



SOLUTIONS FOR THE
**ENVIRONMENTAL
TRANSITION**
OF BUILDINGS
White paper



BUILDING SOLUTIONS

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The building of the future, more respectful of people and the environment, is already here. VINCI Energies Building Solutions is aware of its key role in guiding this transition.

To contribute to engaging the sector in sustainable progress, VINCI Energies Building Solutions offers a set of solutions that have been tested, optimised, approved and then implemented to boost efficiency on a larger scale. Together, they are shaping the sector, a sector that is demonstrating its ability to adapt to the new game rules that are creating our future.

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*More than ever,
 the building sector
 is the focus of all
 expectations."*



Philippe Conus,
 Director
 VINCI Energies
 Building Solutions

Due to the long-term perspective of its activities, the building sector sits at the crossroads of major transitions: climate, energy, digital, demographic, health and social. In response to these changes, the building sector is adapting and even taking on a new role. The sector has gone from being a passive player to a creator of solutions, recognised for its ability to meet future challenges.

A growing number of incentives are being implemented to accelerate the building sector's environmental transition. This pressure comes from occupants themselves, from private and public operators on a pathway towards carbon neutrality, and from investors who incorporate ESG criteria into their investment decisions. What's more, changing economic conditions coupled with rising energy costs, as well as additional legal requirements with the introduction of new environmental regulations, are driving industry actors to reinvent themselves.

To meet these challenges, VINCI Energies Building Solutions, the VINCI Energies business line dedicated to buildings, has set a clear target: bring life to buildings so that they are more sustainable, liveable, and performant. With their strong local roots, our 560 business units (engineering and construction, operation-maintenance and facility management) are working alongside their customers to achieve this goal.

To this end, we are deploying a wide range of environmental solutions, which are detailed in this white paper. These initiatives guide our customers through their environmental transition and the decarbonisation of their buildings. But the challenge is more far-reaching. Our aim is to accelerate the current progress towards sustainability in a truly collective approach.

VINCI ENERGIES' ENVIRONMENTAL POLICY

VINCI Energies is fast-tracking the environmental transition by acting on two major shifts: the energy transition and the digital transformation.

In keeping with the overarching objectives of VINCI Group, we are rallying our employees, customers and suppliers to contribute to tackling these challenges.

VINCI Group has set its environmental ambition for 2030, which has been translated into three priority areas.

Acting for the climate

By reducing our greenhouse gas emissions in line with the commitments of the Paris Climate Agreement to limit global warming to less than 2°C by the end of the century.

Optimising resources

By improving design and production processes, reuse and recycling to move our businesses towards a circular economy approach.

Preserving natural environments

By minimising the impact of our projects on natural environments and by developing solutions to conserve water resources and promote ecological restoration.



VINCI ENERGIES BUILDING SOLUTIONS IS THE VINCI ENERGIES BUSINESS LINE DEDICATED TO BUILDINGS

VINCI Energies Building Solutions business units operate across the life cycle of buildings to make them low-carbon, liveable and performant.

Their technical expertise covers all necessary systems and equipment that bring life to the building, such as electrical and thermal engineering, smart buildings, plumbing, fire protection and safety. They also provide operational support, through the VINCI Facilities brand, in the form of multi-technical maintenance and facility management services.

Operating in 20 countries, VINCI Energies Building Solutions is a global player with a strong network of local business units attuned to the needs of the clients they serve. Its 560 business units leverage cutting-edge expertise and solutions in the fields of energy performance and environmental sustainability, caring for the planet and useful to people.

INTRODUCTION

BUILDINGS: A KEY ROLE IN THE ENVIRONMENTAL TRANSITION

The building sector is Europe's fourth biggest greenhouse gas emitter. Not only does it produce 26% of total CO₂ emissions, it accounts for 30% of global energy consumption worldwide. That makes the building sector a key front in the fight against climate change. (Source: International Energy Agency, 2023).

The sector moves into action

In 2022, the building sector posted a slight decrease in greenhouse gas emissions (GHG) compared to 2021. (Source: European Environmental Agency). The improvement in this indicator is due to a combination of economic factors and political measures, such as campaigns to scale back energy consumption, a mild winter and higher energy prices. This downward trend must continue, as advocated in European Green deal, which has set a target to reduce net greenhouse gas emissions by at least 55% by 2030 and achieve full decarbonisation by 2050.

Untapped potential

Worldwide, the building sector has the potential to reduce its GHG emissions by 66% by 2050. After transport, the building sector is one of two sectors with the highest mitigation potential. By way of comparison, by 2050 the food sector could potentially reduce its GHG emissions by 44% and industry by 29% (Source: IPCC March 2023).

TAKING ACTION FOR THE ENVIRONMENTAL TRANSITION OF BUILDINGS

New buildings integrate environmental regulations as of the construction phase, but the stock of existing buildings is a significant factor in the climate equation. It is estimated that 80% of the new buildings that will be occupied by 2050 already exist. That is why the building transition should focus on transforming and renovating the existing built environment for the years to come.

Contributing to more sustainable building

Sustainable building takes a long-term perspective that embodies a responsible lifestyle while respecting the environment and building occupants. This entails setting the following criteria:

- minimised energy consumption;
- efficient use of natural resources;
- self-consumption of renewable energy;
- design and management based on circular economy principles;
- priorities on occupants' health, comfort and safety, as well as regional development;
- characteristics allowing for climate change adaptation.

Assessing environmental impact

A building project can generally have about a dozen environmental impacts. These impacts can affect:

- air quality;
- water quality;
- natural resources;
- human health.

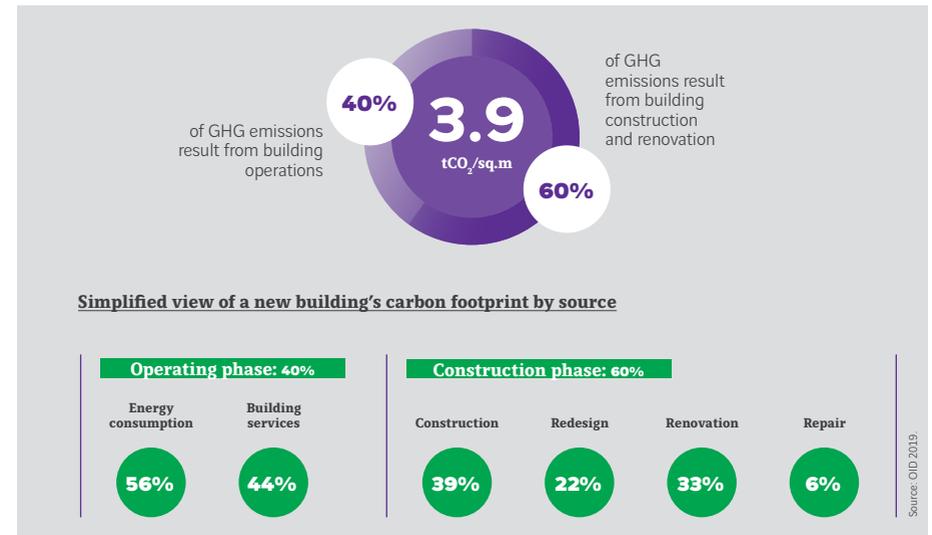
While a building's overall environmental footprint will grow in the years to come, current focus is on its carbon footprint and optimisation of resources needed to mitigate climate change. Air and water quality for occupants will also become areas of concern.



