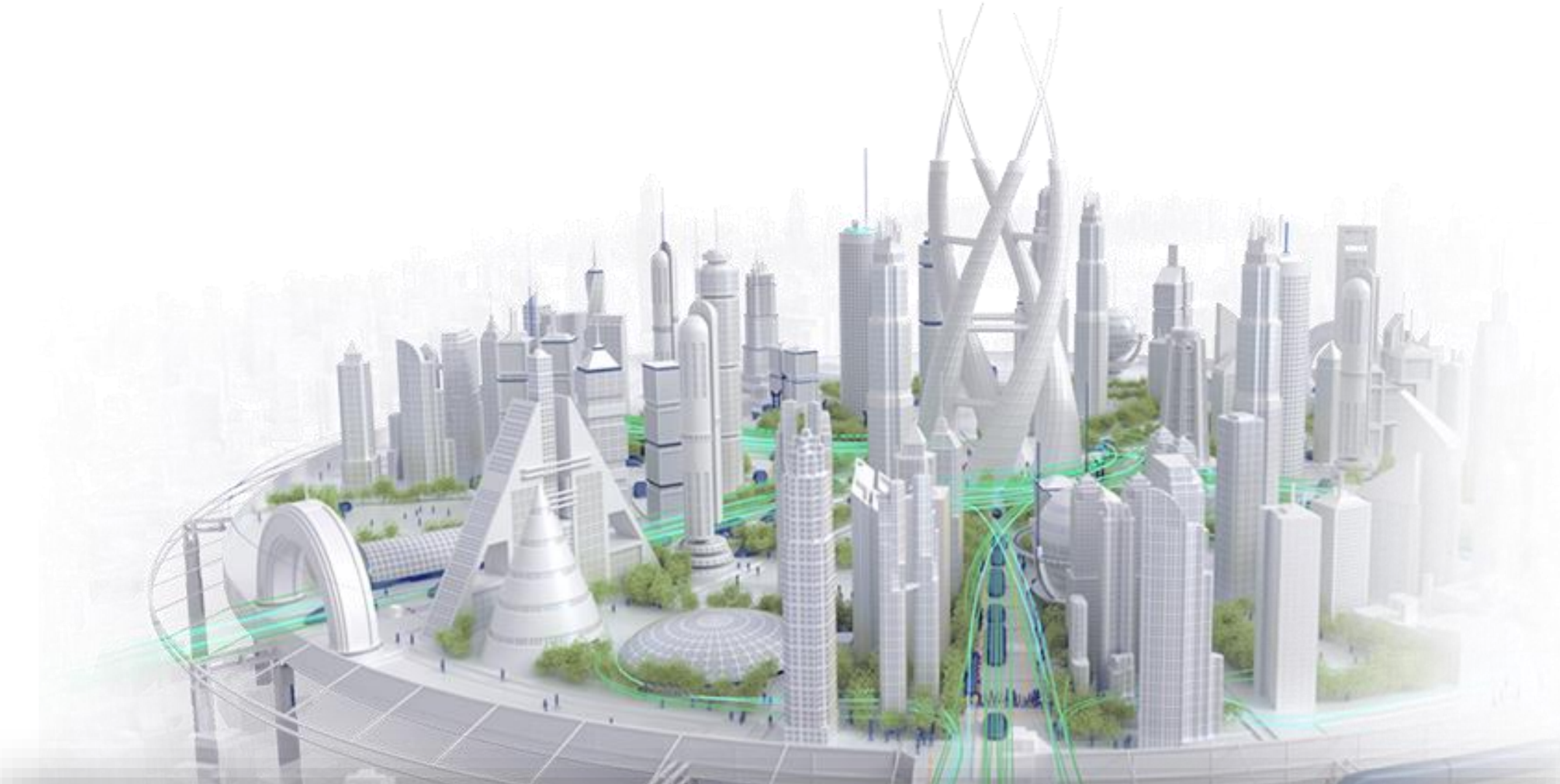


INTRODUCTION

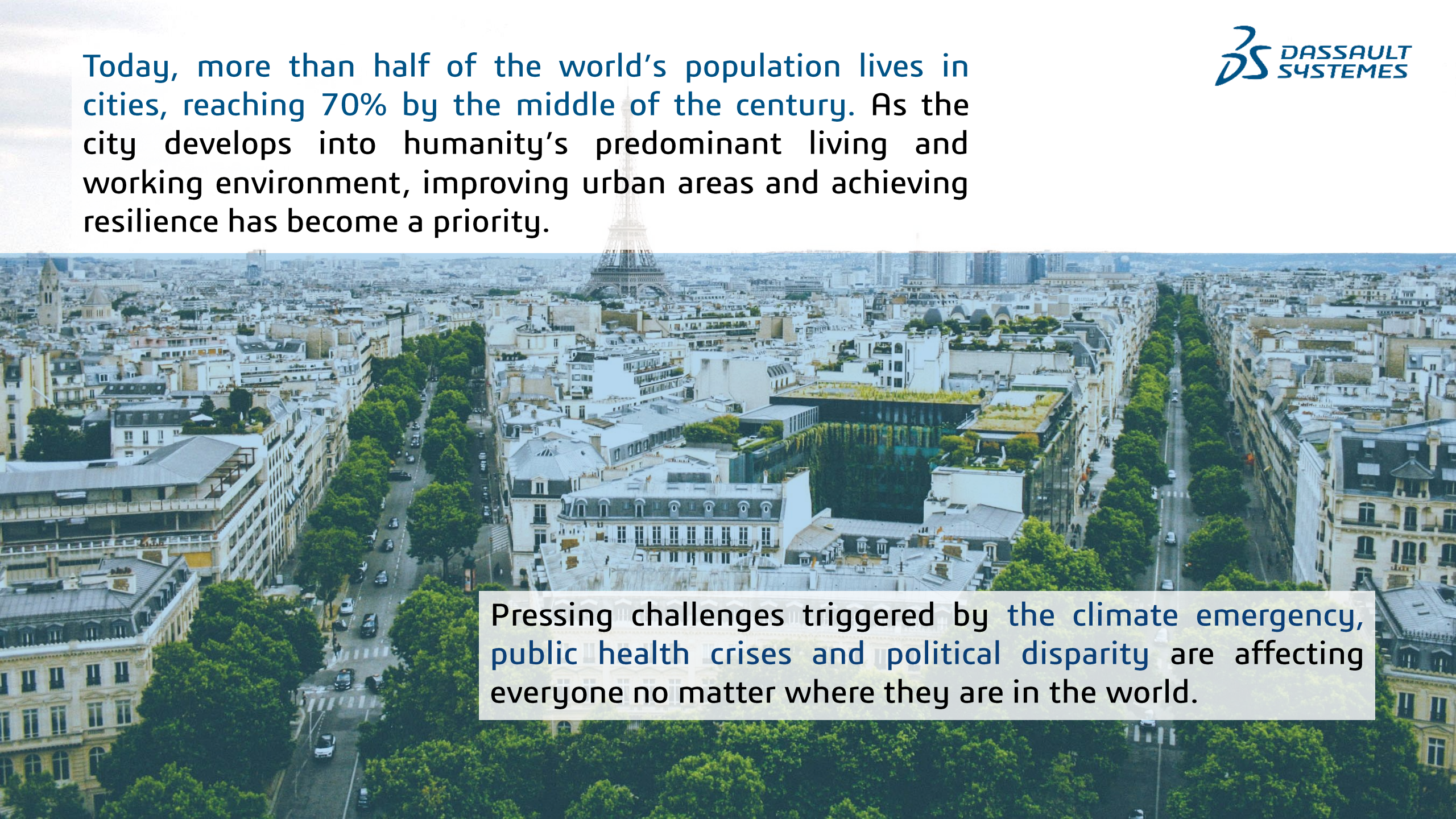
CITY VIRTUAL
TWIN

LEVERAGING
3DEXPERIENCE
SOLUTIONS



3DEXPERIENCE VIRTUAL TWIN FOR CITIES

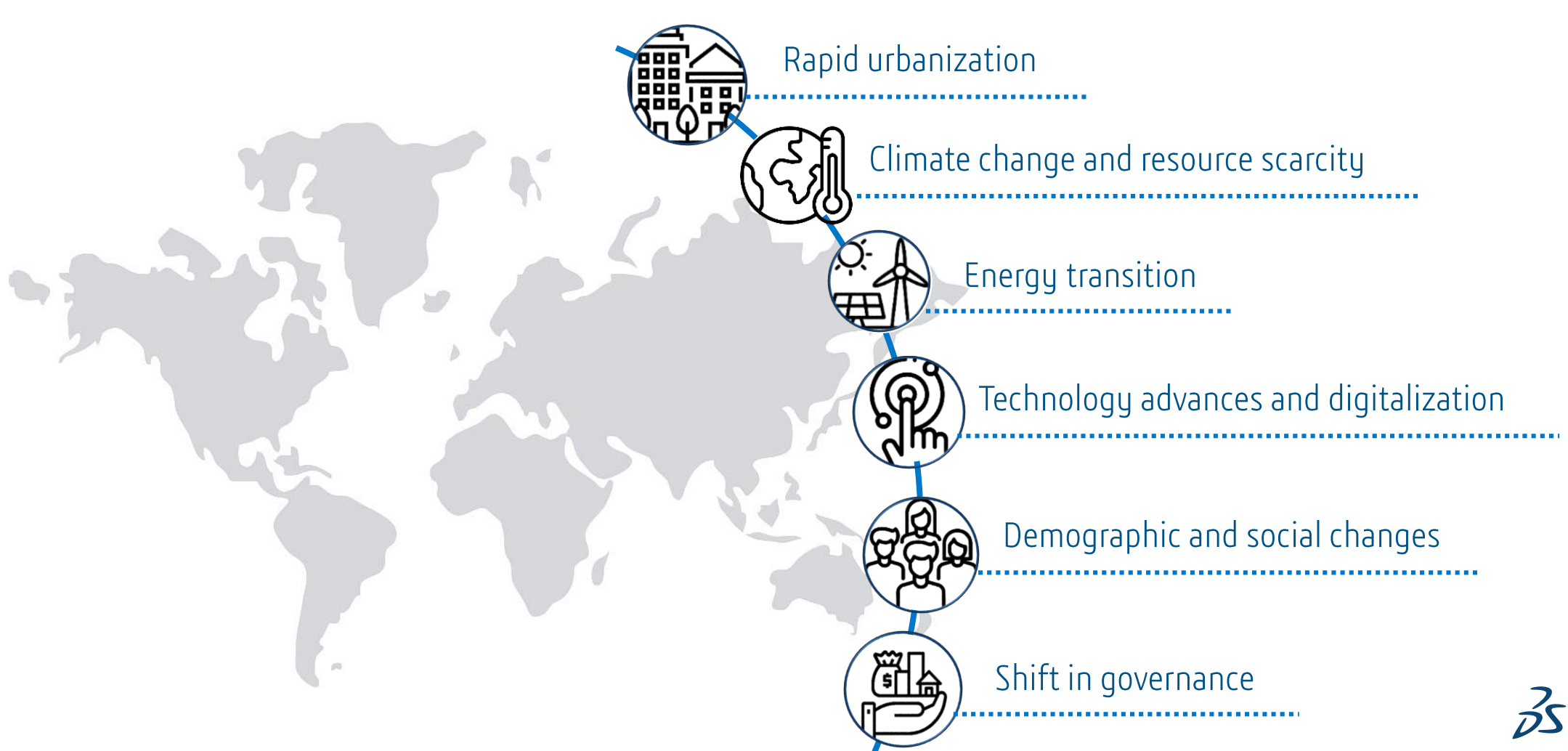
Today, more than half of the world's population lives in cities, reaching 70% by the middle of the century. As the city develops into humanity's predominant living and working environment, improving urban areas and achieving resilience has become a priority.

