

5 CLIMATE COMMITMENTS

50+ INNOVATIONS



Climate change, the deterioration of biodiversity, the digital revolution, demographic growth and galloping urbanisation are all major challenges that require us to display inventiveness and technical prowess. Our innovation policy lies at the heart of our three strategic development pillars: sustainable city construction, the mobility and transportation of the future and, finally, the energy and ecological transition.

With the Paris Agreement, Egis is adopting the goal of “net zero emissions” by 2050 to relieve the atmosphere of the presence of carbon dioxide that human activities generate. This is the only way of halting climate change. **And our contribution specifically revolves around reducing the greenhouse gas emissions generated by our operations, and those triggered by the projects on which we work.** This is our major action lever.

I am pleased to present the 2022 issue of our book *50+ Innovations by Egis*. Discover how these new methods, tools and solutions contribute to meeting the major challenges that lie ahead!

Laurent Germain
Chief Executive Officer of the Egis Group



Creativity is one of Egis' core values and the DNA on which our employees draw every day to respond with passion and determination to the major challenges of our time.

The main thrusts of our innovation dynamic are founded upon co-innovation with our clients and stakeholders, on solid partnerships with start-ups, research organisations and major industrial groups, and on the fertile imagination and motivation of our employees. Furthermore, our corporate project **Impact the Future** backs up our ambition to become a leading player in

the fight against climate change.

Thanks to our multi-disciplinary profile, we can offer a wide array of levers and innovative, effective solutions for the entire lifecycle of physical assets and across all geographical scales with a resolutely systemic approach.

Nothing is more valuable today than to feel useful and to work towards the accomplishment of meaningful projects!

Martine Jauroyon
Chief Sustainability Innovation and Technical Excellence Officer
Member of the Executive Committee of the Egis Group

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ECOLOGY AND ENERGY TRANSITION



"The Environment is an issue that should be addressed in a holistic way. Carbon neutrality, safeguarding biodiversity, reducing noise pollution, restoring air quality, controlling industrial risks and reclaiming polluted wasteland, and the reduction of heat islands are all issues that will contribute to improving our living environment and preserving our planet. They are one and the same battle."

Catherine Jatteau
Environment & Energy Director

RESOURCE MANAGEMENT

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- 6 Storing recycled water through the seasons

BIODIVERSITY

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CARBON SEQUESTRATION

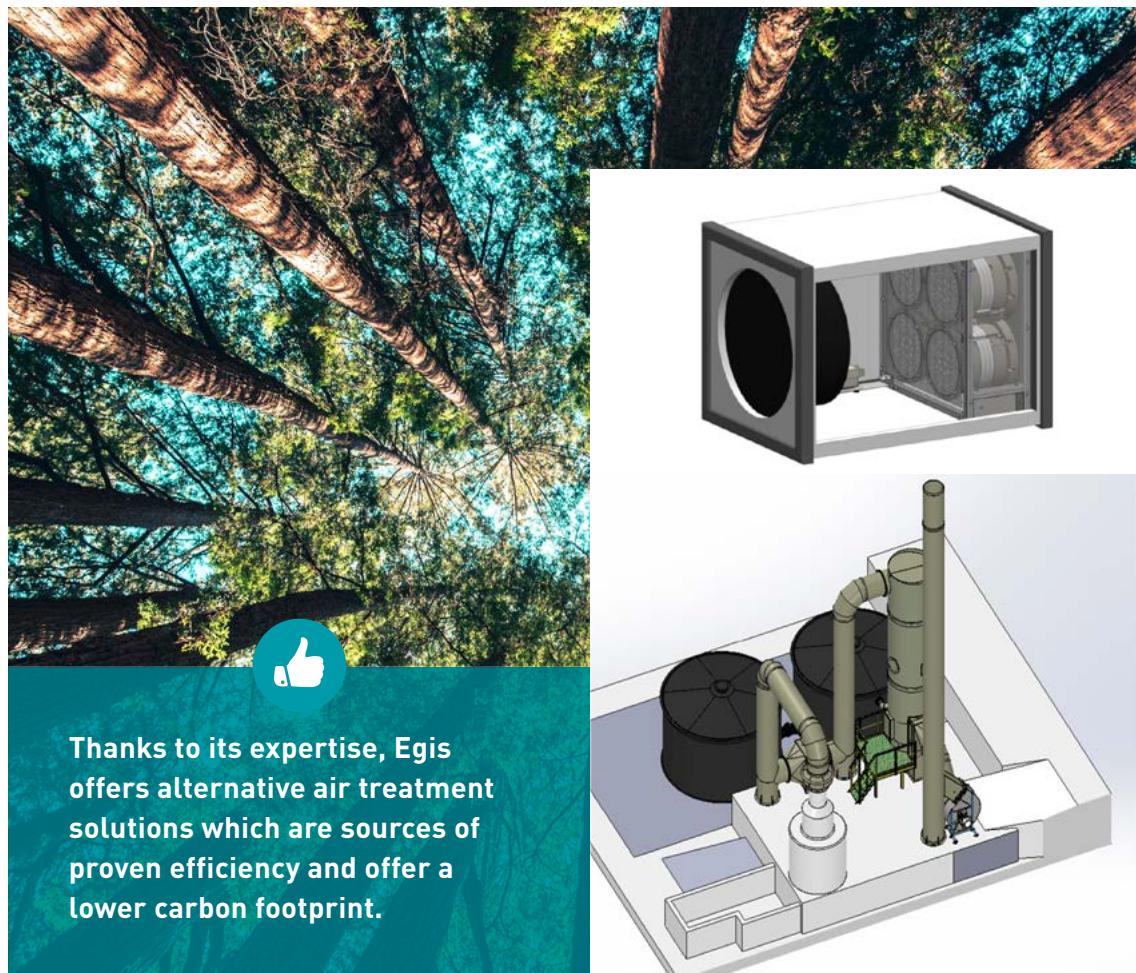
- 9 Preserving and leveraging your carbon safe

CLIMATE CHANGE ADAPTATION / RESILIENCE

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- 13 For a more resilient port sector



ALEPH FILTER



Thanks to its expertise, Egis offers alternative air treatment solutions which are sources of proven efficiency and offer a lower carbon footprint.

PURIFYING THE AIR IN PUBLIC VENUES



Fine particle pollution, repulsive odours, air as a disease spreader... all these themes point to a major problem: the growing need to be capable of purifying the air. Air quality is a major challenge for the years to come, and Egis is responding to this by developing, alongside its partners, innovative solutions adapted to the specific contexts of its clients.



To treat air whose poor quality is due to industrial processes or specific conditions, notably in urban areas, Egis has adopted innovative and sustainable biotechnologies, including bioscrubbing. Compared to other conventional techniques, bioscrubbing has many advantages: no chemical storage required, no waste, low energy and water consumption, etc.



Following a test with the company INNOVIA on a pilot unit, validated after eight months of trials as part of an experimental programme, Egis is today supporting INNOVIA in scaling up to deliver a full-size turnkey bioscrubbling unit.

Egis is also supervising pilot tests for the development and implementation of a new generation laser filtration technology. Christened ALEPH (Amplification of Light Energy by Pulses with Harmonics), this device sucks in air, purifies it in a fraction of a second under the effect of a high-energy pulsed light, then discharges it back into its original environment. The device requires no consumables, no filters and operates with negligible electrical energy.

PARTNERS Innovia, B612

CONTACT Sophie AUBERTIN

SEASONAL STORAGE LAGOON



Recycling of a precious resource
in a hot climate, redevelopment,
enhancement of biodiversity



STORING RECYCLED WATER THROUGH THE SEASONS



In Qatar, 99% of water needs are covered by seawater desalination plants, an expensive and energy-intensive technique. The State of Qatar is increasingly turning to the reuse of treated wastewater, with a 100% recycling target. This recycled water is recovered at the outlet of the treatment plants to supply a network of recycled water, which is used to meet irrigation and watering needs. However, the management of recycled water remains problematic due to a surplus of recycled water in winter and a shortfall in summer.



The solution designed by Egis is to create facilities capable of storing 130,000 m³ of recycled water per day in winter, with a storage capacity of over 20 million m³, which can then be reinjected into the recycled water network in the summer. The key infrastructure consists of a series of five interconnected storage reservoirs, enabling storage time to be managed appropriately - an important factor in maintaining water quality. The total surface area of these reservoirs is 575 hectares. Upstream of the reservoirs, treatment and pumping installations re-inject the recycled water into the network. The solution is also designed to create leisure amenities for the country's population and to promote biodiversity (especially migratory birds, of regional importance).



The detailed design of the TSE Seasonal Storage Lagoon project - located in the centre of the Qatari peninsula, 45 km south west of the city of Doha - began in 2021 and construction works are scheduled for completion in November 2023.

CONTACT Nael ALASHY

LANDBOOST AND SEABOOST



Everywhere, human activity has an impact on the ecosystem in which it takes place. In cities, many invisible species that are essential for maintaining the major balances are no longer able to reproduce or rest due to the artificialization of urban land. In marine environments, the disappearance of essential ecological functions ultimately threatens marine biodiversity. Rebuilding these ecosystems is a priority in order to protect the environment.



Egis has created the SEABOOST and LANDBOOST offers, whose 3D printed solutions, inspired by the living world, are designed to provide an immediate habitat for biodiversity.

- LANDBOOST proposes to make the city of tomorrow more welcoming for biodiversity and compensate for the artificialisation of urban land. Thanks to modular devices that can be free-standing or attached to existing structures, Landboost offers suitable habitats for various animal species and contributes to the reconstruction of the territory's green spaces.
- SEABOOST aims to accommodate marine animal species while an autonomous ecosystem re-establishes itself, drawing on biomimicry and the characteristics specific to each environment. Seaboost provides the conditions for the rapid reproduction of coral reefs and natural aquatic habitats that are necessary for the reconstruction of biodiversity.



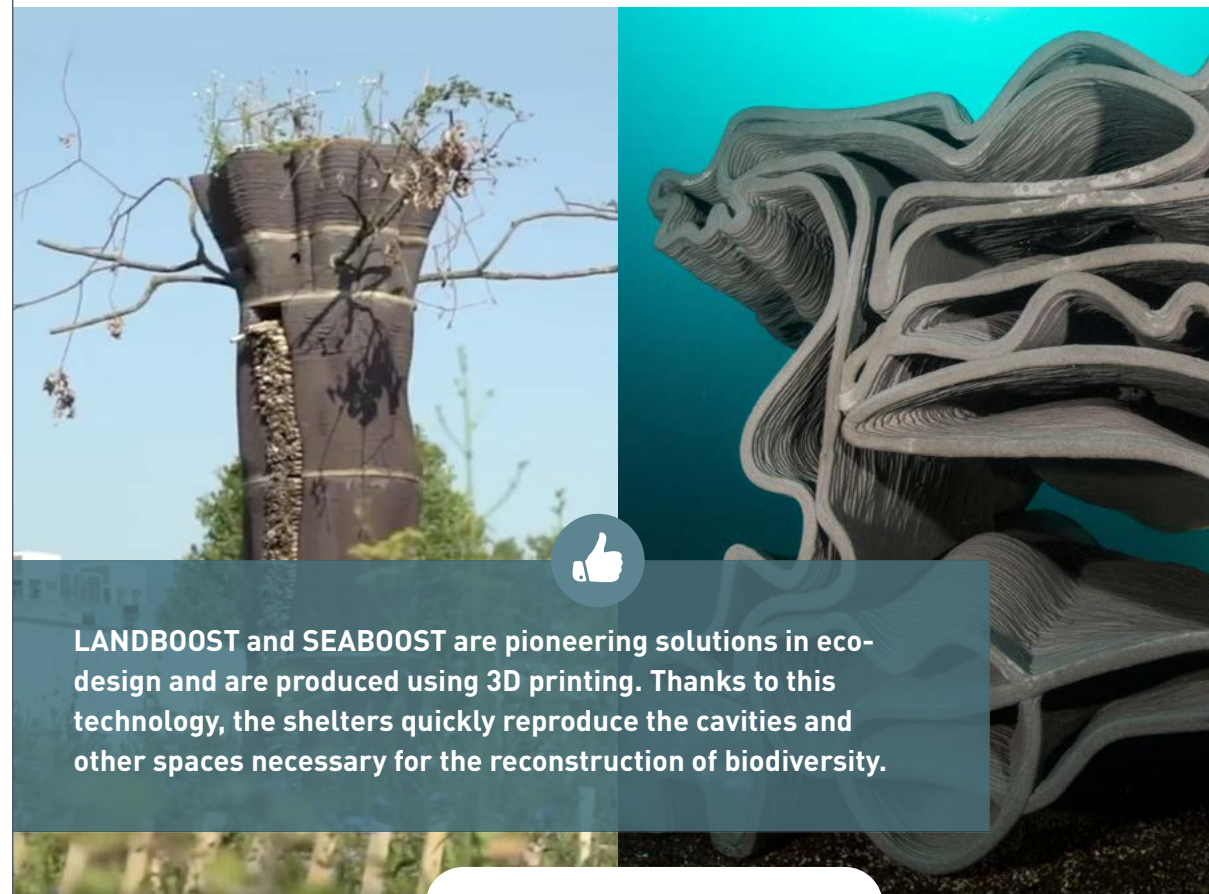
Seaboost has been implemented on more than twenty international projects, notably in the ports of La Ciotat and Menton in France. Landboost's totem module has been deployed on a pilot site at Rungis (an ICADE site). The solution is being developed in partnership with XtreeE for 3D concrete printing.

PARTNERS CEEBIOS, XtreeE

PATENT Seaboost

CONTACTS Hippolyte POUCHELLE (Landboost)
Martin PERROT (Seaboost)

ACCOMMODATING AND REINFORCING BIODIVERSITY



LANDBOOST and SEABOOST are pioneering solutions in eco-design and are produced using 3D printing. Thanks to this technology, the shelters quickly reproduce the cavities and other spaces necessary for the reconstruction of biodiversity.



LANDBOOST

SEABOOST

EVA-BIODIV



According to the global assessment report on biodiversity published in 2019 by UNESCO, 75% of the land-based environment and 65% of the marine environment have been significantly altered by mankind. Biodiversity must be reintroduced into cities to limit the extent of the extinction crisis, rebalance the large biogeochemical cycles and promote health and well-being. Egis has taken the step of harnessing digital solutions to increase the environmental added value of projects.



Egis offers EVA-BIODIV, a methodology to assess and encourage the biodiversity performance of a project. EVA-BIODIV draws on a flash diagnosis made intelligible thanks to a user-friendly interface and simple and accessible results for a facilitated translation into operations on five indicators:

- BAF permeability (Biotope Area Factor),
- Habitat diversity,
- Fauna/flora diversity,
- Ecological continuity,
- Invasive alien species.

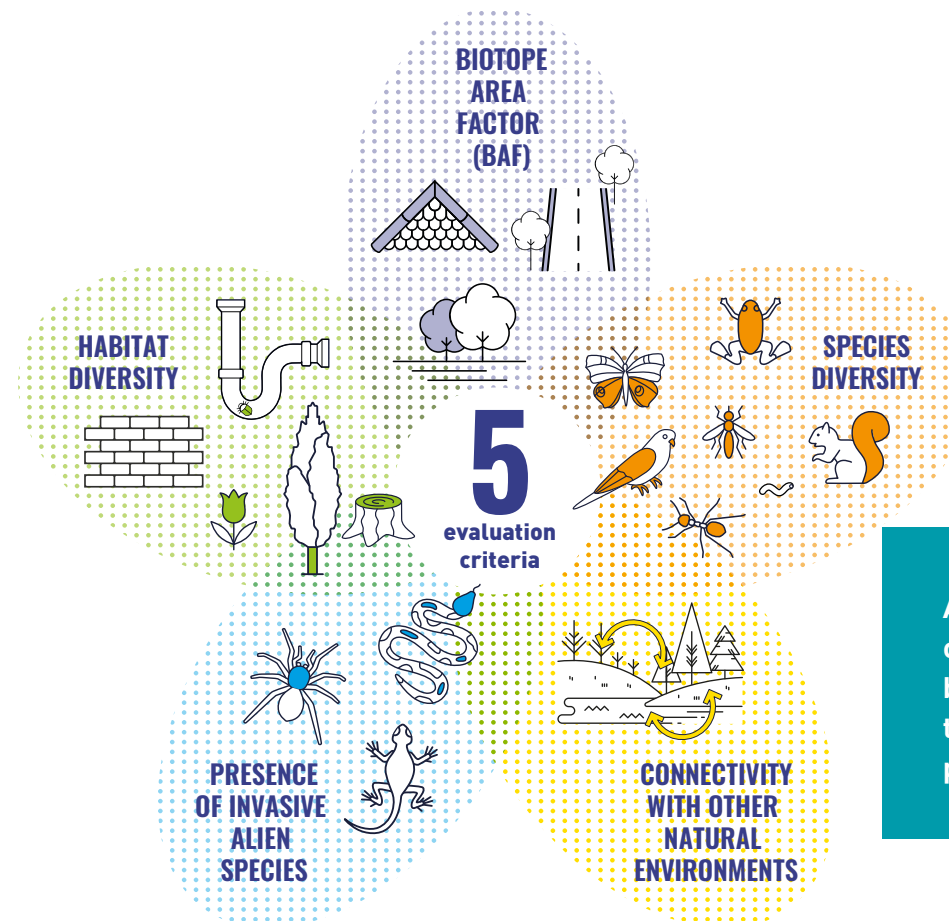


450+ flash diagnoses have been conducted by EVA-BIODIVERSITE since 2016!

PARTNER Icade

CONTACT Sophie AUBERTIN

DATA FOR THE BENEFIT OF BIODIVERSITY PERFORMANCE



A shared commitment to biodiversity in the preliminary phases of projects



BAT3DATA®

CASPARCAS.FR

SMART SOIL



What if the solution were to be found beneath our feet? Soil is the world's largest carbon pool (1.500 billion tonnes of carbon, three times more than in the atmosphere and has the potential to store 6 billion tonnes of carbon dioxide per year across the planet. However, this potential is often overlooked by the owners of land assets. Based on this observation, the idea behind Smart soil is to transform soil into a lever of climate and social innovation.



Smart Soil is a global response which helps increase the on-site carbon sequestration of land holdings, protecting diversity and improving resilience to climate change. Egis is developing an innovative approach and service offer to support the operational application of organisations' CSR and climate commitments. This support aims to optimise the carbon sequestration potential of soils located within their land holdings and leverage their social and environmental co-benefits.



Currently depolyed at Abidjan Airport (more than 1000 ha of surface area to be harnessed). Among the validated scenarios: lagoon restoration, restoration of biochar deteriorated soils and recovery of green waste, innovative partnership with vegetable farmers. Ongoing: National Highway (Congo), Amsterdam and Larnaka airports, Bay of Arcachon.

