CLIMATE CHANGE ADAPTATION SOLUTION CATALOG

2024 version

NOTES

CLIMATE ADAPTATION: TIME FOR SOLUTIONS

Dear colleagues,

The effects of climate change are already being felt in all our territories, posing major challenges for infrastructure adaptation. Just as VINCI is positioning itself as a solutions provider in the area of mitigation - i.e. reducing greenhouse gas emissions - it is crucial that VINCI is also at the forefront of **adaptation to climate change**. With this in mind, in April 2023 we (re)launched the "Climate Adaptation" foresight process with Leonard, the Group's innovation and foresight platform.

The Group's entities are environmental actors!
This catalog brings together a selection of concrete, effective solutions developed by VINCI to meet current and future climate challenges.

More than a collection of solutions, this catalog is a practical guide for every employee, giving us the tools we need to integrate these innovations into your projects. **Let's also use it to promote our know-how to our customers and partners!**

Together, let's put these solutions into practice, let's inspire each other by what's already being done, and let's be the agents of change. Our commitment and creativity are essential if we are to build a world where our infrastructures and buildings are more resilient and ready to face the challenges of climate change.

Let's make a difference!

Isabelle Spiegel,
VINCI Environment Director, Vice-President and member of the VINCI Group Executive Committee

FOREWORD

METHODOLOGY

As part of the activities of the “Climate Adaptation” forward-looking approach launched in April 2023 by Leonard, VINCI's innovation platform, the members wanted to **bring together a selection of solutions proposed by VINCI** to meet the challenges of climate adaptation, grouping them together in a single document. This catalog provides **each employee with a practical tool for finding solutions adapted to the challenges posed by climate change**.

The objectives of this document are to

- **List** a wide variety of recent solutions. This catalog is not intended to be exhaustive of all VINCI solutions.

- **Inspire** employees by highlighting the potential for replicability on different scales

- **To be a source of ideas** on the challenges of adaptation for our customers, in order to develop solutions that are effective and Contextualized so as to avoid maladaptation.

→ If you would like to contribute to the next version of the catalog, please share your project/solution for climate adaptation via this form: https://forms.office.com/e/7r9Em9fVeP

HOW TO USE THIS CATALOG

The document is divided into **four business activities:**

- **Buildings and energy renovation**
- **Transportation and roads**
- **Energy infrastructures**
- **Water infrastructures**

The solutions are also divided into **three types :**

- **Diagnostic solutions**
- **Prevention solutions**
- **Repair solutions**

For each solution, icons have been added in the top left-hand corner, according to the climatic hazard it addresses. You'll find the nomenclature on the next page.

You may **find the same solution in more than one business activities**, if it meets needs in different Territorys.

DEFINITIONS & NOMENCLATURE

- A climate hazard is a more or less predictable, uncontrollable climatic event that can cause damage to people, health, infrastructures and human activities.
- To **reduce the vulnerability** of populations, ecosystems, human activities and infrastructures to climate hazards, **it is essential to adapt territories, while continuing to reduce our impact.**

Here is the list of climate hazards to which the solutions in this catalog respond:


Drought


Rise of temperature


Cyclones and storms


Floods


Forest fires


Coastal erosion


Submersion


All climate risk concerned

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SOLUTION	BUILDINGS AND ENERGY RENOVATION (page 17)	TRANSPORT AND ROADS (page 49)	ENERGY INFRASTRUCTURES (page 84)	WATER INFRASTRUCTURES (page 110)
ResiLens	X	X	X	X
CaledonIA	X	X	X	X
Resil Heat Island	X			X
Biodi(v)strict	X			X
Urbalia	X			X
BI2O	X			X
Surveillance and monitoring of natural and built environments	X		X	
Resilience Performance Diagnostic (DPR)	X	X	X	X
Modeling and monitoring forest fire risks	X	X	X	
REVILO	X	X		X
Adapting existing buildings to climate change (ACDC)	X			
Rénovation Bioclimatique d'un immeuble de bureaux	X		X	
Rehabilitation and design of a mixed-use, resilient neighborhood	X			
Designing a dual-state, reversible landscaping project	X			

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Lille Metropolitan Square	X			
Brest – ENGIE	X			
Use of composite reinforcement	X			
Bio-consolidation treatment for soil, fill and stone - Biocalcis ® process	X	X		
Building Management System	X		X	
Forecasting air quality in urban Territorys	X			
Short-circuit recharging of electric vehicles	X		X	
Autonomous photovoltaic applications	X		X	
Photovoltaic sunshades	X		X	
GREENFLOOR®: Active slab	X			
Reversible ceilings	X			
Coolroofing	X			
Water management and IOT monitoring	X			X

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SOLUTION	BUILDINGS AND ENERGY RENOVATION (page 17)	TRANSPORT AND ROADS (page 49)	ENERGY INFRASTRUCTURES (page 84)	WATER INFRASTRUCTURES (page 110)
Night tracking	X			
Remote IoT control of HVAC systems	X			
Wave	X			
Diagnosis of motorway criticality to climate change		X		
Assessing the resilience of the LGV Sud Europe Atlantique to climate change		X		
Assessing the impact of climate change		X		
Surveillance and monitoring of natural and built environments		X	X	
Resil'Space		X		
Action to prevent climate change (A51)		X		X
GEOTEXTILE Enviro mat - Protection against coastal and river erosion		X		X
Protection against gravity hazards		X		
Wastewater storage basin for heavy rainfall events		X		X
Projet Life Cool & Low Noise Asphalt		X		

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Hydrovia		X		X
Reservoir pavements		X		X
Agrévia®		X		
SOLIS® binder-based clear coatings		X		
DECOVIA®		X		
THERMALIA®		X		
Flood prevention action on the A355 freeway		X		X
Sustainable flood risk management (HS2)		X		X
Thames Tideway Tunnel		X		X
Faro airport climate adaptation plan		X		
ITAMI - Flood prevention measures for heavy rains		X		X
Typhoon and flood disaster prevention at airports		X		X
HELYS project - Solar power plant on parking lot shades		X	X	
Climate change risk/vulnerability study		X		

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Lima Expresa		X		
Maintaining a river crossing under nominal hydraulic conditions		X		X
Decision-support platform for anticipating the maintenance of industrial site infrastructures			X	
Upgrading charging stations			X	
Drinking water produced from air and solar energy			X	
Engineering for the mechanical securing of the RTE network			X	
Network undergrounding			X	
EVE™, Non-destructive testing of tower condition by vibration analysis			X	
Waste heat recovery from chillers			X	
Kabertene – Wind farm			X	
Micro-grids			X	
Electrical substation protection			X	
Post-cyclone reconstruction and adaptation			X	

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SOLUTION	BUILDINGS AND ENERGY RENOVATION (page 17)	TRANSPORT AND ROADS (page 49)	ENERGY INFRASTRUCTURES (page 84)	WATER INFRASTRUCTURES (page 110)
CARAPACE - Dike diagnosis and monitoring				X
RESIL'ADAPT WATER				X
Trenchmix®				X
EQUO VIVO - Ecological engineering expertise				X
Drinking water produced from air and solar energy				X
Development of the Cotinière fishing port				X
HYDROPLUS®				X
SIBELONZIP et Sibelonmat				X
LE GALION				X
CARPI - Underwater renovation and rehabilitation of dams				X

WOULD YOU LIKE TO CONTRIBUTE TO THE NEXT VERSION OF THE CATALOG?

Feel free to share your project/solution for climate adaptation via the QR hereby or this form: https://forms.office.com/e/7r9Em9fVeP

CLIMATE ADAPTATION SOLUTIONS CATALOG

INTERNAL TOOL FOR DECISION MAKING

RESILENS

Solution

ResiLens is an online platform for analyzing the climatic risks associated with the Group's current and future projects. The tool is based on a map of the globe showing exposure to climatic hazards (flooding, etc.), as well as the criticality of infrastructures according to their type. Exposure is calculated on the basis of IPCC data for different time horizons (2030, 2050, 2070). In 2024, maps of water stress zones and protected Territorys for biodiversity protection will be added.

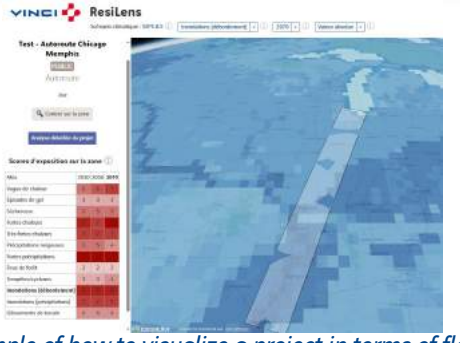
Context

In line with the Group's actions and commitments in favour of the climate, VINCI's environmental department has decided to support its ambition to accelerate the adaptation of our structures and activities by launching the ResiLens platform. ResiLens is the first platform developed and deployed worldwide by a major Group to assess the criticality of its projects and activities in relation to climate risks. The platform has been developed by RESALLIENCE, the Group's specialist entity in this field, in collaboration with VINCI's divisions

Added value

- 14 climate hazards studied (drought, storms and cyclones, rising sea levels, heat waves, etc.)
- Graphic resolution of 30km worldwide; 8km for Europe and 1km for mainland France
- Possibility of importing projects that will be analyzed in relation to climate risks: this produces a pre-diagnosis that identifies the risks as well as the adaptation solutions that can be implemented.
- Tool for raising employee awareness of the need to adapt to climate change
- Sharepoint integrating key information on environmental resilience

Example of visualization for heat wave hazard



Example of how to visualize a project in terms of flood hazards

Deployment

Customer : VINCI

Territory: Worldwide

Budget: tool made available to all Group employees

Date: Deployment in 2023 and new functionalities in 2024

Key contact

Didier SOTO

Resallience expert project manager

didier.soto@resallience.com

Cécile CREN

Environmental Manager

VINCI

cecile.cren@vinci.com

1. BUILDINGS AND ENERGY RENOVATION

1.1 DIAGNOSTIC SOLUTIONS

CALEDONIA

Solution

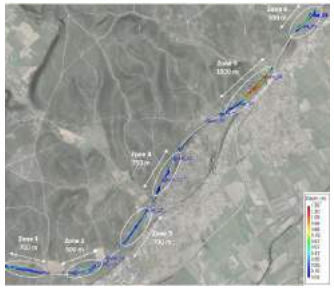
CaledonIA is a calculation program based on artificial intelligence algorithms that takes into account rainfall data from Météo France and simulates urban flooding in real time.

Context

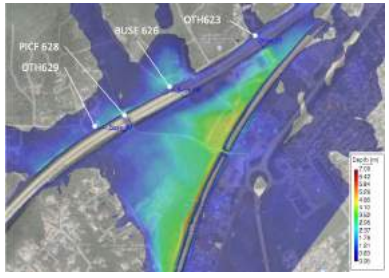
Today, there is no software capable of rapidly predicting (on an hourly scale) 3D flows due to flooding in urban environments. However, in the Context of current climate change, the rainfall rates predicted by Météo France or others are only a few days ahead, leaving local authorities and fluid BEs unable to study future scenarios in the face of flood risk.
The A9 motorway is a case in point. In the past, the Gard region's vulnerability to heavy rainfall during Cevennes events has already blocked the A9 network. With climate change, these events will become more frequent. The aim of the study was to assess the consequences of exceptional rainfall on a section of the A9 freeway, flooding the freeway and detecting the water paths that could cause damage to the infrastructure.

Added value

- Identifying risks
- Anticipate impacts, particularly on users, surrounding Territorys and infrastructure
- Improve prevention and user awareness
- Prepare crisis management in line with potential impacts
- Make informed decisions on which investments to prioritize in a given Territory



Analysis of the impact of the simulation on the A9 infrastructure



Deployment

Customer: local authorities, cities, county councils, insurers, design offices

Territory: France

Key contact

Sofiane HADJI

Scientific Director
Sixense Engineering
sofiane.hadji@sixense-group.com

RESILIENCE PERFORMANCE DIAGNOSIS (DPR)

Solution

Systemic modeling tool that studies all the climatic hazards impacting a region's infrastructures, projects and economy. It can be used to assess the losses and damage induced by these hazards, as well as the investment costs required to reduce losses and damage.

Context

The DPR is available in 4 versions, depending on the Territory to be studied:
DPR city, territory and region, which focuses on critical infrastructures and the interconnections that link them on a city, territory or region scale. This tool has been applied to the city of Tetouan in Morocco.
DPR island states, for systemic modeling of climate risks on the scale of these states, where high-stakes Territorys such as networks (electricity, telecoms, water) or airports are studied with a view to anticipating their economic and social impacts. Applications have been developed for the islands of Dominica and Barbados.
DPR bâtiment, a solution for property and asset managers, focusing on interconnections within the building and its immediate environment. This version has been deployed for CDC-Habitat (France) and AEW (France and Europe).

Added value

- Understanding the interconnections of a given space
- Visibility of Territorys for improvement
- Decision support

Exposure of a Caribbean island capital's buildings to flooding / RESALLIENCE

Deployment

Customer: local authorities, real estate asset managers

Territory: Worldwide

Budget: project-dependent

Date: 2021

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

MODELING AND MONITORING FOREST FIRE RISK

Solution

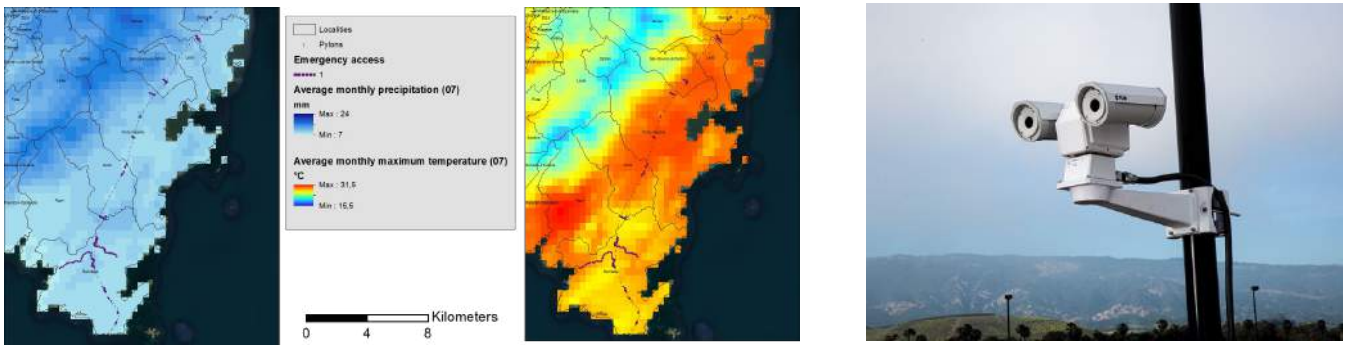
Offer developed in collaboration with VINCI Energies for monitoring and modeling forest fire risks

Context

It has been developed to identify the possible occurrence of fire via video surveillance, and to enable electrical network managers to take action very quickly to prevent network damage. It offers the ability to model the most critical paths and then implement appropriate solutions. This solution was the winner of the 2nd edition of the Trophées Fournisseurs RTE in 2022. The solution has been deployed in Corsica.

Added value

- Real-time monitoring of forest conditions and potential fire outbreaks
- Provide localized warning of forest fire risks
- Take targeted action as quickly as possible in Territorys where fires are starting.



Forest fire risk modeling and monitoring system / RESALLIENCE

Deployment

Customer: local authorities, economic and industrial players

Territory: worldwide

Budget: project-dependent

Date: 2022

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

SURVEILLANCE AND MONITORING OF NATURAL AND BUILT ENVIRONMENTS

Solution

Monitoring and tracking solutions for climate risk management using ground or airborne measurements and satellite tracking

Context

Monitoring technology solutions based on remote sensing or sensors are deployed to track the impacts of extreme weather conditions and monitor induced variations over time in order to take appropriate adaptation measures in a timely manner. They help steer the management of climate risks at a given moment, check their prevalence in the medium term and plan adaptation strategies. This type of solution has been applied to the phenomenon of coastal erosion on the Saint Louis coast in Senegal (OSS project with support from CNES and the United Nations). This solution is intended to be replicated in other coastal countries in the sub-region. Another application involved the monitoring of erosion and silting phenomena in Kazakhstan, with the implementation of nature-based adaptation solutions, notably the establishment of Saxaoul feet.

Added value

- Assess climate risk trends
- Act on the most vulnerable adjustment variables
- Increase the resilience of the region as a whole

Aerial view of Saint Louis (Senegal) / source

Status report for follow-up /RESALLIENCE

Deployment

Customer: any customer

Territory: Worldwide

Budget: depends on project

Date: 2019-22 / 2021-23

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

RESIL HEAT ISLAND

Solution

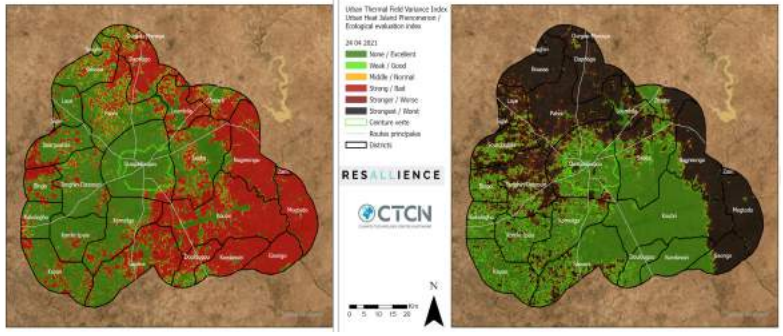
The Resil Heat Island uses satellite data to identify urban heat islands and propose appropriate solutions, including nature-based solutions.

Context

Resil Heat Island is a planning solution that helps local authorities manage their urban development plans by assessing the risks associated with urban heat islands and air quality. It can also be applied to flooding. An application was made as part of a pilot project in Ouagadougou, Burkina-Faso. It identified Territorys of interest for the implementation of nature-based solutions to reduce urban heat islands and flood-related risks, while providing other co-benefits such as income-generating activities or recreational spaces. Replication of this solution in the Context of cities in sub-Saharan Africa is entirely feasible. This project has been accredited by the United Nations Environment Programme and the CTCN.

Added value

- Analysis of urban heat islands
- Helping plan and manage the implementation of nature-based solutions in African cities
- Increasing territorial resilience



Modeling hot spots / RESALLIENCE

Deployment

Customer: any customer

Territory: Worldwide

Budget: project-dependent

Date: 2021-22

Key contact

Nicolas ZIV

Operations Manager
RESALLIENCE

nicolas.ziv@resallience.com

Biodi(V)strict
Urbalia & AgroParisTech

Solution

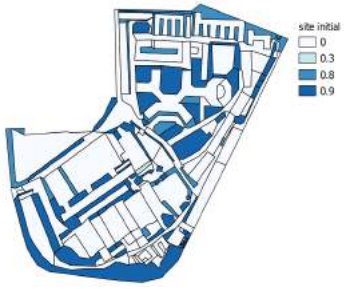
Biodi(V)strict® is a diagnostic and decision-making tool for improving the "biodiversity potential" of urban and peri-urban development projects.

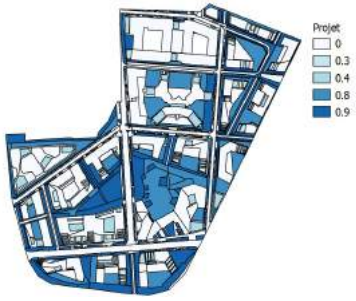
Context

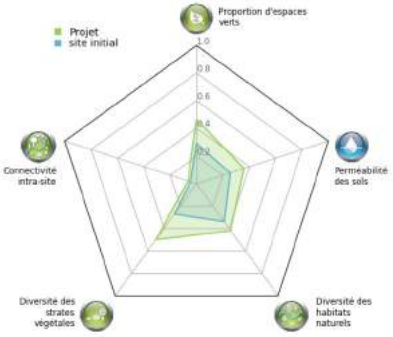
Biodi(V)strict® is a computer program co-developed by Urbalia and AgroParisTech, using GIS (Geographic Information Systems) mapping via QGIS.
This tool enables the biodiversity potential of a project to be assessed, in comparison with the initial site and/or other development scenarios, by calculating five indicators. The values of these indicators and their before-and-after comparison enable us to identify the main pressures weighing on the site in terms of biodiversity, as well as its assets.