An aerial photograph of Paris, France, showing a dense urban landscape with many buildings and green spaces. The Eiffel Tower is visible in the background. The image is used as a background for the text.

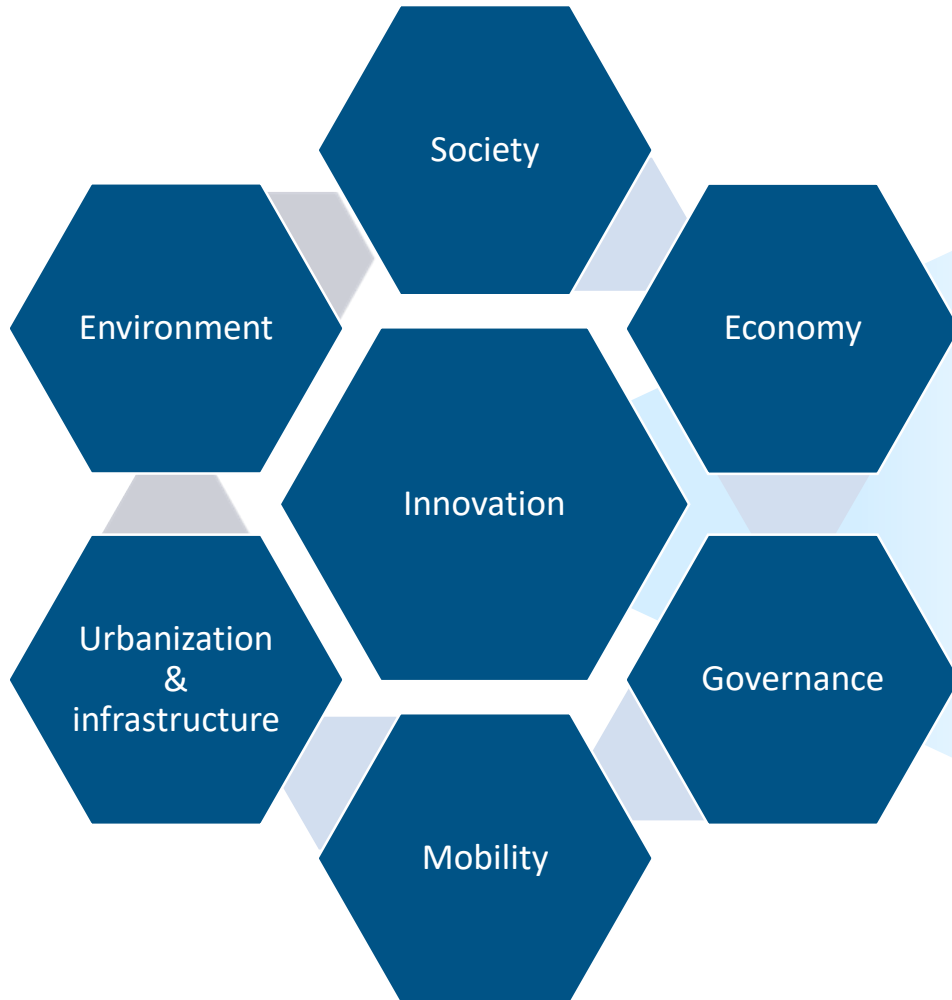
Pressing challenges triggered by the climate emergency, public health crises and political disparity are affecting everyone no matter where they are in the world.