Covering the entire building life cycle

From construction to operation, carbon is emitted at every stage of a building's life cycle. The induced environmental impacts therefore need to be taken into consideration over the entire building life cycle.

BREAKDOWN OF CARBON IMPACT BETWEEN CONSTRUCTION-RENOVATION AND OPERATION-MAINTENANCE PHASES



SUPPORTING THE ENVIRONMENTAL TRANSITION

SOLUTIONS TO DECARBONISE ENERGY AND ITS USES

-  **Improving** a building's energy efficiency
-  **Developing** a building's energy mix
-  **Aiming** for low-carbon mobility

SOLUTIONS TO DECARBONISE MATERIALS AND EQUIPMENT

-  **Adopting** a carbon strategy as of design and implementation
-  **Aiming** for low-carbon sourcing
-  **Implementing** low-carbon management and operations

SOLUTIONS TO PROTECT NATURAL RESOURCES

-  **Optimising** water management
-  **Protecting** biodiversity

SOLUTIONS TO ADAPT TO CLIMATE CHANGE

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FOUR STEPS TO DECARBONISE BUILDINGS

A methodology based on the ACT (Assessing low-Carbon Transition) process developed by the Carbon Disclosure Project (CDP) and the French environment and energy agency (ADEME), can be transposed and adapted to building works and maintenance projects.

1 Analyse emissions

Measurement is the first step in a building decarbonisation plan.

When it comes to implementing a policy to reduce a building's environmental footprint, it is important to establish an agreed upon, indisputable point of departure. This starting point could be a carbon footprint assessment or a broader assessment of the site's environmental footprint (including the impact on biodiversity). VINCI Energies Building Solutions applies its own carbon measurement tools, which are specifically adapted to building maintenance and facilities management. Measurement is also the first step to define the best action plan for achieving the set targets.

2 Define a low-carbon action plan

Based on the emissions analysis, an action plan can be defined by prioritising the most significant emissions sources or by generating simple, immediate reductions at first and then spreading subsequent actions out to achieve each milestone. To prevent the rebound effect (i.e. the difference between planned and actual environmental savings due to behavioural responses from occupants), a low-carbon action plan must follow up with a user awareness plan.

3 Implement and monitor action plans

Implement actions and monitor progress by incorporating performance targets into contracts.

Different performance-based contracts are available for companies that want to engage in this process:

- energy performance contracts (EPC);
- comprehensive energy performance contracts;
- low-carbon performance contracts, a new type of contract we offer our customers.

These contracts are designed to help companies both to achieve energy and carbon targets as they work to meet ESG criteria defined in their CSR policy. Non-financial indicators indeed play an increasingly important role in guiding a company's long-term strategy. At the same time, maximising indicator performance provides a way for companies to comply with environmental label requirements (E+C- for positive-energy and low-carbon buildings, LEED, BREEAM, etc.).

4 Check progress on targets over the long term

Reducing a building's carbon footprint requires an ongoing commitment that pays off in the long run.

It saves energy and reduces operating costs over the entire life of the building. Checking that overall targets are met over the long term will be an increasingly pressing issue in the years to come and could bring about adjustments to the action plans undertaken.

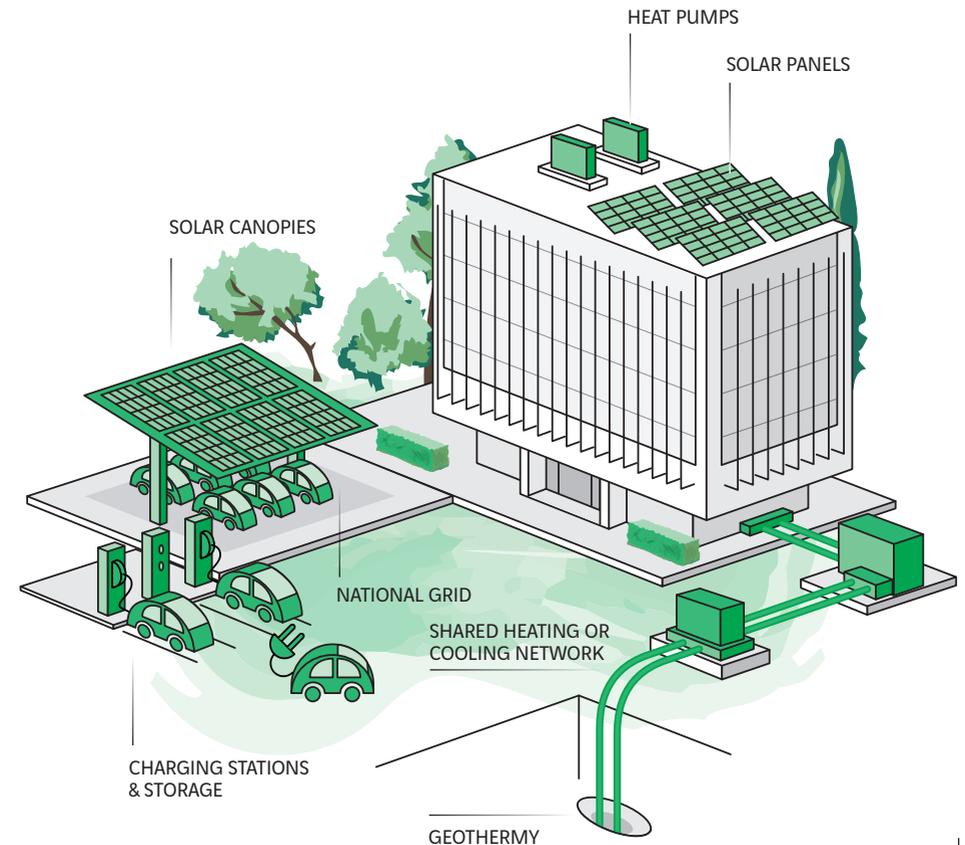
Carbon managers in action

Our carbon managers are certified experts with the competence to work with customers in reviewing their strategy and getting them started on a decarbonisation trajectory.

Our mission is twofold: to be carbon "exemplars" and to achieve carbon "proactivity". The first, being a carbon leader, consists in measuring carbon systematically for all our contracts. The second mission refers to providing our customers with our tools and skills so that they can propose low-carbon actions as part of their business and within their economic reach.

Nicolas G.,
Low-carbon Business Development Manager

SOLUTIONS TO DECARBONISE ENERGY AND ITS USES





Improving a building's energy performance

Energy performance is a key driver of building decarbonisation, encompassing both sustainability and efficiency. It must also comply with a large number of regulatory obligations (European Union's Energy Efficiency Directive (EED), Energy Performance of Buildings Directive (EPBD), Building Automation and Control System (BACS) decree, etc.) that will gradually transform both new and existing buildings.

VINCI Energies Building Solutions helps its customers to design, install and operate virtuous buildings, accelerate the energy renovation of buildings and actively contribute to decarbonising the sector.