Added value

- Quantified measurement of urban biodiversity - before/after
- Indicators that everyone can understand
- Numerical and spatialized data on ecological habitats
- A fast, dynamic tool for simulating different scenarios







Deployment

Customer : Real estate promoters / developers / asset managers

Territory: France

Budget: variable (type, surface)

Key contact

Arthur TULLOU

Urbalia Project Manager

VINCI Construction
arthur.tullou@urbalia.fr

URBALIA – DIAGNOSTIC ÉCOLOGIQUE PATRIMOINE

Solution

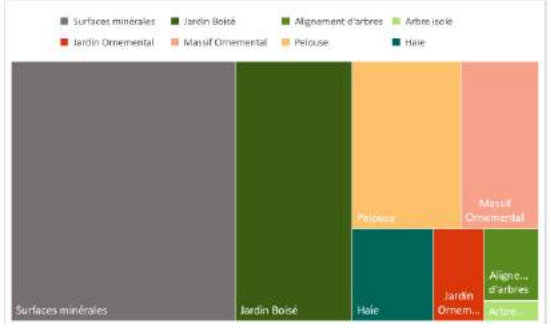
Ecological diagnosis of built and landscape heritage, analysis of biodiversity issues and implementation of an action plan to improve ecological potential.

Context

Urbalia carried out an inventory of the assets of a Parisian social landlord (over 450 sites in Paris), the RIVP, to identify the most relevant Territorys for improvement. The aim was then to launch new works/maintenance contracts to implement concrete actions on the sites identified.

Added value

- Setting up relevant and effective biodiversity indicators
- Produce a complete, quantified inventory of the situation
- A comprehensive approach: from diagnosis to the launch of new contracts
- Three new contracts put in place (differentiated management of outdoor spaces, creation of new semi-intensive green roofs, maintenance of existing green roofs, etc.).



Proportions of landscaping surfaces

Green roof - Patrimoine RIVP

Deployment

Customer: RIVP

Territory: Paris

Budget: variable according to assignment and surface Territory

Date: 2021-2022

Key contact

Arthur TULLOU

Urbalia Project Manager
VINCI Construction
arthur.tullou@urbalia.fr

Solution

Bi2O is a tool for evaluating and comparing the environmental performance of development projects.

Context

Bi2O enhances the value of development solutions by tracking and quantifying environmental improvements, particularly in terms of stormwater management, urban heat island reduction and biodiversity.
This tool can be used to compare different versions of the same project with each other, or with what already exists. It can be used during the tender response phase, as well as during the project design phase.
Bi2O can be used to promote Revilo's offer, as well as other products and processes, to customers.

Added value

- Objective, recognized indicators
- A differentiating approach
- Rapid assessment

Deployment

Customer: All VINCI companies

Territory: France mainly

Budget : variable

Key contact

Marie OBLIGER

Technical Environment Engineer
VINCI Construction
marie.obliger@VINCI-construction.com

1.2 PREVENTIVE SOLUTIONS

REVILO

Solution

A range of urban cooling islands to combat urban overheating and encourage nature in the city. This offer is based on 4 levers: plants, water, soil and surfacing.

Context

With climate change, all cities are subject to urban heat island phenomena, with high temperature levels generating health risks. Revilo is a solution for cooling cities during summer heat waves. Revilo combines and optimizes 4 levers mastered by Eurovia:

- Plants to create shade, facilitate evapotranspiration and bring well-being to residents
- Rainwater management at plot level to direct it towards plants
- Soils for their capacity to store and infiltrate water
- Cladding to enhance permeability and albedo

Added value

- A complete solution
- A response to political ambitions, residents' expectations and the challenges facing the city and its technical departments
- A capacity to design the public space to be refreshed and carry out the work
- Numerous success stories

Jardin de l'Ars, Bordeaux (33)

Parc de la Loubière, Toulon (83)

Cours OASIS, Paris (75)

Deployment

Customer: mainly local authorities

Territory: mainly France

Budget: variable

Date: since 2022

Key contact

Pierre MONLUCQ

Strategic Marketing Director

VINCI Construction Division Route France

pierre.monlucq@VINCI-construction.com

ADAPTING EXISTING BUILDINGS TO CLIMATE CHANGE – ACDC

Solution

Offer on aapting existing buildings to climate change

Context

The team is building a process to design a building adaptation offer to climate change caled ACDC. The process is as follows:
1. Needs and constraints of the site, the building and its occupants
2. Analysis of risks and their consequences on our activities using the Resilens ® tool (Resallience, VINCI Group) and the Biodibat ® tool (Observatoire de l'Immobilier Durable).
3. Selection of adaptation solutions (based on stages 1 and 2 of the process).
4. Project quantification (tCO2e avoided, main co-benefits and cost of inaction and solutions in euros)

Added value

- The VINCI Facilities Sud Centre-Est division supports its customers in their strategy of ATTENUATION (avoiding the unmanageable) thanks to low-carbon and circular economy offers, but also wishes to support them in their strategy of ADAPTATION (managing the unavoidable) by favoring Nature-based Adaptation Solutions (SAFN) in order to maximize the co-benefits of adaptation: rich biodiversity, islands of freshness, better water management, user-friendliness and improved occupant experience at work.

Deployment

Customer: all

Territory: all

Key contact

Noémie FITTERER

Environment and low-carbon project manager

VINCI Energies Building Solutions

noemie.fitterer@vinci-facilities.com

BIOCLIMATIC RENOVATION OF AN OFFICE BUILDING - WOW

Solution

WOW is an 11,356m² office building featuring a bioclimatic design. This reduced the carbon footprint by 22% compared with a conventional design. The building's envelope and technical systems were designed with summer comfort in mind.

Context

This building, located in the heart of the Montmartre district, was purchased by VINCI Immobilier in 2019. It housed the Magasin Dufayel, a former Grand Magasin, comparable to Galeries Lafayette at the time. Construction began in 1856.

The Better Way" approach was applied to the new office uses. This approach advocates building flexibility, the creation of capable spaces, and also the adaptation of thermal design according to zones and needs.
The building's Eiffel structure is highlighted by leaving it visible, as is the technology.

Added value

- Upgrading an exceptional building to give it a new lease of life in the neighborhood
- Reduce the carbon footprint of the works
- Create a living space in this historic office building

Facade

Offices

Rooftop

Deployment

Territory: Paris 18th

Date: 2019-2024

Key contact

Laetitia RIEDIGNER

Program Manager

VINCI Immobilier

Laetitia.riedinger@vinci-immobilier.com

REHABILITATION AND DESIGN OF A MIXED-USE, RESILIENT NEIGHBORHOOD - UNIVERSEINE PROJECT

Solution

Restoration of a 6.4-hectare former industrial wasteland whose land was polluted and artificial, to design a new district taking advantage of urban recycling, cool islands and climate comfort in 2050.

Context

The future housing and office district (3,000 inhabitants and 4,300 employees) of Saint-Denis will first host the athletes' village in 2024.

2024
5 856 athletes' beds

2025
65 333 sqm² of housing
57 029 sqm² of offices and 3 060 sqm² of businesses

Added value

- Construction of resilient structures, designed for summer comfort in 2050 and resilience against heat waves
- Creation of a biodiversity corridor to combat urban heat waves
  - 13,000m2 of repermeabilized surface Territory, enabling rainwater to be managed on a parcel-by-parcel basis
  - 20% soil renaturation throughout the district
- Reduced carbon emissions and resource conservation

Labels and certifications for sustainable building

Deployment

Developer: SOLIDEO

Customer: Ministry of the Interior, PCH, CDCH, COOP IMMO, Individuals

Territory: Saint-Denis

Date: 2018 - 2025

Key contact

Paul DE ROSNY

Program Manager

VINCI Immobilier

paul.derosny@VINCI-immobilier.com

DESIGN OF A DUAL-STATE, REVERSIBLE DEVELOPMENT PROJECT - PROJET UNIVERSEINE

Solution

The Universeine project is unique in terms of building reversibility, with delivery in two phases: the Athletes' Village for 2024, and the Heritage phase, a mixed-use, sustainable district of Saint-Denis.

Context

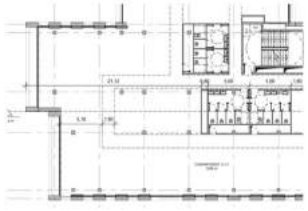
Design of a two-phase real estate project for a district that represents a total of 125,422m² of buildings and will house housing and offices after the 2024 phase.
Unique project with a dual-status building permit: a first in France.

- Design of structures for optimized conversion, construction techniques facilitating change of use and reuse of materials: mushroom floor, reuse of playground partitions, etc.
- The transformation is optimized on three fronts: cost, materials used and deadlines. In particular, delivery of the office campus will take place less than a year after the end of the games.

Added value

- For the first time ever, part of the Athletes' Village will be converted into offices,
- Limiting the impact of a temporary event by optimizing the reversibility of facilities,
- Capitalize on skills to be applied to future projects.

Olympic Phase" Territory Athletes' rooms



Space in "Heritage Phase Office space

Deployment

Developer: SOLIDEO

Customer: Ministry of the Interior, PCH, CDCH, COOP IMMO, Individuals

Territory: Saint-Denis

Date: 2018 - 2025

Key contact

Paul DE ROSNY

Program Manager

VINCI Immobilier

paul.derosny@VINCI-immobilier.com

LILLE METROPOLITAN SQUARE

Solution

To manage a development project in the heart of the Lille metropolitan Territory, involving the redevelopment of an urban wasteland with the aim of creating a mixed-use neighborhood while preserving the Territory, enhancing its biodiversity and renaturating the Territory.

Context

Lille Metropolitan Square aims for environmental sobriety, in particular by reusing and recycling materials from the site (excavated earth, crushed concrete, etc.) and maximizing open spaces for vegetation. A wooded Territory will cover almost the entire site, creating an ecological corridor to optimize water management and refresh the spaces.

280 housings	67 000 sqm² of offices	2000 sqm² of businesses

Added value

- Willingness to preserve trees on the pre-project site for their ability to store more carbon
  - 250 trees planted and 30 retained
  - 8,000 m² of landscaped Territorys, including 6,000 m² of open ground
- Upstream stormwater management
- Creation of an urban micro-forest to create islands of coolness

Perspective of the heart of the district

Pedestrian esplanade perspective

View from the Giants' Garden

Deployment

Developer: VINCI Immobilier / BNP Paribas Real Estate

Customer: RTE, Individuals

Territory: Lille

Date: 2019 - 2029

Key contact

Aurore LAIGNEL

Urban Projects Manager

VINCI Immobilier

aurore.laignel@vinci-immobilier.com

BREST – ENGIE

Solution

Recycling and development of an industrial wasteland, taking into account the site's biodiversity issues while developing an attractive location.

Context

The primary objective of this project is to convert and make profitable this former ENGIE gas plant while contributing tō VINCI Immobilier's goal of achieving Zero Net Artificialization (ZAN) by 2030.
The project is particularly striking due to its topography hemmed in by a cliff and its location in a completely artificialized zone with high-dose pollutants while being in the immediate vicinity of the ocean.
In order to prevent any additional pollution and to be aware of the ecosystem issues present on site, a pre-project layout was carried out to take into account all the parameters of the biodiversity issues upstream of the project.
Winner of the 2021 Prix de l'Environnement.

Added value

- Taking into account the protection of flora and fauna on site
- Clean up the site without affecting the rest of the Territory, so as to have no impact whatsoever

Axonometry of the project

View from Melville rd-point

Deployment

Developer: VINCI Immobilier / Brownfields

Customer : Individuals

Territory: Brest

Date : 2019 - 2028

Key contact

Guillaume GAREL

Urban Projects Manager

VINCI Immobilier

guillaume.garel@vinci-immobilier.com

USE OF COMPOSITE REINFORCEMENT

Solution

Process for adding external reinforcement by bonding composite fabrics (carbon, glass) for reinforcement-repair work.

Context

Many structures require reinforcement, either due to changes in use (increased loads, creation of hoppers, seismic retrofitting, etc.), or due to deterioration in integrity (corrosion, loss of prestressing, excessive cracking, etc.). Existing processes (beams, reinforcement, prestressing, etc.) are often cumbersome or unsuitable, and require work that has a major impact on the structure's operation.

Added value

- Improved durability (resistant to corrosion and degradation), weathering resistance, light weight (compared to traditional materials, while retaining high mechanical strength).
- Design flexibility (can adapt more easily to anticipated climate changes, such as sea-level rise, changes in precipitation patterns, etc.).
- Reduced emissions (manufactured from recycled materials or recyclable, helping to reduce the carbon footprint associated with the construction and maintenance of structures).

Reinforcing the beams of the Reyran viaduct / Escota

Reinforcing beams on an occupied site / Cité de la musique

Deployment

Customer: GTMM Travaux spéciaux

Territory: National

Budget: partly covered by CIR

Date: since 2004

Key contact

Emmanuel LACAUX

Technical Manager
Structures Engineering
emmanuel.lacaux@VINCI-construction.fr

BIO-CONSOLIDATION TREATMENT FOR SOIL, FILL AND STONE
BIOCALCIS ® PROCESS

Solution

The Biocalcis ® process is a biomineralization injection process based on the use of calcifying bacteria to precipitate a calcite-based mineral compound in-situ. Biocalcification increases the cohesion of treated soils, enabling mechanical reinforcement of structures and combating the risks of internal erosion and liquefaction. It is effective in coping with extreme stresses (rising water levels - earthquakes) while preserving the initial permeability of the environment.

Context

This solution was used for work on the René Thinat bridge in Orléans. The bridge's north abutment consists of a reinforced embankment wall, but a survey carried out in 2019 revealed advanced corrosion on the structure's steel reinforcements. The Biocalcis process was used to carry out injection repairs on a section of the face wall where nailing was not possible due to the bridge deck in front of the face wall.

Added value

- Low-intrusive and fast: using injection from small-diameter boreholes, it can be used without risk of pressure build-up in structures and in hard-to-reach Territorys. Reaction takes just a few days.
    - Reinforced materials maintain their original characteristics: calcium carbonate does not create obstructions, and permeability remains unchanged after treatment.
- Heritage management use case: interesting characteristics for heritage restoration, as the treated stone continues to breathe and the calcite formed is of the same nature as the stone, which does not alter its color.
- Favorable carbon balance compared with cement-based processes.

Consolidation work on the René Thinat Bridge

Biocalcis ® used for heritage restoration

Deployment

Customer: Orléans Métropole - Pôle Ouvrage d'Art

Project management: Ingerop - Geos

Date : 2022

Key contact

Annette ESNAULT FILET

R&D Project Manager
Soletanche Bachy

Annette.esnault@soletanche-bachy.com

BUILDING MANAGEMENT SYSTEM

Solution

Thermal plant load shedding

Context

In the event of extreme outdoor temperatures (e.g. over 35 degrees), it may be necessary to switch from less critical Territorys to priority Territorys. The solution consists of a centralized remote control
control of electrical distribution equipment.

Added value

- This solution makes it possible to continue operating a building in a so-called "degraded" mode. It returns to "normal" mode as soon as the outdoor temperature has returned to a reference value.

Deployment

Customer: commercial buildings

Territory: Europe

Budget: all budgets

Key contact

Pierre MEGRET

Smart Building Project Manager

VINCI Energies Building Solutions

pierre.megret@vinci-energies.com

FORECASTING AIR QUALITY IN URBAN TERRITORYS

Solution

Installation of air pollution micro-sensors in urban equipment

Context

Installation of air pollution micro-sensors integrated into urban equipment and a system for communicating sensor data to the hypervisor of the city's traffic control PC.

Added value

- The aim is to use real-time air quality measurements and meteorological data (temperature, wind speed and direction, atmospheric pressure) to build a predictive model of air quality and provide a very short-term forecast with a high level of confidence, in order to inform and build reactive scenarios.

Integrated air pollution micro-sensors

Deployment

Customer: Métropole Rouen Normandie

Territory: Rouen metropolitan Territory, France

Budget: €2.2 million

Date:2019 - 2022

Key contact

Jean-Marc RAYMOND

Director

VINCI Energies - CITEOS Rouen

jean-marc.raymond@tciplus.ca

SHORT-CIRCUIT RECHARGING OF ELECTRIC VEHICLES

Solution

Renewable energy production and storage solutions for commercial buildings.

Context

This renewable energy production and storage offer for commercial buildings is designed to break free from the conventional electricity grid by producing its own energy within a commercial building, using photovoltaic panels to provide "green" energy.

The demonstrator for this offer has been installed at the Demouselle Tertiaire Pas-de-Calais site in Boulogne-sur-Mer, with the following characteristics: 125 m² of rooftop PV, representing 70 panels for an instantaneous output of 23 kW. The panels have a load per m² of 15 kg. In order not to lose this energy, storage is via second-hand batteries (Nissan LEAF) with a capacity of 20 kW. Installation of an IRVE terminal in the parking lot to recharge the fleet of electric vehicles, and those of visitors. Intelligent energy management using the WAVE platform from VINCI Energies Smart Building Energies.

Added value

- This self-production/self-consumption loop means that energy is constantly available thanks to the "storage" effect; in fact, this system covers 80% of overall consumption. The direct benefit is an 80% reduction in electricity bills.

Example of a renewable energy production and storage offer adapted to commercial buildings

Deployment

Customer: commercial buildings

Territory: France

Date:2022

Key contact

François CARLU

CEO

VINCI Energies Building Solutions

francois.carlu@demouselle.fr

AUTONOMOUS PHOTOVOLTAIC SYSTEM

Solution

Autonomous photovoltaic system

Context

The customer wanted to be self-sufficient in electrical energy, so as to be able to operate a sand pit on a site not connected to the electricity grid. It also wanted to reduce its dependence on fossil fuels while improving its carbon footprint.

The project involved the installation of a photovoltaic system coupled to the existing generator, as well as a set of control equipment to distribute and store energy in batteries.

Added value

- Photovoltaic panels produce energy according to the amount of sunlight, and surplus production is stored in batteries. The surplus is released by the system according to the operator's needs, and the generator runs only when demand is too high.
- As the winter period is the least favourable for full autonomy, it is the management unit that regulates and manages the switching on and off of the system (PV + GE) in complete autonomy.

Deployment

Customer:

commercial buildings

Territory: Alsace region

Date: 2022

Key contact

Luc HERBRECHT

Business Manager

VINCI Energies Building Solutions

luc.herbrecht@santerne.fr

PHOTOVOLTAIC SUNSHADE

Solution

Installation of a solar panel sunshade to reduce exposure of the offices to the sun and produce low-carbon energy.

Context

Photovoltaic panels were installed on an office facade in response to the need for sunlight.

This initiative enabled the company to sell 40,000 euros worth of electricity to EDF. At the same time, 6 tonnes of CO2 emissions were saved.

Added value

- Amortization of the project over 7 years is in line with forecasts, thanks to an average annual income of 4,000 euros.
- Contribute to less exposure to the heat for the building

Deployment

Customer: commercial buildings

Territory: France

Key contact

Alexis DAVOU

QSE Correspondent / Coordinator

VINCI Energies Building Solutions

alexis.davou@masselin.fr

GREENFLOOR®: ACTIVE SLAB

Solution

The GREENFLOOR® solution involves passing air through ducts integrated into a very low-carbon concrete slab of conventional thickness.

Context

The GREENFLOOR® solution involves passing air through ducts integrated into a very low-carbon concrete slab of conventional thickness. The air, used as a heat transfer fluid, transmits its heat or coolness to the concrete, which acts as a radiant ceiling.

In this way, GREENFLOOR, a ventilated active slab, gently regulates and reconciles ventilation, air-conditioning and heating, while offering residents optimum comfort and improved air quality within the building.

Added value

- The advantages of GREENFLOOR® rest on three pillars:
- Optimized installation: the GREENFLOOR ® concept
- Improved environmental performance
- Occupant well-being

Deployment

Customer: All

Territory: All

Key contact

Guillaume RABUT

Project Manager

VINCI Energies Building Solutions

guillaume.rabut@vinci-energies.com

REVERSIBLE CEILINGS

Solution

Installation of reversible ceilings

Context

Major renovation and extension of the CIC Nord Ouest headquarters, a 5-storey building with 2 basement levels, located in the heart of Lille. Construction of a substation with a heat output of 750 kW (district heating) and a refrigeration output of 1000 kW (3 chillers and air coolers). The project offers heating and cooling of office spaces by over 5,000 m² of radiant ceilings.
Surface covered: 15,000 m².
Labels: Effinergie and BBC renovation

Added value

- Heating and cooling integrated system
- Radiant ceilings deliver carbon savings of around 15% compared with conventional fan coil systems.