MEGA TRENDS AFFECTING CITIES

Although mega trends differ based on the country and region, we identified those affecting the majority of cities around the world:



TODAY CITIES ARE THE MOST COMPLEX SYSTEMS

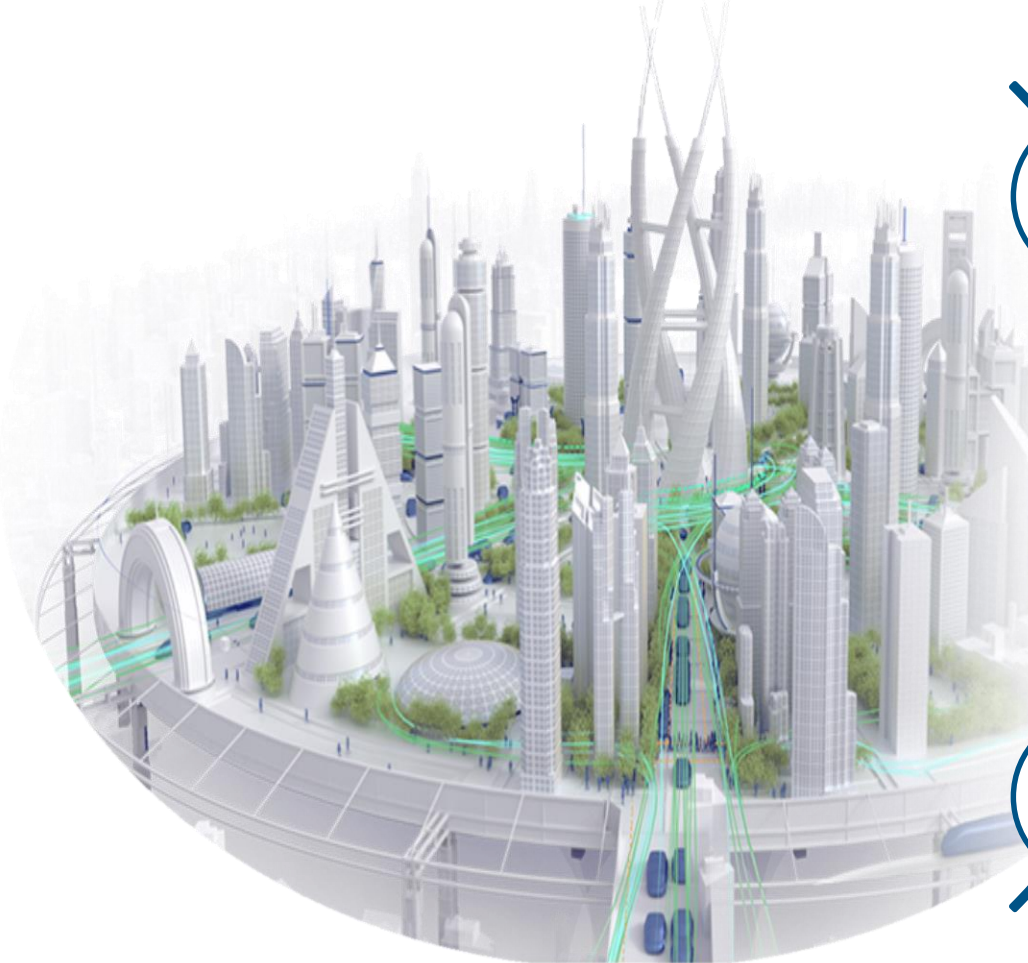


Today, cities are considered the most **complex systems**. Collecting, accessing and analyzing data is critical for any city. In addition, without **innovative** solutions to model, visualize and simulate these data, decision makers will not be able to achieve their main objectives

Objective: to build **resilient cities** through collaborative, participatory, and innovative **methods** with the use of inclusive digital **tools** for smart and connected cities

WHY A VIRTUAL TWIN FOR CITIES?

Cities are systems of systems, making them the most complex systems. New digital technologies help understand their complexity and support cities in their transformation challenges by:



1

Targeting local urban transformation challenges

2

Understanding day-to-day urban challenges through data collection systems

3

Transforming data into information and knowledge through analysis, modelling and simulation

4

Enabling collaboration across multiple stakeholders based on analysis, modelling and simulation

3DS OFFERS A VIRTUAL TWIN EXPERIENCE



1981
**3D
Design**

1989
**3D DMU
Digital
Mock-up**

1999
**3D PLM
Product Lifecycle
Management**



2012
**3DEXPERIENCE®
platform**



2020
**Virtual Twin
Experience
of humans**

A MODULAR PLATFORM FOR CITIES

3DEXPERIENCE Digital Twin



The virtual representation of a city to visualize, model, analyse and manage the systems and its environment

1. Modeling



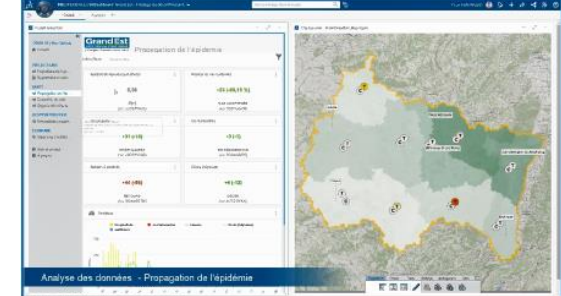
A 3D model of the city with realistic characteristics of buildings and public areas

2. Simulation



Different types simulations to visualise and analyse different future scenarios in the city

3. Data intelligence



Data processing and analysis of existing data to support data-driven decision making

4. Collaboration



Collaboration platform for internal operations and to engage with citizens in real time

HOW CITIES CAN IMPLEMENT 3DS SOLUTIONS

3DS use cases for cities based on urban transformation challenges:

1. URBAN PLANNING

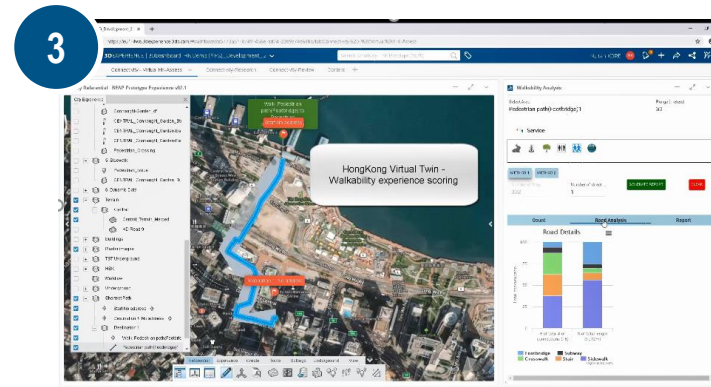
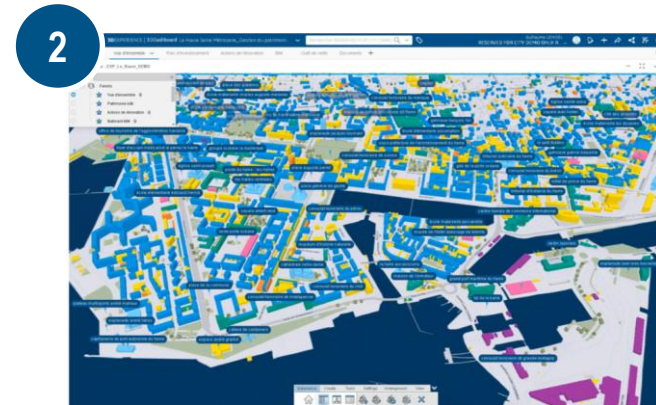
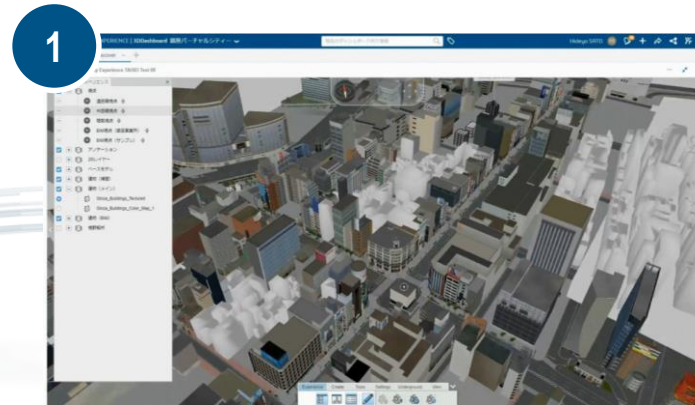
- Urban strategies
- Urban Planning
- Project Orchestration
- Development and Construction

2. LAND USE GOVERNANCE

- Land use planning
- Public patrimony
- Public asset management

3. URBAN MOBILITY

- Walkability
- Urban cycling
- Urban public transportation
- Urban infrastructure



3DS use cases



HOW CITIES CAN IMPLEMENT 3DS SOLUTIONS

3DS use cases for cities based on urban transformation challenges:

4. ENERGY USE AND EFFICIENCY

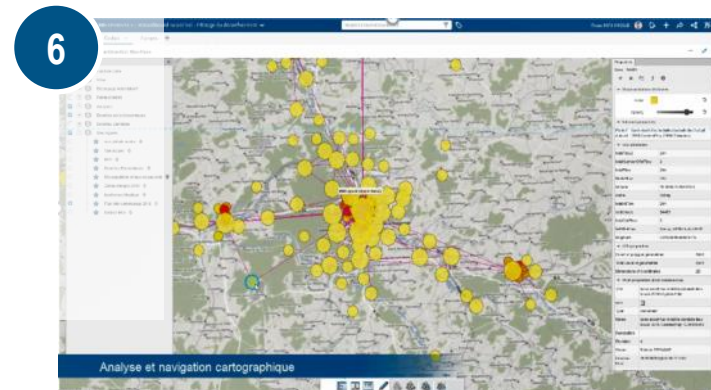
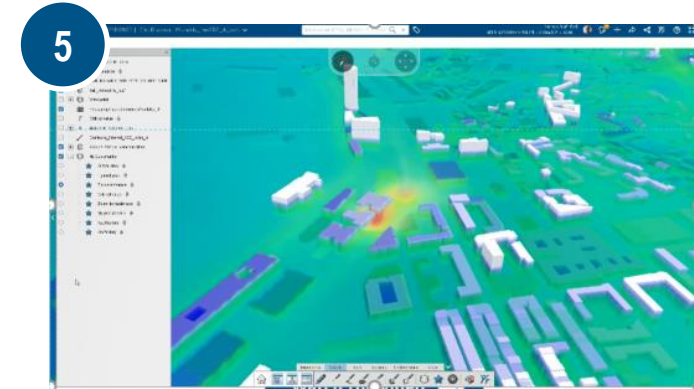
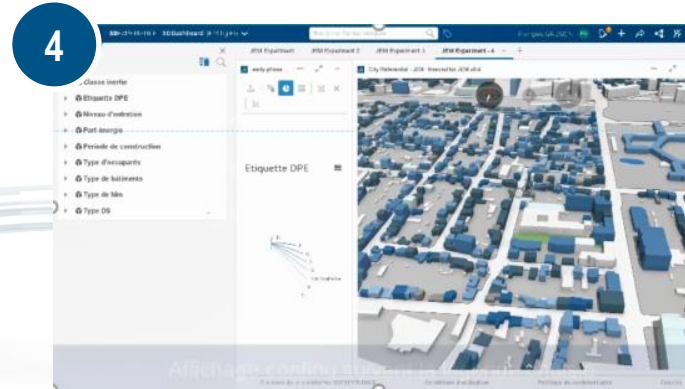
- Energy efficiency in buildings
- Urban energy consumption