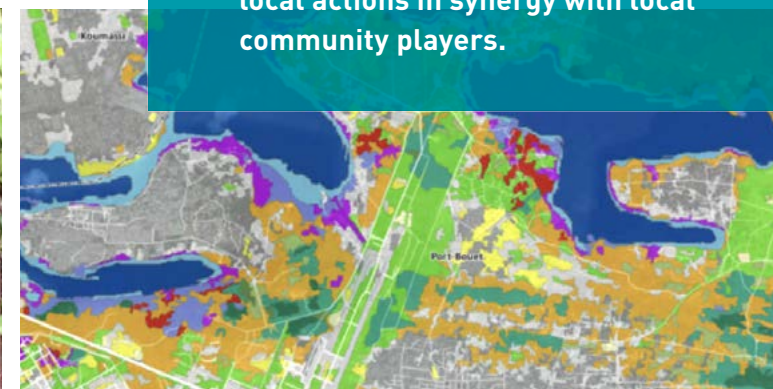
PARTNERS IRD (Eco & Sol)

CONTACT Sofyan MARTIN

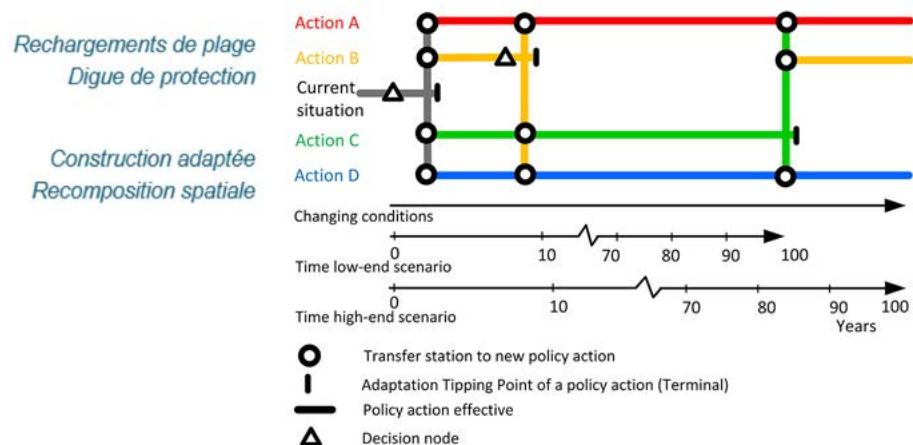
PRESERVING AND LEVERAGING YOUR CARBON SAFE



- **Capture carbon in your own land holdings through a lever that can be found beneath your feet: soil and air biomass.**
- **Evolve towards systemic CSR with local actions in synergy with local community players.**



DYNAMIC ADAPTIVE POLICY PATHWAYS (DAPP)



PLANNING TO ADAPT TO RISKS



To manage territorial communities, policymakers must be sure that the measures that they are taking today will apply over the long term, and that the actions are designed to cater to changing conditions. Egis offers the application of the DAPP method (Hasnoot, 2013) to support them in managing climate and socio-economical uncertainties.



The DAPP method helps planners design adaptive plans with the identification of “low regret” short term actions, long term actions, and adaptation tipping points (which signal when a new decision must be taken). The method uses a DMDU approach which explicitly includes decision making over time and decision sequences (pathways). Several pathways are therefore proposed and visualised on a metro map or decision tree with time or changing conditions (e.g., sea level) one of the axes.



Read the article (in French) on the application of the DAPP method in a coastal environment: Christophe BRIERE, Marjolijn HAASNOOT, 2020. *Gestion des risques littoraux et trajectoires d'adaptation par méthode DAPP.*

CONTACT Christophe BRIERE

KHOSGOL



Anticipating changes in climate conditions (temperature, evapotranspiration, rainfall, wind) and impacts on fauna and flora, the risk of flooding and erosion, the melting of permafrost (ground whose temperature remains below 0°C for more than 2 consecutive years) and the sizing of our projects' infrastructure.

MODELLING THE IMPACTS OF CLIMATE CHANGE



Modelling climate change to anticipate how to deal with its impact and define adaptation or avoidance measures in projects has become essential, especially in the most sensitive environmental contexts.



Egis carried out an analysis of the potential impacts of climate change on the bioclimatic conditions and ecosystems of the Lake Khosgol National Park in northern Mongolia:

- Preparation of vegetation cover and habitat maps for the national park with GIS data
- Determination of the impacts of climate change on the park and definition of different climate change scenarios
- Geospatial modelling and analysis to quantify and map the impacts on the different types of vegetation and on the park's ecosystems
- More specific analysis of the impacts of climate change on certain species
- A geospatial analysis was used to define the climatic envelopes allowing the determination of the climatic parameters relative to each ecosystem.
- WorldClim2 climate data was used to model the new areas to which certain ecosystems could migrate as a result of climate change.



Feasibility study for the Lake Khosgol National Park in Mongolia

CONTACT Laure RUSSIER

VILLE EN ALERTE



Cities are today facing higher risk of flooding. To improve the resilience of urban areas, which are often densely populated, Egis has created a solution to manage crisis situations more efficiently, quickly and collaboratively.



Egis offers the first comprehensive real-time monitoring and management system for hydrological risk via a detailed risk mapping system. Ville en alerte (City on alert) virtually connects the various players involved in flood risk management around the same digital table.

The platform allows organisations to:

- Collect and visualise hydrometeorological data in real time
- Anticipate risks for frequent to extreme rainfall events thanks to a risk map covering different hydrological scenarios
- Manage the crisis a collaborative manner, in real time, with all the local actors
- Mitigate the consequences of floods on property and people



The system has been deployed as a pilot in an urban community comprising the municipalities of Montpellier, Lattes and Pérols, and is currently being extended to the 31 communes of the metropolitan region.

PARTNERS Greater Montpellier Council, Synapse Informatique, Ceneau

CONTACTS Clément CHETOUI

REDUCING THE IMPACT OF FLOODING IN URBAN AREAS



This innovative platform was selected by the French Ministry for the Ecological and Inclusive Transition to illustrate the theme of resilience in the contribution of EcoCité projects to sustainable development goals.



VILLE EN
ALERTE



VIDÉO

FLOODING IN
URBAN AREAS

REST-COAST



Climate change is a disruptive force for coastal and shoreline dynamics. Ports lie at the centre of these changes: 90% of world trade is conveyed by sea, and this proportion is set to grow even further.



Egis recommends an overhaul of coastal risk management and design:

- Integrated supervision to design coastal zone management plans
- Design these plans in a dynamic and adaptative form, identifying short term actions and long term options according to socioeconomic and climatic scenarios.
- Adopt nature-based solutions, including ecosystem restoration, and the implementation of physical asset adaptation and eco-design resources
- Rehabilitate existing structures rather than rebuilding from scratch, based on our innovations that fulfil technical, societal and environmental challenges
- Support coastal communities and ports in their zero-carbon approach
- Offer an upkeep and maintenance method based on our dual port and digital expertise



Our approach is applied systematically in our projects, whenever the context so allows. We are taking part in the European project REST-COAST which aims to demonstrate the upscaling of ecosystem restoration solutions. We are also involved in improving the infrastructure of the Kingston container terminal in Jamaica, and the development of renewable marine energy for the development of the Port of La Turballe.

CONTACT Valérie BLANCHET

FOR A MORE RESILIENT PORT SECTOR



Guaranteeing the resilience of infrastructure to the challenges of tomorrow's world requires thorough knowledge of the sector's issues: such is the value proposition of the *Littoraux et Ports Résilients* (Resilient Coasts and Ports) project.

SUSTAINABLE CITY CONSTRUCTION



"The future RE2020 regulation is part of the National Low Carbon Strategy and the necessary 1.5°C pathway to address the climate emergency. In addition, beyond the current stimulus plan, the conversion of existing physical assets, which is less carbon-intensive than new construction, is a key issue in the ecological transition. This is why our teams are constantly working, through R&D actions and as each of our projects progresses, to improve their design methods and minimise the environmental footprint of works: eco-design, lower consumption and decarbonisation of energy and materials, promotion of the circular economy, etc."

François Consigny,
CEO, Elioth by Egis

ATTRACTIVE AND SUSTAINABLE CITIES

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OUR 10 SUSTAINABLE CITY PRINCIPLES



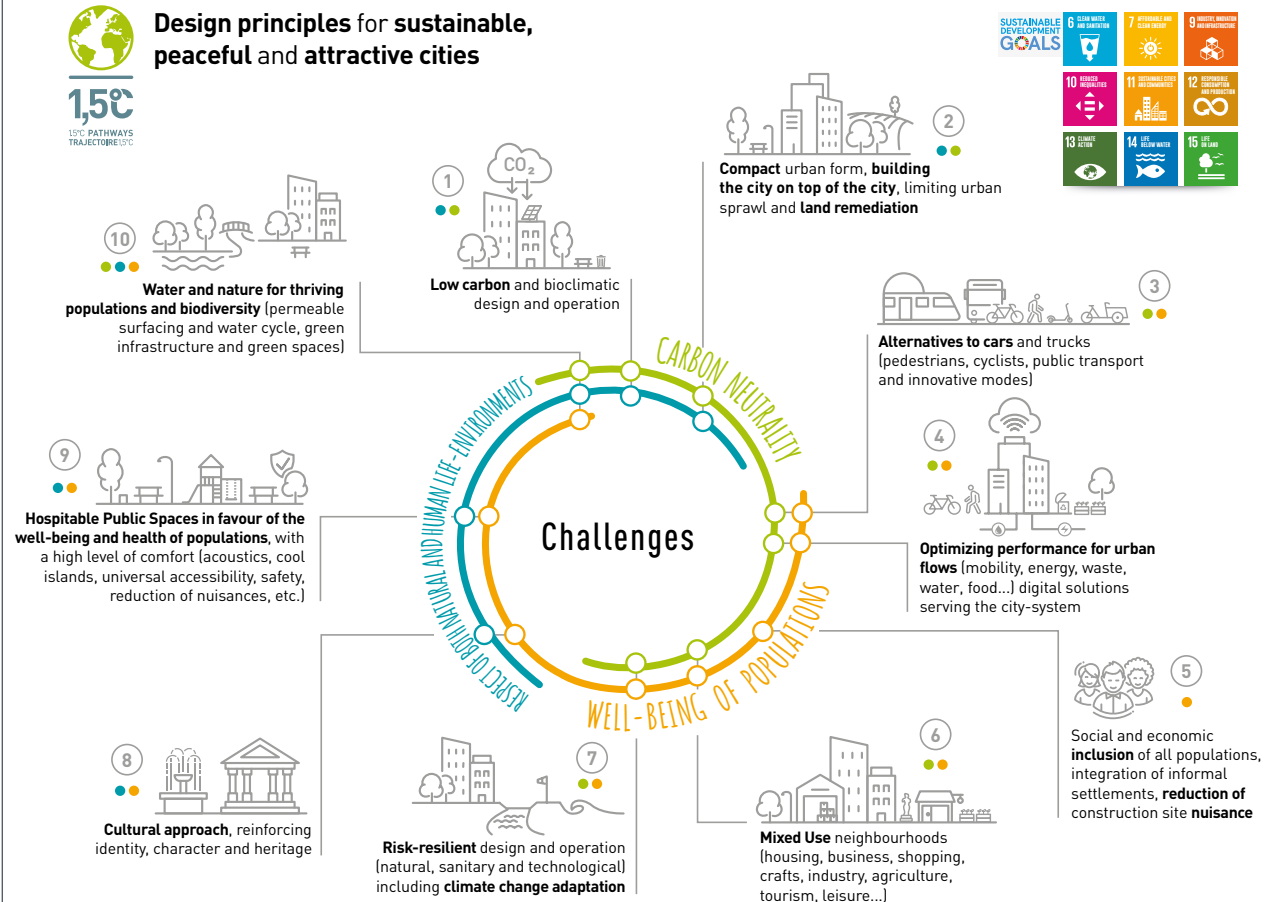
At Egis, we contemplate new development standards to accelerate the transition of cities from their current mineral, energy-intensive and sprawling state to more efficient, denser and more inclusive models, respecting the environment and caring for inhabitants' well-being. As professionals committed to a sustainable future, we also have a duty to change the impact of our projects and have opted to focus our actions on three fundamental areas: carbon neutrality, the well-being of populations and the protection of natural and human environments.



To tangibly translate these three major challenges above, we propose ten principles inspired by our projects. This approach can be illustrated, for example, in low-carbon bio-climatic buildings, optimised resilience in our infrastructure, or the repurposing of our public spaces. The common denominator of these principles is to return nature to its rightful places in cities, due to the many benefits it provides.

CONTACT Fanny GUYOT

RECONCILING THE CITY, NATURE AND PEOPLE



Reverting to common sense solutions that mankind has patiently forged over time, respecting and observing nature. This requires taking into account the history, cultures, heritage and the sometimes ancestral know-how developed by mankind.

ŒIL VERT



In the long term, the Green Eye will be able to propose a participative dynamic through the inclusion in the process of civic and neighbourhood associations, becoming full stakeholders in the projects.

WWW *le blog*

MONITOR YOUR NATURAL HERITAGE



Reintroducing nature into the city is a response to the growing density of our metropolises. Cities will only be sustainable and resilient if they welcome and protect this nature. Indeed, green spaces fulfil vital functions for the city through the co-benefits they bring to the city and its inhabitants. Our challenge: to support city policy makers and managers in improving the resilience of urban communities.



To design a nature project in towns and cities, then to manage and maintain the green heritage of our communities, Egis proposes the Green Eye (l'Œil Vert). Through a spatial approach to the city and communities, an environmental analysis and the co-benefits of existing and future spaces, the data collected enables decision-makers to manage their natural heritage. The data is collected through approaches that are innovative for a city: satellites, drones, IoT, feedback from residents, etc.



The Green Eye has been deployed on the Green Riyadh project in Saudi Arabia. This project aims to plant more than 7 million trees by 2030 and create a new, greener, more eco-friendly city with better quality of life for its inhabitants. The Green Eye will help to manage this gigantic USD 9 billion programme, which includes hundreds of projects, by significantly increasing the quality and quantity of vegetation in the city. This will lead to the development of an interconnected and planned network of natural and semi-natural areas allowing for the reintroduction of biodiversity in the urban environment.

CONTACT Sophie AUBERTIN

SEVE V5



URBAN DEVELOPMENTS, PUBLIC SPACES, ECO-DISTRICTS



Urbanisation is one of the phenomena that have the greatest impact on the environment: carbon dioxide emissions, pollutants and waste linked to the multiple uses of the city, destruction of biodiversity through soil artificialisation, flooding through soil sealing, etc.



Based on the UN's sustainable development goals (SDGs), the sustainable urban development offering aims to meet 8 out of the 17 existing SDGs, thus complying with the requirements of the best CSR labels.

Making the city less watertight, reducing its carbon impact, improving people's comfort in public spaces, stimulating biodiversity, reducing waste and encouraging the recycling of materials: such are the main objectives of the eco-construction approach deployed by Egis teams, in both design and works phases, for urban developments in 15 areas of expertise. In 2021, the focus was placed on:

- Reducing the carbon footprint with eco-comparison tools, notably SEVE, developed by Routes de France in association with Egis in its version 5.
- The incorporation of a quantitative carbon criterion in invitations to tender for works contractors



- "Les Fabriques" district in Marseille: 19,400 m³ of materials needed for backfilling come from the site, 9,000 m³ of polluted soil processed on site in view of their reuse, 6,000 m³ of demolition concrete recycled to be used in roadbuilding.
- Flaubert district in Rouen: 290,000 m³ metres of clean soil from the RN 27 construction site, 16,870 m³ of soil confined on site, 10,000 m³ of existing paving stones and concrete slabs reused.
- And also: redevelopment of the Part-Dieu district in Lyon, urban renovation of Mons-en-Barœul town centre.

PARTNERS Urban and landscape architects: J. Osty, ILEX, AUC, AgenceTER, Architecture Studi, Routes de France, the project owner of the SEVE eco-comparator, etc

CONTACT Fanny GUYOT

ICE



The urban heat island effect (UHI) is the demonstration of how cities overheat compared with surrounding rural areas, most clearly illustrated by lack of cool nights during the summer. The goal of combating urban heat islands is to reduce the public health risks they cause and improve the living conditions of users with regard to heat.



ICE is a measurement tool developed by Egis which calculates ground surface temperatures using an energy footprint assessment incorporating building shade, vegetation and the materials used. Based on the QGIS package, ICE helps to produce a reliable and scientific comparison of urban fittings by keeping the simplicity of the design stage and the ease of comparison between examples. It does not replace more detailed modelling. ICE is available in open source format so as to offer the widest audience the opportunity to factor urban heat into climate change adaptation strategies.

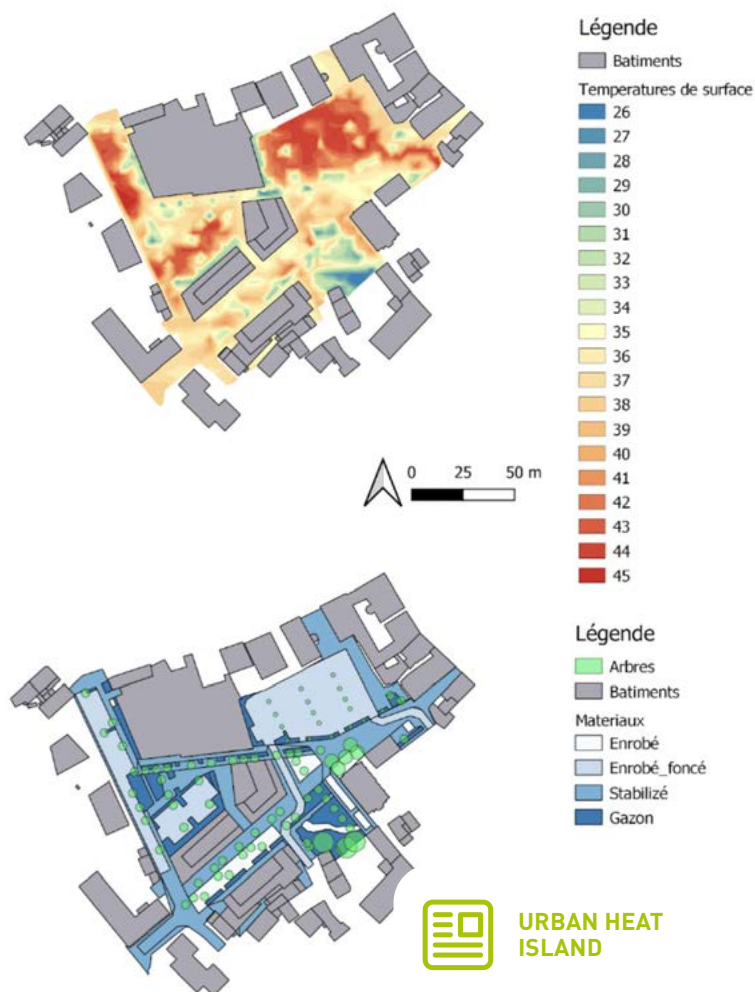


We support project owners in several projects with a range of urban typologies: creation of a rapid transport system (Tram'bus in Bayonne, line T6 in Lyon), the redevelopment of public space (Place de Francfort in Lyon, creation of Rue Raynal in Toulouse, Guebwiller town centre, Neuhof district of Strasbourg, etc.).