Deployment

Customer CIC Nord Ouest:

Territory : France

Key contact

Franck BASSAIL

Manager of Business of Major Projects

VINCI Energies Building Solutions

franck.bassail@santerne.fr

COOLROOFING

Solution

Coolroofing is a clear, regulated envelope that reduces the heat absorbed by the roof.

Context

The absorption of solar radiation by roofs contributes to heating in urban Territorys, as well as to the rise in temperature inside buildings. It is therefore essential to consider suitable roof coverings. As part of its low-carbon performance contracts, VINCI Facilities offers a reflective "coolroofing" paint.

Added value

- Reduces cooling demand three times more than it increases heating demand
- Contributes indirectly to reducing heat around the building

Deployment

Customer: all

Territory: all

Key contact

Nicolas GALET

Low-carbon development manager

VINCI Energies Building Solutions

nicolas.galet@vinci-facilities.com

WATER MANAGEMENT AND IOT MONITORING

Solution

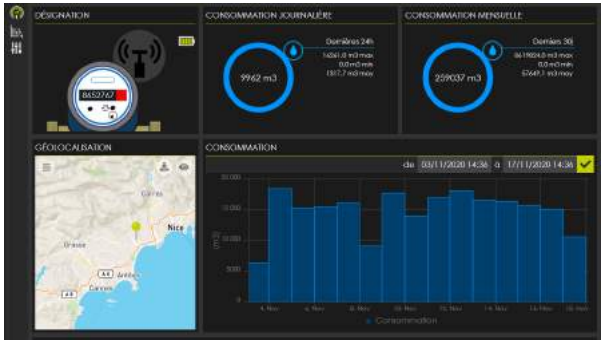
Efficient water management required for healthcare facilities

Context

Efficient water management is essential for healthcare establishments, enabling them to meet a dual challenge: health safety and water savings.
The company won the water management contract for APHM's Hôpital Timone and Hôpital Nord, proposing a comprehensive water management solution that includes the supply, installation and parameterization of water meters, the definition of a water consumption target and an IoT monitoring system based on the IOThink solution, with the installation of sensors to monitor temperatures and water consumption.

Added value

- Two-thirds of facilities claim to have a policy of reducing water consumption.
  - Of these, 85% use water-saving equipment
  - 72% raise staff awareness of this issue.



Deployment

Customer: Hospitals

Territory: Marseille

Key contact

Nicolas BAUDIER

Activity Manager

VINCI Energies Building Solutions

nicolas.baudier@vinci-facilities.com

NIGHT TRACKING

Solution

The aim of night tracking is to identify unnecessary energy wastage in a building when it is unoccupied.

Context

This night tracking operation consists of visiting the site at staggered hours (night or weekend) to check the consistency of the operation of installations which are set on the clock or BMS, and to identify the behaviour of office users (lighting, screen, computer, printer). This solution was proposed for a number of reasons: to check the consistency of initial settings when taking delivery of a new building; to identify Territorys for improvement aimed at optimizing the site's energy performance; to reassure our customers that buildings are indeed switched off during unoccupied periods, in order to reduce light pollution; to raise awareness of user behavior (employees, security guards, technicians).

Added value

- Optimizing plant uptime
- Eliminating unnecessary energy waste
- Identifying inconsistencies in BMS settings and plant operation
- Identifying Territorys for improvement to optimize the site's energy performance

Deployment

- Customer: BNP IMEX IDF real estate portfolio
- Date: 2023

Key contact

Hugo DE CALDAS

Development Director

VINCI Energies Building Solutions

hugo.decaldas@vinci-facilities.com

REMOTE IOT CONTROL OF HVAC SYSTEMS

Solution

Implement predictive maintenance with IoT-based remote control of HVAC systems

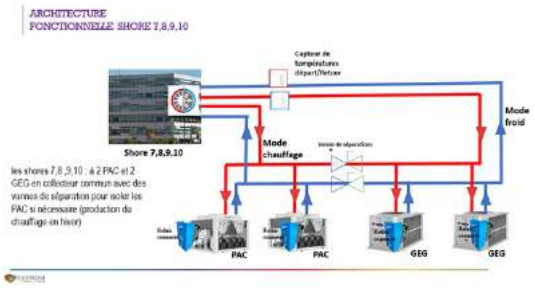
Context

For large sites with more than 25 buildings
The technical management of HVAC machines requires daily visits to building terraces to detect anomalies and ensure that the heat pumps / GEGs are operating correctly.
(high workload). The solution consists of :

- Placing temperature and contact IOTs to provide real-time feedback on the energy performance of HVAC machines, and to warn of any technical drift.
- Strategic change in HVAC maintenance policy from systematic technical management to predictive maintenance, according to messages received by the IOTs and read directly by the CMMS Mission (Mobile Technician Mission).

Added value

- This practice anticipate energy and freon losses,
- it is extremely time-consuming



Deployment

Customer: all

Territory: all

Key contact

Alia KADDARI

Engineering, Innovation and QSE Manager

VINCI Energies Building Solutions

alia.kaddari@expromfm.com

WAVE

Solution

WAVE is the platform developed by Smart Building Energies for intelligent, connected buildings, designed to enable each user to play an active role in managing their comfort and energy impact.

Context

We have created an IoT platform, Waveplatform, combining the worlds of IT and automation. It enables users to manage the building's various services and functionalities. Users can manage energy consumption (water, gas, electricity, etc.); their comfort (temperature, brightness, blinds, etc.); and services (parking reservations, meeting rooms, etc.).

Added value

- The Wave platform enables users to manage a wide range of building services via their smartphone, within a single, secure interface.
- Energy monitoring: gas, water, electricity and more
- Management of meeting room and parking space reservations;
- Manage comfort by adjusting temperature, lighting and blinds;
- Building security via alarm management and door opening within the building.

Deployment

Customer: all

Territory: all

Key contact

Frederic THOUOT

CEO

VINCI Energies Building Solutions

frederic.thouot@smart-building-energies.com

2. TRANSPORTS AND ROADS

2.1 DIAGNOSTIC SOLUTIONS

DIAGNOSIS OF THE CRITICALITY OF MOTORWAY INFRASTRUCTURE TO CLIMATE CHANGE

Solution

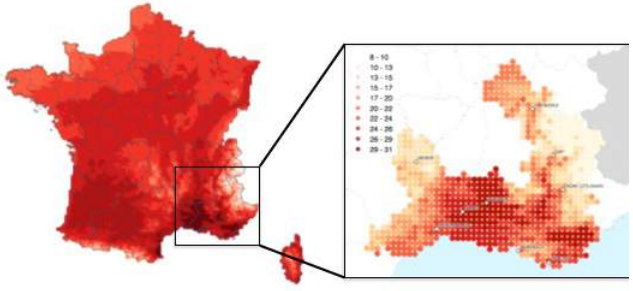
Study of the physical vulnerability of the 4400 km of motorway infrastructure of the ASF, COFIROUTE and ESCOTA networks to changes in climatic events.

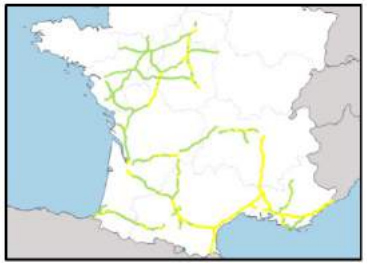
Context

Faced with the intensification of climate change, it was decided to carry out a study, with the Carbone 4 consultancy firm, on assessing the vulnerability of motorway infrastructures to climate change. The aim was to identify, from a functional point of view, the sections of freeway most likely to be affected by future climatic hazards, in order to prepare them as effectively as possible for the growing challenges of climate change, thereby ensuring user safety, operational continuity and the long-term sustainability of our assets.

Added value

- Identify the exposure of the motorway network to climatic hazards
- Calculate the physical vulnerability of infrastructure components
- Define criticality zones to better anticipate future developments





Hazard evolution and illustration of criticality - VINCI Autoroutes and Carbone 4 study

Deployment

Customer : VINCI Autoroutes

Territory: ESCOTA - COFIROUTE - ASF networks

Budget: €70k

Date : 2020

Key contact

Frédéric DEPAEPE

Technical Director VINCI Autoroutes
VINCI Autoroutes
frederic.depaepe@VINCI-autoroutes.com

CALEDONIA

Solution

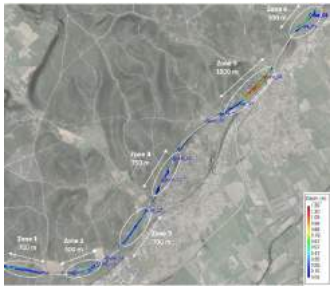
CaledonIA is a calculation program based on artificial intelligence algorithms that takes into account rainfall data from Météo France and simulates urban flooding in real time.

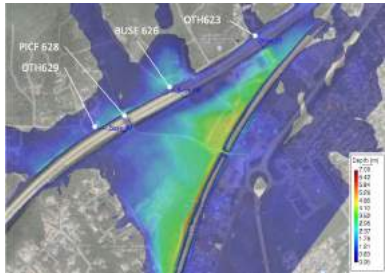
Context

Today, there is no software capable of rapidly predicting (on an hourly scale) 3D flows due to flooding in urban environments. However, in the Context of current climate change, the rainfall rates predicted by Météo France or others are only a few days ahead, leaving local authorities and fluid BEs unable to study future scenarios in the face of flood risk.
The A9 motorway is a case in point. In the past, the Gard region's vulnerability to heavy rainfall during Cevennes events has already blocked the A9 network. With climate change, these events will become more frequent. The aim of the study was to assess the consequences of exceptional rainfall on a section of the A9 freeway, flooding the freeway and detecting the water paths that could cause damage to the infrastructure.

Added value

- Identifying risks
- Anticipate impacts, particularly on users, surrounding Territorys and infrastructure
- Improve prevention and user awareness
- Prepare crisis management in line with potential impacts
- Make informed decisions on which investments to prioritize in a given Territory





Analysis of the impact of the simulation on the A9 infrastructure

Deployment

Customer: local authorities, cities, county councils, insurers, design offices

Territory: France

Key contact

Sofiane HADJI

Scientific Director Sixense Engineering
sofiane.hadji@sixense-group.com

ASSESSING THE RESILIENCE OF THE LGV SUD EUROPE ATLANTIQUE TO CLIMATE CHANGE

Solution

Assessment of the resilience of the LGV Sud Europe Atlantique to climate change on 302 km of high-speed line.

Context

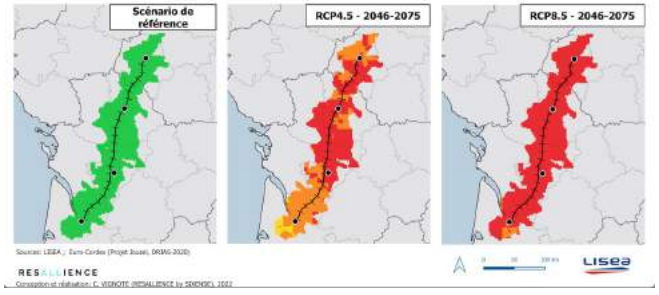
The aim of the study was to assess the potential impact of climatic hazards on the infrastructure, its operation and maintenance. The framework of the study was based on
Two scenarios proposed by the IPCC (a realistic scenario and a pessimistic scenario), along with two time horizons: near-term (before 2050) and medium-term (before 2075):

- The first part of the CEREMA methodology "Vulnerabilities and risks: transport infrastructures in the face of climate" 2019, enabling the diagnosis corresponding to a diagnosis of vulnerabilities.
- The second component is the development of an adaptation program (study scheduled for 2024-2025).

The expertise of the Technical Departments of the Operator-Maintainer (MESEA) and the Concessionaire (LISEA)

Added value

- Identification of exposure to climatic hazards along the entire length of the Infrastructure in the short and medium term
- Assessment and prioritization of physical vulnerabilities (infrastructure components) of the Line
- Assessment and prioritization of functional vulnerabilities (maintenance activity, line availability (traffic))



Deployment

Customer : LISEA

Territory: LGV SEA

Budget : 103 k€

Key contact

Anne-Florence CHAILLOU

Land Manager - Urban Planning
LISEA
anne-florence.chaillou@lisea.fr

CLIMATE CHANGE IMPACT ASSESSMENT - HS2

Solution

Study the impacts of climate change on the HS2 project. Identify measures to be implemented during the Design/Build or Maintenance (Servicing) phases to incorporate the anticipated effects of future climate change.

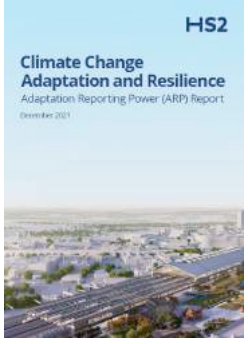
Context

HS2 Ltd.'s overall approach is to design a climate-resilient High Speed Line (HSL) capable of standing the test of time. This study demonstrates how the design/construction of the HS2 project maximizes climate change resilience and the LGV's potential to adapt to climate change in the future, while minimizing the risk of loss of operational performance due to climate change impacts on interdependent infrastructure.

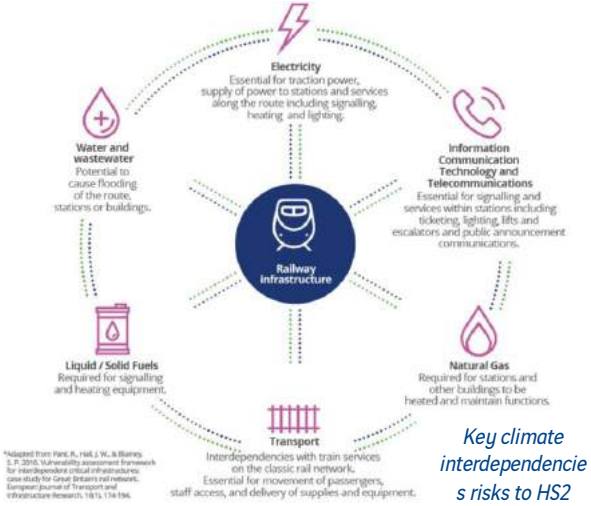
Added value

- Maximize HS2 line resilience to climate change
- Minimize loss of operational performance in the future
- Anticipate the effects of climate change right from the design/build and/or maintenance phase of the line
- Propose alternative approaches where relevant.

HS2 Climate Change Objectives:
- *Adaptation*
- *Resilience*



HS2 Climate Change Adaptation and Resilience Report



Key climate interdependencies risks to HS2

Deployment

Customer: HS2

Territory: N1 N2 BBV JV

Date: 2022

Key contact

Papa Samba DRAME

Head of Environment & Sustainability GeoInfrastructure - BBV

papasamba.drame@VINCI-construction.com

SURVEILLANCE AND MONITORING OF NATURAL AND BUILT ENVIRONMENTS

Solution

Monitoring and tracking solutions for climate risk management using ground or airborne measurements and satellite tracking

Context

Monitoring technology solutions based on remote sensing or sensors are deployed to track the impacts of extreme weather conditions and monitor induced variations over time in order to take appropriate adaptation measures in a timely manner. They help steer the management of climate risks at a given moment, check their prevalence in the medium term and plan adaptation strategies. This type of solution has been applied to the phenomenon of coastal erosion on the Saint Louis coast in Senegal (OSS project with support from CNES and the United Nations). This solution is intended to be replicated in other coastal countries in the sub-region. Another application involved the monitoring of erosion and silting phenomena in Kazakhstan, with the implementation of nature-based adaptation solutions, notably the establishment of Saxaoul feet.

Added value

- Assess climate risk trends
- Act on the most vulnerable adjustment variables
- Increase the resilience of the region as a whole

Deployment

Customer: any customer

Territory: Worldwide

Budget: depends on project

Date: 2019-22 / 2021-23

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

Aerial view of Saint Louis (Senegal)

Status report for follow-up / RESALLIENCE

RESIL'SPACE

Solution

Managing logistics flows on transport infrastructures

Context

Using satellite data, Resil'Space is a logistics management tool that models the impact of climatic hazards on transport infrastructures, whether river, sea, rail or road, in order to effectively manage logistics for the supply of essential products and materials in times of crisis and climatic hazards. A pilot project is currently underway across the entire Seine basin, covering the IDF and Normandy regions, and aims to set up a near real-time warning and forecasting system based on various climate scenarios. This project, which involves collaboration and funding between the public and private sectors, is intended to be replicated in other French and European regions.

Added value

- Optimal management of logistics flows in line with the impact of climatic hazards in crisis situations
- Decision-making support based on near-real-time facts

Congestion of transport networks in the event of a climate-related crisis / The heavy bill for the externalities of road transport | La Transalpine

Deployment

Customer: any customer, especially local authorities

Territory: Worldwide

Budget: project-dependent

Date: 2021-23

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

RESILIENCE PERFORMANCE DIAGNOSIS (DPR)

Solution

Systemic modeling tool that studies all the climatic hazards impacting a region's infrastructures, projects and economy. It can be used to assess the losses and damage induced by these hazards, as well as the investment costs required to reduce losses and damage.

Context

The DPR is available in 3 versions, depending on the Territory to be studied:

- DPR city, territory and region, which focuses on critical infrastructures and the interconnections that link them on a city, territory or region scale. This tool has been applied to the city of Tetouan in Morocco.
- DPR island states, for systemic modeling of climate risks on the scale of these states, where high-stakes Territorys such as networks (electricity, telecoms, water) or airports are studied with a view to anticipating their economic and social impacts. Applications have been developed for the islands of Dominica and Barbados.
- DPR bâtiment, a solution for property and asset managers, focusing on interconnections within the building and its immediate environment. This version has been deployed for CDC-Habitat (France) and AEW (France and Europe).

Added value

- Understanding the interconnections of a given space
- Visibility of Territorys for improvement
- Decision support

Exposure of a Caribbean island capital's buildings to flooding / RESALLIENCE

Deployment

Customer: local authorities, real estate asset managers

Territory: Worldwide

Budget: project-dependent

Date: 2021

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

MODELING AND MONITORING FOREST FIRE RISK

Solution

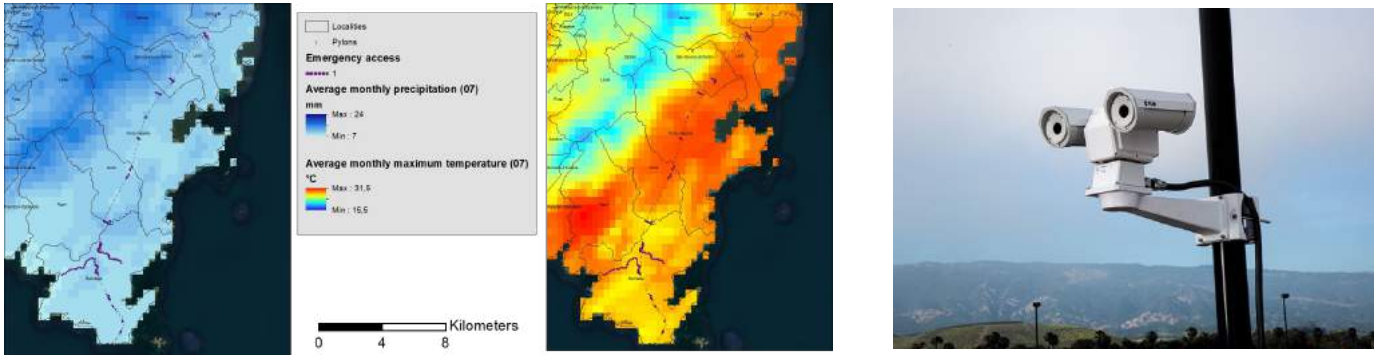
Offer developed in collaboration with VINCI Energies for monitoring and modeling forest fire risks

Context

It has been developed to identify the possible occurrence of fire via video surveillance, and to enable electrical network managers to take action very quickly to prevent network damage. It offers the ability to model the most critical paths and then implement appropriate solutions. This solution was the winner of the 2nd edition of the Trophées Fournisseurs RTE in 2022. The solution has been deployed in Corsica.