Fundamentals

Implementing an energy renovation project requires acting upstream and asking the right questions to define energy needs.

For work on new sites, this approach may involve proposing technology alternatives. New buildings must incorporate performance criteria from the outset. Building environmental regulations encourage this approach by setting strict standards to foster the development of comfortable, energy-efficient buildings by design. In energy renovation, the first fundamental step is an energy audit. These audits entail collecting precise data on the building, its energy consumption, its operation and how it is used.

An energy renovation strategy should then be defined: What is an appropriate approach? By site or overall? Over what timeframe? What are the budgets and subsidies? In response, an action plan is proposed that combines energy performance actions or low-carbon performance actions, with financial estimates and quantified carbon emissions. It includes short-, medium- and long-term initiatives, with a global overview of the works, operation and maintenance. This approach optimises energy efficiency while ensuring clearly defined returns on investment. Three types of action can be sequenced: on usage, on system efficiency and on the building envelope.

Comprehensive energy renovation

makes it easier to harness the building's potential energy savings opportunities. This approach takes a holistic view of the project and manages interfaces between work packages and interactions between works on the building envelope and on systems. A performance commitment can also be attached to the renovation project. In this case, the contract could be a comprehensive energy performance contract.

Renovation in stages, by breaking down the action plan over time, provides greater flexibility, with possible adjustments, but it can also have its drawbacks, such as the risk of not completing all stages (and therefore losing sight of the overall approach) or inconveniencing occupants with continuous and extended works.

Areas of action

1 Focus on building uses: optimise operations to foster sustainability

Supporting occupants and raising their awareness about sustainable behaviour can reduce consumption by 10% to 20% (Source: OID).

Installing smart control and regulation systems on equipment helps to achieve sustainability targets. Required for most buildings as of 1 January 2025 under the BACS decree, a building management system (BMS) efficiently controls the building's energy consumption and enhances occupants' well-being.

Rationalising floor space is a strategy for optimising the use of workspace through the reversibility of space, intensity of use and redesign (e.g. flex office). Measuring the vacancy rate also contributes to reducing energy consumption by aligning building capacity with actual needs.

"Wave": a platform for monitoring energy use"

Whether in an existing or new building, smart technology must be available to everyone. That is why VINCI Energies Building Solutions has developed Wave, a smart platform combining information technology and automation. This tool responds effectively to energy management needs: data feedback, energy reporting, use automation and identification of areas for efficiency improvements.

2 Focus on equipment: benefit from significant energy savings

Install more efficient equipment

For each piece of technical equipment installed, the first essential step is to optimise the size based on current needs and future usage, while assessing its initial carbon footprint and its impact over the entire life of the building.

Building management system (BMS) in line with the BACS decree.



Heat pumps



Programmable thermostats and thermostatic valves

to manage heating and air conditioning and automatically maintain a temperature that is adapted to users and equipment size.



Speed control and efficient motors



Insulation of distribution networks



Relamping and smart lighting



Replacement of air conditioning and use of less CO₂-intensive refrigerant in accordance with the F-Gas regulation.

■ Ensuring the upkeep and maintenance of equipment in operation



Set up regular energy performance monitoring using building management systems and specific energy monitoring systems.



Rethink the functional analysis of regulation systems to adapt them to new uses.



Perform regular energy audits to identify new opportunities for improvement and ensure compliance with current standards.



Ensure the efficiency of HVAC systems by cleaning filters, checking connections, and optimising settings.



Adjust and calibrate temperature sensors and thermostats to guarantee optimal operation of heating and cooling systems.

■ Reducing the building's thermal requirements by using ventilation



Use the difference between indoor and outdoor temperatures to power the cooling system (free cooling).



Install air destratification systems to maintain a more constant temperature and offer efficient solutions for achieving substantial energy savings.

■ Recovering and reusing waste heat



The energy dissipated during certain processes (refrigeration units, industrial processes, servers, etc.), or waste heat, is a source of energy that is lost if it is not recovered and reused by the building. In the long run, capturing this heat is more profitable than consuming a new energy source.

30%

of the energy used in buildings is wasted (Source: Environmental Protection Agency)

3 Focus on the building envelope: to meet overall targets

Some energy renovation projects may require more extensive works than initially planned. During such projects, the renovation of the building envelope (for example, external thermal insulation) can be overseen by the project management team, as well as equipment renovation and actions on uses, to guarantee that planned objectives are met. Energy performance contracts are an example of this form of project management.

25% energy savings in Beersel



Beersel, South of Belgium



Municipality

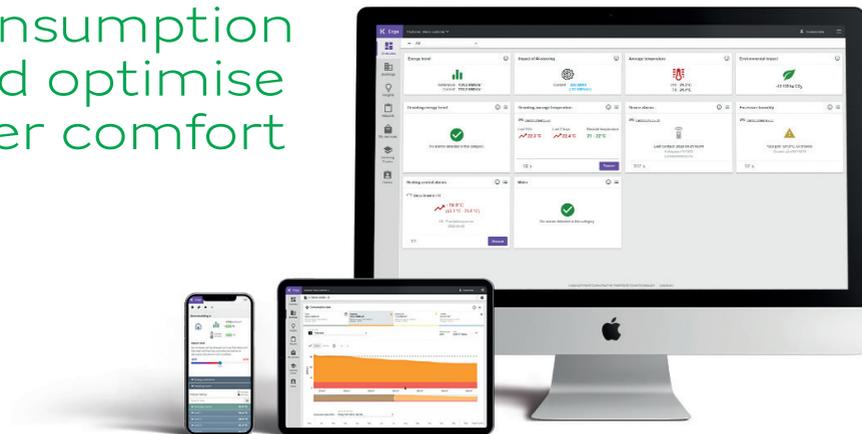
21,000 sq.m

The project's total surface area

VINCI Energies Building Solutions concluded an energy performance contract with the municipality of Beersel in the south of Brussels. The project covers seven sites (including administrative buildings, cultural and sports centres, schools, and rest homes) covering a total surface area of 21,000 sq. metres. The contract covers curative, preventive and corrective management and maintenance of buildings and technical installations, technical management with BMS and energy follow up and monitoring.

Programme target: more than 25% energy saving annually. Halfway through the contract, this project has enabled the municipality to save 412 tons eq CO₂, the equivalent of 20,000 new indigenous trees.

AI to reduce building heat consumption and optimise user comfort



Germany



All types of buildings

At Vinci Energies Building Solutions in Germany, we use an IOT platform which includes self-learning AI (artificial intelligence) that can be connected to almost all buildings. The technology makes it possible to control the indoor climate and optimize the energy consumption of a heating system. The platform collects data in real time and uses sensors to create a constantly adapting and self-learning control system for each individual building. On average, this can save 10% of energy in the heating system. The technology can be used to detect anomalies and analyze and monitor energy consumption. The AI works 24/7 and learns every day.

// *The fast and easy equipping of the system is the enabler for scalability and broader rollouts on bigger portfolios."*

Christian.O,
Project development manager



Developing a building's energy mix

The energy crisis has pointed to the urgent need to optimise the energy mix of buildings. They should play a more active role in producing and consuming their own energy. This transformation will necessarily involve the smart integration of renewable energy sources (solar, geothermal, wind, etc.) and what are referred to as "recovery" energies, as well as the ability to modulate and store this energy supply.

