

FIDIC Award 2015 - Application form

The Sustainable City Simulator is an innovative software developed by a multidisciplinary team led by Artelia, which displayed great inventiveness over a period of a year in order to offer public-sector project owners a decision-aid and communication tool. It was developed by adopting an approach to sustainable cities guided by engineering, based on a reference framework specifically created to characterise the issues of sustainable urban development.



Digital mock-up of Santiago today (1) and urban project for Santiago (desired) (2)

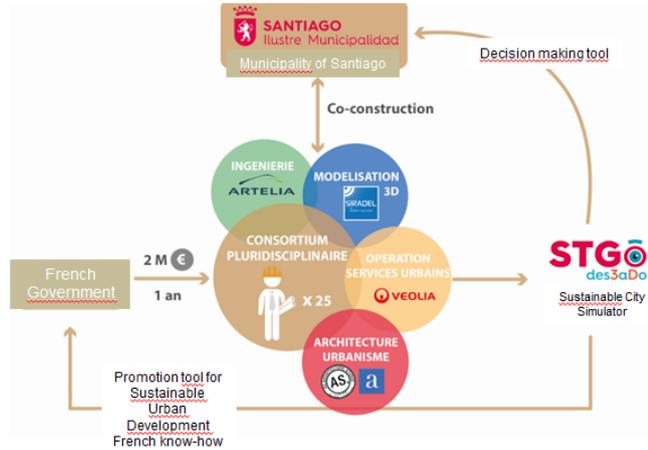
The engineers of the Artelia group, along with their partners (2Ei; AS. Architecture-Studio; Arte Charpentier Architectes; SIRADEL) developed a Sustainable City Simulator, applied to the city of Santiago (Chile). This software, which draws together French know-how in the field of sustainable cities, allows all the sustainable development issues facing an urban area to be addressed in just a few clicks. These include **understanding the regional context, viewing and evaluating proposals for urban development, and integrating innovative technological solutions.**

In 2013, Artelia won a call for tenders issued by the French Ministry of the Economy and Finance, in conjunction with the Vivapolis initiative, to promote French skills in the field of sustainable cities internationally. The goal was to produce **a decision-aid tool to be used by public-sector decision-makers in the framework of a sustainable development project in the heart of an urban area,** which would form a **showcase for French know-how in this field.** Public authorities are increasingly required to make decisions concerning the development of the areas for which they are responsible without knowing all the current and future issues involved, without being able to anticipate the impacts of a development project and/or without having concrete solutions to ensure the implementation and operability of such a project. The Sustainable City Simulator offers the city of Santiago the possibility of addressing these three problems by using a single numerical facility.

Members of the consortium and respective roles

<p>Engineering-studies Eco-design of urban development and services Coordination of urban engineering, Modelling of performance levels</p>	<p>ARTELIA Leading independent French engineering group. 3500 employees - 40 branch offices outside France. => <i>Design of cities on any scale and regarding all components, around the world: engineering for urban development and services</i></p>
<p>Architecture & Urban planning Strategy and territorial analysis / Urban and architectural project</p>	<p>ARCHITECTURE STUDIO 12 associate architects – 220 employees. Many major international references => <i>Design and promotion of French-style cities</i></p> <p>ARTE CHARPENTIER 20 associate architects – interior designers – town planners – landscape architects - 100 employees => <i>Research and creativity at the service of man and his environment, extensive experience in urban planning projects</i></p>
<p>Digital mock-up & 3D Interface Acquisition of data, processing and visualisation. Planning of radio networks</p>	<p>SIRADEL Independent SME - Rennes - Toronto - Shanghai – 55 employees. Turnover: €5m - 250 key accounts - 60 countries – 100 partners. => <i>Creation of 3D data and design of software</i></p>
<p>Major industrial group Innovative technical solutions</p>	<p>2Ei Design office benefitting from the operational experience of Veolia Group operating teams => <i>Consultancy services in waste management energy</i></p>

Artelia, lead firm in a consortium of engineering & architecture firms



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Intended primarily for the city council in Santiago – an urban area of 300,000 inhabitants in the heart of the Santiago de Chile Metropolitan Area (with 7 million inhabitants), the Sustainable City Simulator applies to a **real urban project: the covering over of the Pan-American Highway** running north to south across the continent, which at present splits the city of Santiago both spatially and socially. The software is a way of linking the regional context, characterised by water stress, a trend towards urban sprawl and the development of a city centre neighbourhood based on the roofing over of the urban highway, with the aim of improving the quality of life for citizens faced with the problems of noise, atmospheric pollution and urban heat islands resulting mainly from road traffic and lack of space for pedestrians.