PARTNERS Olivier Papin (Branch E6 of the Nepsen group) and Alexandre Colin (Atelier Colin and Poli Paysages), the creators of the "Score ICU" method.

CONTACTS Guillaume MEUNIER / Olivier LEDRU

SOLUTIONS FOR URBAN COOL ISLANDS



Action levers:

- The presence of water in the public space: fountains, ponds, misters, etc.
- Vegetation and landscaping: evapotranspiration, shading, etc.
- Streetscape surfaces: albedo, thermal capacity, emissivity, etc.
- Building materials: facades, green roofs, etc.
- The urban form: exposure, size of buildings, street widths, etc.

PHARE



PHARE is a decision support aid to manage public policy. This pilot tool is part of a strategy to support the digital transformation of small and mid-sized local authorities through the acquisition, analysis and processing of data. The solution is simple, scalable, multi-themed and adaptable to local authority budgets.



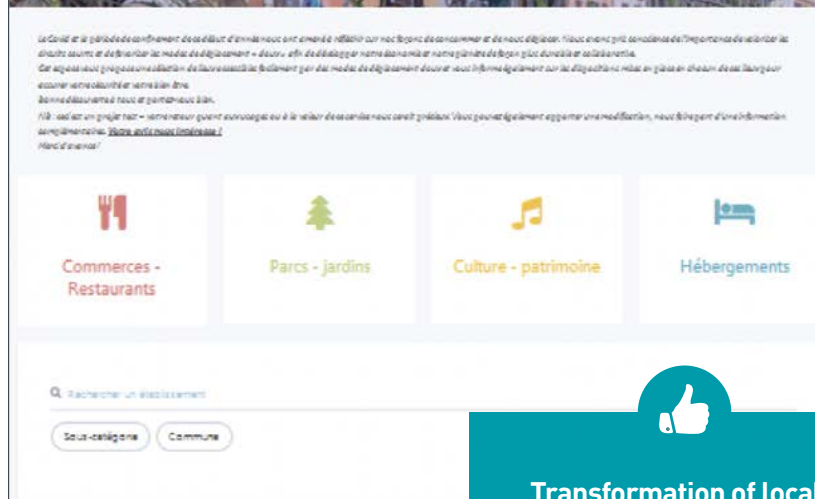
The added value of the PHARE solution:

- An “integrated speciality approach” with the mobilisation of technical expertise in the themes of health, environment, mobility and tourism and data expertise
- A shared approach with a co-construction process and the mobilisation of an ecosystem to qualify the governance issues for local authorities which are going to be increasingly approached by “pay-for” solution suppliers
- Skill transfer with a learning by doing approach and the creation of video training modules.

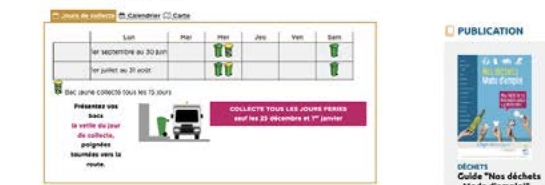


An experimentation conducted as part of the CRP call for projects programme sponsored by the Caisse des Dépôts, PHARE was launched as a pilot in December 2021 with the mobility department of the Saint Louis Agglomération local authority, in the east of France.

PROCESSING DATA BY USER NEED



Transformation of local authority over time (internal)



DEEPMAPPER®



Being fully aware of the condition of urban infrastructure has become a necessity for network managers, as it allows them to better monitor it as it ages and thus prevent malfunctions on the network.



DEEPMAPPER® is a new approach to engineering developed by Egis for public authorities, based on a close relationship between our traditional engineering and engineering linked to digital developments. This new generation of asset management tools, combining online mapping tools and Deep Learning from artificial intelligence, contributes to the transition towards more sustainable cities by making it easier to list all the urban fixtures and facilities. For example, DEEPMAPPER® makes it possible to automatically list and locate the distinctive elements of visible sewerage or rainwater networks (manholes and drains), providing managers with better knowledge of their assets and allowing them to monitor their condition in near-real time.



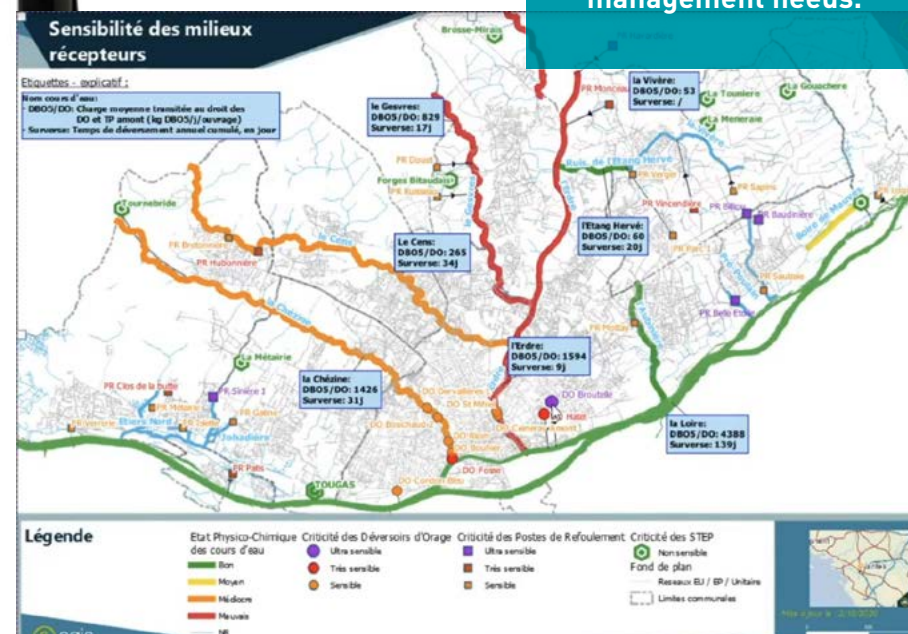
Deployed across major local authorities in France and its overseas department, including Montpellier Métropole, Grand Paris Seine et Oise, Martinique in sewerage and drinking water supply area.

CONTACT Quentin DHENAUT

KNOWING YOUR URBAN ASSETS



The solution has been fully developed by our experts to meet our clients' asset management needs.



UBIPLACE



The graphic features a blue background with a white 'ubiplace' logo at the top center. To the left, a man in a blue uniform and cap waves. To the right, two smartphones are shown: one displaying a dashboard with various icons and a '614' count, and the other showing a map with location pins. At the bottom left, a 'CONNECTED WORKS' video icon is present. At the bottom right, a thumbs-up icon is shown next to two bullet points.

SMART SERVICE CONNECT **DEVIENT** **ubiplace**

ubiplace

A digital business solution
to manage customer liaison, performance and communication

CONNECTED WORKS
VIDÉO

- An application uniting all contributors in a building operation
- Simplified treatment of disturbances reported by residents

CONNECTED PLATFORM AND SMOOTH PROJECTS



City centre building sites generate disturbance for local residents. Taking these disturbances into account is a major challenge for both project owners and project managers keen to conduct their works smoothly and efficiently.

To facilitate this task, it is essential to note all the disturbances created as close as possible to their source, and follow up their resolution through dashboards.



Working in partnership with Egis, Smart Service Connect becomes UBIPLACE and accelerates its growth through two flagship solutions:

1. A connected works app linking up site stakeholders (local residents, project managers, contractors, project owners) with one another to collate all the reports of disturbances, georeferenced with photos, and follow them up (dashboard) in a feedback portal.
2. A SmartVigie app to connect field data using mobile devices. The platform has been rolled out in several areas of application: Smart Vigie Airport, Buildings, Mobility, Risks and Environment, etc. SmartVigie is a genuine building block in an asset management approach.

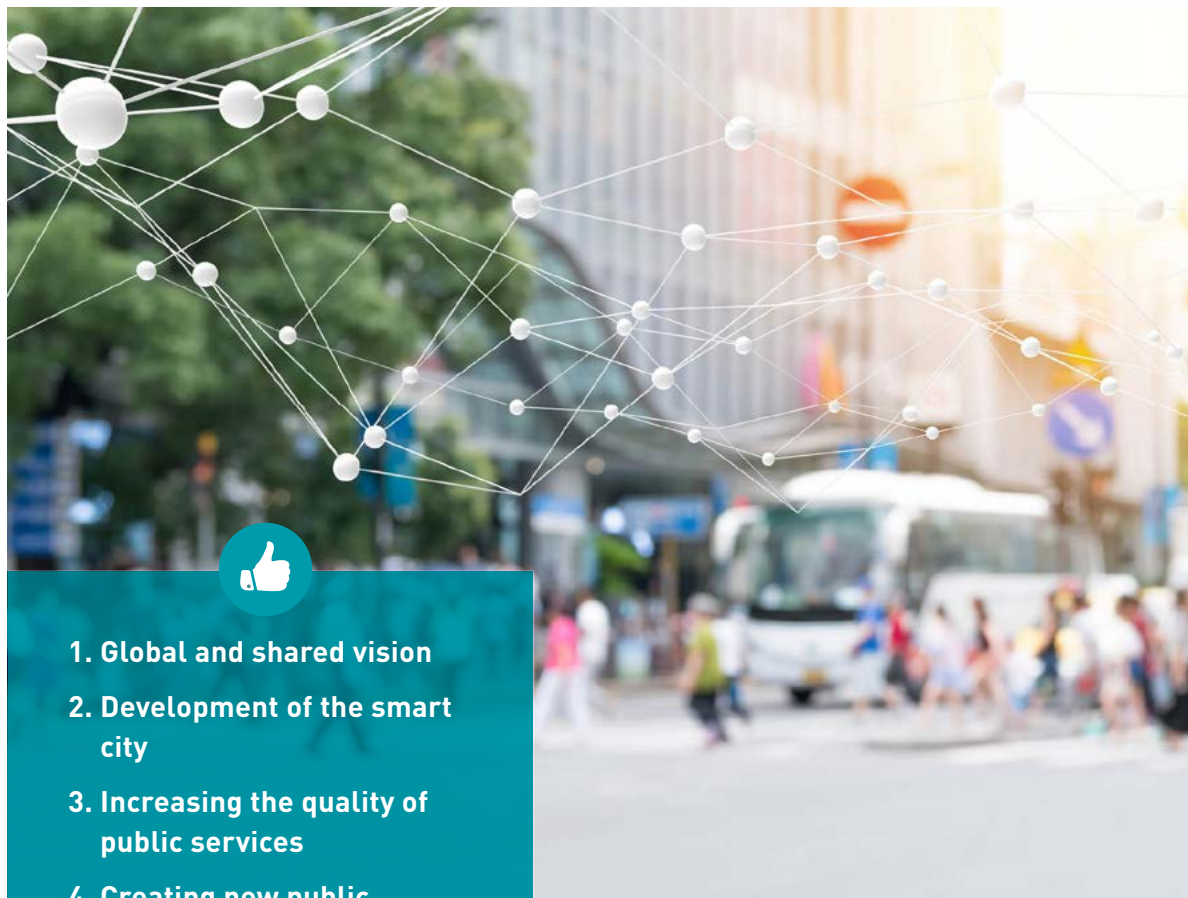


Solutions deployed in the Nice metropolitan area, the Vauban port in Antibes, in the Alpes Maritimes Joint Authority for Flood and Water Management in Cannes in partnership with Vinci, and in the Cities of Toulouse and Lyon.

PARTNER UBIPLACE

CONTACT Davy GAY

IMPACT OF CONNECTED OBJECTS



1. Global and shared vision
2. Development of the smart city
3. Increasing the quality of public services
4. Creating new public services

IOT MASTER PLAN



The Internet of Things (IoT) is one of the primary technological building blocks that contribute to the Smart City concept. To foster the development of technological intelligence in the urban environment through the deployment of a large-scale IoT network, cities must first address several financial, technical and organisational issues.



Today, most French cities are conducting experiments in IoT. The problem lies in converting successful experiments into large scale projects and scaling up, which brings to the fore an array of technical, economic, strategic and organisational uncertainties. In light of this, a master plan must be implemented in order to optimise investments and maximise results. A master plan offers the local authority and its inhabitants a global and shared vision.



A successful experiment in Toulouse has illustrated the need to develop an IoT master plan, since the impacts of scaling up extend beyond the technical problems of deployment or integration into existing systems, even if these are substantial. An IoT project must, at the same time, benefit the local authority's roadmap in terms of living environment, public development, smart initiatives or economic appeal.

PARTNER Toulouse metropolitan authority

CONTACT George CARAIMAN

THIRD PLACES



Redeveloping the city of tomorrow by offering more diversity and proximity? Third places are incredible tools in which to make impacts; they are places of proximity, production, meeting and work that help influence upon social, environmental and economic transitions. Based on this observation, Egis offers turnkey support to facilitate and secure the implementation of third-place projects suited to each community.



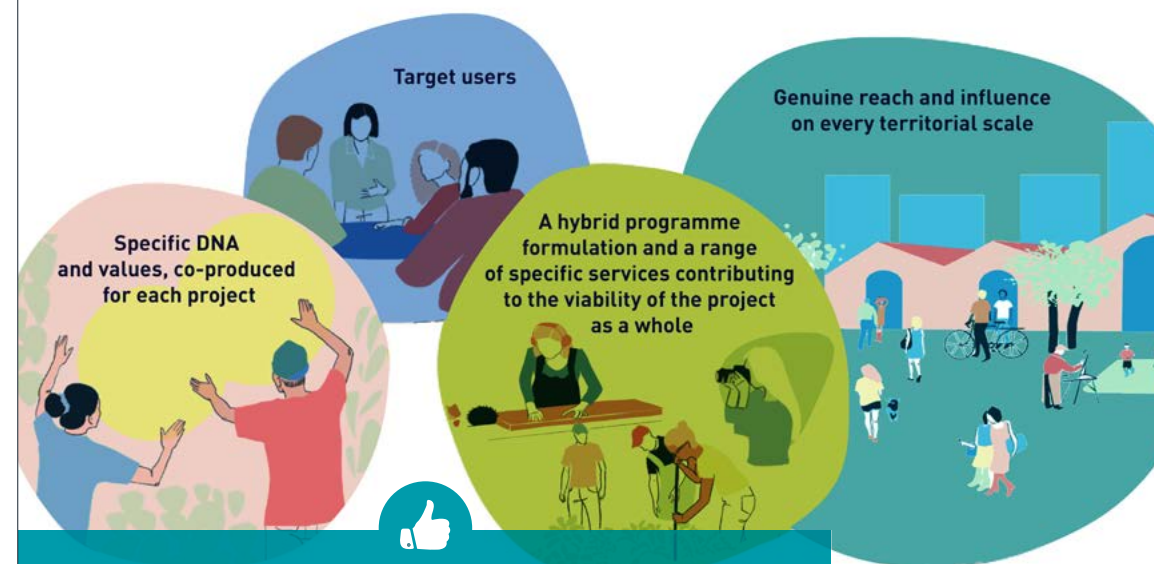
With its strong belief in the potential afforded by the conversion of certain sites and that of the springboard effect of a third place, Egis activates, develops and supports the creation of real estate and urban alternatives for urban, peripheral, rural, connected or isolated communities, from idea to operation. The ambience, the community of players and the aesthetics of a place are accelerators of positive word of mouth, the primary vector in the promotion of a venue and its success. Through continuous monitoring of new concepts and potential operators, a user-based design approach and technical expertise in building design, we strive to combine the engineering of places with a programme adapted to the design and delivery of third-party places that are economically sustainable.



A methodology deployed in several communities: Bergerac, St Pierre de la Réunion, St Brieuc, Vaux-St-Claude, Toulouse, Brest, Guise. Ongoing: Châlons-en-Champagne, Béthune, Louviers

CONTACT Lucie GORCE

A NEW WAY OF CITY DWELLING



Promoting the short-term emergence of bold real estate, social and urban alternatives that address communities' transitions.

Supporting the emergence, activation and development of third-place projects harnessing our experience as designers, entrepreneurs and operators to create impactful third places.

DESIGNING WITH THE WIND



On an urban scale, the increasing frequency of heatwaves illustrates the snowball effect of climate change and demonstrates the urgency of committing to bioclimatic design. Tomorrow's standard bearers will be low-carbon and positive energy buildings, which will have to drastically reduce their demand for energy by showing its capacity to use and channel the energy flows around it and adapt to the climate. Building with the wind means taking into account the role that the outside air can play, the local dynamics of its thermal and kinetic properties as a natural and free resource to improve and produce urban/indoor comfort and to save - and even generate - energy.