Added value

- Real-time monitoring of forest conditions and potential fire outbreaks
- Provide localized warning of forest fire risks
- Take targeted action as quickly as possible in Territorys where fires are starting.



Forest fire risk modeling and monitoring system / RESALLIENCE

Deployment

Customer: local authorities, economic and industrial players

Territory: worldwide

Budget: project-dependent

Date: 2022

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

2.2 PREVENTIVE SOLUTIONS

ACTION TO PREVENT CLIMATE CHANGE - A51

Solution

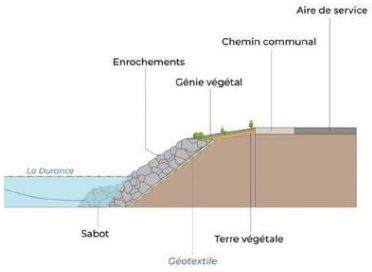
Reinforcement of rockfill banks to protect the A51 freeway from flooding on the Durance.
Vulnerability studies, risk analysis.

Context

The Durance, a tributary of the Rhône, is a river whose hydraulic regime is influenced by rainfall in the Mediterranean climate and by snowmelt from the massifs of the Southern Alps. In the past, the Durance has been the subject of numerous hydroelectric developments, as well as the exploitation of its water and aggregate resources. For several years now, the river's management policy has been aimed at achieving a more natural flow, which has modified the bed's morphology. The effects of climate change and hydromorphological modifications to the riverbed are causing increasingly large, aggressive and frequent floods, particularly for the A51 freeway, which is partly built along the Durance. A number of localized erosions, threatening the stability of the freeway, have necessitated rockfill bank reinforcement work; this is particularly the case at Manosque, with the reinforcement of 210 m of existing banks, to be completed in 2023.
In addition, a comprehensive study of the vulnerability of the A51 motorway to flooding on the Durance, taking into account changes in the river's climate and hydromorphology, has been carried out on the basis of risk analyses, and entrusted to Artelia.

Added value

- Contribute to the long-term safety, sustainability and resilience of the infrastructure.
- Anticipate risks to infrastructure



Reinforcing the banks of the A51 at Manosque - 2023

Deployment

Customer : VINCI-Autoroutes

Territory: ESCOTA network

Budget: €1.1 M excl. tax (val June 2010) (Manosque works)

Completion date: 2023

Key contact

Frédéric Depaepe

Technical Director VINCI Autoroutes
VINCI Autoroutes
frederic.depaepe@VINCI-autoroutes.com

GEOTEXTILE ENVIRO MAT – PROTECTION AGAINST COASTAL AND RIVER EROSION

Solution

Terre Armée offers a range of solutions to protect coastlines and riverbanks against erosion caused by rising sea levels and increasingly frequent extreme events. These include geosynthetic blankets filled with concrete on site and/or geotubes filled with sand by pumping.

Context

Formwork mattresses are made from a woven geotextile with a high polyester thread content, which gives the structure its shape and appearance. Geotubes are also made from woven geotextile and can be used to create dykes or reconstitute shorelines. It's an alternative, sustainable solution for erosion protection that can be applied in a wide range of applications, such as riverbank protection against erosion, dyke protection, coastal defense works, impermeable lining work for reservoirs or canals.
Formwork mattresses have been used, for example, to protect an industrial platform on the Maheskhali coast of Bangladesh from wave erosion.

Added value

- Reduce soil erosion and water velocity.
- Some solutions promote biodiversity by providing an environment conducive to plant growth, supporting ecological diversity and improving visual appeal.
- This solution is less expensive, requires lighter means of installation and has a reduced carbon footprint compared with traditional solutions (riprap or prefabricated concrete blocks).

Deployment

Customers: local authorities, transport infrastructure concessionaires, manufacturers

Territory: Worldwide

Some twenty references

Key contact

Thomas JOUSSELLIN

Chief Technical Officer

Terre Armée

thomas.joussellin@terre-armee.com

PROTECTION AGAINST SERIOUS RISKS

Solution

Terre Armée offers a range of solutions for protection against boulder falls, rockfalls, avalanches and landslides caused by rising permafrost in mountainous Territorys and increasingly frequent extreme events. The systems offered are either metal protection nets or reinforced embankment merlons with a reduced footprint in the case of high energy levels.

Context

This solution stands out for its simplicity, robustness and functionality, making it highly adaptable to climate change. Every component is designed for safety and efficiency, facilitating installation and maintenance in a changing climate. An iterative design process incorporates feedback from customers and contractors, enabling the creation of a high-value product with adaptive performance in the face of climatic challenges.
The reinforced embankment solution was used for avalanche protection on a road in Samuelsberg, Norway.

Added value

- Prevent accidents by preventing potentially dangerous rockfalls for people and property.
- Secure sensitive Territorys by protecting infrastructures and inhabited Territorys from damage caused by rockfalls.
- Strengthen the resilience of infrastructures against rockfalls amplified by extreme meteorological phenomena linked to climate change.

Deployment

Customer: local authorities, transport infrastructure concessionaires, manufacturers

Territory: Worldwide

A dozen references

Key contact

Thomas JOUSSELLIN

Chief Technical Officer

Terre Armée

thomas.joussellin@terre-armee.com

REVILO

Solution

A range of urban cooling islands to combat urban overheating and encourage nature in the city. This offer is based on 4 levers: plants, water, soil and surfacing.

Context

With climate change, all cities are subject to urban heat island phenomena, with high temperature levels generating health risks. Revilo is a solution for cooling cities during summer heat waves. Revilo combines and optimizes 4 levers mastered by Eurovia:

- Plants to create shade, facilitate evapotranspiration and bring well-being to residents
- Rainwater management at plot level to direct it towards plants
- Soils for their capacity to store and infiltrate water
- Cladding to enhance permeability and albedo

Added value

- A complete solution
- A response to political ambitions, residents' expectations and the challenges facing the city and its technical departments
- A capacity to design the public space to be refreshed and carry out the work
- Numerous success stories

Jardin de l'Ars, Bordeaux (33)

Parc de la Loubière, Toulon (83)

Cours OASIS, Paris (75)

Deployment

Customer: mainly local authorities

Territory: mainly France

Budget: variable

Date: since 2022

Key contact

Pierre MONLUCQ

Strategic Marketing Director

VINCI Construction Division Route France

pierre.monlucq@VINCI-construction.com

BASSIN DE STOCKAGE DES EAUX USÉES LORS DE FORTS ÉPISODES PLUVIEUX

Solution

A structure designed to prevent wastewater from being discharged into the Seine from the Paris wastewater network during rainy events.

Context

Soletanche Bachy et Bessac was part of the consortium that built the water storage and release basin (the Austerlitz basin), as well as two water recovery structures from the storm overflows on either side of the Seine.
The basin is made of a 1.2 m thick diaphragm wall anchored at 60 m with precast bar posts. The shaft dedicated to launching the micro-tunneler, adjacent to the basin, enabled work on the tunnel to start independently of progress on the basin.

Added value

- Eliminate current discharges of wastewater from the Paris sewer system during heavy rainfalls
- Improve the sanitary quality of Seine water in preparation for the 2024 Olympic Games and the installation of permanent bathing facilities in the Seine in Paris.
- Mastery of high-depth deviations for cast walls and barrettes, combined with high-strength low-carbon concrete

Austerlitz basin construction site aerial view

Interior view

Deployment

Customer : City of Paris

Territory: Paris

Date : 2021

Key contact

Stéphane MONLEAU

Communications and Marketing Director, Eurofrance

VINCI Construction

stephane.monleau@VINCI-construction.com

LIFE COOL & LOW NOISE ASPHALT PROJECT

Solution

Puma (Eurovia): hot-mix asphalt with light-colored, porous aggregates. It combines the light-reflecting capacity of clear aggregates with the porosity of porous aggregates for water retention in periods of high heat and reduced rolling noise.

Context

The Paris City Council spearheaded this project, the fruit of a virtuous partnership with Colas, Eurovia and the Centre d'évaluation technique de l'environnement sonore en Ile-de-France Bruitparif.
The project is the result of a shared observation: noise and heat are nuisances that particularly affect cities. The LIFE COOL & LOW NOISE ASPHALT project offers a concrete solution for a real and lasting improvement in the well-being of Parisians, by designing new pavements that are both phonic and thermal.

Added value

- The use of light-colored aggregates reflects light (albedo effect) and helps reduce Urban Heat Islands (UHI).
- The porosity of aggregates increases water retention and evaporation, cooling the air during heatwaves.
- Porosity is also an asset in the fight against noise pollution, as it traps rolling noise.

Joachim Bertrand pictures

Deployment

Customer: Mairie de Paris & EU

Territory: City of Paris

Budget: €2.3 million

Date : from 2016 to 2021

Key contact

Florent GAZANIOL

Technical Manager

VCSP route – Eurovia IDF

florent.gazaniol@VINCI-construction.com

HYDROVIA®

Solution

HYDROVIA® is a range of permeable solutions designed to meet the challenges of rainwater infiltration in urban environments. Hydrovia® Soft for soft mobility, Hydrovia® Park for lanes and parking lots, and Hydrovia® Roc and Hydrovia® Print, two complementary alternatives, all depend on the intended use, the expected level of stress and the desired aesthetic effect.

Context

Integrated stormwater management is one of the major thrusts of urban planning and resilience. One of the levers is the use of permeable pavements to infiltrate rainwater "as close as possible to where it falls", while maintaining properties compatible with the intended use: safety, durability, landscape integration. HYDROVIA® range solutions are designed to limit rainwater runoff and infiltrate it as soon as possible.

Added value

- Versatility of the range's solutions: resistance to shearing (surface stripping under car parking), integration of vegetation, landscape integration, etc.
- Possibility of enhancing the color of aggregates with a translucent binder (Solis®), improving their albedo and helping to limit the rise in surface temperature.
- These easy-to-install solutions are particularly well-suited to soft lanes and car parks.

Hydrovia® Soft – Nancy (54)

Hydrovia® Park

Hydrovia® Print

Hydrovia® Roc

Deployment

Customer: All customers

Territory: France

Budget: All budgets

Date : Since 2022

Key contact

Nicolas HIROUX

Technical Engineer

VINCI Construction

nicolas.hiroux@VINCI-construction.com

RESERVOIR PAVEMENTS

Solution

Reservoir pavements are pavement structures with a high water retention capacity. Thanks to their high voids index, these layers of pavement materials buffer rainwater before releasing it back into the natural environment via direct infiltration and/or the stormwater network.

Context

Integrated stormwater management is one of the major thrusts of urban planning and resilience. One of the levers is the use of complete structures such as reservoir pavements, wherever the project footprint allows. By buffering the large volumes of rainfall that can be captured during storms, they enable deferred restitution to the natural environment (depending on its infiltration capacity) or to the network, at a regulated flow, depending on the configuration.

Added value

- High water retention/infiltration capacity on a small footprint
- Particularly suitable for light vehicle parking Territorys
- Adaptable performance to project constraints

The different types of structure

Reservoir roadway under construction

Deployment

Customer: All customers

Territory: France, International

Budget: All budgets

Date : over 30 years

Key contact

Nicolas HIROUX

Technical Engineer

VINCI Construction

nicolas.hiroux@VINCI-construction.com

AGRÉVIA®

Solution

AGREVIA® is an asphalt mix for wearing courses that enhances the natural color of aggregates through surface treatment (hydroblasting or shotblasting).

Context

In urban planning, it is often necessary to differentiate spaces by means of surfacing. Thanks to a simple surface treatment process and the right selection of aggregates for their color, AGREVIA® improves the legibility of structures while maintaining a level of service comparable to that of conventional surfacing. The use of light-colored aggregates significantly improves the albedo of the surfacing, and moderately limits the temperature rise of the wearing course.

Added value

- Highlight the natural color of the aggregate without the use of synthetic translucent binders.
- Adaptable performance to project constraints
- Very easy to apply, it is suitable for all types of traffic.

Village crossings

Boulevard Mayer in Tours (37)

Plestant (22)

Traffic lane differentiation

Deployment

Customer: All customers

Territory: France, International

Budget: All budgets

Date : over 20 years

Key contact

Nicolas HIROUX

Technical Engineer

VINCI Construction

nicolas.hiroux@VINCI-construction.com

SOLIS® BINDER-BASED CLEAR COATINGS

Solution

Viacolor® is a family of asphalt concrete for light-colored wearing courses using translucent, pigmentable SOLIS ® binder. It is naturally suited to all road environments, whether trafficked or not.

Context

In a shared, pleasant environment, colors are landmarks. Occasional visitors or daily users need to visualize a simple, safe path. Thanks to the SOLIS® range of binders, Viacolor® asphalt mixes will naturally find their place in all road environments. The use of light-colored aggregates significantly improves the albedo of the pavement and moderately limits the temperature rise of the wearing course.

Added value

- Improved legibility of the structure, differentiation of spaces by color for better perception of public amenities
- Greater visual comfort for users and residents
- Binder performance adapted to stress levels
- Limitation of surface temperature through the use of high-albedo surfacings.

Traffic lane differentiation

Cycling path

Deployment

Customer: All customers

Territory: France, International

Budget: All budgets

Date: since 2021 for SOLIS &

over 20 years for Viacolor

Key contact

Sabine Le BEC

Technical Engineer

VINCI Construction

sabine.le-bec@VINCI-construction.com

DECOVIA®

Solution

Décovia® is a range of cold mixes based on the use of translucent, non-bituminous binders that enhance the natural hue of the aggregates used. Décovia® is unsuitable for vehicular traffic, and is designed primarily for soft mobility applications. Décovia® is particularly well suited to pedestrian Territorys (sidewalks, public spaces, forecourts and tourist sites) and cycle paths (urban, forest or riverside).

Context

Traffic Territorys dedicated to pedestrians and cyclists must be clearly marked to guarantee safety and comfort. Synonymous with quality design, color helps differentiate paths and spaces dedicated to different uses. The integrated management of rainwater and the limitation of urban heat island effects are two other major aspects of urban development and resilience. Its draining or semi-permeable formulation allows Décovia® to be associated with the limitation of waterproofing of landscaped surfaces. In a light shade, this surfacing is particularly effective in combating the urban heat island effect, and also improves the legibility of urban space.

Added value

- 100% cold process
- Mitigation of the urban heat island effect.
- Natural color of aggregates. Improved visual comfort for users and residents
- Permeability of pavement to allow rainwater infiltration

Deployment

Customer: All customers

Territory: France, International

Budget: All budgets

Date: Since 2019 (28,000m² completed)

Key contact

Thomas LEBARBÉ

Research Engineer

VINCI Construction

Thomas.lebarbe@VINCI-construction.com

THERMALIA®

Solution

Thermalia® is a single-component, waterborne paint designed to cover all black or dark substrates (asphalt mixes, sidewalk asphalt, etc.) to increase the albedo of surfaces for soft mobility (pedestrian walkways, cycle paths, forecourts, school playgrounds). Formulated without titanium dioxide (TiO2), Thermalia® paint incorporates fillers that limit heat absorption in the infrared range, with a choice of colored pigments that limit daytime glare while retaining good anti-heat performance.

Context

Climate change is intensifying urban heat island (UHI) phenomena, which are particularly problematic for health reasons. Rehabilitation of urban Territorys with vegetation integration is not always possible, depending on the configuration of the Territory. Thermalia® cladding can be used on a wide range of dark substrates to raise albedo values at lower cost, thus limiting UHI phenomena in Territorys where immediate vegetation is not possible.

Added value

- A flexible, cost-effective way to combat UHIs
- Available in a range of shades to match the local architectural Context
- Non-hazardous, non-flammable, titanium dioxide-free product
- Very low VOC emissions (<30g/L), water-based paint
- High anti-slip properties (> 0.55)

Deployment

Customer : Mainly local authorities

Territory: France

Budget: All budgets

Date : Since 2022

Key contact

Thomas LEBARBÉ

Research Engineer

VINCI Construction

Thomas.lebarbe@VINCI-construction.com

FLOOD PREVENTION ACTION ON THE A355 FREEWAY

Solution

Implementation of specific storage facilities to collect water from natural catchment Territorys, and thus contain a 100-year rainfall event.

Context

The A355 is a new-generation freeway, exemplary in terms of ecological transparency and environmental integration. Benefiting from innovative environmental measures, this new freeway is also the first road infrastructure project in France to have been subject to compensatory measures even before construction began. A total of 1,315 hectares of environmental compensation were deployed during the development of this major bypass. That's more than 4.5 times the project's final footprint! These measures particularly concern forests and wetlands. Several watercourses located on or near the freeway were re-mandered, with the addition of hydraulic compensation zones. The aim? Restore their original character, regulate their flow and make them more conducive to the development of biodiversity. At the same time, the structures used to cross them have all been designed to take account of their expansion in the event of an exceptional 100-year flood.

Added value

- Limit the impact of infrastructure operations,
- Contribute to the long-term safety, sustainability and resilience of the infrastructure,
- Eliminate the barrier effect of the infrastructure and protect downstream villages from flooding.

Deployment

Customer : VINCI Autoroutes

Territory: ARCOS network

Budget: included in the construction of the A355

Date : 2021

Key contact

Arnaud Guillemin

Environmental Manager
Réseau Arcos
arnaud.guillemin@VINCI-autoroutes.com

SUSTAINABLE FLOOD RISK MANAGEMENT – HS2

Solution

An alternative, ecologically focused and nature-based approach to flood mitigation, using natural flood management techniques on a watershed scale, while integrating ecological value at the design stage (Nature Based Solutions: NBS).

Context

The HS2 high-speed rail link crosses numerous watercourses and their associated flood plains, so without mitigation measures the project is likely to increase the risk of flooding in riparian Territorys. Flood mitigation is usually achieved in the form of hydraulic compensation zones. However, these conventional flood mitigation measures require changes to the topography, resulting in the removal of topsoil and clearing of vegetation, making it difficult to meet HS2's biodiversity commitments: Achieving Zero Net Loss in Biodiversity.

Added value

- Maximize the HS2 line's resilience to climate change.
- Minimize the impact on natural environments and enhance biodiversity on the project.
- Reduce greenhouse gas emissions on the project.
- Reduce costs associated with flood management.

Grazing in wetlands

Canley Brook: Design of hydraulic compensation zone

River Cole: Design of the hydraulic compensation zone

Deployment

Customer: HS2

Territory: N1 N2 BBV JV

Date: 2022

Key contact

Papa Samba DRAME

Head of Environment & Sustainability GeoInfrastructure - BBV

papasamba.drame@VINCI-construction.com

THAMES TIDEWAY TUNNEL

Solution

Design and construction of a tunnel for wastewater storage and transfer from central London to the wastewater treatment plant. The project comprises a 5.5 km main tunnel (7.2 m diameter) and a 4.6 km connecting tunnel (5 m diameter), 5 shafts with internal structures and electromechanical works.

Context

The Thames Tideway Tunnel is a very large-scale project, 25 km long and varying in depth from 35 to 66 meters. It can hold up to 1.6 million cubic meters of wastewater and is built to operate for 120 years, based on climate models from the Met Office Hadley Centre (UKCP09). Modelling of the future scenario suggests that in a typical year, climate change and population growth will greatly amplify the number of sewer overflows into the Thames by 2080.

Added value

- Explore uncertainties for the 2050 and 2080 horizons through climate projections and build for the future.
- Make a vital contribution to the necessary control and improvement of Thames water quality in the near future through resilient infrastructure.
- Resist the risk of rising water levels: new anti-flooding structures built, in particular, on the King's Edward Memorial Park site along the Thames have been designed to allow for a rise in their level in the future, according to water level projections published by the UK Environment Agency (TE2100).