5. CLIMATE AND SUSTAINABILITY

- Urban flooding
- Air and noise pollution
- Urban heat islands

6. CRISIS ANTICIPATION

- Public health management
- Chemical risk
- Indoor ventilation



3DS use cases



THE SMART CITY PROCESS AND ECOSYSTEM

Cities (1) identify targets, (2) set up tools and methods to collect data, (3) gather, process and analyze that data (4) visualize, simulate and model to create discussion, collaborate and arrive to decisions to take the right actions.

1. IDENTIFY



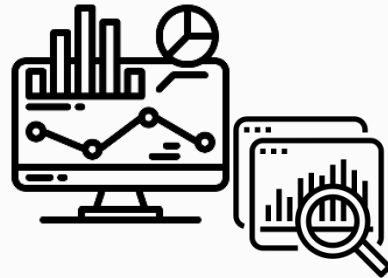
Based on their challenges, cities target and focus their efforts on specific topics (e.g. air pollution) to build strategies and objectives

2. COLLECT



Cities then deploy tools and methods, such as sensors, to collect all the relevant data needed to understand the current situation

3. GATHER, PROCESS & ANALYZE



When all the needed data is collected, it is necessary to clean, process and analyze the data depending on the origin and format

4. COLLABORATE & TAKE ACTION



After data is collected and cleaned, cities model, visualize and simulate these data to get better insides of current and future scenarios. These maps or graph are later use as collaborative inputs for decision-making in planning, managing and creating future cities

Integrated data-driven solutions developed for citizens and the environment : VIRTUAL TWIN

WHO ARE THE STAKEHOLDERS BENEFITING

3DEXPERIENCE platform is designed to support and build on collective intelligence and effective collaboration within all different stakeholders involved in the transformation of cities



LEVERAGING 3DEXPERIENCE SOLUTIONS

URBAN STRATEGIES AND PLANNING

LAND USE GOVERNANCE AND MANAGEMENT

MOBILITY AND URBAN INFRASTRUCTURE

ENERGY USE AND EFFICIENCY

CRISIS ANTICIPATIONS AND MANAGEMENT



URBAN STRATEGIES AND PLANNING

1 Urban planning

Objective:

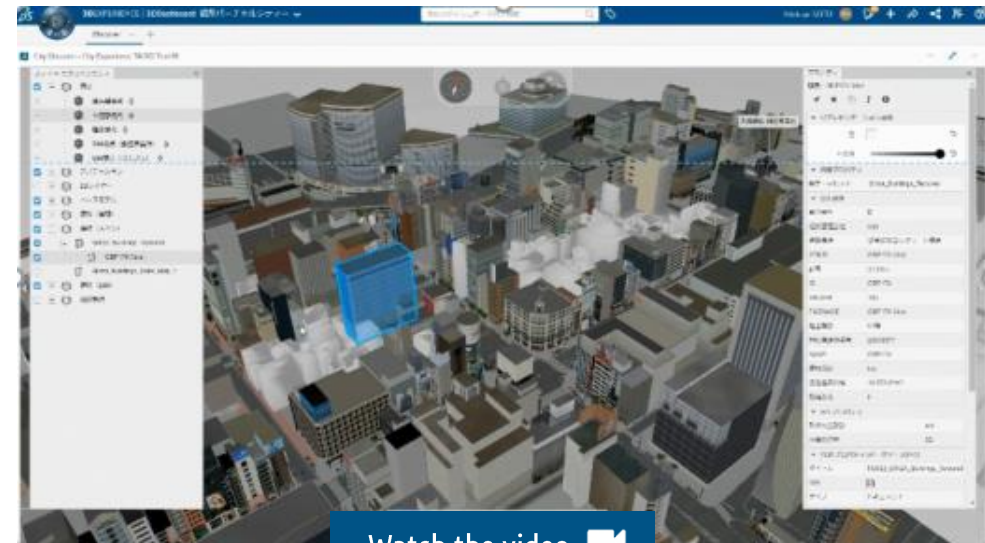
Giving tools to urban planners to have a clear understanding of specific urban areas and the impact of potential projects. The platform provides different type of spatial and environmental simulations, helping urban planners take data-driven decisions.

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.