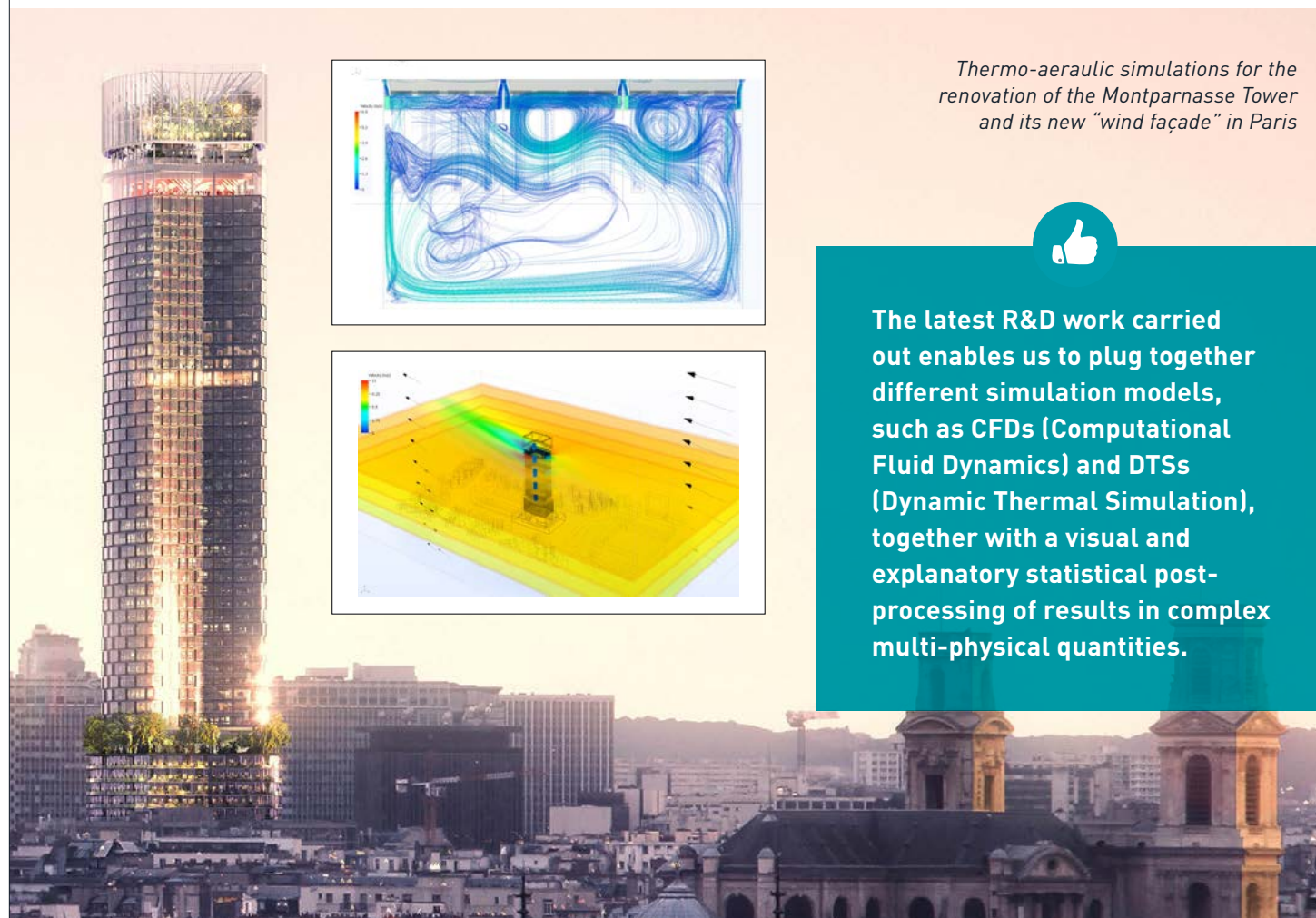
Egis uses and develops a chain of advanced thermo-aeraulic digital tools to model the most complex air flows, including the combination of heat exchanges of all kinds. Typical missions include:

- Study into the impact of wind and urban morphology / buildings on outdoor comfort
- Aeraulic design of natural ventilation / indoor comfort
- Studies of wind energy production potential

PARTNERS French Association for the Development of Low Carbon Building

CONTACT Guillaume MEUNIER

BIOCLIMATIC CONSTRUCTION



Thermo-aeraulic simulations for the renovation of the Montparnasse Tower and its new "wind façade" in Paris



The latest R&D work carried out enables us to plug together different simulation models, such as CFDs (Computational Fluid Dynamics) and DTSs (Dynamic Thermal Simulation), together with a visual and explanatory statistical post-processing of results in complex multi-physical quantities.

RT THERMAL CALCULATIONS



This new data-driven scientific approach combines the expertise of Egis' Buildings expertise and Egis Data & Solutions' Data expertise, drawing on the high volume of data available:

- Egis expertise: heat energy and economic studies for our projects
- Open Data: the government provides the thermal analyses of 370,000 projects with its 487 parameters (all building permits from 2012 to October 2018)



We combine the specialist approach of the construction observatory and the Big Data approach thanks to the provision by the gouv.fr website of all the RT (Thermal Regulation) data on construction in France.

This approach by volume of data thus allows us to develop our information system according to 3 functional objectives:

- RT Data Explorer
- Comparator to situate our projects and calculations
- Decision support tool by analysing RT calculations according to project parameters

CONTACT Christophe BINARD

EXPERTISE AND OPEN DATA



**A BigData approach for
analysis and decision support
on RT calculations**

DIGITAL TWIN



The French Energy Transition Act sets out targets to reduce energy consumption by 50% by 2050. As buildings are the biggest energy consumer, energy renovation in this sector is therefore crucial. Faced with this challenge, building owners are looking for efficient and innovative solutions to improve their energy footprint and sustainably reduce their environmental impact, while ensuring comfortable conditions for users.



Egis deploys its skills in thermal modelling (associated with 3D volumetric models), the processing of data collected on site, data visualisation, technical advice, legal and financial support and performance monitoring to enable its clients to be sure of their energy consumption in the long run. Egis deploys the digital twin on a cloud platform enabling the implementation, processing and analysis of building performance using AI (Artificial Intelligence) algorithms.

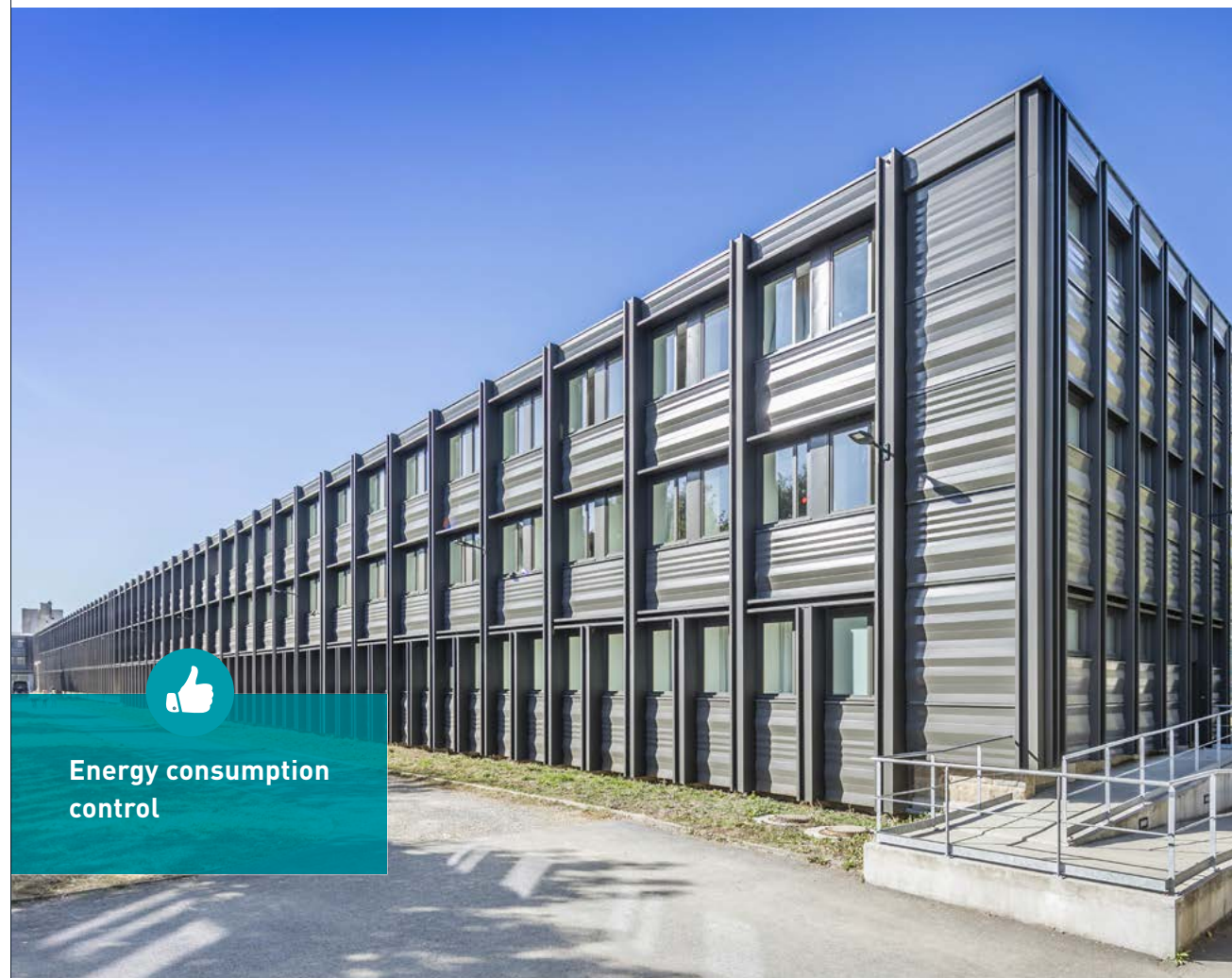


Lycée de Bréquigny in Rennes (Brittany Region)
Ploemeur Aquatic Centre (Brittany Region)



CONTACT Jérôme DIOT

BUILDING ENERGY PERFORMANCE



Energy consumption
control

SMARTGRID

Paris - BRUNESAU district- AG
Real Estate, Nexity, Icade, Les
Nouveaux Constructeurs



SmartGrid allows for the pre-sizing of the internal distribution network of a neighbourhood, thanks to the integration of the GeoCAD solution, also developed by Egis.



ENERGY MIX AND NEW GENERATION NETWORKS



In large urban projects, several energy carriers are mobilised to meet the heat, cooling and electricity needs of buildings. Connection to heating and/or chilled water networks, geothermal energy, heat pumps, recovery, gas boilers: there are many options, and their respective advantages may change depending on the use of the buildings and the objectives set by the contracting authority. How can the investment, the total cost, greenhouse gas emissions, primary energy consumption, or "metered" consumption be optimised?



For the simulation and optimisation of energy networks, Egis offers the "SmartGrid" solution, based on the Pypsa computer library, a toolkit for the simulation and optimisation of power supply systems and related sectors used by research institutes and global companies. SmartGrid helps balance requirements power levels with those of the energy distribution and generation systems for each interval in the 8,760 hours throughout a year.



Design of a multi-energy smartgrid optimised at hourly intervals according to the needs of the buildings and the carbon intensity of the concession networks - Bruneseau district in Paris. AG Real Estate, Nexity, Icade, Les Nouveaux Constructeurs.

Composition of the energy mix and integration of renewable and recoverable energies for a hospital north of Paris in Saint-Ouen-sur-Seine.

CONTACT Guillaume MEUNIER

WOOD CONSTRUCTION



Wood, a traditional material, paves the way for progress in responsible construction. 1 kg of wood stores 1.8 kg of CO₂ (source Ademe). Whether in a structure, a façade, insulation or for energy systems, wood lends itself to many uses.

Egis, through its project management missions and its active participation in national working groups on timber construction, contributes to removing regulatory obstacles, promoting local resources originating from sustainably managed forests and helps develop the French timber industry.



Egis designs the technical systems and draws up specifications to enable the construction of high-rise buildings, whether for the Silva tower in Bordeaux (50 m), the Carmelha tower in Monaco (47 m), or for the future tower in the Bruneseau district in Paris (180 m).

PARTNERS Association Adivbois, "Oui au Bois" Association, French Association for the Development of Low Carbon Buildings

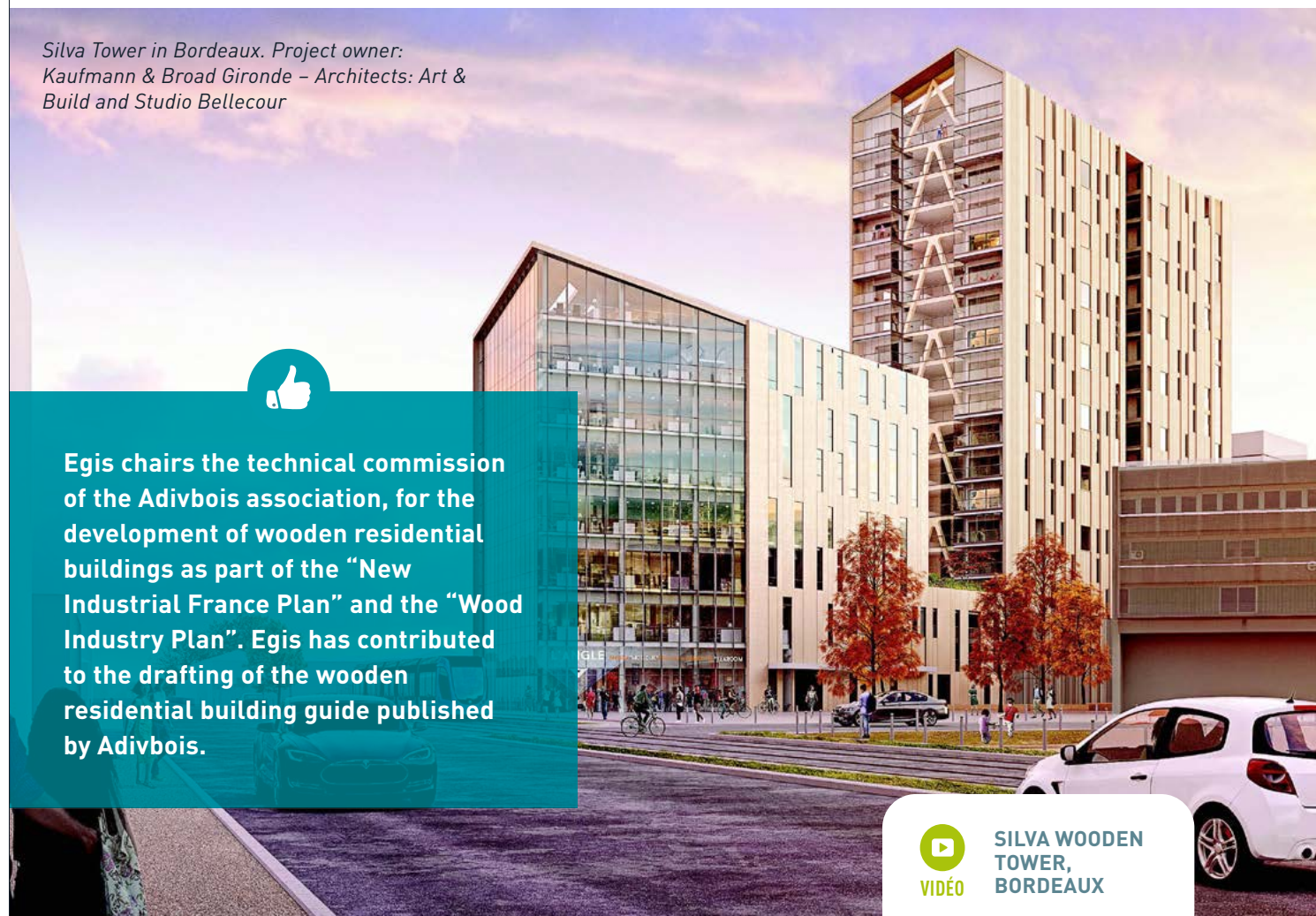
CONTACT François CONSIGNY

WOOD FOR HIGH-RISE BUILDINGS

Silva Tower in Bordeaux. Project owner: Kaufmann & Broad Gironde – Architects: Art & Build and Studio Bellecour



Egis chairs the technical commission of the Adivbois association, for the development of wooden residential buildings as part of the "New Industrial France Plan" and the "Wood Industry Plan". Egis has contributed to the drafting of the wooden residential building guide published by Adivbois.



VIDÉO

SILVA WOODEN TOWER, BORDEAUX

STRAW CONSTRUCTION



- Egis is a member of the *Réseau Français de la Construction Paille* (RFCP, French Straw Construction Network) and several employees have attended "Pro Paille" training courses, which are a reference in this field.
- The combination of wood and straw materials is now established as a path of excellence for low-resource, sustainable and low carbon construction. Egis is proud to be one of its leading proponents.



le blog **STRAW: THE ULTIMATE GREEN BUILDING SOLUTION**

PROMOTING STRAW FOR PASSIVE CONSTRUCTIONS



As an intrinsically low-carbon and low-tech material, straw, whether it be a by-product of wheat, rice or another cereal, captures CO₂ as it grows and only needs very little energy for the few conversion operations when it is used in buildings.

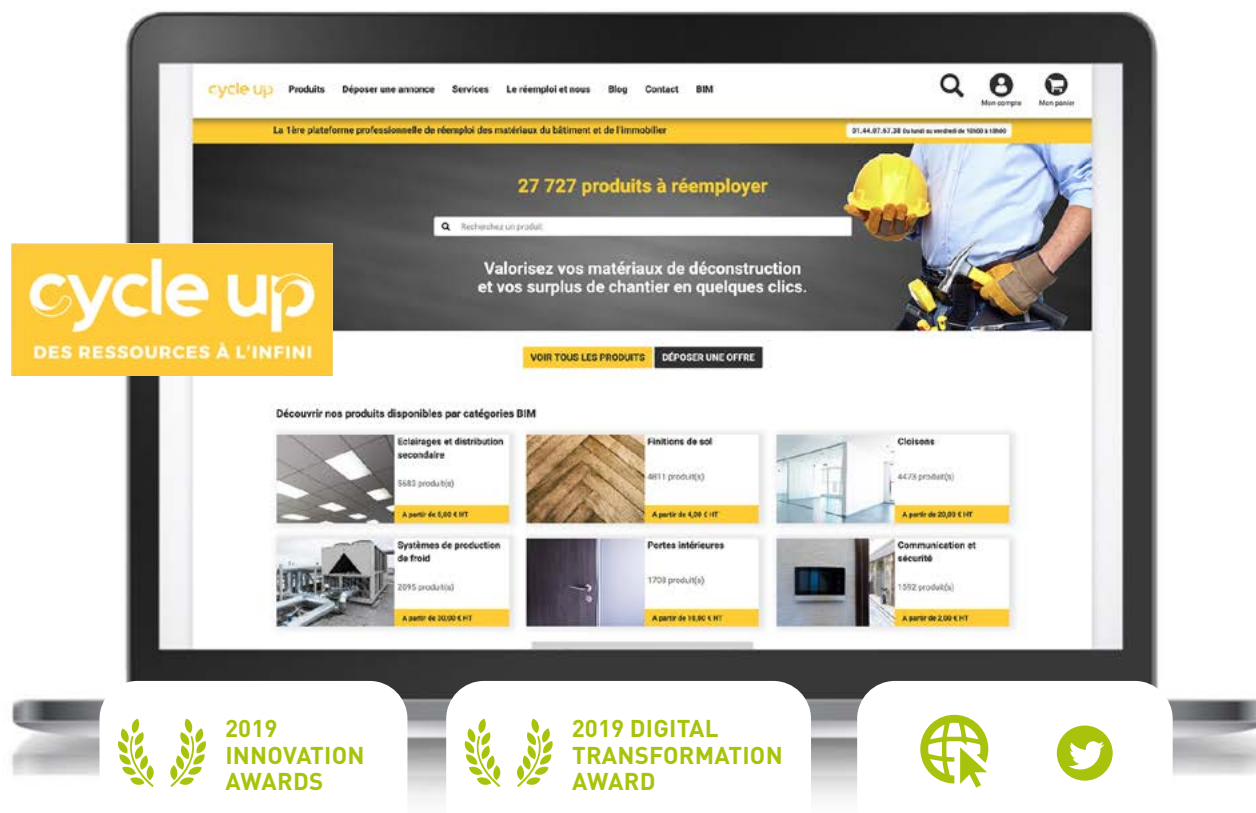
Perfectly renewable and with no impact on health, straw also offers solid heat insulation properties, in line with the requirements of current and future heat energy regulations.



Egis has developed the technical specifications to enable the several pilot operations to be built with straw:

- A school in the Nétreville district of Évreux, in collaboration with the architect DCL, with the use of straw in wooden panels for wall and roof construction.
- Support to the Solar Bretagne team during its participation in Solar Decathlon China, for the straw insulation of a sustainable house.