Fundamentals

The implementation of a smart system to coordinate the different production methods and energy sources is essential for the building sector. It is helpful to find a balance in real time between production and consumption. The building's consumption data can be used to anticipate the installation of any storage solutions. Whatever the needs, it is important to support the project as of the design stage through to maintenance, providing specific expertise in analysing consumption data.

Areas of action

■ Connecting buildings to district heating networks

The latest generation of district heating networks simultaneously distributes heating and cooling between neighbouring buildings using equipment such as heat pumps. This distribution of energy can take place at low temperatures.

■ Developing solar energy production

Supported by favourable legislation, photovoltaics is currently the most competitive technology for generating electricity and is set for massive rollout. Energy production is maximised by taking advantage of available surface area on roofs and facades. Combined with storage systems, solar solutions provide reliable, continuous energy, reducing dependence on traditional electricity sources.

What's more, a facility is more profitable when its size is adapted to self-consumption. Photovoltaics is constantly evolving but remains the simplest way to make a building more self-sufficient.

Its impact on electricity consumption is immediate and measurable, as soon as the facility is connected. However, the carbon value of solar panels should be taken into account. Solar panels last 20 to 25 years. We have therefore made a long-term commitment to our customers, ensuring they clearly understand their building's energy performance challenges.

■ **Integrating geothermal power into building design**

Geothermal energy may sound complex, but it is actually based on a fairly simple principle: capturing energy from the ground by means of, for example, a heat pump, to heat a building (winter mode) or, conversely, transferring heat into the ground from indoor spaces to cool the building down (summer mode). Geothermal systems can therefore provide a renewable source of heating and cooling. Virtually inexhaustible, and with low CO₂ emissions, geothermal energy is not dependent on weather conditions. As land tenure is not an issue, it provides a permanent solution, and the system size can be adapted to serve the building throughout its life. The initial investment is relatively high but pays for itself within seven to 10 years, significantly down from the 20-year payback time before the energy crisis.

Installed photovoltaic capacity in Europe must reach

750 Gw

by 2030
(SolarPower Europe)

>10%

of Europe's power demand could be provided by geothermal power

(Source: European geothermal energy council – European commission)

Target of 30% energy savings through solar canopies and ground-mounted panels



Angoulême, France



Production site

VINCI Energies Building Solutions is working towards the ambitious target of a total reduction in Joubert Plywood Group's energy consumption of 30% for its Saint-Jean-d'Angély and Eliots sites. To date, 18% of needs have been met. With a capacity of 1,476 kWp, the project currently involves 3,350 solar panels, spread over an area of more than 6,000 sq. metres, including 10 canopies and two ground-mounted installations. Our commitment goes beyond maintaining the installations over time: our companies provide customers with in-depth building energy expertise to actively support their energy independence strategy.

“Solar power requires a wide range of expertise. By understanding all aspects, we can support customers from design, installation and operation, through to retrofit.”

Christophe L.,
Director

-50% energy savings per visitor



Bredene, Belgium



Swimming complex

VINCI Energies Building Solutions will carry out HVAC and electricity works and maintenance of the Lago aquatic complex with a surface area of of 3000 sq. metres in Bredene in Belgium. The HVAC system includes a deep geothermal heat pump (1.250 m depth, regime 30/20°C) and uses HFO-1234ze as a sustainable refrigerant as well as the installation of high performant handling units (AHUs).

The most notable feature of this project is that the swimming pool can run entirely electrically and therefore no longer emit any CO₂. Additionally, each visitor barely uses 6 kWh of energy which 50% less energy per visitor than in a traditional swimming pool.

// *First deep geothermal project in Belgium. Substantial energy conservation is achieved through a sustainable, gas-free building approach, which proves particularly impactful in such energy-intensive infrastructure."*

Benoit. G.
Business development manager



Aiming for low-carbon mobility

The revolution in electric mobility in Europe confirms more than ever the need for more effective integration between urban and building infrastructure. As zero-emission vehicles become more widely available, and low-emission zones are developing, regulations are tightening requirements on pre-equipment and electric vehicle charging infrastructure for residential and commercial buildings. This presents the building sector with a new opportunity: to become a major player in decarbonised mobility.

Fundamentals

For a successful transition to electric mobility, charging solutions will have to be available nationwide. To handle this massive increase in demand while respecting heritage, new user habits and the attractiveness of sites, electric vehicle charging infrastructure (EVCi) must be deployed and integrated intelligently into a broader approach to overall building management.

This will ensure that installations are sized appropriately to meet needs, while balancing energies in real time between production and consumption and guaranteeing equipment longevity.

1.3 million

public charging stations needed in Europe by 2025 (2.9 million by 2030)

(Source: European Federation for Transport and Environment)

According to estimates,

40 million

electric vehicles will be on European roads by 2030, a massive increase from the current +8 million EVs.

(Source: McKinsey)

Areas of action

■ Aiming for integrated deployment

Installing EVCI remains complex for building owners and managers, due to the number of stakeholders involved and the wide variety of offers on the market. Projects encompass many stages – scoping, feasibility studies, equipment supply, installation of EV charging terminals, commissioning for end-users, supervision, maintenance, and operation. That is why an integrated offering from a single operator throughout the entire life cycle has become of strategic importance.

■ Maximising the longevity of infrastructure

Maintaining EVCI in good working condition is one of the top expenditures over its entire life cycle. While adapting EVCI to building constraints and features (fire safety, resistance to impact and weather conditions) is an initial guarantee of the infrastructure's durability, its IT system must also be protected. In addition to preventing attacks, compliance with cybersecurity standards extends the availability and maximises equipment uptime. Whether on public roads, on business premises or in multi-unit housing complexes, monetising EVCI will need to be more transparent and simpler.

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Our customers are tackling the issue, but it is nevertheless new to them. The support phase is a crucial stage in the process, in that it broadens their understanding of the subject and helps them to find the best combination between the technical solution, energy and financing."

Jérôme M.,
Head of Business Development

■ Taking advantage of smart charging

To help manage the limited energy capacity of buildings, smart charging is developing fast to balance the power distributed to charging points in real time with the building's consumption. These solutions can also facilitate the integration of renewable energy into the building's energy mix and increase both the availability rate of EVCI and their return on investment. By 2025, "bi-directional" EV charging will provide buildings with even greater flexibility by using vehicle batteries for storage.

Scalable modular solutions for decarbonized mobility



Netherlands



all types of buildings

VINCI Energies Building Solutions created several scalable modules for electric mobility that can be applied depending on the customer's local situation and wishes.

The modules can consist in any composition of: EV charging, solar carport, battery, connection power grids, cloud solutions, advisory (consulting) and service & maintenance.

The solutions provided have significant benefits as they enable customers to advance through the energy transition despite limited power grid availability.

Quantified benefit for each parking space:

1,750 kg
CO₂ reduction

19,750 kWh
solar generation

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The shift to electric vehicle fleets challenges multiple building installations due to limited electric grid capacity. Addressing peak electricity demand by spreading it throughout the day and utilizing battery storage offers a potential solution. Our initiative offers scalable modules to meet diverse customer needs in achieving sustainability goals."

