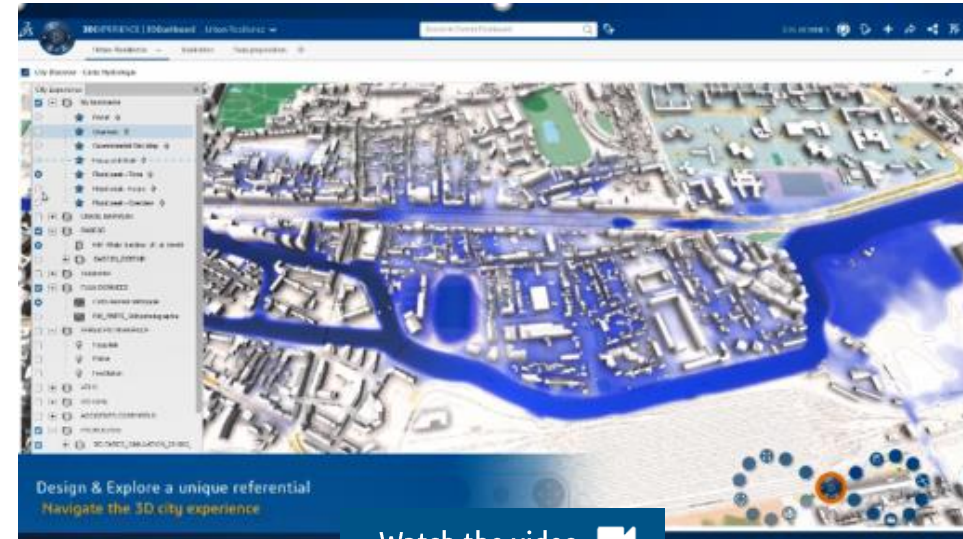
① Urban flooding

Objective:

Offering urban flooding simulation in a 3D environment to show the potential risk and the areas affected by the flooding of the river. The environment provides the possibility of visualizing and collaboration around the urban flooding simulation.

Description:

Mapping all existing river systems in the territory and identifying the urban areas that are in grater risk of flooring. The example shows a 3D view on which building would be affected and how the platform can aid to improve collaboration and decision making among stakeholders.

Potential benefits:

Having a 2D or 3D visual representation of the risk of an environmental phenomena such as urban flooding, allows to forecast all potential consequences and better plan for crisis responses and mitigation strategies.

Watch the video 🎥

Rennes, France
Urban flooding simulation (Partnership with Deltares)

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

CLIMATE CHANGE AND SUSTAINABILITY

3 **Air pollution**

Objective:

Offering a simulation of air pollution and dispersions from polluting infrastructures (ports, factories) in a 3D environment, show the impact on other part of the city.

Description:

This example demonstrate how air pollution emitted by a specific building is spread in the air around the city. The level of concentration of the polluting particles is displayed with a variation of color based on it (red for high concentration, green for low).

Potential benefits:

Having a 3D representation and simulation of air pollution and spreading is fundamental to inform the public administration on the impacts on public health, sustainability and climate change. This information can support decision makers to better understand and act to decrease the negative impact on the health and the environment.

Watch the video

Marseille, France
Air pollution simulation

3DExperience solutions:

o   Urban Transformation
o   Citizen Engagement

CLIMATE CHANGE AND SUSTAINABILITY

**3** **Noise pollution**

Objective:

Simulation of noise pollution surrounding a group of buildings represented on a digital twin of the city. First step to understand the impact of noise for the citizens and act on it if possible.

Description:

The environmental noise is classified by different levels of noise impacting the different facades of the building. Each façade of the buildings show a different classification of noise levels impacting all the facades of each building.

Potential benefits:

Air pollution impacts the health of people and should also be considered as a strategic element for cities. With noise pollution information, planners can adapt different areas of the city to be protected by noise depending on the usage (e.g. hospitals, schools, etc...).
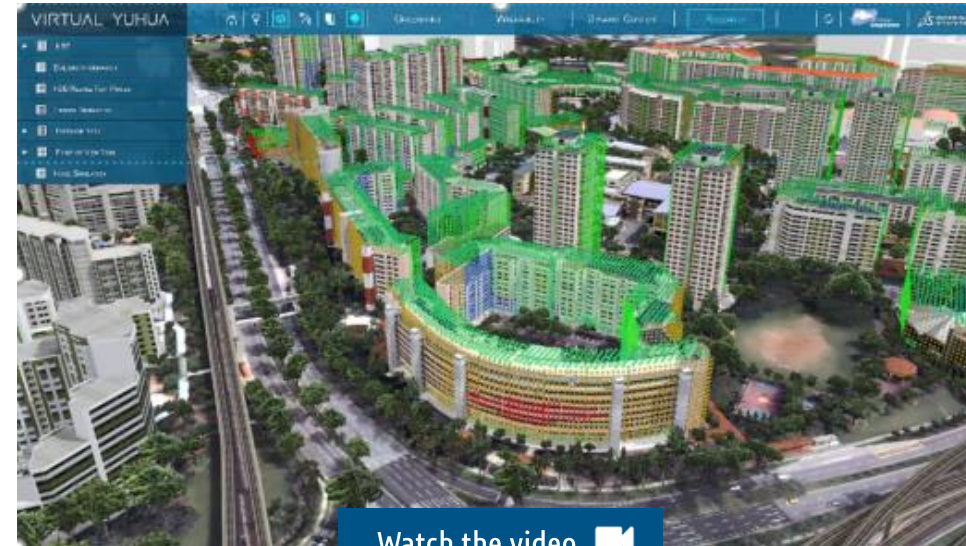
Watch the video