CYCLE UP + BIM



ENSURING THE REUSE OF MATERIALS THROUGH BIM



Egis has removed obstacles to the reuse of materials in the construction sector by setting up the Cycle Up platform which has been running since 2018. Offering free access to all professionals, the interactive platform cycle-up.fr has been designed to help match up supply and demand for reusable materials and bring together the players in the sector: owners, contracting authorities, architects, engineers, demolition workers and builders, whatever the stage of the building's life cycle: construction, renovation or deconstruction.



The Cycle Up marketplace today features a significant innovation by incorporating a BIM process: the new Massive ReUse module cross-references the Cycle Up catalogue with BIM mock-ups of projects. The aim of the module is to find matches between products from the marketplace catalogue and objects from the digital model of projects wishing to reuse materials. The products available on the platform are accompanied by a technical description summarising a set of product characteristics in the sales advert. This data is necessary for the creation and operation of the construction. They are matched up by analysing the attributes of the product and the properties of the object. This innovation mission is a world first.

PARTNERS Icade, company Cycle Up

CONTACT Sébastien DUPRAT / Christophe BINARD

MOBILITY & TRANSPORTATION OF THE FUTURE



"From active mobility (cycling, walking, etc.) to sustainable car use (car sharing, reserved lanes, carpooling, self-hire vehicles, etc.), from public transport to electric vehicles or autonomous transport, tomorrow's urban mobility will necessarily have to fit in with a sustainable development strategy. Necessarily connected to enable the development of new services, this new mobility will be sparing on energy, resources and space, in order to find its full place in a low carbon society."

Elias Seddiki,
Mobility & Systems Director

MANAGING SUSTAINABLE MOBILITY

- 32 Ensuring smooth, safe airport passenger handling
- 33 The mobility hypervisor
- 34 Transport services adapted in real time
- 35 360° project immersion
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- 37 The high definition image of dynamic carpooling
- 38 Connectivity to make our roads safe

AUGMENTED INFRASTRUCTURE

- 39 Augmented infrastructure maintenance
- 40 Inclusive motorway
- 41 Autonomous goods convoys
- 42 The mobile app for drivers
- 43 Connected and intelligent vehicle weighing
- 44 The application for rail operations in brazil



SMOOTH & SAFE PAX PROCESSING



Smaller-sized airports (< 5 MPax per year) are facing an unprecedented health crisis with limited human and technical resources. How do you regain the trust of airport users? Reduce waiting times? Prevent congestion in the terminal?



Egis has developed "Smooth & Safe Pax Processing", a web application to predict passenger behaviour a few days or hours in advance. This web service identifies in advance the time slots displaying imbalances between passenger demand and airport capacity. The innovative module integrates the prediction of passenger behaviour using machine learning and "What if" functions to assess the benefits of a given measure (decision support).

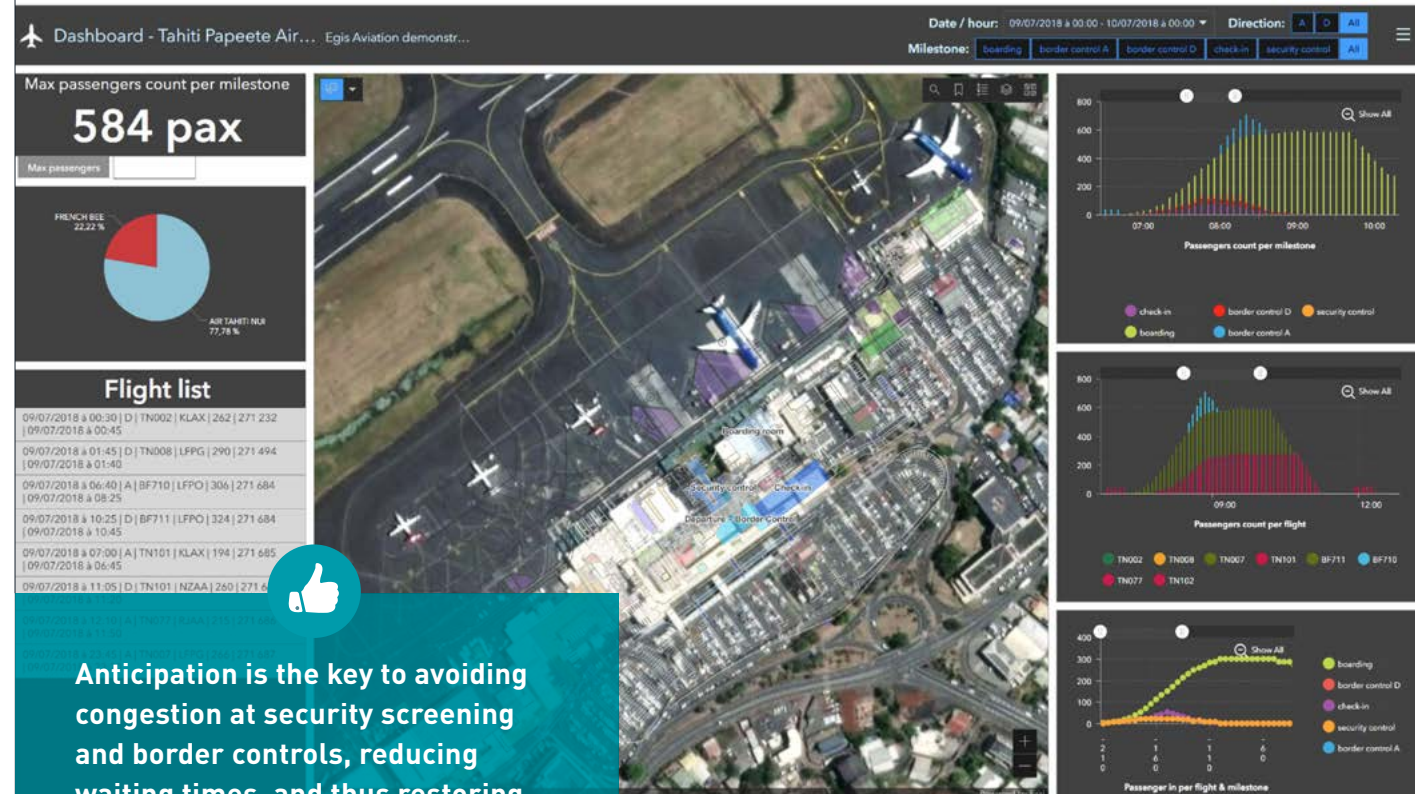


Smooth & Safe Pax processing is a ready-to-use full web solution that is economically viable for small and medium sized airports. Deployment is currently underway at Egis airports.



CONTACT Olivier GUILLET

ENSURING SMOOTH, SAFE AIRPORT PASSENGER HANDLING



HYPERVISION



1. Improves regularity of public transport
2. Makes journey times more reliable
3. Encourages modal shift
4. Global mobility management
5. Parking management

THE MOBILITY HYPERVISOR



"Mobility" within a city is no longer limited to conventional public transport (bus, metro, tram). New mobility solutions and intermodality (carpooling, scooters, bicycles, EV, etc.) must now also be included in the mix. In this context, traditional supervisors employed to manage public transport no longer provide for the optimal management of urban mobility. The notion of hypervisor is therefore entirely appropriate.



The hypervisor allows for the global management of urban mobility and manages the safety of all modes of transport. From a user's point of view, the hypervisor can help to provide MaaS (Mobility as a Service) and ticketing applications with reliable data. From the point of view of public institutions, it allows for the global management of the city, ensuring smooth mobility. (freer flowing traffic, intermodality, clean vehicles), with management of public transport, alternative solutions, electrical energy (lighting for safer road crossings at night and EV stations), video surveillance, etc.



A successful Egis experience in Curitiba, Brazil, demonstrated the need to move from supervisor to hypervisor. Even if public transport is managed efficiently, the city is congested. In this context, the hypervisor facilitates decision making and provides effective reporting to policymakers to help them decide on the right investments.

PARTNER City of Curitiba (Brazil)

CONTACT Yves COHEN

OPTIFLOW



TRANSPORT SERVICES ADAPTED IN REAL TIME



The transport service offer is drawn up for long periods of time and is only adjusted when exceptional and planned events take place, according to a predefined schedule. However, events external to the network, such as holiday departures, weather conditions or a demonstration in the city can significantly change travel habits and schedules, especially when they happen simultaneously.



As part of a call for ideas from the Nice metropolitan council, Egis is designing a predictive model that will enable the operator to propose transport services suited to the conditions observed in real time (weather, events, incidents, road traffic, etc.).



The proposed solution is based on machine learning technologies powered by the operator's business data, and on external data. The aim is to predict expected passenger numbers at public transport stops so as to provide the operator with recommendations on the best services to lay on.

CONTACT Stéphane DUMARTY

WEBGIS

PROVISION OF A WEBGIS AND 360° IMAGES TO SHARE PROJECT PROGRESS



Works supervision represents a major challenge for the project owner, particularly in terms of planning, user disturbance or communication with the public. It is therefore essential to have a good understanding and a realistic view of how the works underway are progressing.



Egis has developed a WebGIS application based on the acquisition of georeferenced 360° images. These images can then be consulted in conjunction with configurable project mapping (display of the work lot progress, areas of vigilance, etc.). The data is recorded and updated regularly, thus allowing a remote view of the progress of the work directly through our interface. This application plugs directly into our GIS and EDM tools.

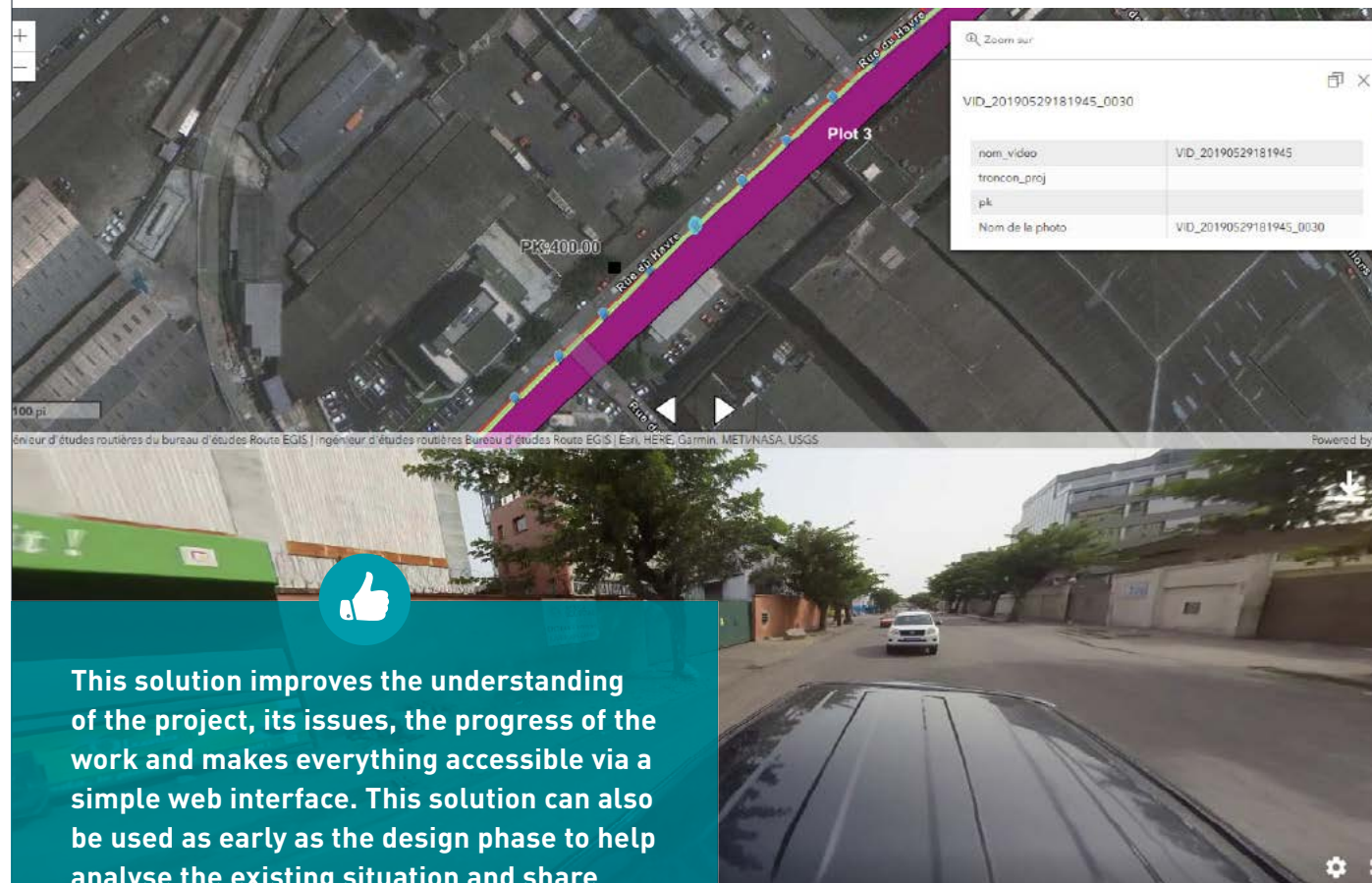


An experimentation site: Abidjan Transport Project



CONTACT Christophe BLANCHET

360° PROJECT IMMERSION



This solution improves the understanding of the project, its issues, the progress of the work and makes everything accessible via a simple web interface. This solution can also be used as early as the design phase to help analyse the existing situation and share geographical information.

SESAR



SESAR will ultimately bring about more efficient air traffic management, leading to a 10% reduction in CO₂ emissions, while improving the operational performance of the Single European Sky.

FOR A MORE SUSTAINABLE EUROPEAN SKY



In normal times (outside the context of a health crisis), European airports and airspace face continuous growth in traffic which doubles every 10 years. The major aim of the European research and innovation programme SESAR (Single European Sky ATM Research) is to increase the safety and capacity of airspace and airports while reducing the environmental impact (noise and gas emissions) of aviation activity.



The Air Navigation Services Department (DSNA) in charge of air traffic control in France, is a major contributor to SESAR and Egis has been advising it since 2010 in the definition and progressive validation of new operational concepts, providing its engineering expertise in the air traffic management field (ATM) and in Human Factors:

- Implementation of a "Free Route Airspace" (FRA), corresponding to a portion of airspace in which airlines can choose optimised trajectories by breaking away from predetermined route networks
- Continuous Climb and Descent Operations (CCO/CDO) around airports to optimise vertical trajectories and reduce fuel consumption, while alleviating the workload of air traffic controllers
- Assistance to air traffic controllers in optimising the phases of surface movements and guiding pilots and vehicle drivers (A-SMGCS)

PARTNER DSNA

CONTACT Hervé DREVILLON

COVEGIS



Mobility problems in city regions can be addressed through incentives encouraging motorists to change their habits. Carpooling is one of the means implemented by various cities. However, to become an integral part of a transport policy, technologies must be developed that can objectivise the adoption of the concept.



Egis has developed COVEGIS, a turnkey product which accurately determines the number of occupants in a vehicle subject to carpooling policy enforcement checks.



Faced with heavy cross-border commuter traffic on the Swiss border, ATMB (Autoroutes et Tunnel du Mont-Blanc) has dedicated a lane to carpoolers during rush hour, and Egis was asked to provide a user-friendly detection system. The system has been installed since July 2020 and the experiment was successfully completed in July 2021.



PARTNERS ATMB, CEREMA, CEA Tech, R&D Vision

CONTACT Mounir CHAOUCHE

THE HIGH DEFINITION IMAGE OF DYNAMIC CARPOOLING



*Vehicle occupancy (carpooling)
detection system*

**Lower CO₂ emissions,
less congestion, less
space occupied by
roads**

ROAD BIG DATA



This solution enables rapid data acquisition, saves time in analysing the existing situation and provides an innovative response to road safety diagnostics. It also helps identify areas generating over-pollution (greenhouse gas emissions) due to inappropriate driver behaviour.

PARC D'ACTIVITÉS DES PRÉS LORIBES

CENTRE COMMERCIAL DOUAI FLERS

CONNECTIVITY TO MAKE OUR ROADS SAFE



Road safety is a major issue in the construction and layout of road infrastructure. The development of vehicle connectivity opens up new opportunities to increase knowledge about the driving behaviour of road users and near misses.



Egis and Xee have developed a solution that collects data on driving behaviour via anonymous on-board devices and an "expert" device that gives accurate feedback on the geometry of the road travelled. Our experts thus analyse user behaviour in correlation with the characteristics of the road used in the aim of identifying risks and recommending corrective actions.



Three experimental sites: Lille southern ring road (A25), RD642 between Strazeele and Hazebrouck, A21 motorway around Douai.



PARTNER Xee

CONTACT Eric LOCQUET

VIRTUAL REALITY



Egis endeavour to provide the highest standard of service in road and tunnel operations, looking for opportunities to move beyond the current norm in preventative maintenance standards through the utilization of emerging technologies and remote practices.



AR smart glasses operate through the projection of real-time information onto the inside of the lens of the glasses. This allows the wearers to receive remote support from specialists while maintaining focus on their physical task. As experts are available immediately and do not need to travel, the downtime of equipment can be reduced drastically.



Introduction on the Dublin Tunnel in Ireland. Other sites, notably the M25 motorway in the United Kingdom, will also adopt these augmented reality glasses to improve the maintenance of equipment.

PARTNERS UtilityAR, an Irish start-up

CONTACT Bob CLARE

AUGMENTED INFRASTRUCTURE MAINTENANCE



Despite the travel restrictions imposed by Covid-19, the scheduled preventive maintenance on the Linear heat fire system was completed successfully remotely by a specialist engineer and resulted in savings of 70% on a normal site visit.

DISABILITY TOLL EXEMPTION SCHEME (DTES)



People with reduced mobility (PRM) are a fragile population with often limited resources. Offering toll exemption to PRM motorists contributes to making mobility more inclusive.



The Disability Toll Exemption Scheme (DTES) is the first toll exemption scheme for PRMs in Ireland.

Easytrip, Egis' subsidiary in Ireland (50%-owned), has introduced and is managing this programme, which offers toll exemption all over Ireland to all disability converted vehicles. Easytrip Ireland has set up a unique and tailored programme for this population: an inclusive website (accessibility, Gaelic version, etc.) for information and registration, a unique identification sticker and a multi-channel relationship (telephone, e-mail, chat) with the beneficiaries of this programme, which is in step with the trend towards increasingly personalised toll pricing. A first in Ireland!