Alex.P,
Business Unit Manager

Installation of charging stations in a commercial building



Switzerland



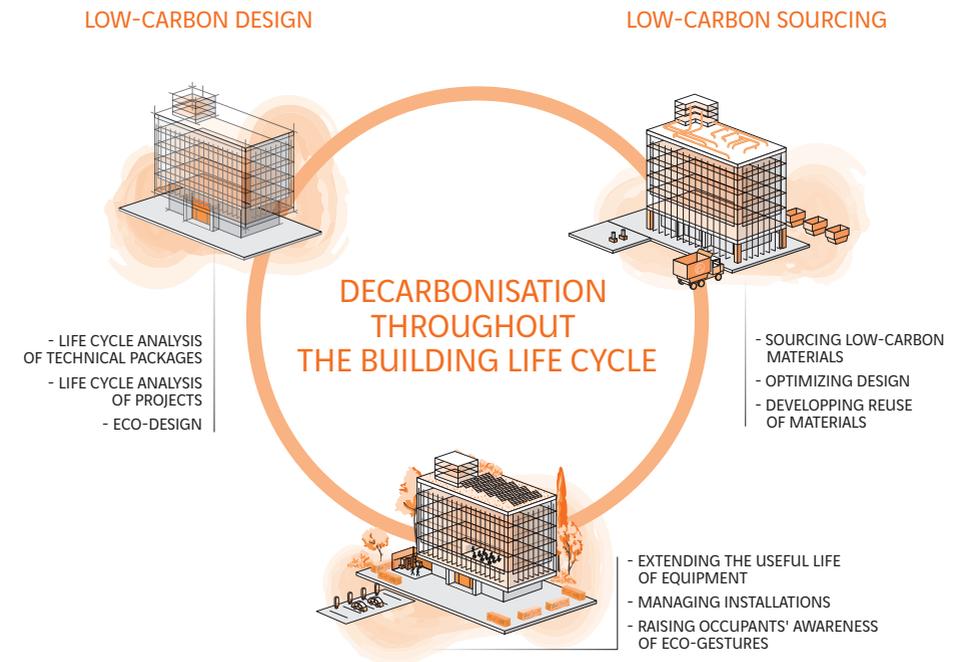
Commercial building

ETAVIS Grossenbacher AG, a business unit part of VINCI Energies Building Solutions, has successfully expanded the electric charging infrastructure at the Coop Gallusmarkt shopping center in St. Gallen.

The project entailed installing the market's first two 50kW, 300A main charging stations, along with a new control panel extending from the transformer station. Notably, this setup incorporates dynamic load management capabilities, enhancing efficiency and functionality.

SOLUTIONS TO DECARBONISE MATERIALS AND EQUIPMENT

DECARBONISATION OF THROUGHOUT THE BUILDING LIFE CYCLE



The decarbonisation of a building's materials and equipment is a strategy that has to be integrated across a project's life cycle. It begins at the design and engineering phase, extends to the supplies required for construction and continues through to operation, maintenance and, finally, renovation, or even deconstruction of the building. The goal is to minimise the building's carbon footprint throughout its use, by adopting a circularity model and studying each stage separately in the life cycle of equipment and materials.



Adopting a carbon strategy as of design and implementation

Fundamentals

A project's low-carbon design starts with an assessment of the CO₂ equivalent impact of materials and equipment at each stage of the life cycle: manufacture, transport, use and end of life. The use of equipment has a major impact on the overall footprint of a project. In designing new projects, environmental regulations provide a framework by setting increasingly ambitious targets. The aim is to comply with current requirements and to stay a step ahead of future thresholds for low-carbon buildings. In designing renovation projects, experts run a preliminary assessment to define the various low-carbon design proposals focusing on two major goals: harnessing the value of existing equipment and materials (for future use or third-party building sites) and developing more efficient systems.

Areas of action

■ Mapping processes and materials

Establish a life cycle assessment (LCA) for technical packages

An inventory of the technical categories with the highest impact is drawn up based on CO₂ emissions indicators provided in product environmental profiles. Essential decarbonisation actions can then be defined by technical category and by order of impact.

// *A project's life cycle assessment identifies the largest sources of CO₂ emissions, so that we can implement actionable decarbonisation solutions. That's why we need to measure during the bidding process as well as in the design and implementation phases.*

Ali M.B.,
Low-carbon solutions engineer

This general process is refined iteratively and adapted to new projects. On a global, multi-technical project, actions can be directed at three main sources of carbon emissions:

- steel ventilation ducts as part of the heating, ventilation and air-conditioning (HVAC) package;
- inverters for power consumption as part of the electrical works package (low and high voltage);
- steel pipes as part of the fire safety package.

Establish an LCA for the project

The first step is to apply the recommendations and solutions identified during the LCA of technical packages. This is followed by a project-by-project life cycle analysis, using a carbon calculator to measure each emissions source and determine the equipment alternatives with a lower CO₂ impact. In this project LCA, equipment consumption must be considered in addition to its share in emissions. This integral approach looks at the cumulative carbon impact over the life of the project in choosing the best option to achieve the shortest carbon payback time.

■ Eco-designing the project

Optimise the design process

Starting with the design phase, the most efficient processes are implemented to anticipate and limit impacts during the execution phase. Systematically using the BIM design method contributes to reaching these goals by reducing losses of material, avoiding errors during construction, and anticipating interface problems between technical packages. The prefabrication of certain components (sanitary fittings, HVAC system, etc.) also offers significant potential for reducing carbon impacts.

Focus on function over product

A low-carbon goal is less about focusing on a product than about meeting the right need (comfort, safety, performance, etc.), integrated into a lean design approach:

- simplifying and rationalising equipment (AHUs, fans, etc.), or grouping systems together (piping, ductwork);
- eliminating oversized equipment;
- reducing amounts by improving network distribution, for example, to shorten network lengths;
- positioning technical equipment rooms as close as possible to the areas they serve by energy source.

Anticipate changes in use

The use of a project or installation may evolve over time, which can affect its CO₂ impact. It is important to support these changes and prepare for its second life:

- set up traceability systems, such as circular passports, to track the history of equipment (characteristics, maintenance, changes);
- choices made during the design phase to facilitate equipment dismantling, repairability and interchangeability.

1 kg
of steel less = 7 kg
of carbon saved



Aiming for low-carbon sourcing

Fundamentals

Sourcing is a key stage in decarbonising projects. A low-carbon procurement strategy is organised around two principles: improving purchasing and reuse and keeping in mind that the option with the least carbon impact is the product not consumed.

Areas of action

■ Source materials with a low-carbon impact

To select the least carbon-intensive products, companies must engage in a proactive approach when dealing with their main suppliers by:

- raising their awareness about a low-carbon supply policy;
- encourage them to create product environmental profiles for their ranges;
- develop reuse to maximise carbon gains.

It is important to identify equipment with a high carbon impact and to structure supply chains (sources, storage, refurbishing) in a way that enables large-scale reuse based on new expertise:

- diagnostics and guidance between cleaning and installation teams to establish proper delivery procedures for the technical equipment;
- creation of internal repair and refurbishing hubs for special equipment;
- identification of external marketplaces and establishment of contracts with them.