[Watch the video](#)

Ginza, Japan
Virtual city

3DExperience solutions:

- Urban Transformation
- Data-Driven Public Policies



LAND USE GOVERNANCE AND MANAGEMENT

2 Public asset management

Objective:

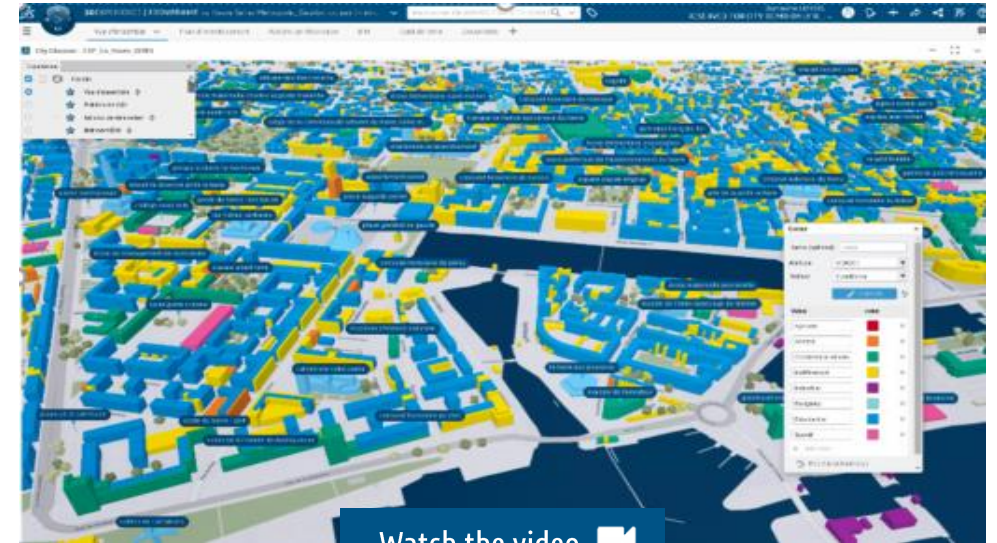
Providing an inventory on public assets from GIS data and building attributes, and a collaborative platform for public administrators to better monitor the state of public buildings and conduct renovation and/or demolishing projects if needed.

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.



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

3DExperience solutions:

- Urban Transformation
- Data-Driven Public Policies



MOBILITY AND URBAN INFRASTRUCTURE

1 Walkability

Objective:

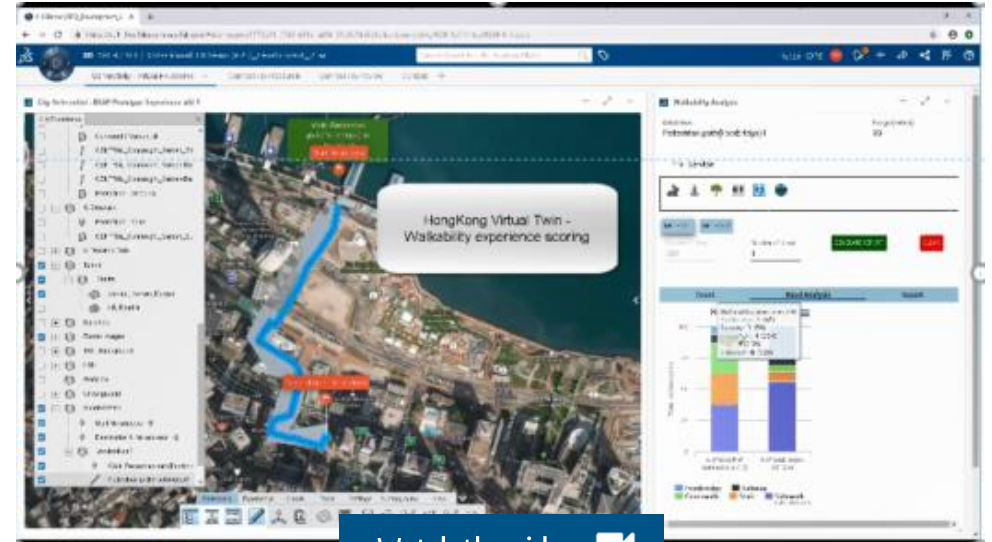
Providing city planners with a 3D environment and information about existing and potential pedestrian routes and paths in the city. Overlapping other type of information such as urban equipment to have a holistic view of the pedestrian experience.

Description:

The display of pedestrian routes 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.



Singapore
Urban cycling paths, Virtual Singapore ([website](#))

3DExperience solutions:

- o Urban Transformation



ENERGY USE AND EFFICIENCY

1 Energy efficiency in buildings

Objective:

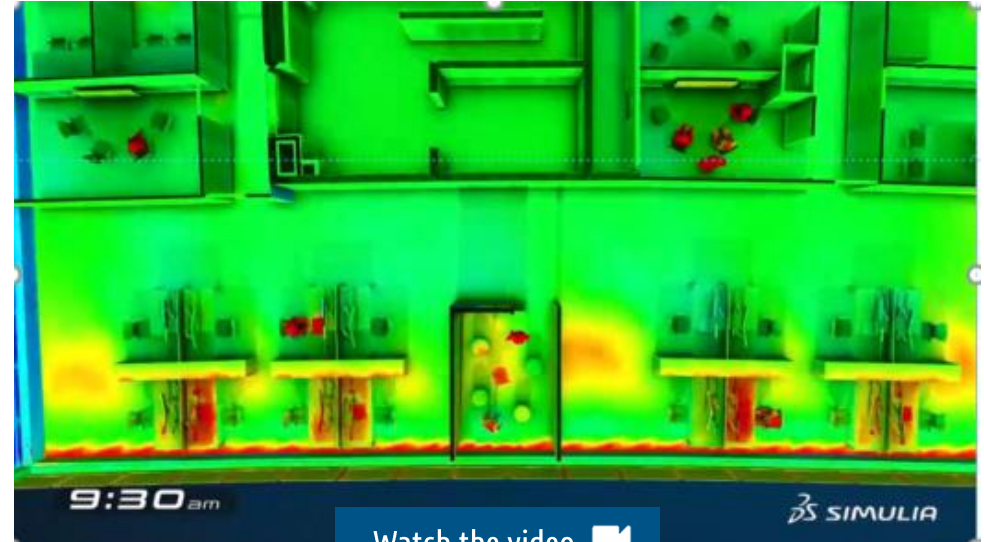
Providing a 3D model of a building and leverage a LoD 4 to simulate the energy consumption in building from heating and cooling central systems and potential exposure of sunlight throughout a specific day.