Singapore
Noise simulation, Virtual Singapore (website)

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

Cities & Public Services

CLIMATE CHANGE AND SUSTAINABILITY
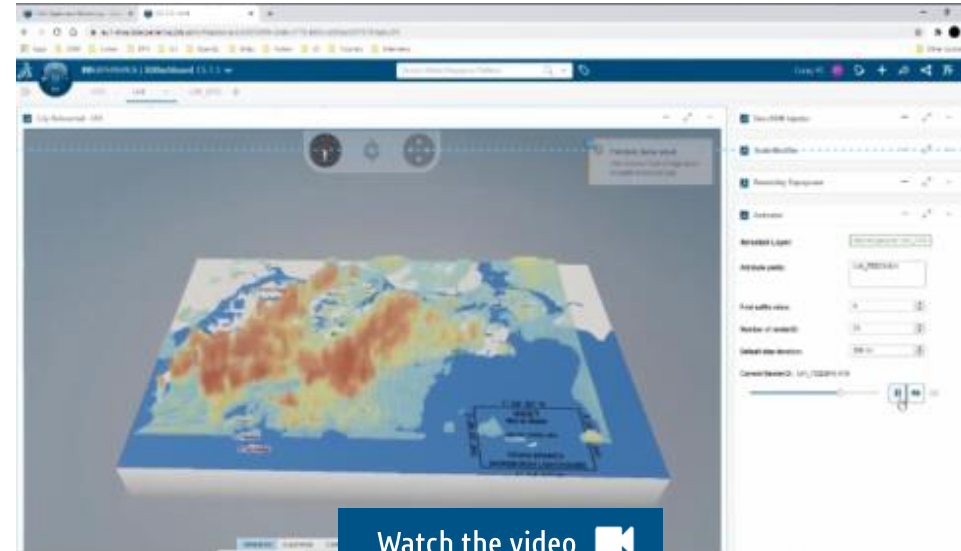
4 Heat island

Objective:

Provide a simulation and mapping of heat dispersion of the city to identify the different areas of Urban Heat Islands in a given territory. Data comes from historic data and can be extrapolated to simulate future scenario of heat in the city.

Description:

This video shows the simulation of the Urban Heat Islands run in 3 different places using historic and predicted data from scientific modelling. The time-series simulation shows a climate digital twin of the whole territory and deep dives in a specific urban area.

Potential benefits:

This type of simulation makes it possible for decision makers to visualize, analyze and predict heat islands, potential heat waves and the impact on specific urban areas. This information also provides insides on where to retrofit and mitigate the impact.

Watch the video

Singapore,
SEC FCL Cooling Singapore, Virtual Singapore (website)

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

Cities & Public Services

CLIMATE CHANGE AND SUSTAINABILITY

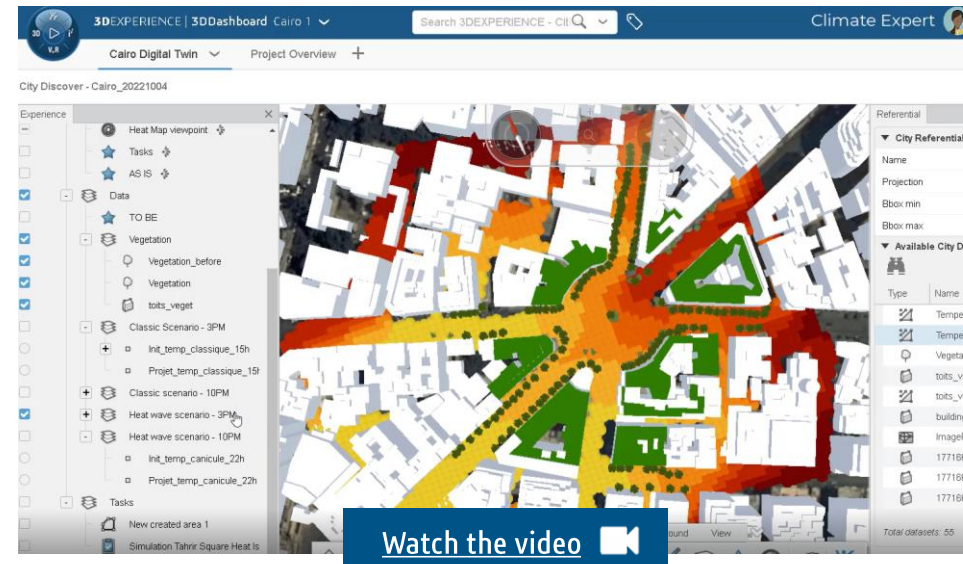## ④ Heat island & air pollution

Objective:

Air Cairo is a project over downtown Cairo. The objective is to build a climate change observatory to help local authorities better understand the consequences of climate change on air pollution and heat islands phenomena in the city.

Description:

The platform visualizes climate data from different sources (sensors, satellite, weather forecast). This science based exact replica of the city virtual twin allows to simulate future scenarios of the pollution and the heat island effect down to the street level. All the stakeholders involved in the project (city officials, climate experts, urban planners) can then collaborate directly on the 3DEXPERIENCE.

Potential benefits:

The city and its supporting ecosystem are improving the collaboration to imagine what can be done to mitigate the climate crisis. With Air Cairo, simulating ''WHAT IF'' scenarios to measure the impact of the decisions before validating best practices.

Watch the video 🎥

Cairo, Egipt
Heat island and air pollution simulation, partnership with SUEZ ARIA

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

CRISIS ANTICIPATION AND MANAGEMENT

1 Public health management

Covid-19 highlighted the central role of public governance in cities, states and regions in tackling the crisis. Decision-making needs to happen fast and on the ground, in close cooperation between national and local governments. Offering a strong crisis anticipation and management system is critical for cities today. Using simulation methods can enable cities to be ready for crisis.

More information

3 Indoor ventilation

Improving ventilation in public and private indoor environments can help you reduce virus particles, such as COVID-19, from spreading. In public building this becomes of special concern for city administration as it might cause crisis situations linked to public comfort and health. To help anticipate this situations, authorities can simulate the phenomena and anticipate it.

More information

2 Chemical risk

Common chemical pollutants in urban areas include: lead, air pollutants from fuel combustion, toxic/hazardous wastes, and ambient air pollution. These preventable health burdens cause disease, accidents, and premature death. Aspects such as the socio-spatial inequities in the distribution of risks and mitigation responses are essential when anticipating chemical risks.

More information

CRISIS ANTICIPATION AND MANAGEMENT

## 1 Public health management

Objective:

Providing local public actors with information about the public health situation during a sanitary crisis. The platform has the capability of overlapping public health data with socio-economic data. It also provide a mapping of infection rate for the specific case of a virus.

Description:

This video displays the functionality of the 3DExperience platform to inform people in charge about the public health situation in a large area. The platform shows: occupancy level of hospital beds, the number of people infected and predictions of the virus spread.

Potential benefits:

The 3DExperience platform offers a strong crisis anticipation and management system that is critical for cities and territories today. Using data and geospatial analytics combined with simulation methods to enable cities to be ready for crisis. This allows decisions to be made faster on the ground, in close collaboration with national, regional and local governments.

Analyse et navigation cartographique

Watch the video ▶
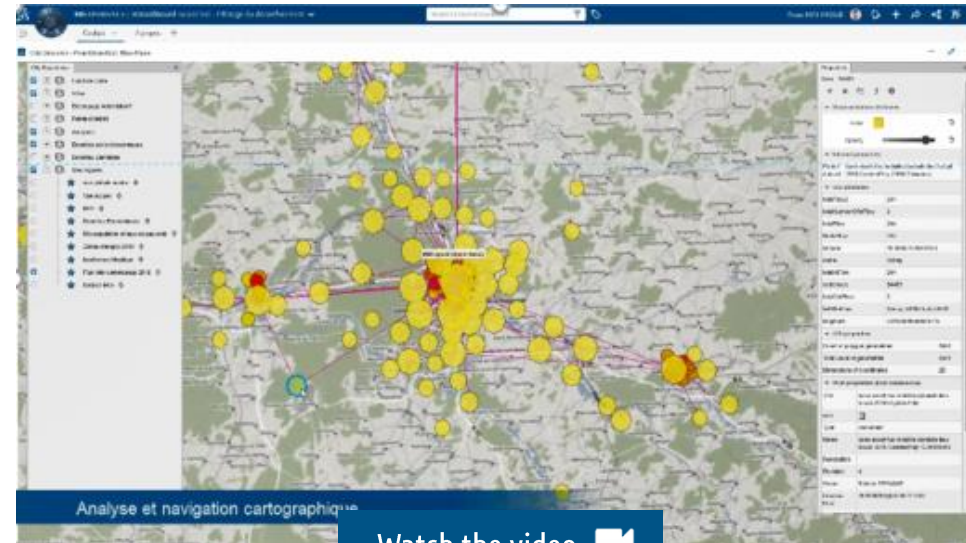
Grand Est, France
Predict'EST