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To offer our customers decarbonised alternatives, we need to work closely with our suppliers and identify the most sustainable products.”

Christian A.,
Head of Purchasing

//

Reyuz is a platform we developed for our business units. As of its first year, the app was used to reuse equipment between companies and even suggest product alternatives for customer projects.”

Stéphane B.,
Technical Expertise Manager

Only 1%

of construction materials are reused after their initial use in north-west Europe
(Interreg North-West Europe 2022)



Implementing low-carbon management and operations

Fundamentals

All operation and maintenance activities should be reviewed to meet the terms of a low-carbon performance contract. That involves assessing existing processes, drawing up an action plan and committing to a decarbonisation pathway, especially using a monitoring tool.

Areas of action

■ Extending the useful life of existing technical equipment

Rolling out centralised equipment management is useful in defining predictive models for sensitive installations with a high carbon impact. The aim is to maintain installations in perfect working condition, avoiding breakdowns and premature replacements.

■ Monitoring installations to optimise energy consumption

Operating and maintaining a building consists in monitoring equipment for optimal performance, while achieving sustainable energy use. This means:

- ensuring that equipment is kept in perfect condition for its proper use;
- adjusting equipment operating times in line with actual building usage;
- using the building's thermal inertia.

■ Renovating high-impact installations

In the operating phase, a potential refrigerant leak would have a major carbon impact. These installations should be identified, and other fluids with a lower CO₂ impact should be proposed to replace existing refrigerants.

■ Managing waste by type

Amounts of waste must be reduced by prioritising reuse and transformation.

■ Raising occupants' awareness about eco-friendly practices

Teaching occupants about these issues highlights all the efforts made during operation and contributes to extending equipment lifespan.

■ Selecting the least carbon-intensive products

This process involves drawing up an inventory of consumables and spare parts that are replaced on a recurring basis under the operation-maintenance contract and choosing low-carbon alternatives to maintain stocks:

- through repair and refurbishment (inverters, circuit boards);
- by finding new opportunities for equipment reuse (emergency lighting units, sanitary fittings, LED lights, switch blocks, cast iron radiators, office furniture, etc.);
- by selecting low-carbon products (AHU filtration, electrical wiring).

Carré Vert Campus: a test with 800 meters of reused cable tray pathways



Levallois-Perret, Greater Paris Region



Commercial property

Located in the heart of Levallois-Perret in outside Paris, the Carré Vert Campus comprises five buildings laid out around a central garden. Crédit Agricole Immobilier was commissioned to renovate all the buildings, for a total of 19,000 sq. metres of usable office space.

VINCI Energies Building Solutions business units (TOP In Situ, SAGA Evo Smart and GTIE Tertiaire) were selected to cover the heating, ventilation, air-conditioning, plumbing and electrical installation works packages. Engaging in a circular economy approach, and in partnership with Crédit Agricole Immobilier, the teams reused 800 linear metres of cable trays on site, saving 4.5 tonnes of CO₂, thus confirming their economic model for these materials.

19,000 sq.m

of office space

4.5 tonnes

of CO₂ saved

A multi-expertise project centered on energy efficiency



Rabat, Morocco



Healthcare tower

Located in the capital of Morocco, the Ibn Sina hospital tower comprises 33 floors, with a bed capacity of 1044 beds, a sixteen-story medical-technical center, a conference center, another training center, and a boarding school with a covered area of more than 130,293 sq.m.

Cegelec business unit, part of VINCI Energies Building Solutions was selected for the high current electrical work for the 33-level floor tower, for the medical technical platform and for the ancillary buildings. The tower building will integrate into its design multiple eco-construction practices as well as new technologies (solar filters, photovoltaic panels, natural ventilation, rainwater recovery and their use in watering the hospital's green spaces) allowing better energy efficiency.

130,293 sq.m

of surface area

2,500 of luminaires reused in Sweden



Stockholm, Sweden



Office building

VINCI Energies Building Solutions in Sweden was commissioned to replace older lighting technology with new, more energy-efficient lighting systems for a total of 32,000 sq. metres of office space.

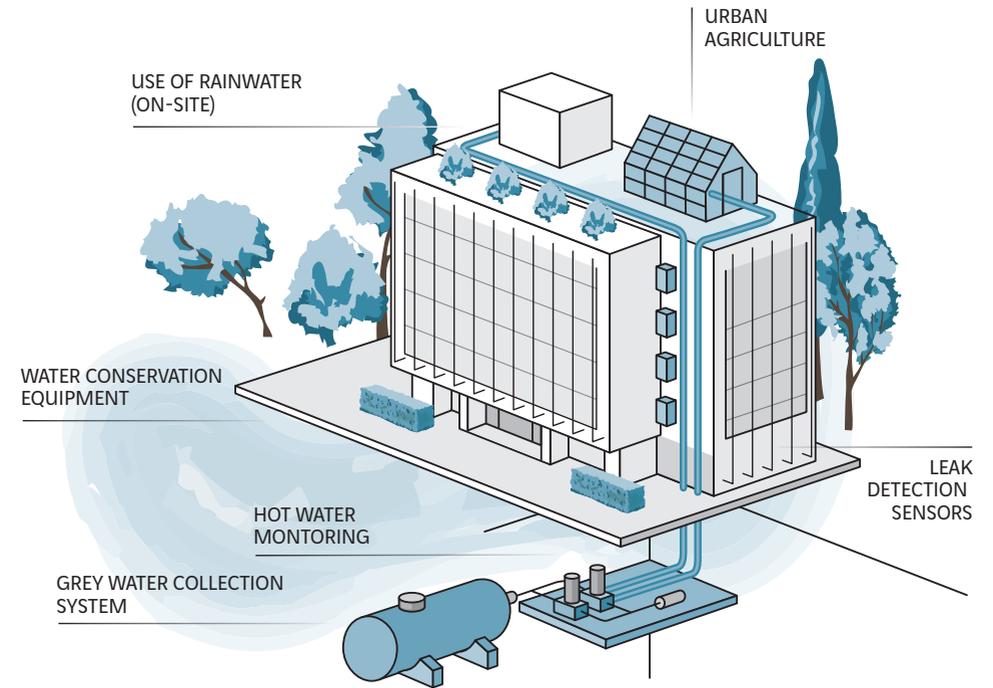
A large part of the lighting work consisted of dismantling and rebuilding approx. 2,500 luminaires. The reconstruction of the fixtures was done on site by setting up a production line in the property, which resulted in the reuse of existing fixtures and the reduction of packaging and transport.

In addition to the lighting work, other electrical, telecommunication and fire alarm installations have been adapted and supplemented after floor plan changes and surface renovations. Electric vehicles charging infrastructure have also been installed.