Based on a 3D numerical model of the Santiago urban area, the virtual medium is first of all a way of analysing the current state of the city using a set of **interactive maps showing geo-referenced indicators**, devised using data of extremely varied types and origins at different scales. This facility for analysing the existing situation, referred to as a “scan”, is a way of **identifying the issues facing the area** and allows decision-makers – and the project team – to adopt an objective approach and define an urban strategy to develop the city centre. Two development proposals are represented in the digital mock-up of the existing situation. The user then has the **opportunity of visualizing in 3D** a “desired” Santiago – “Santiago Deseado” -, of exploring both options in this mock-up of the future city, and of understanding, comparing and assessing the impacts of these components.

Context: challenge of revitalising Santiago’s city centre bisected by the Pan-American Highway



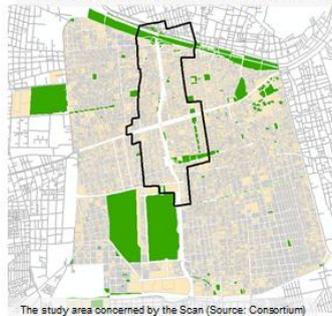
The Pan-American highway running through the Americas (Source: Almanaque grafico mexicano)



An immersion in the **historic centre of Santiago’s Metropolitan Region**: an urban project to improve quality of life and make the city centre more dynamic



The Pan-American Highway at the heart of Santiago (Source: Santiago Municipal Council)



The study area concerned by the Scan (Source: Consortium)

Scope of study: Project area measuring 350 ha (black outline on the map opposite), bisected from north to south by the Pan-American Highway (drawn in white), located at the heart of Santiago municipality (310,000 inhabitants, 23 km² – coloured area on the opposite map), the historic heart of the Metropolitan Area (7 million inhabitants)

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The scan: allowing everyone to understand the challenges currently facing cities

Results of the scan: 68 geo-referenced indicators in 3D, broken down into 20 sections that characterise the 11 key components for Santiago to become a Sustainable City

URBAN DENSITY	SOCIAL EQUITY	ECONOMY & JOBS	URBAN CONNECTIVITY	CULTURAL IDENTITY	NATURE IN THE CITY
Urban density can be increased if quality of life is maintained	High inequality at the metropolitan level, but also municipal level	Uneven distribution of jobs	Antennas unevenly distributed although many households own mobile phones	Protecting and promoting architectural and cultural heritage, and facilitating access to cultural & leisure facilities	Scarce and unevenly distributed green areas
USE OF RESOURCES	QUALITY OF LIFE	RISKS & CLIMATE CHANGE	URBAN SAFETY	SUSTAINABLE MOBILITY	
Scarce water resources, heavy reliance on fossil fuels and nearly non-existent recycling	Quality of life harmed by strong increase in environmental pollution	Increased risks due to climate change	Strong sense of insecurity inside the safest conurbation in Latin America	Car-centred mobility and a vital need to organise and revitalise alternative modes of transport	

The strategies: design of an urban project based on the understanding of challenges combined with the city’s political ambitions

Design an urban project that accommodates all the ambitions by covering the central highway, which splits the city at its core.