3DExperience solutions:

o Urban Transformation
o Data-Driven Public Policies

Cities & Public Services

CRISIS ANTICIPATION AND MANAGEMENT
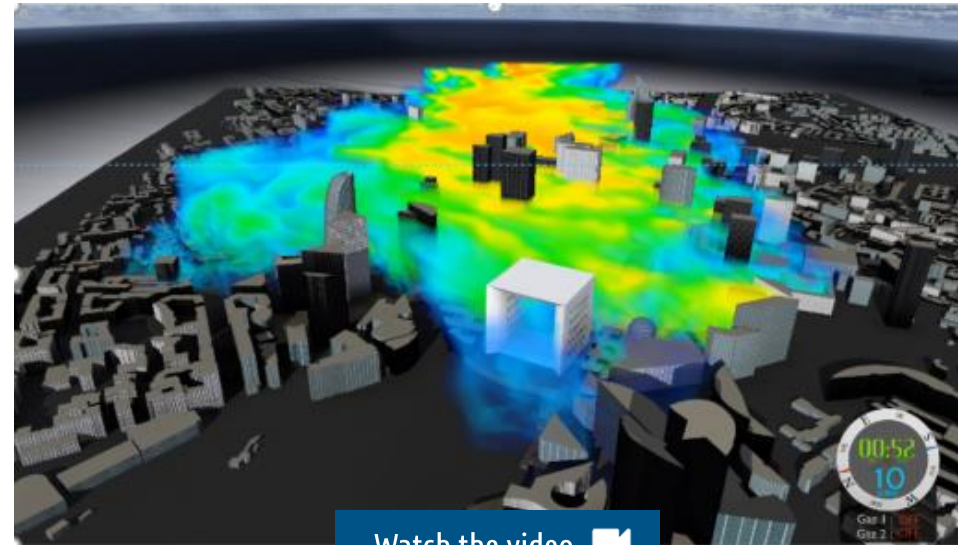
2 **Chemical risk**

Objective:

Modelling and simulation of potential chemical risk in a specific urban area. Helping the authorities to better understand the risks of different scenarios according to weather conditions or the nature of the agent spread.

Description:

The example shows the simulation of a chemical risk dispersion in a high transit area in Paris. Over time, the chemical is changing direction based on the wind and on the building obstacles. The intensity of the chemical is classified by color (red is high concentration).

Potential benefits:

With such simulation and predictive tool, the authorities can plan for potential risks and be equipped with possible risk scenarios. This will allow them to be better prepared and plan for evacuation plans or response mechanisms.

Watch the video 🎥

La Defense, Paris, France
Chemical risk simulation

3DExperience solutions:

o   Urban Transformation

Cities & Public Services

CRISIS ANTICIPATION AND MANAGEMENT

3 **Indoor ventilation**

Objective:

Providing an indoor simulation accessible through a digital twin. Playing specific scenarios such as the spread of a virus in a public building. The tool can simulate the impact of particles' spread and the air ventilation inside the building.

Description:

The example shows the situation of a virus spread and the indoor air flow in a concert hall. The simulation shows the impact of different prevention and safety measures, such as the use of masks, and how the different levels of ventilation help ease the effect of a virus spread.

Potential benefits:

With the recent pandemic, public authorities have move towards more preventing a safety measure to be prepared and avoid catastrophic effects of a new pandemic. This type of simulations support public authorities to better plan and anticipate these situations. This is also a very powerful tool to communicate with citizens or people working here showing them that all measures have been taken for their safety.

THE AIR FLOW IS GUIDED AND CONTROLED
IT PREDOMINENTLY FLOWS IN THE BACK OF SPECTATORS AND MUSICIANS

Watch the video 🎥

**Philharmonie de Paris, France
Indoor ventilation simulation**

3DExperience solutions:

o Urban Transformation
o Citizen Engagement

CONTINUING THE CONVERSATION

Dassault Systèmes is keen to continue the discussion with stakeholders across the cities and public services value chain, to understand how this vital environments can continue their transformation for the benefit of all citizens. We welcome the views of policymakers in local & national governments, professionals within the industry and the wider urban design community within planning, architecture and cities engineering.
Collaborative knowledge sharing and real-world simulation have the potential to drive many innovations and changes.

The goal is a system of operational excellence which will continue to ensure that cities and territories around the world remain competitive in focusing on the sustainability of businesses, people, products and the environment.

Join this sustainable and innovative transformation and have your say.

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Cities & Public Services