Tideway East interior view

London tunnel construction sites

Deployment

Customer : Bazalgette Tunnel Limited (Tideway)

Territory: London, United Kingdom

Budget: £1.2 billion

Date: 2015-2024

Key contact

André TOURTOIS

Directeur de Projet Adjoint
VINCI Construction
Grands Projets

andre.tourtois@VINCI-construction.com

FARO AIRPORT CLIMATE ADAPTATION PLAN

Solution

Global climate adaptation action plan for Faro airport (Portugal) built around a participatory approach

Context

After conducting a diagnosis of Faro airport's vulnerabilities and climate risks, a global action plan was co-constructed with various stakeholders around 4 phases in 4 phases: (1) identification of current and (2) future vulnerabilities, (3) evaluation of adaptation and mitigation solutions, (4) definition of an action, monitoring and training plan. To define the action plan, the methodology used included the following sequence: immediate actions; actions linked to predictive studies; monitoring and recording; proposal for future projects.
The action plan addresses the following aspects: **Flood risk** (e.g. rainfall monitoring, protocols with stakeholders to regularly inspect and clean water pipes outside the airport), **drought** (e.g. reuse of treated wastewater), **high temperatures** (e.g. shading of terminals, taking into account the occurrence of heatwaves in the projection of future runway surfaces), **risk of extreme heat exhaustion for platform workers** (e.g. specific training for employees, putting in place a system to prevent heat exhaustion): specific training for employees, implementation of a new work regime, provision of suitable equipment and clothing for workers), **risk of extreme heat for workers and passengers** (e.g. monitoring energy requirements, energy simulation of terminals), **prevention of new tropical diseases** (e.g. insect capture system, personal protection, awareness campaigns). It is also important to monitor extreme weather events at the airport. This recording will provide a historical database of climatic events and, consequently, local vulnerabilities, which will be used in future plan revisions.

Added value

- Anticipating climate risks in a systemic way
- Risk prevention and improved resilience
- Optimizing investments and costs

Workshops with internal and external stakeholders and employees

Deployment

Customer : Aeropuertos de Portugal

Territory: Faro

Key contact

Andreia RAMOS

Sustainability Director
Portugal Airports
arramos@ana.pt

ITAMI - FLOOD PREVENTION MEASURES FOR HEAVY RAINS

Solution

ITAMI - Preventive drainage measures to cope with flooding at Japan's Kansai airport.

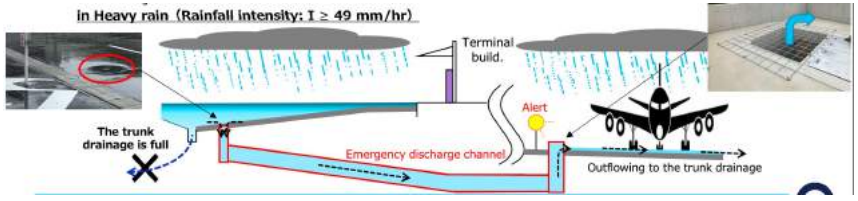
Description

Situated on an artificial island, almost 5 km from the coast, Kansai airport is 5 metres above sea level. A number of measures have been taken to mitigate the risk of flooding:

- Preventive measures: installation of an inflow drainage channel (the drainage trench receives surface water flowing into the parking area from outside the airport during heavy rainfall, and the water is discharged into the existing underground collector, preventing flooding of low-lying roads and parking areas) and an underground drainage canal.
- Measures to be adopted in the event of flooding: installation of a removable water stop plate on the automatic door and watertight doors for the generator rooms (to be installed in 2019)
- Measures for rapid restoration: acquisition of a large drainage pump vehicle (introduced in 2019)

Added value

- Passenger and personnel safety
- Ensuring business continuity or rapid recovery
- Adaptability of infrastructures to climatic contingencies



Deployment

Client : ITAMI

Territory : Japan

Key contact

Mathieu BOUTITIE

Technical Director
VINCI Airports Japan KK
mathieu.boutitie@kansai-airports.co.jp

TYPHOON AND FLOOD DISASTER PREVENTION AT AIRPORTS

Solution

Disaster prevention linked to the impact of typhoons and flooding on airports due to climate change

Description

Kansai Airports, in partnership with Kyoto University's Disaster Prevention Research Institute and Kumamoto University's Department of Civil Engineering and Architecture, have developed a model capable of forecasting weather conditions (typhoons and extreme weather events) in relation to climate change, and numerically analyzing the impact on airports of natural phenomena such as precipitation, waves and storm surges. This model could enable more accurate disaster planning not only for Kansai International Airport, but also for other airports. The model has been developed and put into practice, and has been validated by reproducing the damage caused by Typhoon JEBI in 2018.
The model will enable the development and revision of investment plans for dike maintenance, etc. at Kansai International Airport and Kobe Airport using a typhoon model that takes climate change into account. The target areas are the two Osaka Bay airports.

Added value

- Adapting infrastructures to climatic hazards
- Anticipation of extreme weather events

Deployment

Territory : Japan

Key contact

Mathieu BOUTITIE

Technical Director
VINCI Airports Japan KK
mathieu.boutitie@kansai-airports.co.jp

HELYS PROJECT – SOLAR POWER PLANT ON PARKING LANDINGS

Solution

With Neoen and Sunmind (VINCI Concessions subsidiary) deployment of a photovoltaic power plant in parking lot shades on the Lyon-Saint Exupéry Airport site, in order to decarbonize Scope 3, enhance the value of the land, meet future regulatory obligations and improve passenger comfort. Third-party investor project, contracted via an Autorisation d'Occupation Temporaire (AOT)

Context

Lyon Airport has a large surface Territory of parking lots. The idea is to use part of this Territory to install 20 MWp of photovoltaic power for injection, covering around 14 hectares of parking lots.

Added value

- Annual production of around 25,000 MWh of renewable electricity fed into the ENEDIS grid
- Annual fee collected by the airport
- Net creation of parking spaces through redevelopment of parking Territorys
- Contributes to meeting future regulatory obligations (anticipation)
- Limitation of heat island effect due to parking lot asphalt due to shading
- Protection for vehicles and pedestrians (sun, rain, etc.) for a better passenger experience

Aerial view (rendering) - HELYS solar power plant

Pedestrian view (rendering) - HELYS solar power plant

Deployment

Customer : Aéroports de Lyon

Territory: Colombier-Saugnieu

Budget: 0 (third-party investor)

Date: 2021-2025

Key contact

René VATOUX

Decarbonation Manager

Aéroports de Lyon

rene.vatoux@lyonaeroports.com

STUDY OF RISK/VULNERABILITY TO CLIMATE CHANGE

Solution

Study carried out with Resallience, in association with a Greek consultant TT&E consultant S.A, on the vulnerability to climate change of the extension of the Olympia Odos motorway infrastructure on the new 75 km section between Patras and Pyrgos (PaPy).

Description

Climate change could exacerbate the long-term climatic parameters affecting the operation and maintenance of the PaPy section, as well as the frequency, intensity and duration of climatic shocks (floods, heatwaves, etc.). The aim of the study was to assess the risks and/or opportunities associated with climate change, in order to identify whether certain parts of the infrastructure are exposed to certain natural hazards.

Added value

- Identify and assess climate-related risks including climate change (flooding, landslides, forest fires) over the concession period in sufficient detail to identify critical points on the section.
- Produce a summary map of the project's risk zones to illustrate the vulnerability and exposure of the infrastructure.
- Verify the performance of hydraulic structures based on changes in extreme daily rainfall / re-evaluation of peak flows linked to climate change.

Simulation and analysis of impact on infrastructure

Deployment

Customer: Olympia Odos

Territory: Greece (Patras - Pyrgos section)

Budget : 36k€ HT

Date : 2021

Key contact

Fabrice BRETON

Technical Manager
Olympia Odos
fbreton@olympiaodos.gr /
fabrice.breton@VINCI-highways.com

BIO-CONSOLIDATION TREATMENT FOR SOIL, FILL AND STONE
BIOCALCIS ® PROCESS

Solution

The Biocalcis ® process is a biomineralization injection process based on the use of calcifying bacteria to precipitate a calcite-based mineral compound in-situ. Biocalcification increases the cohesion of treated soils, enabling mechanical reinforcement of structures and combating the risks of internal erosion and liquefaction. It is effective in coping with extreme stresses (rising water levels - earthquakes) while preserving the initial permeability of the medium.

Context

This solution was used for work on the René Thinat bridge in Orléans. The bridge's north abutment consists of a reinforced embankment wall, but a survey carried out in 2019 revealed advanced corrosion on the structure's steel reinforcements. The Biocalcis process was used to carry out injection repairs on a section of the face wall where nailing was not possible due to the bridge deck in front of the face wall.

Added value

- Low-intrusive and fast: using injection from small-diameter boreholes, it can be used without risk of pressure build-up in structures and in hard-to-reach areas. Reaction takes just a few days.
- Reinforced materials maintain their original characteristics: calcium carbonate does not create obstructions, and permeability remains unchanged after treatment.
    - Heritage management use case: interesting characteristics for heritage restoration, as the treated stone continues to breathe and the calcite formed is of the same nature as the stone, which does not alter its color.
- Favorable carbon balance compared with cement-based processes.

Consolidation work on the René Thinat Bridge

Biocalcis ® used for heritage restoration

Deployment

Customer: Orléans Métropole - Pôle Ouvrage d'Art

Project management: Ingerop - Geos

Date : 2022

Key contact

Annette ESNAULT FILET

Project manager R&D
Soletanche Bachy

Annette.esnault@soletanche-bachy.com

LIMA EXPRESA

Solution

Series of reinforcement works and exercises for the Lima Express line

Context

VINCI Highways, concessionaire of two highways in Lima by its subsidiary Lima Expresa, is investing to improve the climate resilience of infrastructure.

The teams are currently carrying out works to consolidate the banks of Rimac river along the expressways, to prevent the risk of flood impact in anticipation of climate phenomenons. It consists of reinforcing the two banks of the Rímac river by installing ground anchors six to eight meters deep and covering the embankment with sprayed concrete for its stabilization. In total, 100 m of banks on either side of the river will benefit from this reinforcement work.

The second phase of the project began in June 2024, after the rainy season. It will continue to reinforce the embankments by injecting concrete into piles located 2 meters below the river bed, and will protect the base of the embankments by installing anti-wear metal plates.

Added value

- Reducing the risk of flooding, particularly in view of the El Niño phenomenon

Deployment

Territory : Peru

Date : 2024

Key contact

Luis ZAPATA

Manager, Public Affairs, Communications and Sustainability

luis.zapata@limaexpresa.pe

2.3 REPAIR SOLUTIONS

MAINTAINING A RIVER CROSSING UNDER NOMINAL HYDRAULIC CONDITIONS

Solution

Intervention in the event of an intense rainfall event, to remove any logjams that reduce the capacity of a river crossing structure (set of nozzles) below its nominal capacity.

Context

In the Alpes-Maritimes region, the A8 freeway crosses the Brague coastal river via a series of hydraulic nozzles. When originally designed in the 1950s, this system was designed to withstand a 30-year flood. Beyond this level, the freeway is invaded by high water and no longer plays its role.

Poor maintenance of the banks of the Brague upstream of the freeway can, in the event of flooding, lead to the arrival of logjams on this crossing structure. Jams larger than the diameter of the individual culverts are blocked by the culverts, reducing their capacity to below their rated capacity. This increases the likelihood and frequency of freeway closures due to flooding of traffic lanes.

In the event of a forecast heavy rainfall event, a truck crane is positioned above the nozzles to remove any ice jams that may obstruct them.

Added value

- Keeping the freeway running, particularly vital in the event of a weather event, especially to enable emergency services to get around.

Flooding of the A8 freeway by the Brague river

Removal of logjams

Deployment

Customer : VINCI-Autoroutes

Territory: ESCOTA network

Budget : 3 k€ HT

Date : Recurrent

Key contact

Blaise RAPIOR

Managing Director ESCOTA VINCI Autoroutes

Blaise.rapior@VINCI-autoroutes.com

CLIMATE ADAPTATION SOLUTIONS CATALOG

ENERGY INFRASTRUCTURES

3.1 DIAGNOSTIC SOLUTIONS

CALEDONIA

Solution

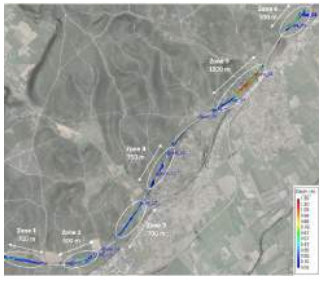
CaledonIA is a calculation program based on artificial intelligence algorithms that takes into account rainfall data from Météo France and simulates urban flooding in real time.

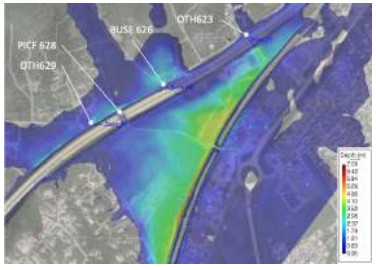
Context

Today, there is no software capable of rapidly predicting (on an hourly scale) 3D flows due to flooding in urban environments. However, in the Context of current climate change, the rainfall rates predicted by Météo France or others are only a few days ahead, leaving local authorities and fluid BEs unable to study future scenarios in the face of flood risk.
The A9 motorway is a case in point. In the past, the Gard region's vulnerability to heavy rainfall during Cevennes events has already blocked the A9 network. With climate change, these events will become more frequent. The aim of the study was to assess the consequences of exceptional rainfall on a section of the A9 freeway, flooding the freeway and detecting the water paths that could cause damage to the infrastructure.

Added value

- Identifying risks
- Anticipate impacts, particularly on users, surrounding Territorys and infrastructure
- Improve prevention and user awareness
- Prepare crisis management in line with potential impacts
- Make informed decisions on which investments to prioritize in a given Territory





Analysis of the impact of the simulation on the A9 infrastructure

Deployment

Customer: local authorities, cities, county councils, insurers, design offices

Territory: France

Key contact

Sofiane HADJI

Scientific Director Sixense Engineering
sofiane.hadji@sixense-group.com

SURVEILLANCE AND MONITORING OF NATURAL AND BUILT ENVIRONMENTS

Solution

Monitoring and tracking solutions for climate risk management using ground or airborne measurements and satellite tracking

Context

Monitoring technology solutions based on remote sensing or sensors are deployed to track the impacts of extreme weather conditions and monitor induced variations over time in order to take appropriate adaptation measures in a timely manner. They help steer the management of climate risks at a given moment, check their prevalence in the medium term and plan adaptation strategies. This type of solution has been applied to the phenomenon of coastal erosion on the Saint Louis coast in Senegal (OSS project with support from CNES and the United Nations). This solution is intended to be replicated in other coastal countries in the sub-region. Another application involved the monitoring of erosion and silting phenomena in Kazakhstan, with the implementation of nature-based adaptation solutions, notably the establishment of Saxaoul feet.

Added value

- Assess climate risk trends
- Act on the most vulnerable adjustment variables
- Increase the resilience of the region as a whole

Aerial view of Saint Louis (Senegal) / source

Status report for follow-up /RESALLIENCE

Deployment

Customer: any customer

Territory: Worldwide

Budget: depends on project

Date: 2019-22 / 2021-23

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

RESILIENCE PERFORMANCE DIAGNOSIS (DPR)

Solution

Systemic modeling tool that studies all the climatic hazards impacting a region's infrastructures, projects and economy. It can be used to assess the losses and damage induced by these hazards, as well as the investment costs required to reduce losses and damage.

Context

The DPR is available in 4 versions, depending on the Territory to be studied:
DPR city, territory and region, which focuses on critical infrastructures and the interconnections that link them on a city, territory or region scale. This tool has been applied to the city of Tetouan in Morocco.
DPR island states, for systemic modeling of climate risks on the scale of these states, where high-stakes Territorys such as networks (electricity, telecoms, water) or airports are studied with a view to anticipating their economic and social impacts. Applications have been developed for the islands of Dominica and Barbados.
DPR bâtiment, a solution for property and asset managers, focusing on interconnections within the building and its immediate environment. This version has been deployed for CDC-Habitat (France) and AEW (France and Europe).

Added value

- Understanding the interconnections of a given space
- Visibility of Territorys for improvement
- Decision support

Exposure of a Caribbean island capital's buildings to flooding / RESALLIENCE

Deployment

Customer: local authorities, real estate asset managers

Territory: Worldwide

Budget: project-dependent

Date: 2021

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

MODELING AND MONITORING FOREST FIRE RISK

Solution

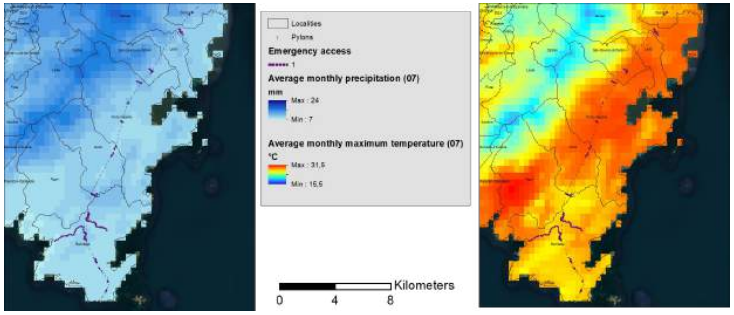
Offer developed in collaboration with VINCI Energies for monitoring and modeling forest fire risks

Context

It has been developed to identify the possible occurrence of fire via video surveillance, and to enable electrical network managers to take action very quickly to prevent network damage. It offers the ability to model the most critical paths and then implement appropriate solutions. This solution was the winner of the 2nd edition of the Trophées Fournisseurs RTE in 2022. The solution has been deployed in Corsica.

Added value

- Real-time monitoring of forest conditions and potential fire outbreaks
- Provide localized warning of forest fire risks
- Take targeted action as quickly as possible in Territorys where fires are starting.



Modélisation des risques liés aux feux de forêt et mise en place de système de monitoring / RESALLIENCE

Deployment

Customer: local authorities, economic and industrial players

Territory: worldwide

Budget: project-dependent

Date: 2022

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

DECISION-SUPPORT PLATFORM FOR ANTICIPATING THE MAINTENANCE OF INDUSTRIAL SITE INFRASTRUCTURES

Solution

Development of a platform and operational tool dedicated to the anticipation and management of climatic risks, as well as to the predictive maintenance of infrastructures and industrial sites.

Context

Two use cases can be cited as examples of the concrete implementation of this solution: 1) the development of the STORM tool for AXIONE to anticipate the need for predictive, curative or reinvestment maintenance of fiber optic networks on the scale of several departments; 2) the modeling of the impact of silting phenomena (see monitoring solution) on KATCO's pipeline networks in Kazakhstan.
All economic and industrial players can be supported, provided their businesses are located in Territorys potentially affected by climatic risks.

Added value

- Assess the evolution of infrastructures and industrial sites in relation to climate change
- Anticipate and size maintenance and investment requirements

STORM hub / RESALLIENCE

Deployment

Customer: economic and industrial players

Territory: Worldwide

Budget: depends on project

Date: 2021 / 2022-2023

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

3.2 PREVENTIVE SOLUTIONS

UPGRADING CHARGING STATIONS

Solution

Installation of a DC charging station accessible to the public in a flood zone.

Context

The customer wanted to install a DC fast-charging facility with 12 charging points, each capable of delivering up to 300 kW of power, in a flood-prone location in Lillehammer, Norway. Despite the risk of flooding, the customer wanted to go ahead with the project because of the high level of traffic in the Territory. We therefore raised the ground level where the infrastructure was placed, and used stand-alone chargers with a pit solution underneath to facilitate dismantling and relocation if necessary. The whole system was tested during a flood in autumn 2023, and the results were published in issue 2 of Omexom magazine.

Added value

- Enables the construction of recharging facilities in popular but flood-prone Territorys, increasing customer profits and market share.
- Protects expensive equipment from flood damage, while reducing environmental impact by avoiding the need to replace equipment.
- Reduces CO2 emissions by enabling charging infrastructures to be set up in Territorys where they would not otherwise be available.

Photos of the floods of 2023, systems remained safe

Deployment

Customer: Circle K Norge AS

Territory: Lillehammer, Norway

Budget: €1M

Date: 01.04.2022

Key Contact

Vetle RYNNING

Project- and service manager

Omexom E-mobility Oslo

Vetle.rynning@omexom.com

BIOCLIMATIC RENOVATION OF AN OFFICE BUILDING - WOW

Solution

WOW is an 11,356m² office building featuring a bioclimatic design. This reduced the carbon footprint by 22% compared with a conventional design. The building's envelope and technical systems were designed with summer comfort in mind.

Context

This building, located in the heart of the Montmartre district, was purchased by VINCI Immobilier in 2019. It housed the Magasin Dufayel, a former Grand Magasin, comparable to Galeries Lafayette at the time. Construction began in 1856.

The Better Way" approach was applied to the new office uses. This approach advocates building flexibility, the creation of capable spaces, and also the adaptation of thermal design according to zones and needs.
The building's Eiffel structure is highlighted by leaving it visible, as is the technology.