The design of a sustainable city based on the relevant challenges provides a vision for the future of the city based on strategic directions. It sets the objectives that will serve as foundations for any future urban proposals and works:

- Redevelop a network of green corridors
- Generate multimodal hubs
- Exploit new land



Redeveloping a network of green corridors (Source: Simulator)

AMBITIONS			
REVITALISE THE CITY CENTRE		REDUCE DISCREPANCIES & INEQUALITIES	MANAGE THE USE OF NATURAL RESOURCES
MAIN OBJECTIVES	Densify urban areas	Develop equitable access to services	Set up low-consumption urban services
	Develop economic activities that promote the cultural heritage	Develop and connect cultural and green areas in the city	Promote recovery of urban waste
	Create new centres around transport hubs	Promote local connectivity and mobility	Exploit the city’s renewable energy potential

To produce this mock-up, Artelia formed a **multidisciplinary team** consisting of architects and urban planners (AS. Architecture-Studio; Arte Charpentier Architectes) to take charge of urban design aspects alongside engineering ones, a design office working in close collaboration with industries acting for urban environmental departments (2Ei), to guarantee access to a range of innovative and operational technological solutions ensuring better management of urban departments, and an IT firm (SIRADEL), to develop the software for the digital mock-up. Artelia and its partners in the integrated team have thus developed not only a **innovative facility for the public authorities**, but also proposed a genuine urban project to breathe new life into the city centre of Santiago, and, in particular, **invented an innovative procedure and methodology for designing sustainable urban development projects**. The Artelia team both motivated and supervised the implementation of the project. As lead partner of the multi-skilled consortium, it imagined the structure and organisation of the mock-up, and invented and put into effect the procedure.

Artelia mobilised a team of engineers specialising in the issues of sustainable development for urban environments, risks connected with the impacts of climate change, professional interfaces between urban planners and engineers, and numerical tools for urban design. Throughout the project, the team contributed its technical and operational experience to ensure that it was successfully completed. It performed the preliminary environmental and urban analyses of the area, supervised the development of the software, discussed with the project beneficiary and provided a link between the ambitions of the Santiago city council and those of the French ministry funding the project. **The consulting engineer also provided leading-edge expertise for each of the city departments:** integrated water management, solid waste management, energy management, and in particular in the field of transportation and mobility for the city of the future. To translate development choices into concrete actions, the Sustainable City Simulator proposes a selection of innovative solutions - technologies,

services, consultation, engineering and infrastructure resources – that are appropriate to the issues facing the area, while evaluating their benefits notably in the environmental and social fields. Drawing on leading-edge technical expertise and in liaison with the other trades, engineering offers a comprehensive vision of the life cycle of urban development projects.

The Solutions: make a connection with the concrete, innovative solutions for the city

Materialisation of the strategies for the city

Technology, infrastructure and services

Implementation of the solutions in the context of the urban project

Technical and contextualised analysis of proposals

Key figures:

70 solutions for sustainable cities represented graphically in the 3D digital mock-up of Santiago and broken down into

40 sets of coherent solutions that meet the challenges regarding the 11 key components for sustainable cities

in direct connection with 200 products and services proposed by 130 French companies

A range of innovative solutions to implement in Santiago: pneumatic collection of waste, introduction of tramways in the transport network, etc.



Examples:

- **Rationalisation of water use:** solutions to collect stormwater and recycle water (on the scale of a district and building)
- **Management of urban solid waste / recycling:** in the communities, by bringing together services from municipalities and private private companies
- **Solutions to save energy:** photovoltaic power for lighting and other sources of electricity
- **Solar thermal energy:** solar panels to heat domestic hot water

The Sustainable City Simulator claims to represent a **new method for designing urban projects** for developing the cities of the future, and **reflects comprehensive, cross-disciplinary know-how in the field of sustainable development** in the current context of climate change, minimisation of environmental impacts and improvement of the quality of life of urban residents. It offers a platform **enabling public decision-makers to study, discuss** and share their vision to guarantee the success of the sustainable urban development project. **The numerical platform created in this way is also an innovative means of communicating with citizens:** it enables everyone to understand the issues of major urban projects and makes citizens the central players in designing a sustainable territory, supported by the multidisciplinary nature of the engineering developed by Artelia.

N.B.: a video presenting the project and team (lasting about 5'30) is available on demand.

Useful links:

- Artelia: <http://www.arteliagroup.com>
- Web Club: <http://www.stgo3d.com>
- VIVAPOLIS: <http://business.ubifrance.com/vivapolis-fr>