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.



Building efficiency simulation

3DExperience solutions:

- o Urban Transformation



CLIMATE CHANGE AND SUSTAINABILITY

1 Urban flooding

Objective:

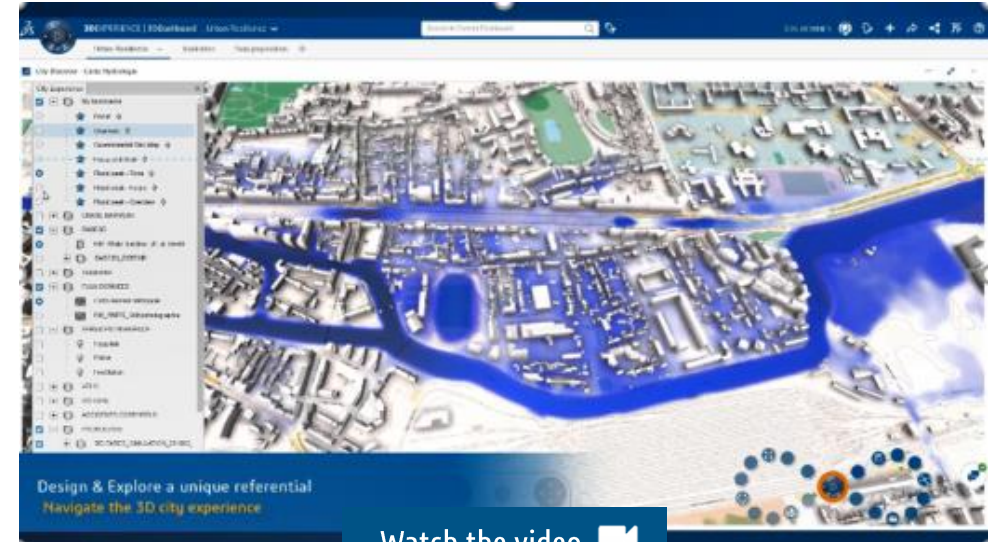
Offering urban flooding simulation in a 3D environment to show the potential risk and the areas affected by the flooding of the river. The environment provides the possibility of visualizing and collaboration around the urban flooding simulation.

Description:

Mapping all existing river systems in the territory and identifying the urban areas that are in greater risk of flooding. The example shows a 3D view on which buildings 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.



Rennes, France

Urban flooding simulation (Partnership with Deltares)

3DExperience solutions:

- Urban Transformation
- Citizen Engagement



CLIMATE CHANGE AND SUSTAINABILITY

2 Noise pollution

Objective:

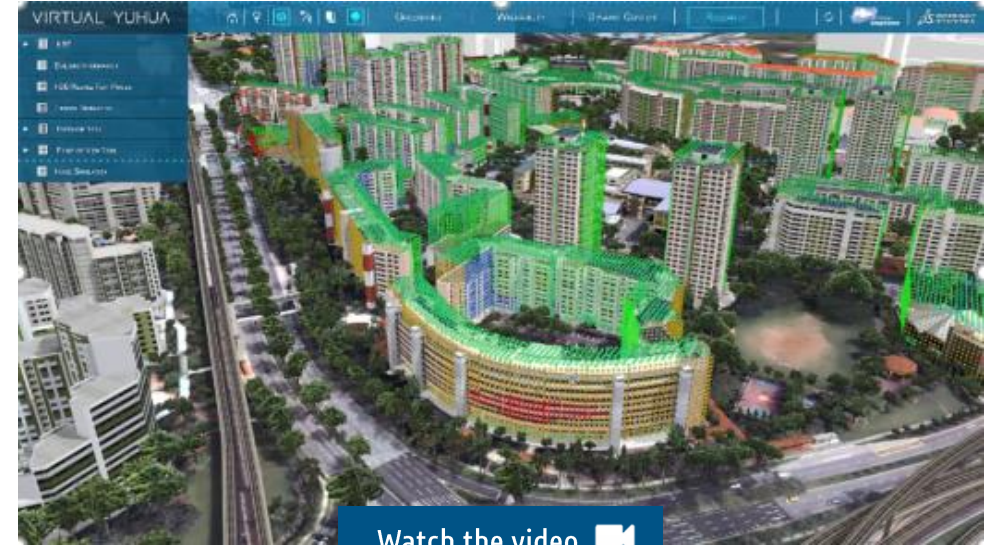
Simulation of noise pollution surrounding a group of buildings represented on a digital twin of the city. First step to understand the impact of noise for the citizens and act on it if possible.

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

CRISIS ANTICIPATION AND MANAGEMENT

1 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.



[Watch the video](#)

Philharmonie de Paris, France
Indoor ventilation simulation

3DExperience solutions:

- Urban Transformation
- Citizen Engagement