Added value

- Upgrading an exceptional building to give it a new lease of life in the neighborhood
- Reduce the carbon footprint of the works
- Create a living space in this historic office building

Facade rue de Clignancourt

Offices

Rooftop

Deployment

Territory: Paris 18th

Date: 2019-2024

Key contact

Laetitia RIEDIGNER

Program Manager

VINCI Immobilier

Laetitia.riedinger@vinci-immobilier.com

HELYS PROJECT – SOLAR POWER PLANT ON PARKING LANDINGS

Solution

With Neoen and Sunmind (VINCI Concessions subsidiary) deployment of a photovoltaic power plant in parking lot shades on the Lyon-Saint Exupéry Airport site, in order to decarbonize Scope 3, enhance the value of the land, meet future regulatory obligations and improve passenger comfort. Third-party investor project, contracted via an Autorisation d'Occupation Temporaire (AOT)

Context

Lyon Airport has a large surface Territory of parking lots. The idea is to use part of this Territory to install 20 MWp of photovoltaic power for injection, covering around 14 hectares of parking lots.

Added value

- Annual production of around 25,000 MWh of renewable electricity fed into the ENEDIS grid
- Annual fee collected by the airport
- Net creation of parking spaces through redevelopment of parking Territorys
- Contributes to meeting future regulatory obligations (anticipation)
- Limitation of heat island effect due to parking lot asphalt due to shading
- Protection for vehicles and pedestrians (sun, rain, etc.) for a better passenger experience

Aerial view (rendering) - HELYS solar power plant

Pedestrian view (rendering) - HELYS solar power plant

Deployment

Customer : Aéroports de Lyon

Territory: Colombier-Saugnieu

Budget: 0 (third-party investor)

Date: 2021-2025

Key contact

René VATOUX

Decarbonation Manager

Aéroports de Lyon

rene.vatoux@lyonaeroports.com

DRINKING WATER PRODUCED FROM AIR AND SOLAR ENERGY

Solution

Production of fresh drinking water without any connection to the water and electricity supply networks

Description

Device producing fresh drinking water (10 to 15 l/day with 2 hydro-panels) using only air condensation and solar energy.

Added value

Self-contained, sustainable device:
Zero greenhouse gas emissions
Zero groundwater extraction
>90% of the materials used to manufacture the device are mass-recyclable

Deployment

Customer: Olympia Odos

Territory: Greece

Budget: €10k excl. tax/unit

Date : 2021

Key contact

Fabrice BRETON

Technical Manager
Olympia Odos
fbreton@olympiaodos.gr /
fabrice.breton@VINCI-highways.com

FLOATING WIND PROJECT STUDY

Solution

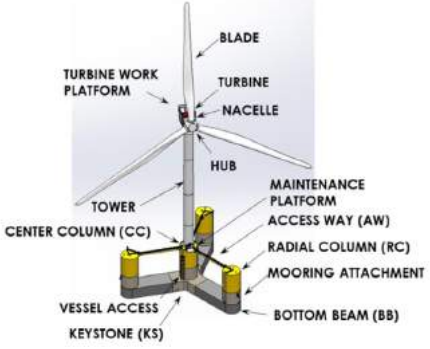
Manufacturing solutions for floating wind turbines: 100/200m high, quadripod operation, each branch 90 m long, with the aim of keeping weight down to a minimum by limiting the use of excess material.

Context

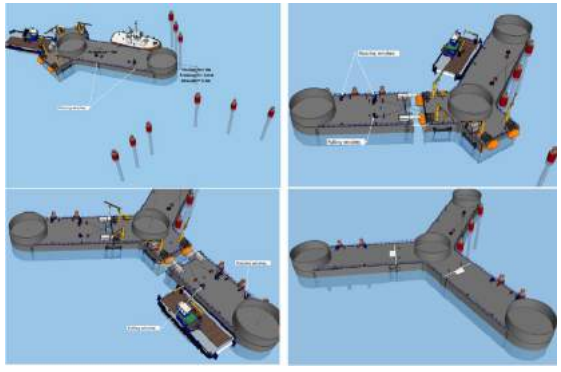
The gigantic scale of offshore wind turbines requires support infrastructures that are themselves out of the ordinary. Onshore construction of wind turbines must take account of this fact and the marine environment, while reducing the size of the manufacturing sites.
This study was carried out in response to the scarcity of available land and to avoid touching the seabed.

Added value

Reduced land-use conflicts, better energy performance (winds at sea are generally stronger and more constant than on land, enabling electricity to be generated more consistently and at higher output levels), location flexibility with more land available for siting, and reduced impact on the seabed.



Overview



Installation of elements

Deployment

Customer : VCGP

Territory: Le Havre, France

Date : 2022

Key contact

Emmanuel LACAUX

Technical Manager
Structures Engineering

emmanuel.lacaux@VINCI-construction.fr

ENGINEERING FOR THE MECHANICAL SECURING OF THE RTE NETWORK

Solution

Mechanical securing of the RTE network

Deployment

Client : RTE

Territory : France

Context

As part of the mechanical securing of the RTE network, Omexom is carrying out studies for the widening of forest trenches, the installation of anti-cascade pylons and the reinforcement of existing structures.

Added value

- Increasing the climatic resilience of power transmission lines across the entire RTE network over 15 years.

Key contact

Philippe LETSCHER

CEO

VINCI Energies Omexom

philippe.letscher@omexom.com

NETWORK UNDERGROUNDING

Solution

Secure networks by burying them underground

Context

Network burial work in urban and rural Territorys.
Construction of a 6 km 63 kV underground link.

Following storms Martin in 1999 and Klaus in 2009, RTE is pursuing a policy of securing the network, notably by burying lines.

Added value

- Improving safety
- Reducing disturbances
- Power system resilience in the event of hazards

Deployment

Customer: RTE

Territory: Landes, France

Budget: €2.2M

Date:2017 - 2019

Key contact

Nicolas LEGLISE

Business Manager

VINCI Energies Axians

nicolas.leglise@axians.com

EVE™ NON-DESTRUCTIVE TESTING OF TOWER CONDITION BY VIBRATION ANALYSIS

Solution

EVE™ is a on-destructive testing of tower condition by vibration analysis

Context

The EVE™ method, based on the measurement of dynamic parameters of a structure under ambient background noise, enables the diagnosis of structural aging or damage, as well as soil-structure interaction.

Added value

- The EVE™ method makes it possible to carry out diagnostics on structures subjected to intense wind phenomena, without damaging the structure.

Deployment

Customer :Swissgrid

Region: Auvergne-Rhône Alpes, France

Budget : 30k

Date : 2017

Key contact

Charles GOVIN

Business Developer

VINCI Energies Omexom

BUILDING MANAGEMENT SYSTEM

Solution

Thermal plant load shedding

Context

In the event of extreme outdoor temperatures (e.g. over 35 degrees), it may be necessary to switch from less critical Territorys to priority Territorys. The solution consists of a centralized remote control
control of electrical distribution equipment.

Added value

- This solution makes it possible to continue operating a building in a so-called "degraded" mode. It returns to "normal" mode as soon as the outdoor temperature has returned to a reference value.

Deployment

Customer: commercial buildings

Territory: Europe

Budget: all budgets

Key contact

Pierre MEGRET

Smart Building Project Manager

VINCI Energies Building Solutions

pierre.megret@vinci-energies.com

SHORT-CIRCUIT RECHARGING OF ELECTRIC VEHICLES

Solution

Renewable energy production and storage solutions for commercial buildings.

Context

This renewable energy production and storage offer for commercial buildings is designed to break free from the conventional electricity grid by producing its own energy within a commercial building, using photovoltaic panels to provide "green" energy.

The demonstrator for this offer has been installed at the Demouselle Tertiaire Pas-de-Calais site in Boulogne-sur-Mer, with the following characteristics: 125 m² of rooftop PV, representing 70 panels for an instantaneous output of 23 kW. The panels have a load per m² of 15 kg. In order not to lose this energy, storage is via second-hand batteries (Nissan LEAF) with a capacity of 20 kW. Installation of an IRVE terminal in the parking lot to recharge the fleet of electric vehicles, and those of visitors. Intelligent energy management using the WAVE platform from VINCI Energies Smart Building Energies.

Added value

- This self-production/self-consumption loop means that energy is constantly available thanks to the "storage" effect; in fact, this system covers 80% of overall consumption. The direct benefit is an 80% reduction in electricity bills.

Deployment

Customer: commercial buildings

Territory: France

Date:2022

Key contact

François CARLU

CEO

VINCI Energies Building Solutions

francois.carlu@demouselle.fr

WASTE HEAT RECOVERY FROM COOLING UNITS

Solution

Recovering waste heat from chillers

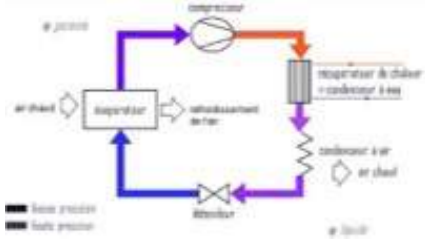
Context

In the evaporator of a chiller, the refrigerant takes on the heat of the medium to be cooled.
This waste heat is removed by the condenser. This heat can be recovered in large quantities thanks to a number of efficient processes well known to refrigeration engineers. Financial assistance from CEE, CPE, etc. is available.

The solution consists of installing a water-to-water chiller with heat recovery (the chiller consumes electricity to produce cold, and as it does so, it releases heat which is recovered (instead of being rejected into the environment). This heat is re-injected into the building's heating circuit.

Added value

- In industry, processes often run continuously, and buildings or domestic hot water are heated.
- In data centers, energy is recovered and fed back into heating networks.
- In hospitals, swimming pools, supermarkets, hospitals, ice rinks, etc., we analyze the possibilities for on-site energy recovery.



Deployment

Customer: industry, data centers, hospitals, swimming pools, supermarkets

Territory: France

Key contact

Elhem CHALGHMI

Operations Coordinator

VINCI Energies Building Solutions

elhem.chalghmi@vinci-facilities.com

AUTONOMOUS PHOTOVOLTAIC SYSTEM

Solution

Autonomous photovoltaic system

Context

The customer wanted to be self-sufficient in electrical energy, so as to be able to operate a sand pit on a site not connected to the electricity grid. It also wanted to reduce its dependence on fossil fuels while improving its carbon footprint.

The project involved the installation of a photovoltaic system coupled to the existing generator, as well as a set of control equipment to distribute and store energy in batteries.

Added value

- Photovoltaic panels produce energy according to the amount of sunlight, and surplus production is stored in batteries. The surplus is released by the system according to the operator's needs, and the generator runs only when demand is too high.
- As the winter period is the least favourable for full autonomy, it is the management unit that regulates and manages the switching on and off of the system (PV + GE) in complete autonomy.

Deployment

Customer: commercial buildings

Alsace region

Date:2022

Key contact

Luc HERBRECHT

Business Manager

VINCI Energies Building Solutions

luc.herbrecht@santerne.fr

PHOTOVOLTAIC SUNSHADE

Solution

Installation of a solar panel sunshade to reduce exposure of the offices to the sun and produce low-carbon energy.

Context

Photovoltaic panels were installed on an office facade in response to the need for sunlight.

This initiative enabled the company to sell 40,000 euros worth of electricity to EDF. At the same time, 6 tonnes of CO2 emissions were saved.

Added value

- Amortization of the project over 7 years is in line with forecasts, thanks to an average annual income of 4,000 euros.
- Contribute to less exposure to the heat for the building

Deployment

Customer: commercial buildings

Territory: France

Key contact

Alexis DAVOU

QSE Correspondent / Coordinator

VINCI Energies Building Solutions

alexis.davou@masselin.fr

KABERTENE - WIND FARM

Solution

Setting up a wind farm that resist to extreme heat

Context

Turnkey construction of Algeria's first wind farm in the Sahara desert. Integration of 12 generators for 850 kW GAMESA wind turbines operating at an ambient temperature of 50°C. This involved specific sizing of the power electronics and integration of the electrical equipment (medium-voltage cells, transformer and the generator's main generator main panel) in air-conditioned buildings.

Added value

- Resistance to extreme temperatures
- Resilience of infrastructure to cope with the heat of the local environment .

Deployment

Customer :SONELGAZ

Territory: Adrar region, Algeria

Budget :20 M

Date:2011 - 2014

Key contact

Benoit PUEYO

CEO

VINCI Energies Omexom

benoit.pueyo@f-g.fr

MICRO-GRIDS

Solution

Access to electricity via micro-grids

Context

Design, construction, operation and maintenance of 1,360 off-grid systems. Each site is equipped with 1.28 kWp photovoltaic panels, 3kWh batteries and solar inverters. Each house is equipped with 3 lamps and 2 sockets. Each system can produce up to 45 kWh per month.
This solution brought electricity for 1,353 households and 7 community centers without access to the grid
Ilumina Pantanal, a microgrid project in Brazil, was recognized at the Solar & Storage Live Awards 2021 held in Birmingham (UK) as the best project in the "International Solar and/or Storage Project of the Year" category.

Added value

- Cost-effective
- Environmentally-friendly

Deployment

Customer: CELPA - CENTRAIS ELÉTRICAS DO PARÁ S.A.

Territory: Tucurui - State of Pará, Brazil

Budget: 5.3 M

Date: 2018 - 2020

Key contact

Flavio GOMIDE

Business Unit Manager

VINCI Energies Omexom

flavio.gomide@omexom.com

ELECTRICAL SUBSTATION PROTECTION

Solution

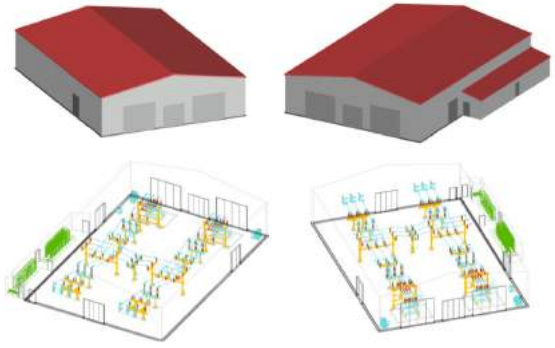
Electrical substation protected by a wooden structure to minimize environmental impact

Context

A 50/10kV (72.5/12 kV) substation dating from 1950, with equipment from the 1960s, is considered end-of-life and will have to be replaced by a new substation.
With this wooden weather protection, we need to do less blasting, use less backfill and less concrete. When the substation is protected from the elements, maintenance is reduced and the impact of the climate on the equipment is lessened, which means it is likely to last longer. In addition, the strength of the steel structure may be reduced due to less exposure to wind and weather, and therefore less metal in the foundations.

Added value

- Use fewer material resources
- Natural insulation
- Protection against climatic hazards



Deployment

Customer: any customer

Territory: Worldwide

Budget: project-dependent

Key contact

Gerd KARLSSON

Project manager

OMEXOM Sweden

Gerd.karlssons@vinci-energies.com

3.3 REPAIR SOLUTIONS

RECONSTRUCTION AND POST-CYCLONIC ADAPTATION

Solution

Resilient rebuilding of electrical networks: burying and reinforcing networks, raising structures, installing new transformer substations.

Context

Following the destruction of the power grids in the Northern Islands by Hurricane Irma in 2017, EDF and the Collectivités decided to rebuild a resilient network to guard against the rising waters concomitant with high-wind phenomena. The project was carried out in emergency response with local teams.

Added value

- Protecting infrastructures and coping with the intensification of extreme phenomena in the region, networks are now protected against new cyclonic events.

Destruction of networks in 2017

Deployment

Customer: EDF-SEI

Territory: Saint Martin and Saint Barthélémy (French West Indies)

Budget: €12.8 million

Date: 2018-2021

Key contact

Stéphane GORE

CEO of Getelec
VINCI Energies

stephane.gore@gp.getelec.fr

WATER-RELATED INFRASTRUCTURES

4.1 DIAGNOSTIC SOLUTIONS

CALEDONIA

Solution

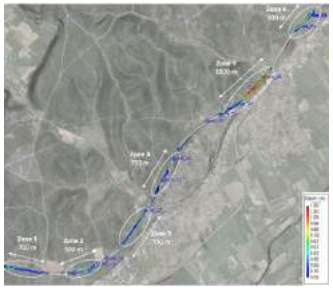
CaledonIA is a calculation program based on artificial intelligence algorithms that takes into account rainfall data from Météo France and simulates urban flooding in real time.

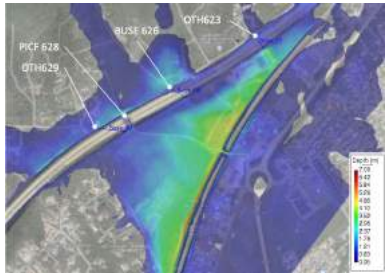
Context

Today, there is no software capable of rapidly predicting (on an hourly scale) 3D flows due to flooding in urban environments. However, in the Context of current climate change, the rainfall rates predicted by Météo France or others are only a few days ahead, leaving local authorities and fluid BEs unable to study future scenarios in the face of flood risk.
The A9 motorway is a case in point. In the past, the Gard region's vulnerability to heavy rainfall during Cevennes events has already blocked the A9 network. With climate change, these events will become more frequent. The aim of the study was to assess the consequences of exceptional rainfall on a section of the A9 freeway, flooding the freeway and detecting the water paths that could cause damage to the infrastructure.

Added value

- Identifying risks
- Anticipate impacts, particularly on users, surrounding Territorys and infrastructure
- Improve prevention and user awareness
- Prepare crisis management in line with potential impacts
- Make informed decisions on which investments to prioritize in a given Territory





Analysis of the impact of the simulation on the A9 infrastructure

Deployment

Customer: local authorities, cities, county councils, insurers, design offices

Territory: France

Key contact

Sofiane HADJI

Scientific Director Sixense Engineering
sofiane.hadji@sixense-group.com

DIAGNOSIS AND MONITORING OF DIKES - CARAPACE

Solution

3D dike modeling solution: installation of a digital twin to measure block displacements and check that the dike is in good condition in the face of risks of deterioration, ground settlement, heavy swell, etc.

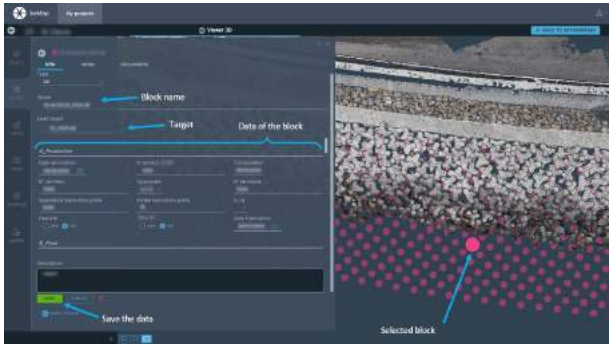
Context

- A patented 3D reconnaissance tool for dike and block analysis (bathymetric and aerial surveys),
- An asset management platform for long-term monitoring with centralized information and decision-making: enables comparison of the positions and displacements of dike blocks in the face of hazards.

Two main use cases have been identified: assisting engineering offices in the design (simulations) and subsequent installation of dykes, and enabling more reliable controls, or monitoring the condition of dykes in the face of continuous and extreme degradation, and alerting in the event of infrastructure non-compliance.

Added value

- Allows maintenance to be targeted effectively
- Ensures the safety of the structure, and therefore of the territories it protects, in the face of increasing risks linked to coastal erosion, rising sea levels and violent climatic hazards such as cyclones.



Dike monitoring platform

Visualization of dam movements block by block

Deployment

Customer: All customers

Territory: Mainly France and Middle East

Budget: All budgets

Date : Since 2019

Key contact

Elisabeth GARDON

Department Manager
Sixense Engineering

elisabeth.gardon@sixense-group.com

RESIL'ADAPT WATER

Solution

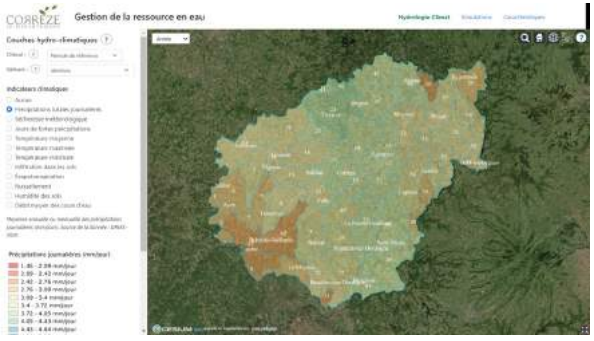
A tool dedicated to the resilient and concerted management of water resources, to adapt water-related uses in a given territory according to projected future evolution scenarios.