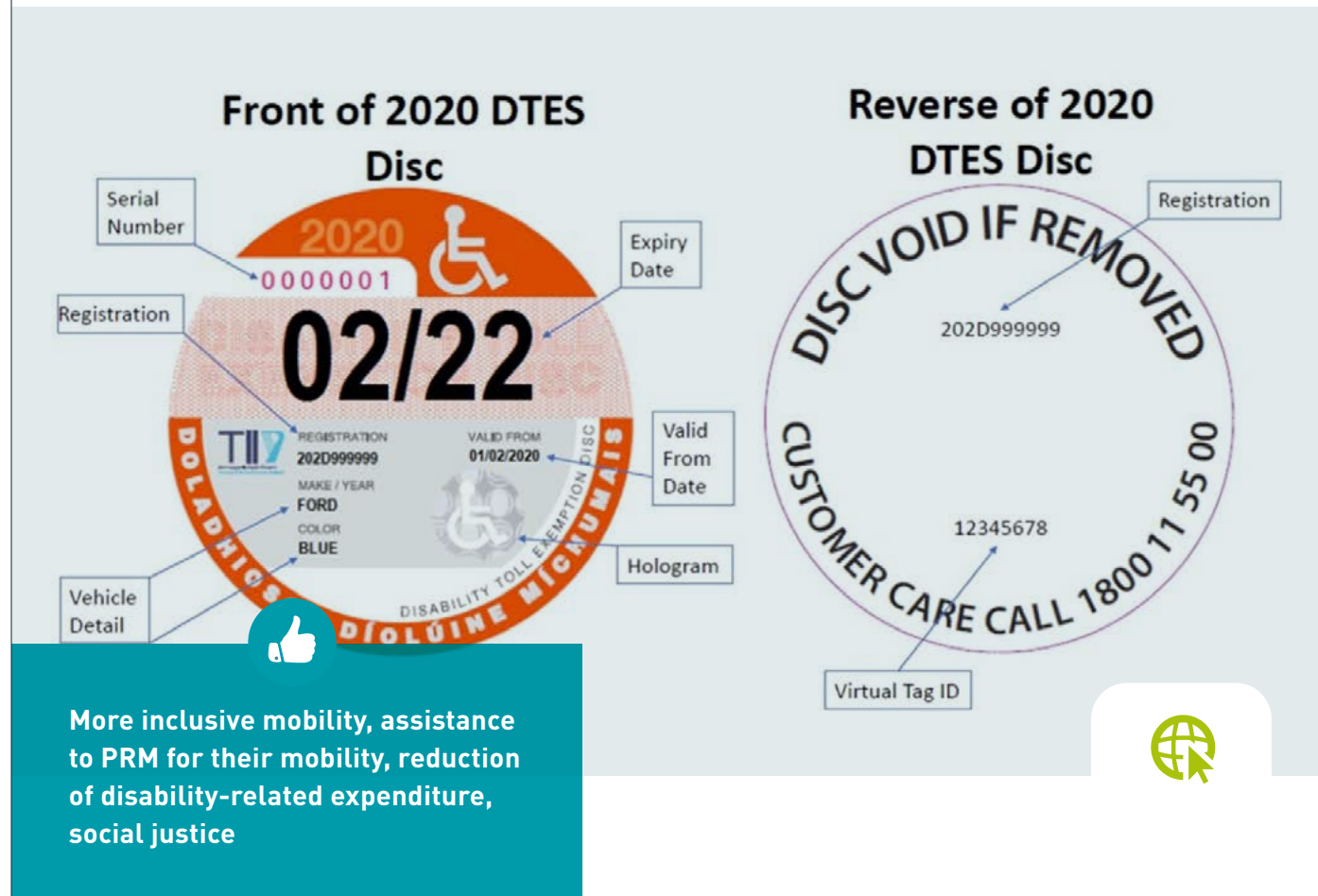


Ireland

PARTNER TII (Transport Infrastructure Ireland)..

CONTACT Lionel COSMANO

INCLUSIVE MOTORWAY



PLATOONING



With freight volumes worldwide expected to double in the next three decades, road transport represents a major environmental and social challenge.



Egis, the Nouvelle Aquitaine regional authority and its academic and local partners are working on an experiment in real life conditions of organising HGV traffic into convoys over short distances (known as platooning). This experimentation platform will be unique in France and more advanced than equivalent areas in Europe or the United States.

The various use cases include testing the new V2X-LTE and 5G communication technologies, relayed by roadside units and on-board connected devices. The aim is to evaluate the concrete benefits and to define the conditions under which platooning could be deployed on a larger scale in total safety.



A63 motorway, France. (30 km between Saugnacq-et-Muret and Labouheyre), a segment incorporating all the driving conditions that pose problems for autonomous vehicles (tolls, lay-bys, junctions).



AUTONOMOUS GOODS CONVOYS



- Reduces CO₂ emissions, fuel consumption, driver fatigue.
- Improves road safety, traffic flow, journey times

PARTNERS Nouvelle-Aquitaine, Atlandes, Gustave Eiffel University (IFSTTAR), GEOSAT, Cerema, ERTICO-ITS Europe, NeoGLS

CONTACT Laurent CHARLES-NICOLAS

CONNECTED MULTISERVICE

01 Add Vehicle

Add or Modify Your Vehicle Details

02 Easier Parking

Find All Easytrip Tag Parking Locations

03 Transactions

View Your Most Recent Transactions

04 Manage Payments

Manage Payment & View Your Balance

05 Promotions

Offers & Promotions: Get discounts and offers from some of our key partners

06 Easy Dashboard

Easy to use Dashboard helping you find information in one click.

- Less queuing
- Faster payments
- Less risk of transmission of Covid-19

THE MOBILE APP FOR DRIVERS



A driver has to manage several types of payments linked to the use of their vehicle - tolls, parking, car wash, etc. equating to just as many movements and contacts with the outside world! Having a single application helps save time and gives you full control over all your payments and invoices, without leaving your vehicle.



Egis, through its subsidiary Easytrip, has developed a mobile application whose aim is to make life easier for motorists by adding ever more services. For example, users will soon be able to pay for car washing via Bluetooth from the application, contact-free and without leaving the vehicle! This service will be added to the other contactless and risk-free services already in place, such as tolls and parking.

In addition, the application has the following functions:

- Managing vehicles connected with the badge
- Location of car parks
- Transaction history (tolls, parking...)
- Management of means of payment
- Offers and promotions



Ireland, Easytrip by Egis

PARTNER Irish car wash chain

CONTACT Lionel COSMANO

SIPE

CONNECTED AND INTELLIGENT VEHICLE WEIGHING



Integrate the vehicle weighing sub-systems of the various manufacturers and ensure remote management between the weighing station and the operational control centre.



Thanks to connected sensors installed on the roadway, the Egis Weighing Integration System (SIPE in French) receives weighing and vehicle flow data in real time, which makes it possible to monitor road wear and manage its longevity. The system architecture enables the remote management of several vehicle weighing stations through a single control centre.



State of São Paulo, Brazil

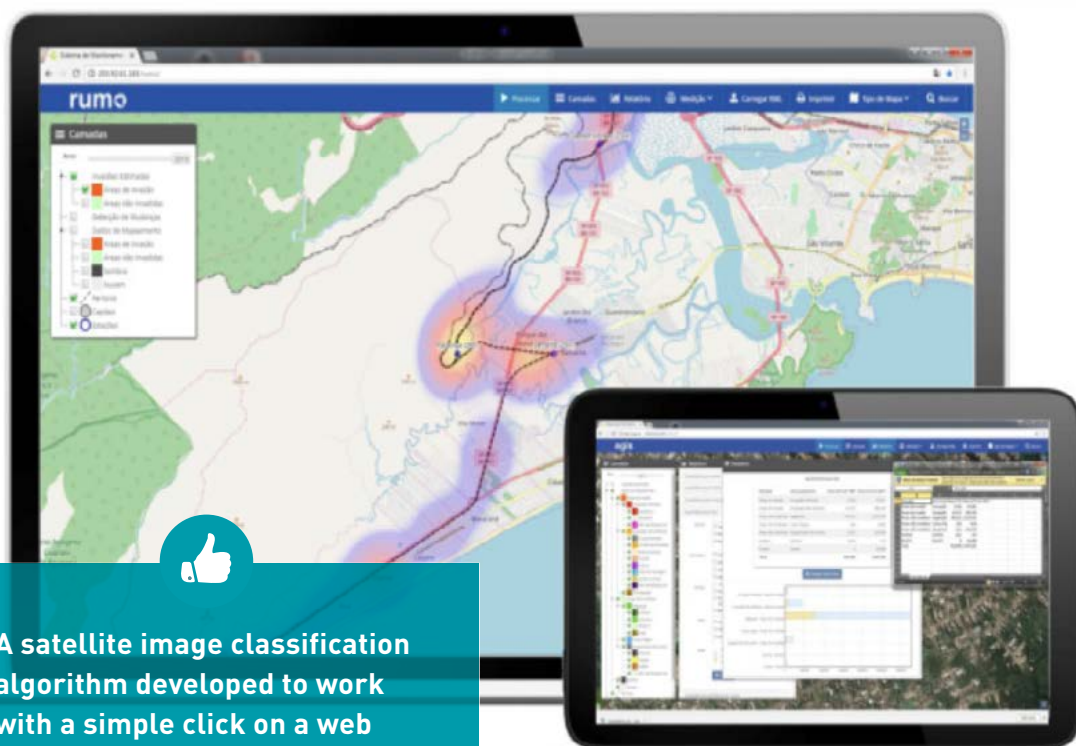


VEHICLE
WEIGHING

VIDÉO

CONTACT Rodrigo BERTO

STRATEGIS



A satellite image classification algorithm developed to work with a simple click on a web browser.



STRATEGIS

THE APPLICATION FOR RAIL OPERATIONS IN BRAZIL



Rail network operators need tools to manage their installations strategically and solve problems such as encroachment into railway property borders.



Egis has developed the "Strategis" solution, a geographic information system (GIS) that checks encroached areas extracted automatically from satellite imagery using an algorithm. Accessible via a Web interface, Strategis assists operators in their decision-making process by taking into account the geographical attributes of their assets.



Brazil, State of São Paulo, cities of Cubatão and Piracicaba.

PARTNERS Egis India (Egis Geoplan) and RUMO

CONTACT Rodrigo BERTO

ENGINEERING 4.0



"Engineering professions are constantly evolving. Beyond the necessary proficiency in new digital tools, the very approach to our professions is changing! As the issues at stake become increasingly complex and interlinked, collaborative working is becoming the norm to bring forward more innovative and ambitious projects, which will help shape the world we will live in tomorrow."

*Béatrice Gasser,
Technical, Innovation and Sustainable Development Director (Egis Group)*

AUTOMATED DATA ACQUISITION / BIG DATA / AI

- 46 Monitoring with satellite data
- 47 Managing são paulo's bridges and viaducts
- 48 A data approach for asbestos diagnoses
- 49 Supervised infrastructure and power plants

PARAMETRIC DESIGN / GENERATIVE DESIGN

- 50 Assessing the digital maturity of local authorities

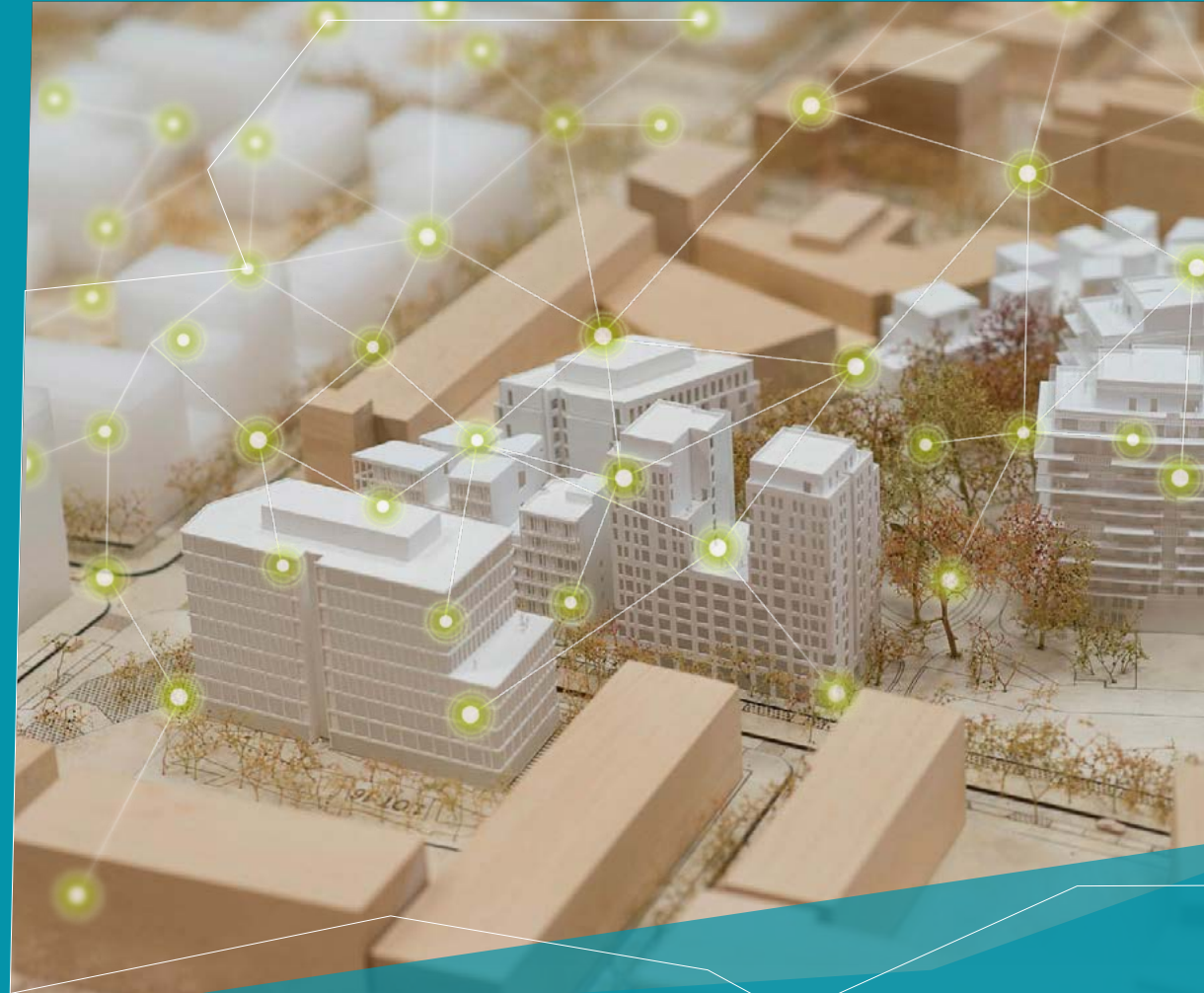
INNOVATIVE METHODS

- 51 Parametric design
- 52 New project support

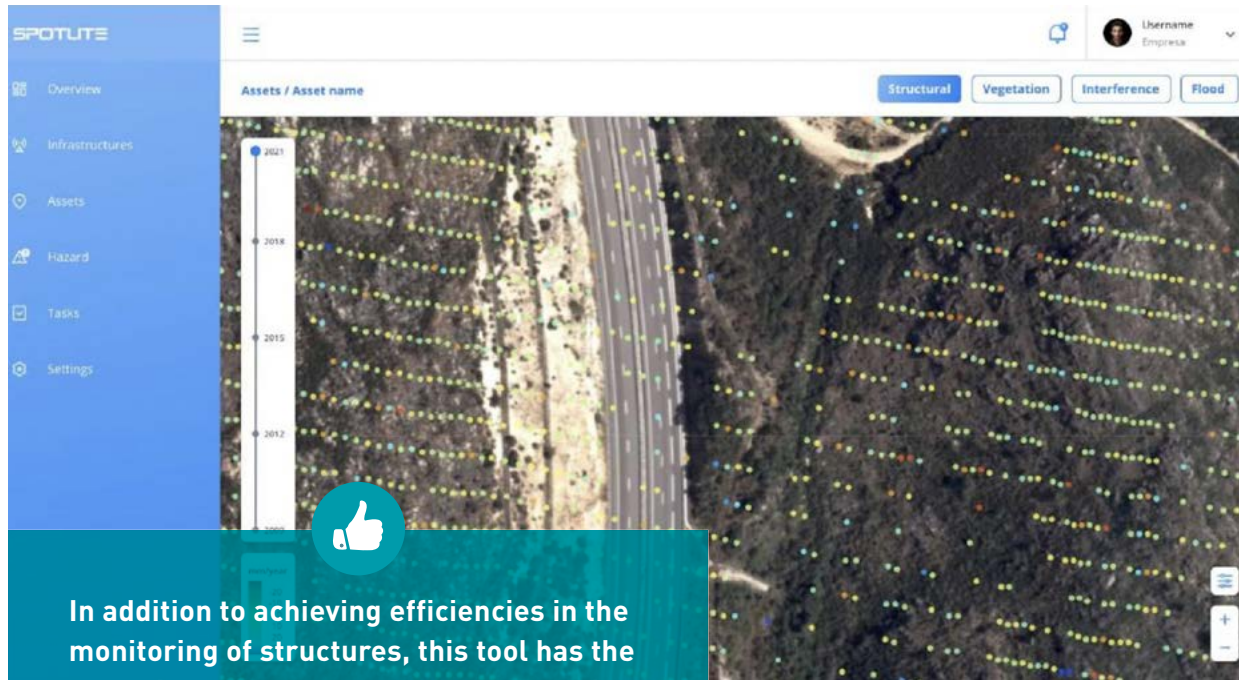
- 53 Reducing the volume and risks of radioactive waste
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DIGITAL TWIN

- 55 Securing underground works with imaging
- 56 Digital twin and project coordination
- 57 Digital twin and asset life cycle
- 58 Digital twin and collective intelligence
- 59 Digital management of tunnel assets



REMOTE GROUND MOTION INSTABILITY DETECTION



In addition to achieving efficiencies in the monitoring of structures, this tool has the potential to prevent unexpected landslides and therefore builds the resilience of motorways against the consequences of climate change.

MONITORING WITH SATELLITE DATA



Monitoring the stability of geotechnical structures is a real challenge for asset managers and operators. Traditional monitoring measurements (topography, inclinometers) are quite manual and labour-intensive.



With an accuracy of 4-6mm, advanced remote sensing techniques are used to detect ground deformation and monitor slope stability and subsidence throughout the road network. This tool facilitates diagnostics, monitoring in large areas and decision-making.



Following a first feasibility study on the A24 motorway in Portugal, Egis and its partner Theia continue to explore the potential advantages of satellite data on other motorways in the Egis network, thanks to a grant from the European Space Agency.

PARTNER Theia, Portuguese start-up

CONTACT Paulo BARRETO

AUTOMATED DATA ACQUISITION



MANAGING SÃO PAULO'S BRIDGES AND VIADUCTS



The of São Paulo City Bridges and Viaducts Management and Maintenance Program requires detailed blueprints of the structures, as well as recording and drawing deterioration on the structures, even in the absence of original drawings. Such activity could cause impact in many aspects, for example, traffic stoppage and inaccuracies in visual surveys of complex engineering structures.