32,000 sq.m

of office space

SOLUTIONS TO PROTECT NATURAL RESOURCES



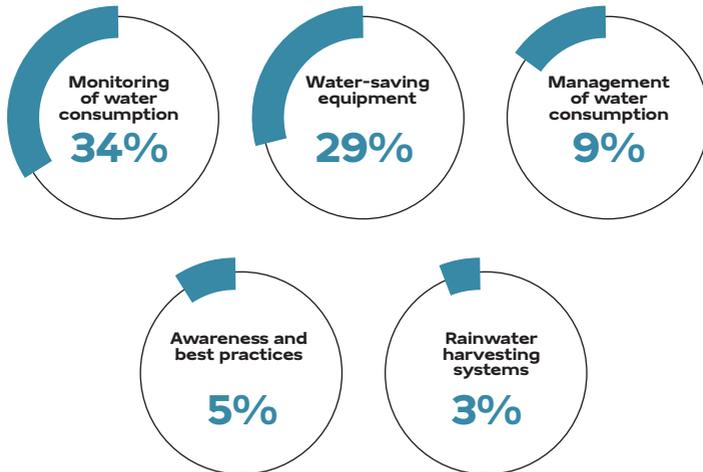


OPTIMISING WATER MANAGEMENT

The increase in the frequency and intensity of extreme weather events has made water management and conservation a crucial issue, especially for the building sector. The majority of Europe’s public water supply is used in buildings, accounting for around 21% of total abstracted water (World Green Building Council). Although monitoring water consumption is now a more widespread practice, it is time to go further by setting specific targets and exploring how to interconnect water conservation and energy performance.

Areas of action

EXAMPLE OF ACTIONS IMPLEMENTED BY THE PROPERTY MANAGEMENT SECTOR IN FRANCE TO REDUCE WATER CONSUMPTION



(Source: OID 2022)

■ Using data to prevent leaks

Insulating the water network is essential. Some solutions go even further, such as leak detectors, smart water circuit breakers for planning equipment maintenance, and even artificial intelligence integrated to guide assessment towards a specific type of leak.

■ Installing water collection systems

To limit the use of drinking water, an on-site rainwater harvesting system can be installed as well as a grey water system to collect water from washbasins, showers and condensation water produced by energy equipment. Other solutions collect cooling water during the weekly testing of the sprinkler motors in buildings with sprinkler systems.

■ Optimising equipment consumption

Installing water-saving equipment, such as low-flow taps, has a direct, easy and rapid impact on consumption. Unnecessary discharge of water can also be reduced directly by installing a control valve downstream of the control station. This prevents the network from being completely emptied during required drainage maintenance.



In a commercial building, unconventional water remains an untapped resource, and buildings often do not have the proper equipment to benefit from it. Most of the water used does not have to be drinkable, especially for sanitation facilities and watering green spaces, which contribute to the cool island effect.”

Arnaud M.,
Energy Project Manager

Only 7%

of water in buildings is reused
(Source: world green building center)

0.34 cu.m/sq.m

of water per year: average consumption of an office building
(Water consumption of the European real estate sector)
(Source: Statista 2022)

2,600 litres of water saved per week via HVAC condensation water



Faro, Portugal



Airport

HVAC condensate, often overlooked as wasted water, holds significant potential as a valuable resource. Instead of being channeled into wastewater systems, it can be harnessed to promote water conservation and sustainable practices.

To capitalize on this opportunity, VINCI Energies Building Solutions in Portugal implemented a solution at Faro Airport that consists of installing dedicated containers adjacent to each boarding bridge to capture the water discharged from air conditioning units. The water collected can be used for maintenance, cleaning, watering the plants or rother and thus reducing water demand and promoting sustainable water use.

Approximately

135,000 litres

in potential water savings per year



Protecting biodiversity

Due to the disruption caused to natural habitats by urban expansion and new construction, it is essential to improve the integration of buildings into their environment. Taking biodiversity into account means assessing both the positive and negative impacts that buildings cause in situ on their environment and on ecosystems, as well as ex situ, i.e. through the choice of materials, construction products and plant species.

Fundamentals

Biodiversity objectives are often integrated into the design phase of building projects, but sustainable, efficient solutions that meet long-term goals also need to be implemented throughout the construction, renovation and deconstruction phases. These solutions can be part of a broader approach to building certification and labels (e.g. BiodiverCity) in the assessment and continuous improvement of project participants.

Areas of action

■ Integrating biodiversity prior to project launch

Biodiversity conservation requires forging a deep connection between the building project and its region. This starts with a preliminary assessment of the building's non-degradation of ecological potential and its improvement to the land. By collaborating with ecologists, biodiversity experts enlisted from the outset in a project's design, ecological recommendations can be established and respect for biodiversity guaranteed throughout all creation and operation phases of the building using specific tools according to requirements. An ecological assessment tool can be used to measure a site's ecological potential and better understand the benefits of optimising it.

// *It's important to bear in mind that the current context of water restrictions and drought may conflict with the deployment of green surface solutions, or even mitigate the positive effects if the irrigation system is not optimised as part of the project."*

Didier S.,
Project Manager

■ **Greening unused spaces**

Vegetation contributes to reducing air pollution and filtering rainwater. While regulations are facilitating the development of planting solutions in commercial buildings (urban farms, composting areas, etc.), the key prerequisite for any greening project is an optimal irrigation system that can fully guarantee the cooling benefits within the building.

■ **Integrating building biodiversity into an ecosystem mindset**

Biodiversity is often characterised as going against the objectives of the building industry. But biodiversity can actually present opportunities for the building, for its occupants, and for the broader environment in which it is located. Biodiversity improves quality of life for users and city residents by creating shaded cool islands and fosters the creation of new ecosystems. A “four season” inventory of the flora and fauna can be carried out to ensure the diversification of habitats, strata and shelters for local diverse and hardy species that have adapted to the physical and chemical conditions of their environment, be it nocturnal, on land or in water.

//
To recreate high-quality, sustainable green spaces, we need to understand the species present on the site and others that may come to it. We must adopt a comprehensive and detailed view of how to integrate biodiversity into the building and the surrounding region.”

Chloé C.,
 Senior Ecology Consultant

20%

of EU’s land need to be restored by 2030 as part of the EU biodiversity deal
 (European parliament 2023)

>85%

of the EU territory is subject to some degree of light pollution
 (Night light, Interreg Europe)