Context

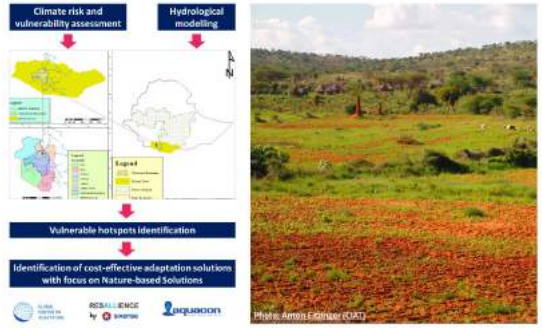
This solution involves modeling potential water resource shortages and surpluses. The modeling is then coupled with suggestions for improving or changing uses to adapt resource management to the impacts of climate change. Various levers for action, including nature-based solutions, are tested to compensate for water deficits as adaptation solutions. Case studies were carried out in two Territorys with different morphologies: the Corrèze department and the Borana region of Ethiopia.

Added value

- Identification of the Territorys with the greatest shortfalls in available water reserves for different uses
- Visualization of the geographical distribution of trends resulting from possible scenarios
- Decision support



Example of the solution's application to the Corrèze / RESALLIENCE department



Example of the application of the solution in the Borana region-Ethiopia / RESALLIENCE

Deployment

Customer: any customer whose activities depend on the availability of water resources, in particular local authorities and real estate concessionaires.

Territory: Worldwide

Budget: project-dependent

Date: 2022-23

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

RESILIENCE PERFORMANCE DIAGNOSIS (DPR)

Solution

Systemic modeling tool that studies all the climatic hazards impacting a region's infrastructures, projects and economy. It can be used to assess the losses and damage induced by these hazards, as well as the investment costs required to reduce losses and damage.

Context

The DPR is available in 4 versions, depending on the Territory to be studied:
DPR city, territory and region, which focuses on critical infrastructures and the interconnections that link them on a city, territory or region scale. This tool has been applied to the city of Tetouan in Morocco.
DPR island states, for systemic modeling of climate risks on the scale of these states, where high-stakes Territorys such as networks (electricity, telecoms, water) or airports are studied with a view to anticipating their economic and social impacts. Applications have been developed for the islands of Dominica and Barbados.
DPR bâtiment, a solution for property and asset managers, focusing on interconnections within the building and its immediate environment. This version has been deployed for CDC-Habitat (France) and AEW (France and Europe).

Added value

- Understanding the interconnections of a given space
- Visibility of Territorys for improvement
- Decision support

Exposure of a Caribbean island capital's buildings to flooding / RESALLIENCE

Deployment

Customer: local authorities, real estate asset managers

Territory: Worldwide

Budget: project-dependent

Date: 2021

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

RESIL HEAT ISLAND

Solution

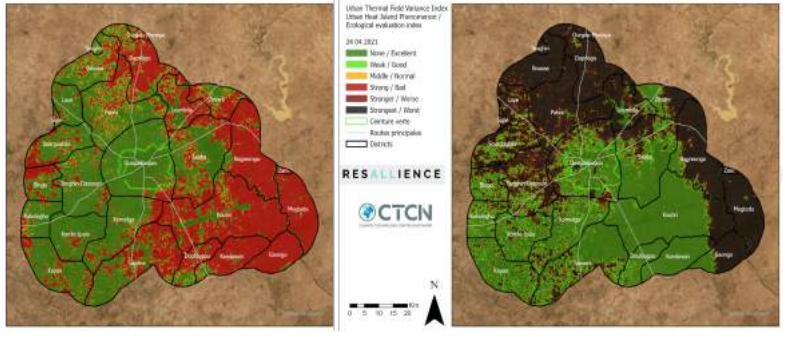
The Resil Heat Island uses satellite data to identify urban heat islands and propose appropriate solutions, including nature-based solutions.

Context

Resil Heat Island is a planning solution that helps local authorities manage their urban development plans by assessing the risks associated with urban heat islands and air quality. It can also be applied to flooding. An application was made as part of a pilot project in Ouagadougou, Burkina-Faso. It identified Territorys of interest for the implementation of nature-based solutions to reduce urban heat islands and flood-related risks, while providing other co-benefits such as income-generating activities or recreational spaces. Replication of this solution in the Context of cities in sub-Saharan Africa is entirely feasible. This project has been accredited by the United Nations Environment Programme and the CTCN.

Added value

- Analysis of urban heat islands
- Helping plan and manage the implementation of nature-based solutions in African cities
- Increasing territorial resilience



Modeling hot spots / RESALLIENCE

Deployment

Customer: any customer

Territory: Worldwide

Budget: project-dependent

Date: 2021-22

Key contact

Nicolas ZIV

Operations Manager

RESALLIENCE

nicolas.ziv@resallience.com

BIODI(V)STRICT

Solution

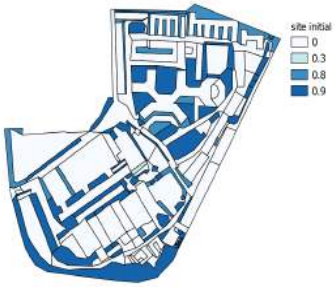
Biodi(V)strict® is a diagnostic and decision-making tool for improving the "biodiversity potential" of urban and peri-urban development projects.

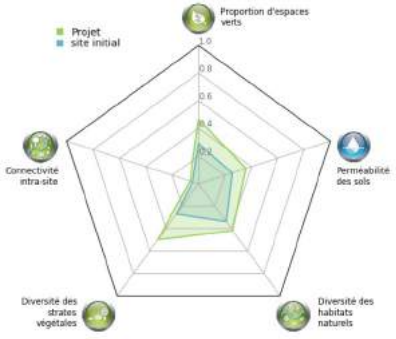
Context

Biodi(V)strict® is a computer program co-developed by Urbalia and AgroParisTech, using GIS (Geographic Information Systems) mapping via QGIS.
This tool enables the biodiversity potential of a project to be assessed, in comparison with the initial site and/or other development scenarios, by calculating five indicators. The values of these indicators and their before-and-after comparison enable us to identify the main pressures weighing on the site in terms of biodiversity, as well as its assets.

Added value

- Quantified measurement of urban biodiversity - before/after
- Indicators that everyone can understand
- Numerical and spatialized data on ecological habitats
- A fast, dynamic tool for simulating different scenarios





Deployment

Customer : Real estate promoters / developers / asset managers

Territory: France

Budget: variable (type, surface)

Key contact

Arthur TULLOU

Urbalia Project Manager

VINCI Construction
arthur.tullou@urbalia.fr

URBALIA – DIAGNOSTIC ÉCOLOGIQUE PATRIMOINE

Solution

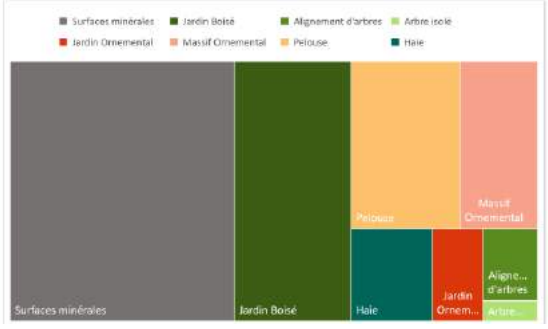
Ecological diagnosis of built and landscape heritage, analysis of biodiversity issues and implementation of an action plan to improve ecological potential.

Context

Urbalia carried out an inventory of the assets of a Parisian social landlord (over 450 sites in Paris), the RIVP, to identify the most relevant Territorys for improvement. The aim was then to launch new works/maintenance contracts to implement concrete actions on the sites identified.

Added value

- Setting up relevant and effective biodiversity indicators
- Produce a complete, quantified inventory of the situation
- A comprehensive approach: from diagnosis to the launch of new contracts
- Three new contracts put in place (differentiated management of outdoor spaces, creation of new semi-intensive green roofs, maintenance of existing green roofs, etc.).



Proportions of landscaping surfaces

Green roof - Patrimoine RIVP

Deployment

Customer: RIVP

Territory: Paris

Budget: variable according to assignment and surface Territory

Date: 2021-2022

Key contact

Arthur TULLOU

Urbalia Project Manager
VINCI Construction
arthur.tullou@urbalia.fr

BI2O

Solution

Bi2O is a tool for evaluating and comparing the environmental performance of development projects.

Context

Bi2O enhances the value of development solutions by tracking and quantifying environmental improvements, particularly in terms of stormwater management, urban heat island reduction and biodiversity.
This tool can be used to compare different versions of the same project with each other, or with what already exists. It can be used during the tender response phase, as well as during the project design phase.
Bi2O can be used to promote Revilo's offer, as well as other products and processes, to customers.

Added value

- Objective, recognized indicators
- A differentiating approach
- Rapid assessment

Deployment

Customer: All VINCI companies

Territory: France mainly

Budget : variable

Key contact

Marie OBLIGER

Technical Environment Engineer
VINCI Construction
marie.obliger@VINCI-construction.com

4.2 PREVENTIVE SOLUTIONS

GEOTEXTILE ENVIRO MAT – PROTECTION AGAINST COASTAL AND RIVER EROSION

Solution

Terre Armée offers a range of solutions to protect coastlines and riverbanks against erosion caused by rising sea levels and increasingly frequent extreme events. These include geosynthetic blankets filled with concrete on site and/or geotubes filled with sand by pumping.

Context

Formwork mattresses are made from a woven geotextile with a high polyester thread content, which gives the structure its shape and appearance. Geotubes are also made from woven geotextile and can be used to create dykes or reconstitute shorelines. It's an alternative, sustainable solution for erosion protection that can be applied in a wide range of applications, such as riverbank protection against erosion, dyke protection, coastal defense works, impermeable lining work for reservoirs or canals.

Formwork mattresses have been used, for example, to protect an industrial platform on the Maheskhali coast of Bangladesh from wave erosion.

Added value

- Reduce soil erosion and water velocity.
- Some solutions promote biodiversity by providing an environment conducive to plant growth, supporting ecological diversity and improving visual appeal.
- This solution is less expensive, requires lighter means of installation and has a reduced carbon footprint compared with traditional solutions (riprap or prefabricated concrete blocks).

Deployment

Customers: local authorities, transport infrastructure concessionaires, manufacturers

Territory: Worldwide

Some twenty references

Key contact

Thomas JOUSSELLIN

Chief Technical Officer

Terre Armée

thomas.joussellin@terre-armee.com

REVILO

Solution

An offer for urban cooling islands to combat urban overheating and encourage nature in the city. This offer is based on 4 levers: plants, water, soil and surfacing.

Context

With climate change, all cities are subject to urban heat island phenomena, with high temperature levels generating health risks. Revilo is a solution for cooling cities during summer heat waves. Revilo combines and optimizes 4 levers mastered by Eurovia:

- Plants to create shade, facilitate evapotranspiration and bring well-being to residents
- Rainwater management at plot level to direct it towards plants
- Soils for their capacity to store and infiltrate water
- Cladding to enhance permeability and albedo

Added value

- A complete solution
- A response to political ambitions, residents' expectations and the challenges facing the city and its technical departments
- A capacity to design the public space to be refreshed and carry out the work
- Numerous success stories

Garden of'Ars, Bordeaux (33)

Loubière Park, Toulon (83)

Cours OASIS, Paris (75)

Deployment

Customer: mainly local authorities

Territory: mainly France

Budget: variable

Date: since 2022

Key contact

Pierre MONLUCQ

Strategic Marketing Director

VINCI Construction Division Route France

pierre.monlucq@VINCI-construction.com

TRENCHMIX®

Solution

Creation of a Trenchmix ® watertight screen for the dikes (9,000 m² of Soilmixing wall).

Context

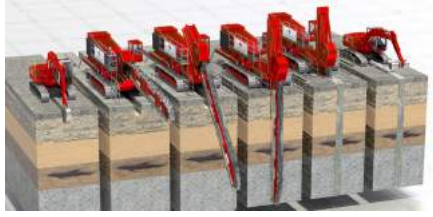
The Seine Grands Lacs project involves the creation of diked Territorys upstream of the Paris region, capable of holding back part of the water from the Seine in the event of a major flood. The Bassée pilot site is the first 360-hectare diked Territory, capable of holding 10 million m3 of water. A pumping station and an 8 km dike have been built in the communes of Châtenay-sur-Seine, Balloy, Egligny and Gravon.

Added value

- Resists the risk of flooding in the event of high water. Continuous screen construction. Reinforces the watertightness of existing reservoirs. Combats dyke erosion. Small machine footprint
- The environmental benefits of Trenchmix ® :
  - Fewer natural resources consumed, such as water, cement and aggregates, which are replaced by the soil in place.
  - Little or no spoil is produced.
  - Soil contamination is neutralized by treating it in situ with a binder.
  - No soil displacement

The Bassée pilot site

TM80 n°1 trencher



Deployment

Customer : The region

Territory: IDF

Date : 2023

Key contact

Fabrice MATTHIEU

Expert Methods Engineer

Soletanche Bachy

fabrice.matthieu@VINCI-construction.com

WASTEWATER STORAGE BASIN FOR HEAVY RAINFALL EVENTS

Solution

A structure designed to prevent wastewater from being discharged into the Seine from the Paris wastewater network during rainy events.

Context

Soletanche Bachy et Bessac was part of the consortium that built the water storage and release basin (the Austerlitz basin), as well as two water recovery structures from the storm overflows on either side of the Seine.
The basin is made of a 1.2 m thick diaphragm wall anchored at 60 m with precast bar posts. The shaft dedicated to launching the micro-tunneler, adjacent to the basin, enabled work on the tunnel to start independently of progress on the basin.

Added value

- Eliminate current discharges of wastewater from the Paris sewer system during heavy rainfalls
- Improve the sanitary quality of Seine water in preparation for the 2024 Olympic Games and the installation of permanent bathing facilities in the Seine in Paris.
- Mastery of high-depth deviations for cast walls and barrettes, combined with high-strength low-carbon concrete

Austerlitz basin construction site aerial view

Inside's view

Deployment

Customer : City of Paris

Territory: Paris

Date : 2021

Key contact

Stéphane MONLEAU

Communications and Marketing Director, Eurofrance

VINCI Construction

stephane.monleau@VINCI-construction.com

HYDROVIA®

Solution

HYDROVIA® is a range of permeable solutions designed to meet the challenges of rainwater infiltration in urban environments. Hydrovia® Soft for soft mobility, Hydrovia® Park for lanes and parking lots, and Hydrovia® Roc and Hydrovia® Print, two complementary alternatives, all depend on the intended use, the expected level of stress and the desired aesthetic effect.

Context

Integrated stormwater management is one of the major thrusts of urban planning and resilience. One of the levers is the use of permeable pavements to infiltrate rainwater "as close as possible to where it falls", while maintaining properties compatible with the intended use: safety, durability, landscape integration. HYDROVIA® range solutions are designed to limit rainwater runoff and infiltrate it as soon as possible.

Added value

- Versatility of the range's solutions: resistance to shearing (surface stripping under car parking), integration of vegetation, landscape integration, etc.
- Possibility of enhancing the color of aggregates with a translucent binder (Solis®), improving their albedo and helping to limit the rise in surface temperature.
- These easy-to-install solutions are particularly well-suited to soft lanes and car parks.

Hydrovia® Soft – Nancy (54)

Hydrovia® Park

Hydrovia® Print

Hydrovia® Roc

Deployment

Customer: All customers

Territory: France

Budget: All budgets

Date : Since 2022

Key contact

Nicolas HIROUX

Technical Engineer

VINCI Construction

nicolas.hiroux@VINCI-construction.com

RESERVOIR PAVEMENTS

Solution

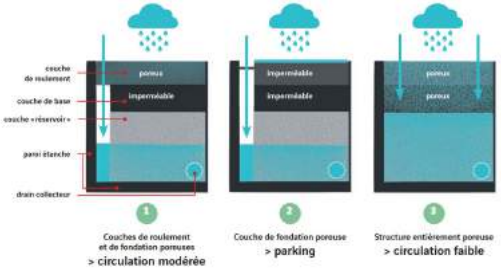
Reservoir pavements are pavement structures with a high water retention capacity. Thanks to their high voids index, these layers of pavement materials buffer rainwater before releasing it back into the natural environment via direct infiltration and/or the stormwater network.

Context

Integrated stormwater management is one of the major thrusts of urban planning and resilience. One of the levers is the use of complete structures such as reservoir pavements, wherever the project footprint allows. By buffering the large volumes of rainfall that can be captured during storms, they enable deferred restitution to the natural environment (depending on its infiltration capacity) or to the network, at a regulated flow, depending on the configuration.

Added value

- High water retention/infiltration capacity on a small footprint
- Particularly suitable for light vehicle parking Territorys
- Adaptable performance to project constraints



The different types of structure

Reservoir roadway under construction

Deployment

Customer: All customers

Territory: France, International

Budget: All budgets

Date : over 30 years

Key contact

Nicolas HIROUX

Technical Engineer

VINCI Construction

nicolas.hiroux@VINCI-construction.com

EQUO VIVO - ECOLOGICAL ENGINEERING EXPERTISE

Solution

Ecological engineering know-how to promote ecosystem resilience. Mastery of all techniques aimed at improving and restoring biodiversity and ecological functions in all natural and artificial environments.

Context

Equo vivo has been awarded the contract for compensatory measures for the Bassée pilot site project in Châtenay-sur-Seine (77).
The project is located in regulated Territorys (two type I ZNIEFFs, one type II ZNIEFF) and in the flood zone of the Seine. Ecological works are to be carried out on the periphery of bodies of water, historically former material extraction sites, in coordination with the project's infrastructure works. In summary, 200,000m3 of earthworks divided into 21 cut/fill zones on the various water bodies, 2Ha of wetlands created and/or restored, 25Ha of meadows reconstituted

Added value

- Management and coordination of the various trades required for the project: forestry work, earthworks, plant engineering, etc.
- Adaptation of all projects in order to obtain the desired functionalities (re-alignment of projects taking into account water table levels, balance of earth movement, etc.).
- Adaptation of in-house methods and equipment for work in wetlands (tracked dumpers, marsh shovels, amphibious shovels).
- Consideration of species life cycles in work planning

Landscaping at the end of earthworks

Overall plan

Deployment

Customer: EPTB Seine Grands Lacs

Territory: ¨Seine-et-Marne

Budget: €5.05M

Date: 2021-2024

Key contact

Julien PERRIN

Equo Vivo brand Manager
VINCI Construction
julien-philippe.perrin@VINCI-construction.fr

FLOOD PREVENTION ACTION ON THE A355 HIGHWAY

Solution

Implementation of specific storage facilities to collect water from natural catchment Territorys, and thus contain a 100-year rainfall event.

Context

The A355 is a new-generation freeway, exemplary in terms of ecological transparency and environmental integration. Benefiting from innovative environmental measures, this new freeway is also the first road infrastructure project in France to have been subject to compensatory measures even before construction began. A total of 1,315 hectares of environmental compensation were deployed during the development of this major bypass. That's more than 4.5 times the project's final footprint! These measures particularly concern forests and wetlands. Several watercourses located on or near the freeway were re-mandered, with the addition of hydraulic compensation zones. The aim? Restore their original character, regulate their flow and make them more conducive to the development of biodiversity. At the same time, the structures used to cross them have all been designed to take account of their expansion in the event of an exceptional 100-year flood.

Added value

- Limit the impact of infrastructure operations,
- Contribute to the long-term safety, sustainability and resilience of the infrastructure,
- Eliminate the barrier effect of the infrastructure and protect downstream villages from flooding.

Deployment

Customer : VINCI Autoroutes

Territory: ARCOS network

Budget: included in the construction of the A355

Date : 2021

Key contact

Arnaud Guillemin

Environmental Manager
Réseau Arcos
arnaud.guillemin@VINCI-autoroutes.com

SUSTAINABLE FLOOD RISK MANAGEMENT

Solution

An alternative, ecologically focused and nature-based approach to flood mitigation, using natural flood management techniques on a watershed scale, while integrating ecological value at the design stage (Nature Based Solutions: NBS).