In this context, Egis implemented topographic, planimetric, altimetric, and geometric survey solutions using a high-performance 3D Laser Scanner System (TLS - Terrestrial Laser System), where the points are irradiated with lasers to virtualize the surroundings, along with 360° geo-referenced photos. Scanning structures produces point cloud data, with precision of up to 1.5 mm, also providing resources to develop a 3D Model in BIM platform. In addition to the 3D Laser Scanner, Egis used of cranes for approach movements and a drone to take aerial photos, thus eliminating the use of physical approach devices such as trucks and platforms, the risk of accidents, and lane interdictions.

CONTACT Rodrigo BERTO

DIAG AMIANTE



Optimisation of our specialised missions, automation of low added value tasks

A DATA APPROACH FOR ASBESTOS DIAGNOSES



Egis Data & Solutions offers software solutions for data processing and use. The "Diag Amiante" (asbestos diag) approach through data thus makes it possible to combine building trade expertise, on a large volume of building sites to be examined.



Egis develops and integrates the data approach that contribute to optimising our traditional service offers:

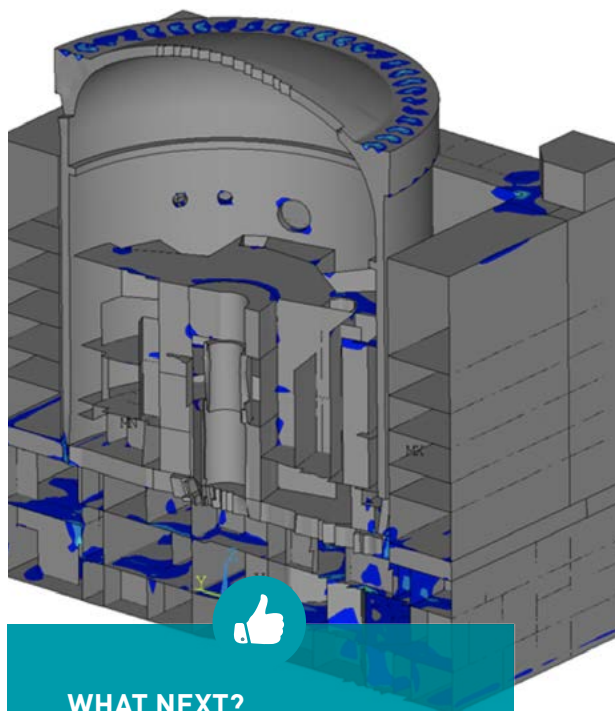
- Ability to coordinate the diagnosis of more than 3,000 buildings
- Optimisation and automation of the production of deliverables
- Ability to carry out technical analyses using iterative approaches
- Genuine capitalisation of our technical expertise
- An image of technological expertise that backs up our service offers



SNCF - Asbestos Diagnostic Mission coordination

CONTACT Christophe BINARD

ARTIFICIAL INTELLIGENCE MONITORING



WHAT NEXT?

AI to monitor reinforced concrete structures of nuclear power plants in real time

SUPERVISED INFRASTRUCTURE AND POWER PLANTS



Nuclear structures are fantastically unique. In order to avoid any risk, monitoring their evolution over time is fundamental. Egis proposes innovative techniques and methodologies to monitor the structure to assess its actual state



We use artificial intelligence to process, analyse and detect concrete cracks, structure vibrations and other important data for the structural health of the asset. Egis has successfully applied this innovative approach to different types of structures: tunnels, bridges, dikes ...



We are currently extending this approach to the monitoring of the structures of nuclear power plants using Egis expertise acquired in the monitoring of nuclear structures: photogrammetric data treatment to determine the deformation of cooling towers, structures monitoring with innovative optical fibre sensors, digital image correlation for cracking in reinforced concrete walls, definition of the monitoring of the Reactor building of Khmel'nitsky nuclear power plant, etc.

PARTNERS ICOS consortium (Egis leader, Tractebel, Setec),
BYLOR consortium (Bouygues TP, Laing O' Rourke), EDVANCE
(EDF subsidiary), Arvoo

CONTACTS Olivier GAY / Stéphane CAZADIEU

SMART'EST



Enable local authorities to self-assess their digital maturity
Involve local authorities in the development of digital uses and service

ASSESSING THE DIGITAL MATURITY OF LOCAL AUTHORITIES



The Smart'Est solution from Egis Data & Solutions has been online since 2021. It came in response to the "Territories and digital uses" initiative launched by the Grand Est Regional council to accelerate the development of digital uses and services in joint authorities and medium-sized towns of the region.



Using a questionnaire developed by the teams at Egis Conseil, local authorities can self-assess their degree of digital maturity. Guided by tailored content and questions, they can carry out this diagnosis independently and at their own pace. Each local authority can then publish a personalised diagnosis (generated automatically thanks to our deduction and semantic assembly algorithms), including evaluations, graphs, areas for improvement and information sources. A collaborative section allows local authorities to list their digital projects, for internal use or, more widely, to interact with other local authorities in the Grand Est region.

PARTNERS : Grand Est Regional Council, Banque des Territoires

CONTACT Christophe BINARD

CARBON NEUTRALITY

*Renovation of the Montparnasse Tower:
optimisation of the scenarios in terms of the
tower's consumption*



**Non-exhaustive list of software and languages
used: Rhino-Grasshopper, Ladybugtools,
Galapagos, Revit Dynamo, Revit API, Python,
Django, SQL, Jupiter, IES, OpenFoam, Radiance.**

PARAMETRIC DESIGN



At a time when the carbon footprint of buildings is becoming a major issue, regulatory tools are lagging behind and are not integrated into traditional design processes. Today, parametric tools make it possible to improve the design process and provide the most appropriate responses to current challenges. Instead of following a traditional linear and standardised design process, the method consists of posing a problem, defining constraints and objectives, using calculators to explore a multitude of solutions and identifying the optimal solution or the best compromise.



The parametric studies carried out by Egis are based on an ecosystem of software solutions capable of dialoguing with one another and databases resulting from our experience. A few references:

- Design of the renovation of the Montparnasse Tower in Paris
- Design of the wooden roof structure for the Allianz Riviera stadium in Nice
- Contractor drawings for the ZAC Claude Bernard footbridge over the Paris ring road

CONTACT Guillaume MEUNIER

TACT BY EGIS



NEW PROJECT SUPPORT



Embarking upon a project that changes the use and shape of public space is never easy for decision-makers. Behind the enthusiasm of a future benefit lies the fear of disruption during implementation. They are transitory, but present nonetheless, and can never be ignored. We strongly believe that doing something "for" people also means doing it "with" them. Our approach combines a global command of technical aspects with detailed attention to the environment and to the expertise of use of the site. We have developed tools, methods and a state of mind that guarantee that you can move forward with complete peace of mind.



Egis has developed an approach that is applied as early as design phase. Our expertise is based on a common thread: consideration of the people related to or involved in the project: context analysis, consultation and co-design, communication. For the construction phase, we have developed tools and specifications to be integrated into the construction contracts, in line with our belief that low-impact construction, a transparent construction site open to dialogue, and the ability to adjust and adapt are all opportunities for the positive take-up of the project.



This approach was implemented on the TEO 2 BRT project in Saint-Brieuc (Brittany): "a successful experiment!" according to our client, Saint-Brieuc Armor Agglomération.

CONTACT Solenne LESOURD

THERAMIN



Thermal treatment can enable significant volume reduction, waste passivation, and destruction of organic materials, thereby reducing the cost and risk of storage and disposal.

REDUCING THE VOLUME AND RISKS OF RADIOACTIVE WASTE



To provide improved safe long-term storage and disposal of intermediate-level and low-level radioactive waste streams (ILW and LLW), by increasing the technology readiness level of thermal treatment processes to accelerate industrial implementation



Within the THERAMIN project, Galson Sciences Limited (part of the Egis Group) led the evaluation of the potential for thermal treatment of particular waste streams across the EU, including consideration of where the greatest benefits from EU-wide collaboration may be realized. The analysis included:

- the types of waste that could be treated,
- the volumes of waste and potential volume reduction achievable following treatment,
- the capabilities of available treatment technologies,
- the waste behavior and waste product performance for geological disposal, and
- the specific thermal treatment needs for waste streams in participating European countries.



THERAMIN was a European Commission Research Project, carried out by a consortium of 12 partners*, representing a European-wide community of experts on thermal treatment technologies and radioactive waste management and disposal. The project benefited from close engagement of an End User Group of waste producers and waste management organisations.

*This project has received funding from the Euratom research and training programme 2014-2018 under Grant Agreement No 755480.

PARTNERS Andra, Orano, CEA, VTT, FJZ, LEI, NNL, ONDRAF/NIRAS, SCK-CEN, USFD, VUJ

CONTACT Daniel GALSON

SUBSOIL IMAGING



Knowing the nature and mechanical characteristics of the soil on which tomorrow's infrastructure will be built is the starting point for any construction project to guarantee its stability and durability. The risks of water infiltration, cracks, differential settlement and landslides can thus be avoided to offer structures better resilience.



Egis draws inspiration from the techniques used by seismologists to understand the structure of the soil, by developing a new method for imaging the subsoil: passive seismic. This is based on listening to ambient seismic noise produced by natural phenomena (ocean swell, wind, etc.) or anthropogenic phenomena (industrial and urban activities, motorways, etc.) to obtain a 3D vision of the subsoil in depth. It is thus possible to obtain a detailed model of the different layers that make up the soil of our construction site. This technology provides for data acquisition thanks to the installation of autonomous sensors, the generation of a 3D model to characterise the shear wave displacement speeds in the different geological layers and the virtual digital modelling of the reaction of the subsoil to seismic stress.

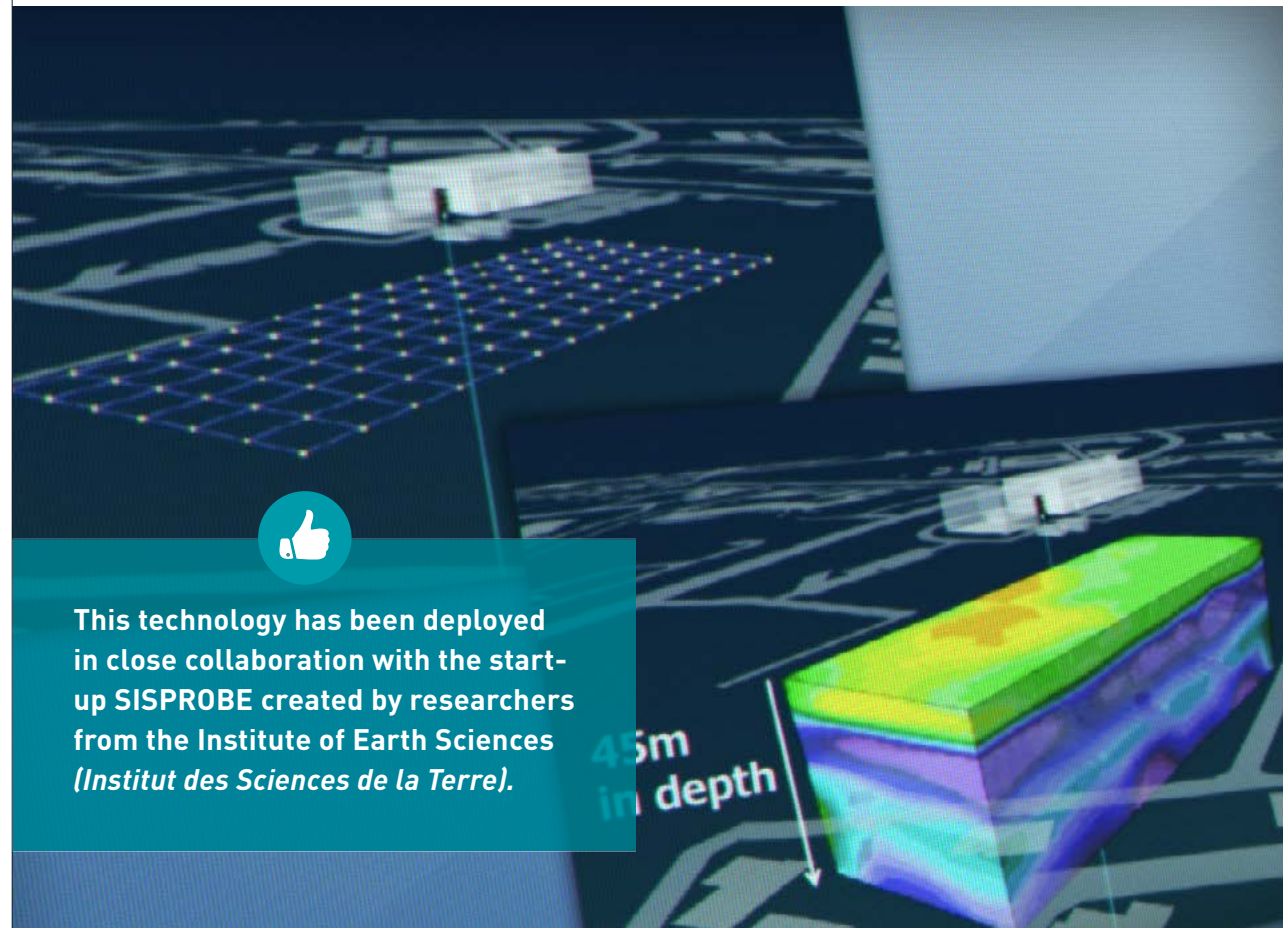


This solution has already been deployed by Egis on two industrial sites in the Rhône Valley.

PARTNERS University of Grenoble, ISTerre, Sisprobe

CONTACT Olivier MAGNIN

A TECHNIQUE INSPIRED BY SEISMOLOGISTS



This technology has been deployed in close collaboration with the start-up SISPROBE created by researchers from the Institute of Earth Sciences (Institut des Sciences de la Terre).

MUONIC TOMOGRAPHY



Underground work involves a high degree of risk caused by poor knowledge of the subsoil. Any resulting shutdowns of tunnel boring machines can have significant financial repercussions for our customers. A technology that helps to better anticipate hazards would help to secure budgets and timeframes.

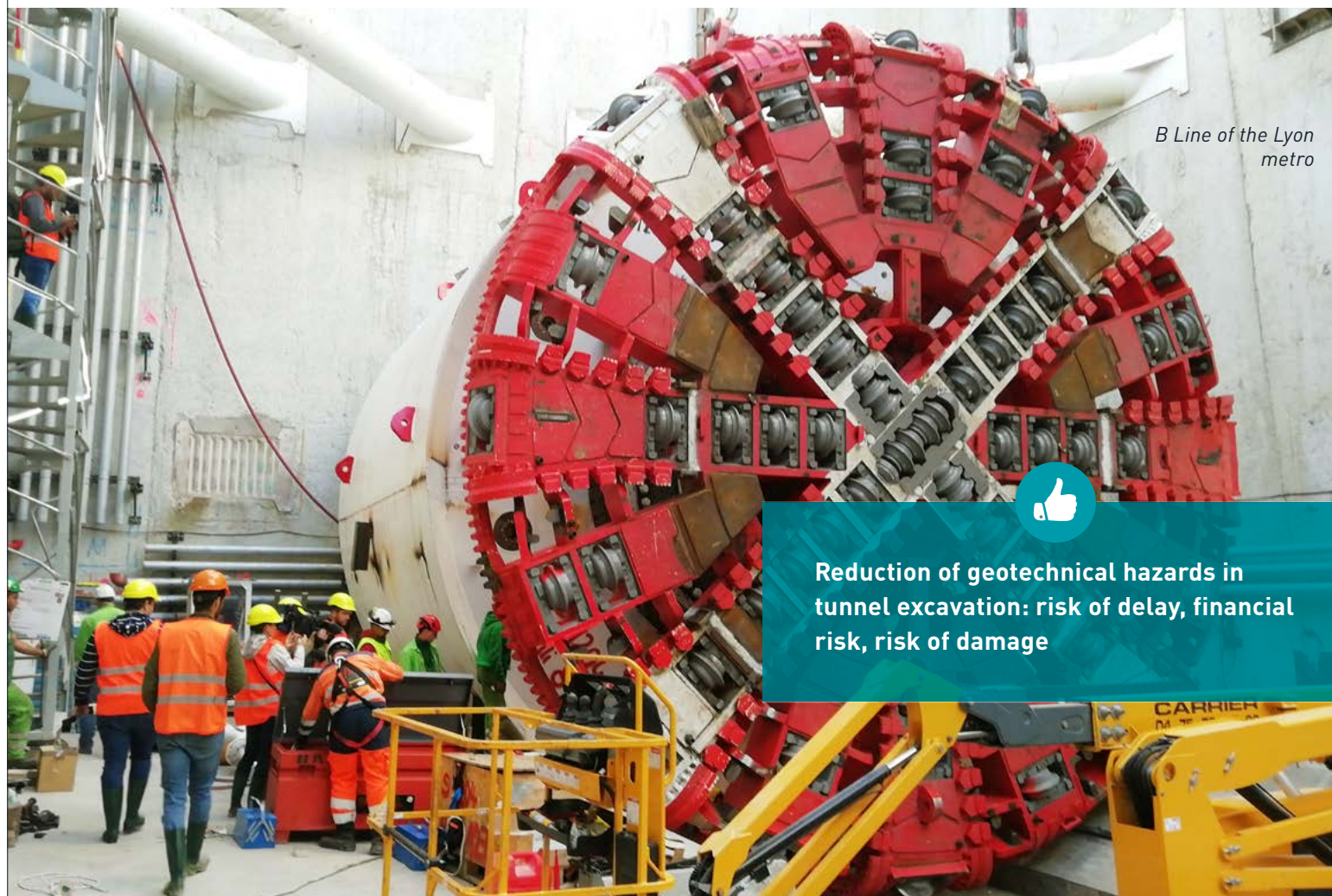


In partnership with CEA Tech, Egis has validated through simulation the pertinence and feasibility of integrating a muonic tomography system (imaging to measure the contrast between densities of the materials observed) into tunnel boring machines to continuously detect the presence of cavities during boring operations. This is the transposition of a technology that led to the discovery of a funerary chamber in the Cheops pyramid.

PARTNERS CEA Tech

CONTACT Bernard BARADEL

SECURING UNDERGROUND WORKS WITH IMAGING



B Line of the Lyon metro



Reduction of geotechnical hazards in tunnel excavation: risk of delay, financial risk, risk of damage

OPTIMISED MANAGEMENT OF ROAD ASSETS



Road infrastructure managers wish to have processes and tools that provide them with a much more accurate view of the structural pathologies of their infrastructure.



Production of a digital model of a viaduct that combined historical data on the structure of the viaduct with real-time condition reports. The data integrated into the digital twin platform helped to better diagnose the cause of the deterioration on this section of motorway and better determine how best to maintain it.



Candaba viaduct, NLEX Corporation, Philippines

DIGITAL TWIN AND PROJECT COORDINATION



Managing road assets
with a digital twin



By incorporating multiple data streams and digital technologies into a shared platform, the twin also becomes a tool to exchange information, coordinate activity and communicate about the asset.