BiodiverCity-labelled offices in the heart of Paris



Paris, France



Offices

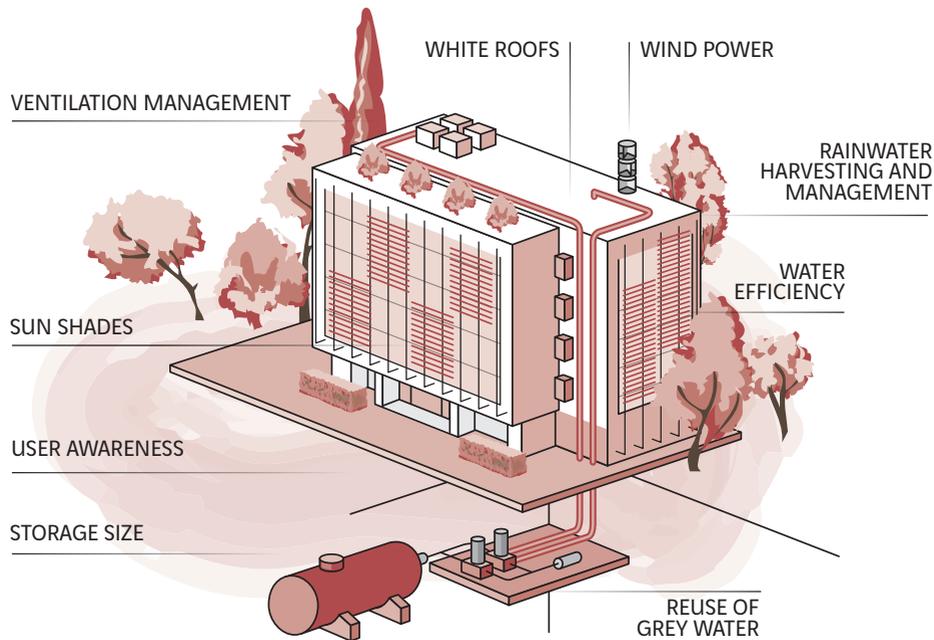
As part of the restructuring of a property complex covering more than 15,000 sq. metres, special attention was given to protecting and strengthening biodiversity. A team of consultants prepared an ecology report primarily to present the project’s ecological context, run an assessment of existing conditions and analyse the landscaping project with the aim of providing short- and long-term recommendations. This approach optimises the integration of the building into the initiative to restore green corridors, establishing a connection with a large nearby woodland.

Around

30%

Of the biodiversity loss globally is caused by the building sector
 (World Economic Forum 2021)

SOLUTIONS TO ADAPT TO CLIMATE CHANGE



In the building sector, global warming is often regarded from the point of view of mitigation, and less from that of adaptation. While mitigation consists in reducing the impact of greenhouse gas emissions, adaptation involves limiting the building's vulnerability to extreme weather events or benefiting from their effects. Combining these two approaches is essential, especially for renovation work, to avoid maladaptation.

Fundamentals

Given all the risks that can threaten the building industry, only a single approach can apply. The climate resilience of buildings needs to be developed on a case-by-case basis and throughout the building to counteract and reduce the impact of weather events. Resilience must not only acknowledge the impact of hazards such as storms and floods, which affect how buildings are designed, but also take into account and anticipate heat waves and drought, which have an impact on existing buildings.

Areas of action

Ensuring the building's continuity of service

Climate risks require buildings to integrate control systems designed to optimise the operation of equipment. The challenge is to maintain the building's continuity of service by providing it with, for example, back-up energy systems in the event of very high temperatures, such as load shedding for thermal installations, forced ventilation of transformer rooms, installation of advanced fire detection and suppression systems, and redundant telecommunications network equipment to ensure connectivity in the event of a climate event.

Adapting ventilation systems to outdoor air quality

Passive cooling techniques have been thoroughly studied, and their effectiveness is now recognised. Natural ventilation is one of the strategies that can ensure both higher airflow rates and more significant cooling effects, without increasing energy consumption. However, this solution should not be relied on alone, as it can have the opposite of the desired effect in high temperatures and polluted conditions. A good alternative could be to upgrade equipment by adding smart air purifiers and filtration systems.

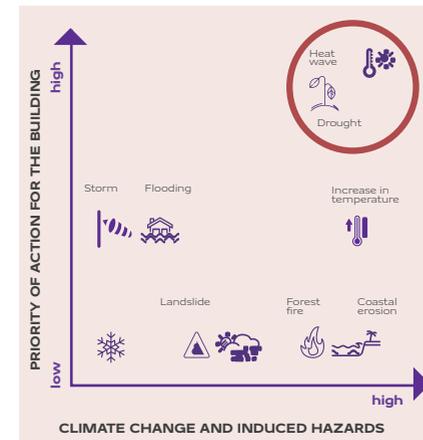


Diagram of climate risks (Ademe - Burgeap - WattGo - Franck Boulté Consultants, Prospective study on the impacts of climate change for the building industry from 2030 to 2050).

■ Reducing indoor temperature

Other strategies to reduce indoor temperature by a few extra degrees include shading techniques (solar protection, sun shades, etc.). These systems impact thermal comfort during periods of extreme heat and rising temperatures to the point of offering a viable alternative to air-conditioning systems. Roofing can also play a crucial role in climate change adaptation. In addition to planting vegetation, roofs can also be covered with a white waterproof coating with reflective properties, that is resistant to age and dirt.

Cost of inaction over climate change between now and 2100:

3%
to 30%

of global GDP
(Source: AXA IM analysis)

>50%

of the global population highly exposed to climate risks such as flood, drought, cyclone or heatwave.
(The world Bank 2023)

Adaptation of existing constructions to climate change



Hoenheim, France



Office spaces

VINCI Facilities Alsace has developed a solution named "ACDC" (Adaptation of existing constructions to climate change) to assist its clients in their climate change adaptation strategy.

Initially deployed at the VINCI Facilities office space in Alsace, covering an area of 10,000 square meters, the ACDC solution started with a vulnerability analysis of the building, conducted using Resilens, an in-house tool providing an initial assessment of a project's climate change adaptability and sensitivity to weather events.

Based on this assessment, a combination of **Nature-Based Adaptation Solutions** (wilderness and urban swales, extensive vegetation, rainwater storage, green walls, rain gardens etc..) **and technical solutions** (renewable energies, reversible heat pumps, shade sails, water and energy monitoring, and electric car charging stations etc..) were implemented to enhance climate resilience of the building.

10,000
sq.m

of office space

1,392
tonnes

of CO₂ saved per year

//
Resilens is a diagnostic tool dedicated to resilience performance that allows companies to calculate a climate change criticality score for any building."

Didier S.,
Project Manager

RESSOURCES

■ Improving a building's energy performance

- Green Building Observatory (OID), Changing occupants' behaviour to reduce energy consumption, 2018 (*Changer les comportements des occupants pour réduire les consommations énergétiques, 2018*)
- Environmental Protection Agency (EPA), 2017

■ Developing a building's energy mix

- SolarPower Europe, Rebuilding European solar manufacturing
- European geothermal energy council – European commission

■ Aiming for low-carbon mobility

- European Federation for Transport and Environment, 2024, Public charging in Europe: where are we at?
- McKinsey, 2022, Europe's EV opportunity— and the charging infrastructure needed to meet it

■ Adopting a carbon strategy as of design and implementation

- Ademe, Reuse of construction materials (*Réemploi des matériaux de construction*)
- Interreg North-West Europe, 2022, facilitating the circulation of reclaimed building

■ Water

- World Green Building Council, A sustainable built environment at the heart of Europe's future
- OID, Survey of Energy and environmental performance of buildings (*Baromètre de la performance énergétique et environnementale des bâtiments*)
- World Green Building Council, 2022, A sustainable built environment at the heart of Europe's future
- Statista 2022, Water consumption of the real estate sector in Europe by building type.

■ Protecting biodiversity

- European parliament 2023, European Union Biodiversity deal
- Night light, Interreg Europe, 2022

■ Adapting to climate change

- Ministry of the Ecological Transition, Impacts of climate change: health and society (*Impacts du changement climatique: santé et société*)
- AXA IM analysis, The cost of climate change: Action versus inaction
- The World Bank, 2023, Climate Shocks: Estimates of People Exposed, Vulnerable, and at High Risk



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