Context

The HS2 high-speed rail link crosses numerous watercourses and their associated flood plains, so without mitigation measures the project is likely to increase the risk of flooding in riparian Territorys. Flood mitigation is usually achieved in the form of hydraulic compensation zones. However, these conventional flood mitigation measures require changes to the topography, resulting in the removal of topsoil and clearing of vegetation, making it difficult to meet HS2's biodiversity commitments: Achieving Zero Net Loss in Biodiversity.

Added value

- Maximize the HS2 line's resilience to climate change.
- Minimize the impact on natural environments and enhance biodiversity on the project.
- Reduce greenhouse gas emissions on the project.
- Reduce costs associated with flood management.

Grazing in wetlands

Canley Brook: Design of hydraulic compensation zone

River Cole: Design of the hydraulic compensation zone

Deployment

Customer: HS2

Territory: N1 N2 BBV JV

Date: 2022

Key contact

Papa Samba DRAME

Head of Environment & Sustainability GeoInfrastructure - BBV

papasamba.drame@VINCI-construction.com

ACTION TO PREVENT CLIMATE CHANGE - A51

Solution

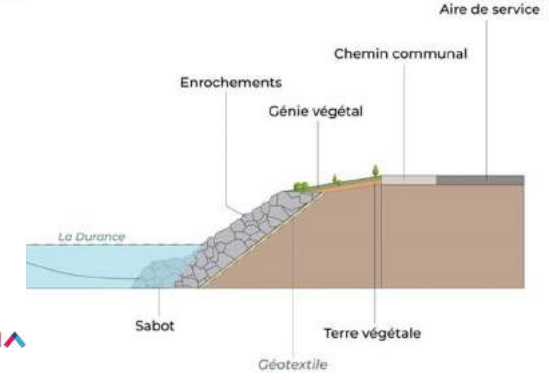
Reinforcement of rockfill banks to protect the A51 freeway from flooding on the Durance.
Vulnerability studies, risk analysis.

Context

The Durance, a tributary of the Rhône, is a river whose hydraulic regime is influenced by rainfall in the Mediterranean climate and by snowmelt from the massifs of the Southern Alps. In the past, the Durance has been the subject of numerous hydroelectric developments, as well as the exploitation of its water and aggregate resources. For several years now, the river's management policy has been aimed at achieving a more natural flow, which has modified the bed's morphology. The effects of climate change and hydromorphological modifications to the riverbed are causing increasingly large, aggressive and frequent floods, particularly for the A51 freeway, which is partly built along the Durance. A number of localized erosions, threatening the stability of the freeway, have necessitated rockfill bank reinforcement work; this is particularly the case at Manosque, with the reinforcement of 210 m of existing banks, to be completed in 2023.
In addition, a comprehensive study of the vulnerability of the A51 motorway to flooding on the Durance, taking into account changes in the river's climate and hydromorphology, has been carried out on the basis of risk analyses, and entrusted to Artelia.

Added value

- Contribute to the long-term safety, sustainability and resilience of the infrastructure.
- Anticipate risks to infrastructure...



Reinforcing the banks of the A51 at Manosque - 2023

Deployment

Customer : VINCI-Autoroutes

Territory: ESCOTA network

Budget: €1.1 M excl. tax (val June 2010) (Manosque works)

Completion date: 2023

Key contact

Frédéric Depaepe

Technical Director VINCI Autoroutes
VINCI Autoroutes
frederic.depaepe@VINCI-autoroutes.com

ITAMI - FLOOD PREVENTION MEASURES FOR HEAVY RAINS

Solution

ITAMI - Preventive drainage measures to cope with flooding at Japan's Kansai airport.

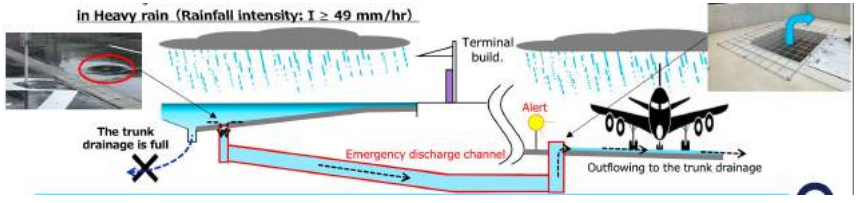
Description

Situated on an artificial island, almost 5 km from the coast, Kansai airport is 5 metres above sea level. A number of measures have been taken to mitigate the risk of flooding:

- Preventive measures: installation of an inflow drainage channel (the drainage trench receives surface water flowing into the parking area from outside the airport during heavy rainfall, and the water is discharged into the existing underground collector, preventing flooding of low-lying roads and parking areas) and an underground drainage canal.
- Measures to be adopted in the event of flooding: installation of a removable water stop plate on the automatic door and watertight doors for the generator rooms (to be installed in 2019)
- Measures for rapid restoration: acquisition of a large drainage pump vehicle (introduced in 2019)

Added value

- Passenger and personnel safety
- Ensuring business continuity or rapid recovery
- Adaptability of infrastructures to climatic contingencies



Deployment

Client : ITAMI

Territory : Japan

Key contact

Mathieu BOUTITIE

Technical Director
VINCI Airports Japan KK
mathieu.boutitie@kansai-airports.co.jp

TYPHOON AND FLOOD DISASTER PREVENTION AT AIRPORTS

Solution

Disaster prevention linked to the impact of typhoons and flooding on airports due to climate change

Description

Kansai Airports, in partnership with Kyoto University's Disaster Prevention Research Institute and Kumamoto University's Department of Civil Engineering and Architecture, have developed a model capable of forecasting weather conditions (typhoons and extreme weather events) in relation to climate change, and numerically analyzing the impact on airports of natural phenomena such as precipitation, waves and storm surges. This model could enable more accurate disaster planning not only for Kansai International Airport, but also for other airports. The model has been developed and put into practice, and has been validated by reproducing the damage caused by Typhoon JEBI in 2018.
The model will enable the development and revision of investment plans for dike maintenance, etc. at Kansai International Airport and Kobe Airport using a typhoon model that takes climate change into account. The target areas are the two Osaka Bay airports.

Added value

- Adapting infrastructures to climatic hazards
- Anticipation of extreme weather events

Deployment

Territory : Japan

Key contact

Mathieu BOUTITIE

Technical Director
VINCI Airports Japan KK
mathieu.boutitie@kansai-airports.co.jp

DRINKING WATER PRODUCED FROM AIR AND SOLAR ENERGY

Solution

Production of fresh drinking water without any connection to the water and electricity supply networks

Description

Device producing fresh drinking water (10 to 15 l/day with 2 hydro-panels) using only air condensation and solar energy.

Added value

- Self-contained, sustainable device with:
  - Zero greenhouse gas emissions
  - Zero groundwater extraction
  - >90% of the materials used to manufacture the device are mass-recyclable

Deployment

Customer: Olympia Odos

Territory: Greece

Budget: €10k excl. tax/unit

Date : 2021

Key contact

Fabrice BRETON

Technical Manager
Olympia Odos
fbreton@olympiaodos.gr /
fabrice.breton@VINCI-highways.com

THAMES TIDEWAY TUNNEL

Solution

Design and construction of a tunnel for wastewater storage and transfer from central London to the wastewater treatment plant. The project comprises a 5.5 km main tunnel (7.2 m diameter) and a 4.6 km connecting tunnel (5 m diameter), 5 shafts with internal structures and electromechanical works.

Context

The Thames Tideway Tunnel is a very large-scale project, 25 km long and varying in depth from 35 to 66 meters. It can hold up to 1.6 million cubic meters of wastewater and is built to operate for 120 years, based on climate models from the Met Office Hadley Centre (UKCP09). Modelling of the future scenario suggests that in a typical year, climate change and population growth will greatly amplify the number of sewer overflows into the Thames by 2080.

Added value

- Explore uncertainties for the 2050 and 2080 horizons through climate projections and build for the future.
- Make a vital contribution to the necessary control and improvement of Thames water quality in the near future through resilient infrastructure.
- Resist the risk of rising water levels: new anti-flooding structures built, in particular, on the King's Edward Memorial Park site along the Thames have been designed to allow for a rise in their level in the future, according to water level projections published by the UK Environment Agency (TE2100).

Tideway East interior view

London tunnel construction sites

Deployment

Customer : Bazalgette Tunnel Limited (Tideway)

Territory: London, United Kingdom

Budget: £1.2 billion

Date: 2015-2024

Key contact

André TOURTOIS

Directeur de Projet Adjoint
VINCI Construction
Grands Projets

andre.tourtois@VINCI-construction.com

DEVELOPMENT OF THE COTINIÈRE FISHING PORT

Solution

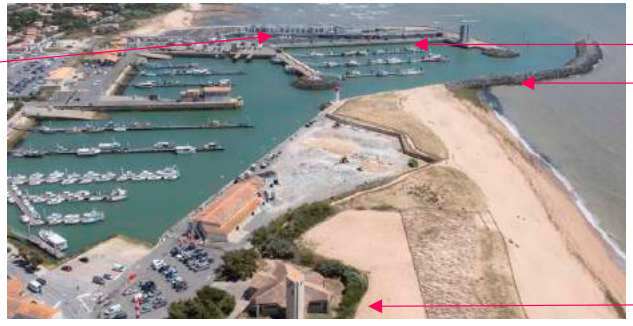
Redevelopment of coastal Territorys: design and construction of dykes and quays to withstand and adapt to rising water levels

Context

On the existing port, construction of a 3rd basin, 2 protective dikes, a 250 m quay, a median strip and a new fish market, all designed to withstand 100-year combinations of events and the rise in sea level by 2100 (+ 0.60 m). In addition, a former unauthorized parking lot will be revegetated. This project is part of an overall strategy for the department and its local authorities to redevelop coastal Territorys: work on biodiversity and dune ecosystems, reinforcement of protection against flooding and other climatic hazards.

Added value

- Improving the protection of land and people against future risks associated with rising sea levels.
- Restore the Territory's dune balance and reduce the artificialization associated with the construction of new dykes and embankments by revegetating the former unauthorized parking lot:
  - Helps combat erosion and maintain the dunes as natural protection
  - Minimizes the need for dyke and dune maintenance.



View of the port of La Cotinière after construction (2022)

Pre-work renaturation zone (2019)

Post-work renaturation zone (2022)

Deployment

Customer : Department of Charente-Maritime

Territory: Saint Pierre d'Oléron

Budget: €65M

Date : 2016-2021

Key contact

Antoine BLANDIN

Project Manager Térélian VINCI Construction

antoine.blandin@VINCI-construction.com

HYDROPLUS®

Solution

Installation of 14 labyrinth-type Fusegate®, 3 m high, increasing the reservoir's storage capacity by 31%.

Context

The Sans Souci hydroelectric dam, operated by the Central Electrical Board (CEB), is located on the island of Mauritius. The Mauritian government, wishing to reduce its dependence on fossil fuels, decided to increase the dam's hydroelectric production capacity.
The feasibility study showed that the optimum solution was to raise the level of the normal reservoir by 3 m using a Fusegate® system. This resulted in a storage gain of 1.36 hm3, representing 31% of the original volume. Annual energy production can thus be increased by 3 GWh per year.

Added value

The raising of the Sans Souci dam is a fine example of hydroelectric optimization on an existing site. Thanks to the use of Fusegate®, the dam was raised without reducing the safety of the structure.
By replacing a thermal energy source, this project is extremely interesting from a carbon footprint point of view. Over an average year, the additional production of 3Gwh saves 3180 tCO2e per year compared with the same energy produced by a coal-fired power station.

Deployment

Customer: Dam operators and owners

Territory: Worldwide

Budget: All budgets

Date : Since 1991

Key contact

Franck DEL REY

Director

Hydroplus SAS

franck.delrey@VINCI-construction.com

SIBELONZIP ET SIBELONMAT

Solution

Geomembrane-based lining systems are placed underwater, while the canal continues to operate normally.
SIBELONZIP®: prefabricated geomembrane waterproofing in panels, with a zipper system to connect them underwater.
SIBELONMAT® : waterproof mattress made of geotextiles and two geomembranes, injected with cement grout.

Context

Canal reclamation is a very costly operation, and it is not always possible to interrupt canal operations.
These activities have a considerable impact on the local environment and biodiversity.
SIBELONMAT® and SIBELONZIP® solutions can be installed underwater at any depth, covering the entire surface or just the critical Territorys.

Added value

- Save water: prevent water losses and ensure efficient capture, storage and distribution of water throughout the water cycle.
- Avoid interruption of canal operation, with all the attendant consequences in terms of operation, cost, environmental impact, impact on local communities, etc.
- Rapid construction process: fewer personnel, less activity on site, fewer installations required, less machinery used.
- By maintaining water levels and flows, they promote biodiversity, ecosystem health and the sustainable use of water in the surrounding environment.
- Prevent catastrophic scenarios caused by dyke instability.

SIBELONMAT®

SIBELONZIP®

Deployment

Customer: all

Territory: worldwide

Date : since 2018

Key contact

Serena GUANCI

QHSE

Carpi Tech

VINCI Construction

serena.guanci@carpitech.com

FLOATING WIND PROJECT STUDY

Solution

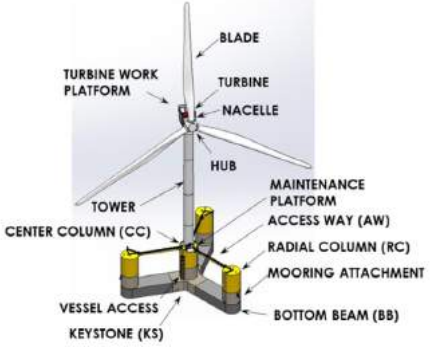
Manufacturing solutions for floating wind turbines: 100/200m high, quadripod operation, each branch 90 m long, with the aim of keeping weight down to a minimum by limiting the use of excess material.

Context

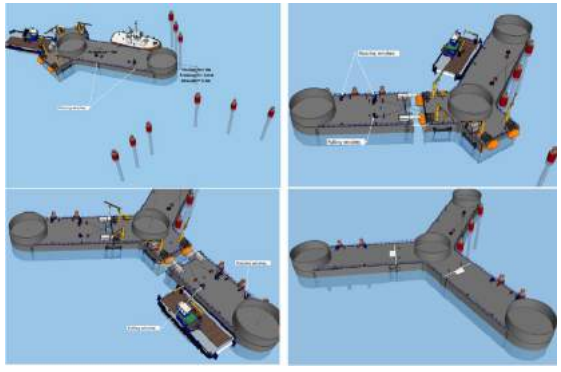
The gigantic scale of offshore wind turbines requires support infrastructures that are themselves out of the ordinary. Onshore construction of wind turbines must take account of this fact and the marine environment, while reducing the size of the manufacturing sites.
This study was carried out in response to the scarcity of available land and to avoid touching the seabed.

Added value

Reduced land-use conflicts, better energy performance (winds at sea are generally stronger and more constant than on land, enabling electricity to be generated more consistently and at higher output levels), location flexibility with more land available for siting, and reduced impact on the seabed.



Overview



Installation of elements

Deployment

Customer : VCGP

Territory: Le Havre, France

Date : 2022

Key contact

Emmanuel LACAUX

Technical Manager Structures Engineering

emmanuel.lacaux@VINCI-construction.fr

WATER MANAGEMENT AND IOT MONITORING

Solution

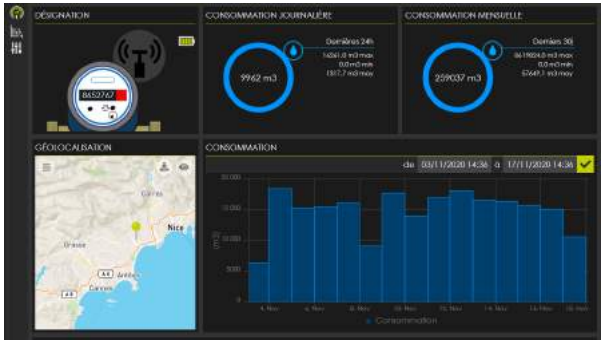
Efficient water management required for healthcare facilities

Context

Efficient water management is essential for healthcare establishments, enabling them to meet a dual challenge: health safety and water savings.
The company won the water management contract for APHM's Hôpital Timone and Hôpital Nord, proposing a comprehensive water management solution that includes the supply, installation and parameterization of water meters, the definition of a water consumption target and an IoT monitoring system based on the IOThink solution, with the installation of sensors to monitor temperatures and water consumption.

Added value

- Two-thirds of facilities claim to have a policy of reducing water consumption.
  - Of these, 85% use water-saving equipment
  - 72% raise staff awareness of this issue.



Deployment

Customer: Hospitals

Territory: Marseille

Key contact

Nicolas BAUDIER

Activity Manager

VINCI Energies Building Solutions

nicolas.baudier@vinci-facilities.com

LE GALION

Solution

Combustion turbine in a flood zone liquefiable in the event of an earthquake

Context

Installation of a combustion turbine, in a flood zone and liquefiable in the event of an earthquake, to secure the island's electricity supply. High-voltage substation based on ballasted columns on embankments, above the 100-year flood level.

The reinforced design proved its worth when, just a few months after commissioning, the plant had to cope with Hurricane Dean.

Added value

- Contribute to the resilience of the infrastructure to climate risks

Deployment

Customer : Albioma

Territory: Martinique, France

Budget : 20 M

Date : 2005 - 2007

Key contact

Arnaud BANNER

Technical and Innovation Director

VINCI Energies Omexom

arnaud.banner@vinci-energies.com

4.3 REPAIR SOLUTIONS

CARPI – UNDERWATER RENOVATION AND REHABILITATION OF DAMS

Solution

Underwater installation of CARPI waterproofing system using SIBELON® geomembrane on hydraulic structure

Context

Dewatering reservoirs is not always possible due to project-related constraints, such as the canal's role in water supply or the risk of energy loss in hydroelectric schemes, or because emptying and filling the reservoir may damage its structure.
In such cases, underwater installation becomes necessary. Compared with dry installation, the underwater working environment requires the modification of certain components and a specialized team.

Added value

- Geomembrane ensures watertightness
- Avoiding impacts on fish, wildlife, the environment and economic activities
- Reservoir depletion halts or reduces hydroelectric power generation.
- Reservoir depletion interrupts water supplies for human consumption and irrigation.
- Reservoir depletion requires permits, which are sometimes difficult/impossible to obtain.

SIBELON® Geomembrane unrolling, positioning and fixation underwater

Deployment

Client : all

Territoire : worldwide

Budget : all

Date : since 1994

Key contact

Serena GUANCI

QHSE

Carpi Tech

VINCI Construction

serena.guanci@carpitech.com

MAINTAINING A RIVER CROSSING UNDER NOMINAL HYDRAULIC CONDITIONS

Solution

Intervention in the event of an intense rainfall event, to remove any logjams that reduce the capacity of a river crossing structure (set of nozzles) below its nominal capacity.

Context

In the Alpes-Maritimes region, the A8 freeway crosses the Brague coastal river via a series of hydraulic nozzles. When originally designed in the 1950s, this system was designed to withstand a 30-year flood. Beyond this level, the freeway is invaded by high water and no longer plays its role.

Poor maintenance of the banks of the Brague upstream of the freeway can, in the event of flooding, lead to the arrival of logjams on this crossing structure. Jams larger than the diameter of the individual culverts are blocked by the culverts, reducing their capacity to below their rated capacity. This increases the likelihood and frequency of freeway closures due to flooding of traffic lanes.

In the event of a forecast heavy rainfall event, a truck crane is positioned above the nozzles to remove any ice jams that may obstruct them.

Added value

- Keeping the freeway running, particularly vital in the event of a weather event, especially to enable emergency services to get around.

Flooding of the A8 freeway by the Brague river

Removal of logjams

Deployment

Customer : VINCI-Autoroutes

Territory: ESCOTA network

Budget : 3 k€ HT

Date : Recurrent

Key contact

Blaise RAPIOR

Managing Director ESCOTA
VINCI Autoroutes
Blaise.rapior@VINCI-autoroutes.com

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Writing and editing: **Valentine Huet** et **Julien Villalongue**
Contributors: **Alice Porcherot** et **Law Verra**

Leonard
6 place du Colonel Bourgoin
75012 Paris
contact@leonard.vinci.com

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