CONTACT Laurent CHARLES-NICOLAS

DATA PROJECT MANAGEMENT (DPM)



This platform, developed by Egis, ensures the digital continuity of information throughout the lifecycle of a physical asset. By leveraging the project's BIM data, it also facilitates analysis and requirements controls for the project owners.



Based on openBIM formats (IFC, COBie and BCF), the platform optimises the design of the programme mock-up and the checks of the design, production and maintenance deliverables. It allows all project stakeholders to harness the data of their project.

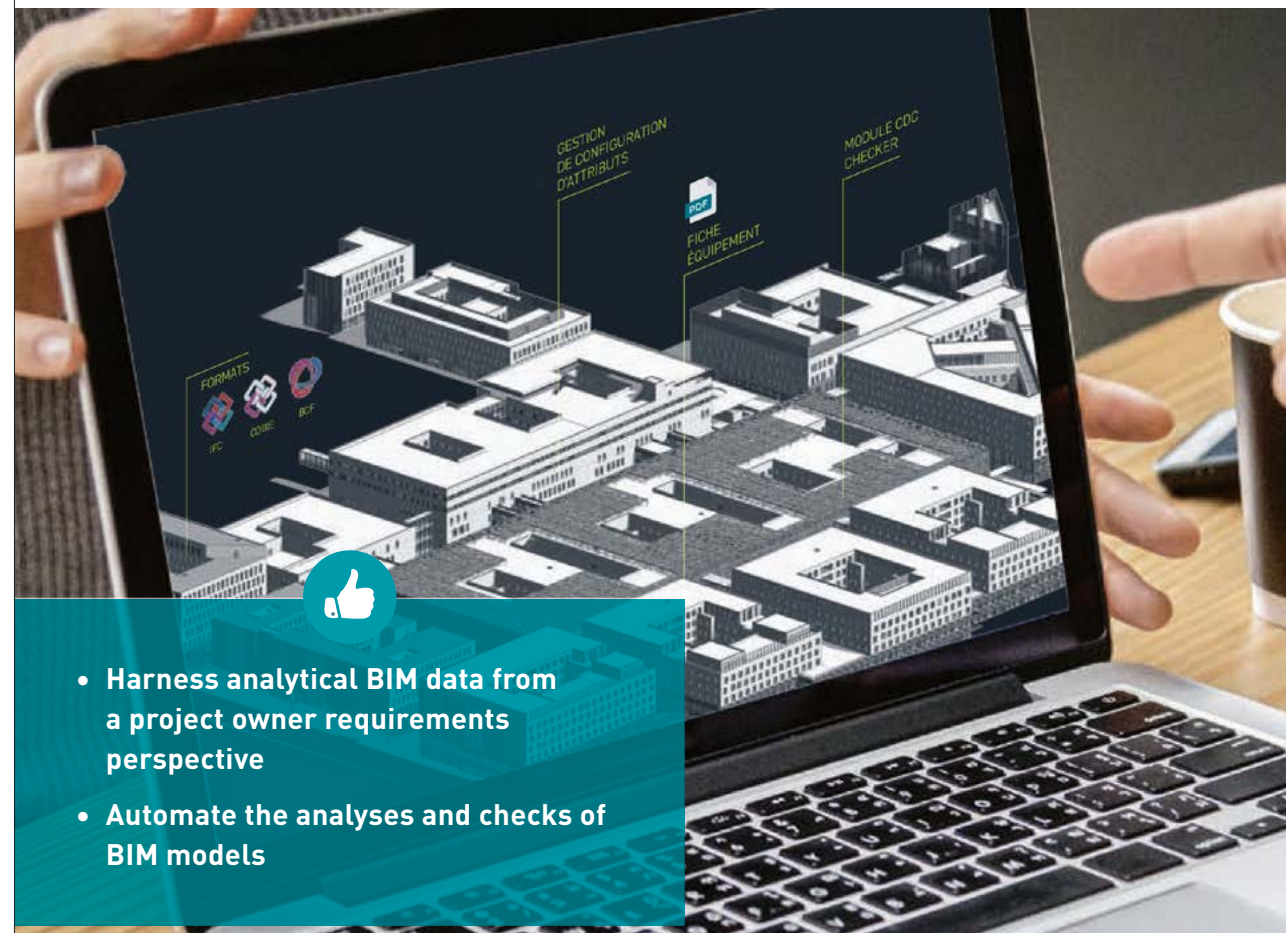
With DPM, we bring an innovative dimension to our project management consultancy missions, for the entire life cycle of the project: programming, design, construction, operation, deconstruction and reuse. Thanks to DPM, the project owner can secure, safeguard and capitalise on their data.



- BIM PMC Nantes hospital
- BIM PMC Nantes Crédit Agricole
- BIMisation of the Lannelongue hospital programme

CONTACT Christophe BINARD

DIGITAL TWIN AND ASSET LIFE CYCLE



- Harness analytical BIM data from a project owner requirements perspective
- Automate the analyses and checks of BIM models

COLLABORATIVE BIM



Tramway projects in urban areas bring together many stakeholders with sometimes contradictory requirements and constraints. Increasing the acceptability of these complex urban projects, by allowing all stakeholders to express themselves around a digital mock-up, guarantees the success of such an operation and reduces risks and costs and saves time.



As programme manager for the North and South extensions of the Marseille light rail line, Egis offered its teams and stakeholders a new experience in digital mock-up design through the use of a BIM collaboration platform (Bimsync solution, from Catenda) from the design kick-off phase. This platform has made it possible for all stakeholders - and not just BIM specialists - to navigate through the project mock-up and consult its content, using a simple web browser connected to the Internet.

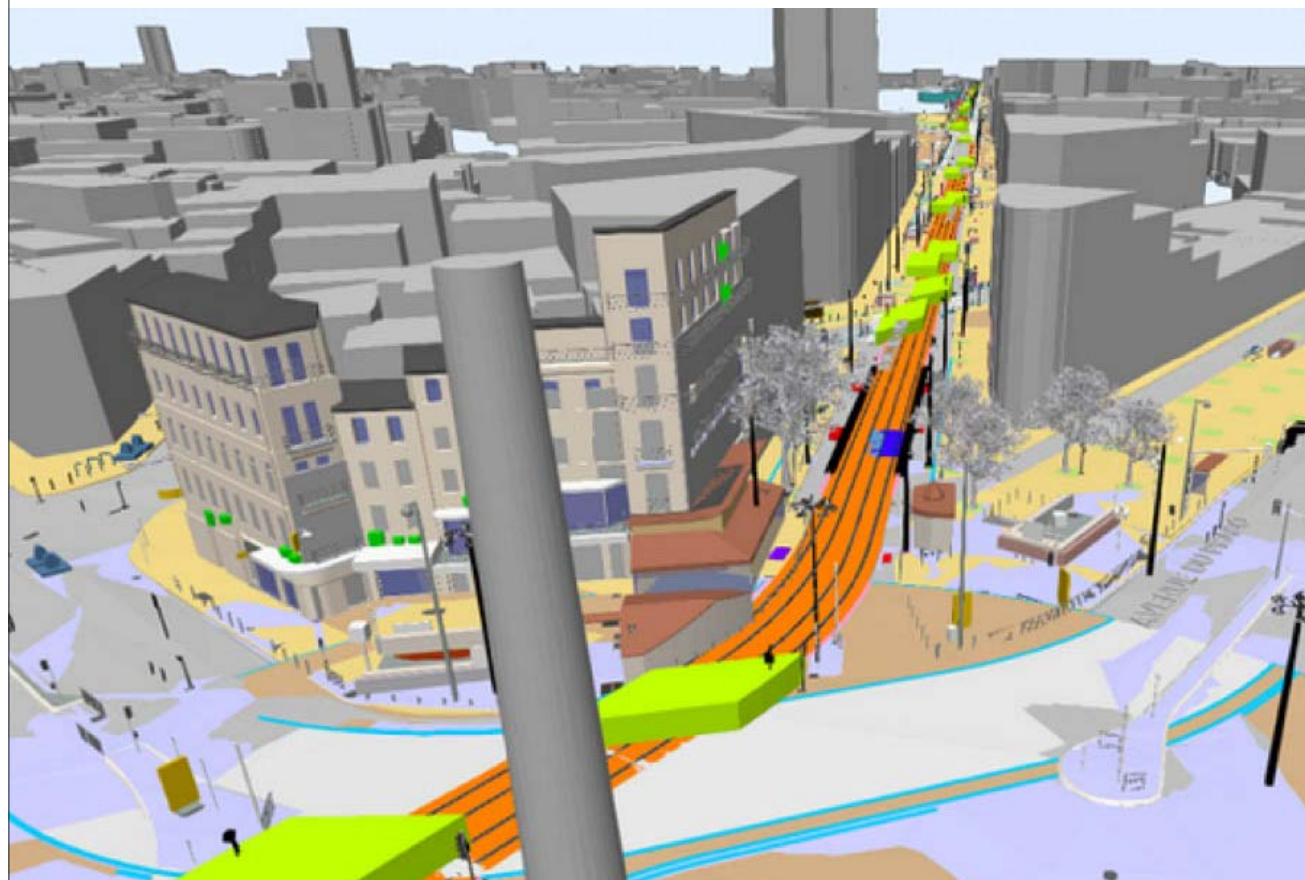


The possibility of creating observations in the model and managing them in a dashboard, won the support of all the engineers and architects of the team. Through the platform, it is a bit like conducting technical project reviews 24/7!

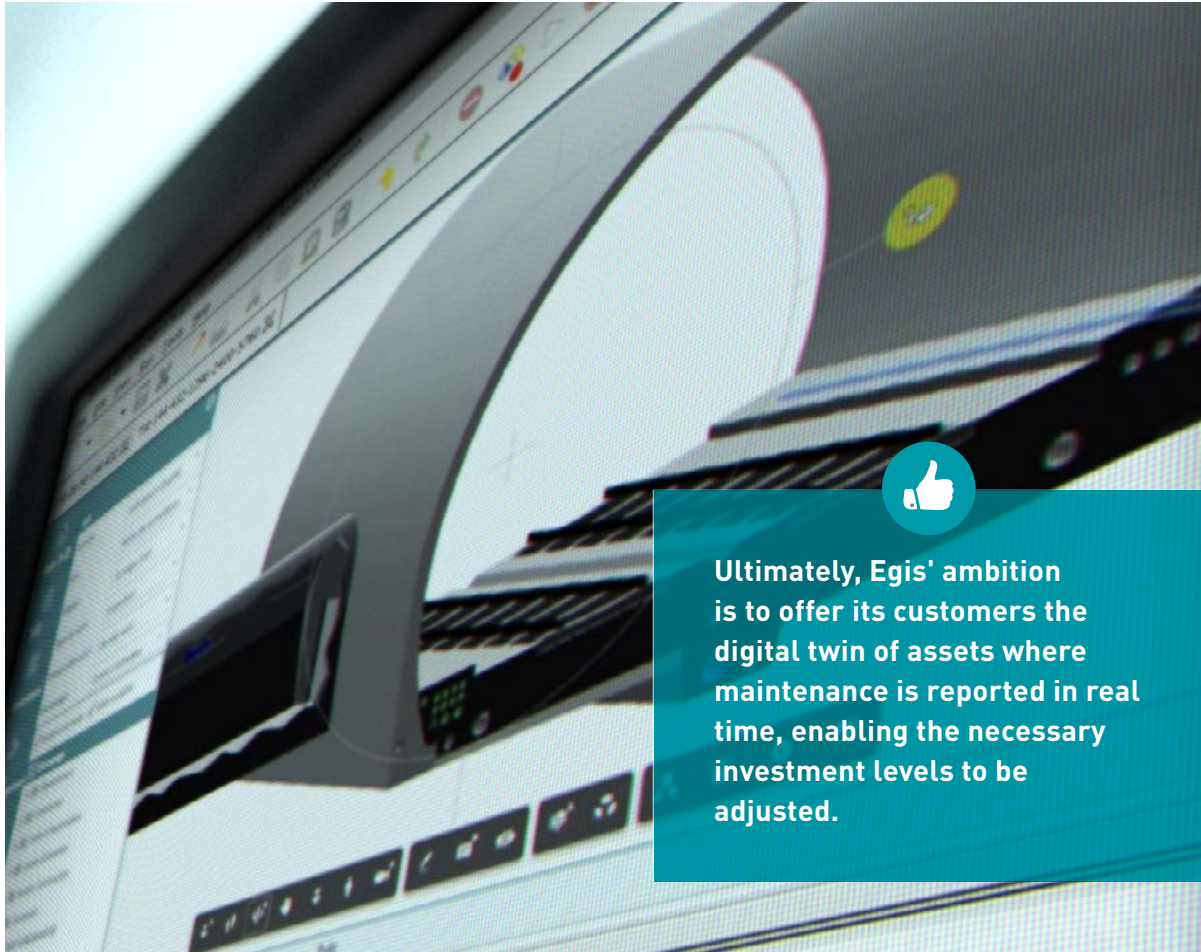
PARTNERS CATENDA, Bimsync solution

CONTACT Nicolas FERRARA

DIGITAL TWIN AND COLLECTIVE INTELLIGENCE



TUNNEL ASSET MANAGEMENT



DIGITAL MANAGEMENT OF TUNNEL ASSETS



Keeping a tunnel in good condition is the key to ensuring the safety of its users on a daily basis. But this requires constant coordination of the structure: operators need to be able to supervise, plan and organise maintenance operations in such a way as to carry out operations at the right time while keeping budgets under control. Egis is developing Tunnel Asset Management, a digital solution meeting operator needs that squares the circle of long-term investment and everyday tunnel management.



Through a cartographic interface coupled with the 3D representation of the structure, the operator plans the investment they are making in the structure, in liaison with the structure maintenance management tools (CMMS) for the structures. Thanks to a realistic and long-term visualization of its asset, the operator can decide on an appropriate investment renewal strategy.



The project is being developed with a long-standing partner, Brussels Mobility, which manages the city's tunnels.

PARTNERS Brussels mobility

CONTACT Jérôme BLANCHARD

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THE INNOV'NET

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*Cities, Roads & Mobility

CO-INNOVATION



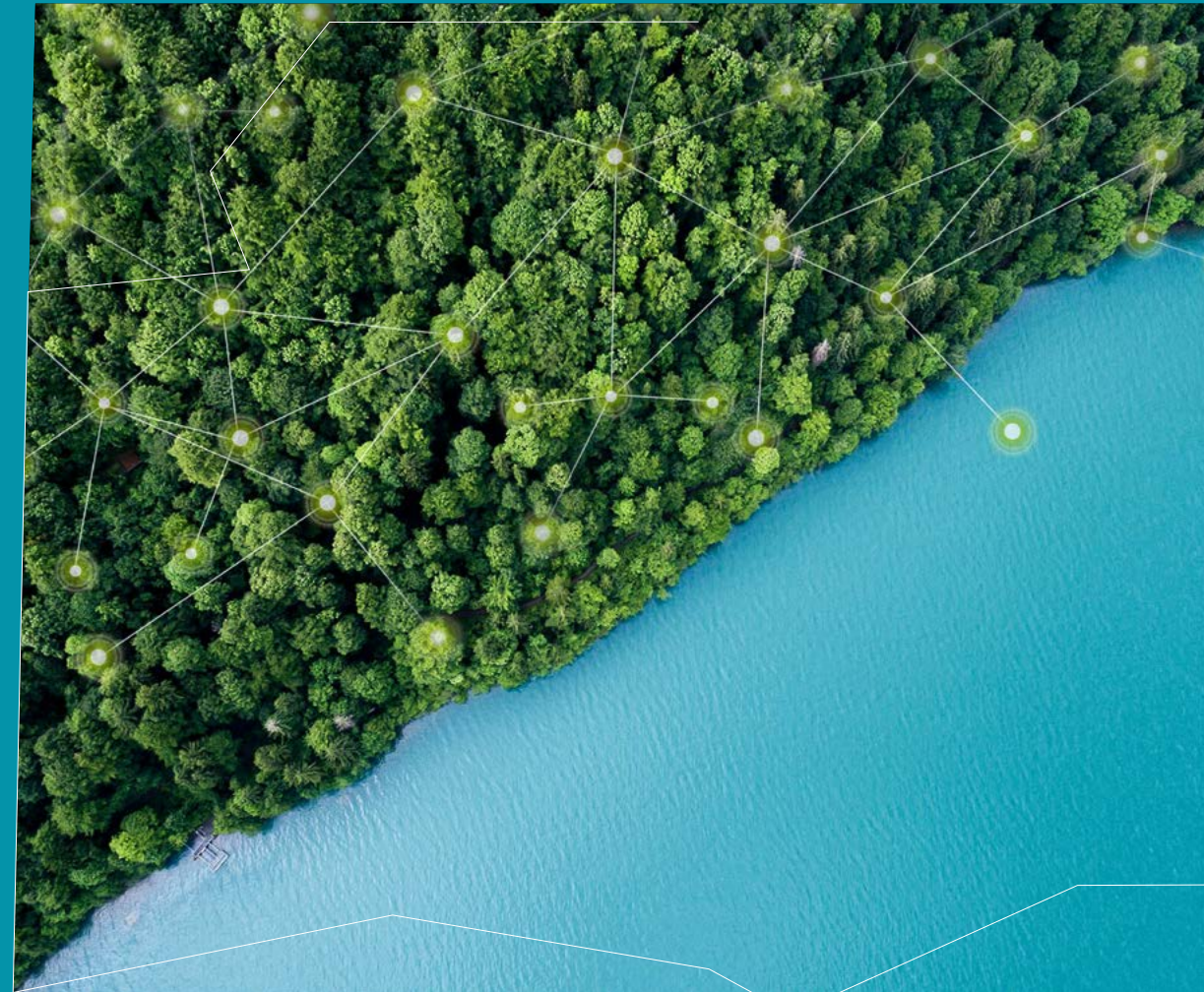
Co-innovation with our customers lies at the heart of our approach. For every innovative project, at every stage of its development, interaction with the customer is a decisive element, and has a predominant effect on its future success.

From ideation to collaborative work, including the testing of new uses, the customer is placed at the centre of our innovation policy, according to a win-win model.

Innovation at Egis also means working constantly alongside our partners, start-ups, research institutes and major industrial groups, with whom we are constantly seeking **to push the boundaries of the impossible.**

In innovation just like anywhere else, "there is always strength in numbers"!

Elena Umanets,
Open Innovation Manager





Egis is an international player active in the consulting, construction engineering and mobility service sectors. The Group creates and operates intelligent infrastructure and buildings capable of responding to the climate emergency and helping to achieve more balanced, sustainable and resilient territorial development. With operations in 120 countries, Egis places the expertise of its 16,000 employees at the disposal of its clients and develops cutting-edge innovation accessible to all projects. Through its wide-ranging fields of activity, Egis is a central player in the collective organisation of society and the living environment of citizens all over the world.

€1.07 BN
managed turnover in 2020

62 %
of our business
outside France

29
road operating
companies in 20
countries

17
airports managed
in 7 countries

16,000
employees worldwide,
including 4,000
in France