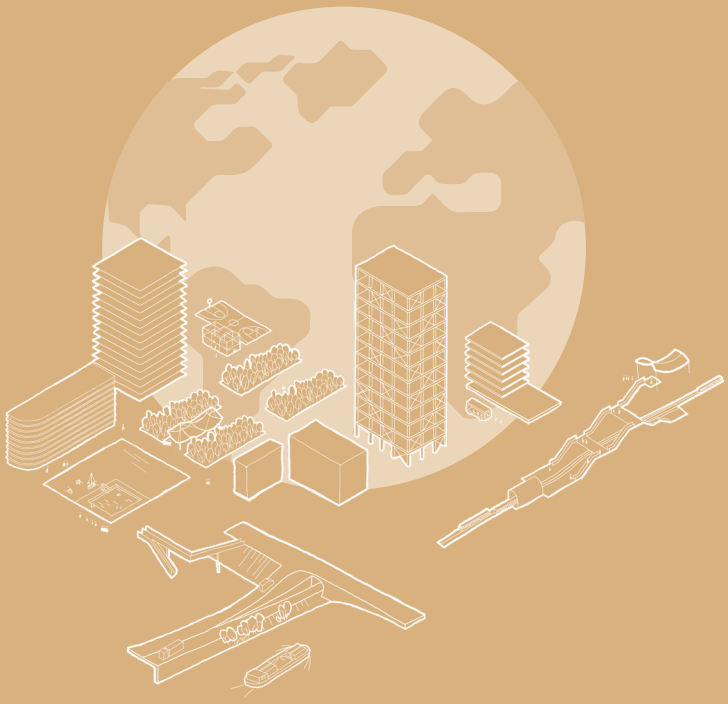


MANIFESTO

for ***low carbon construction***

setec
Engineers & Citizens

Michel Kahan,
president

Conscious of the urgent need to act against climate change, the employees of the **setec** Group have rallied around an «engineers and citizens» approach. Citizens, because concerned individually, we want to have a say, express our ideas and act within our means. As engineers, we feel invested with a duty to propose virtuous solutions and, as an engineering company, we are able to lead projects that respect the environment and climate.

This is reflected in everyday actions related to our own activity, but especially in the choices and solutions we propose in our projects. It has been shown that the impact of this second field of eco-design is several orders of magnitude greater than our eco-behaviour gestures.

This is why we have divided the eco-design themes into challenges for engineering in the coming years: low-carbon design, carbon-free mobility, resilience of territories, increased competence of our employees on climate and environmental issues are the challenges we have decided to tackle.

On the theme of low-carbon design, we recognise that we are only one of the actors within the chain of action of building. However, our mission is important: We must enlighten project owners on the impact of their programmatic choices: Should we build new or rehabilitate? Is it possible to offer flexibility for a building, an industrial installation, an infrastructure structure, an urban fabric and thus anticipate its changes in use within a few decades? Our mission is also to design by broadening our spectrum of solutions, by favouring low-carbon materials, by promoting recycling and reuse, by optimising maintenance and operations and by anticipating the entire life cycle of structures from the outset.

Our commitment is only valid if it is shared by other stakeholders throughout the chain: Project owners, architects, urban planners, landscapers, colleagues from the engineering world, builders, suppliers and producers of materials, control offices, asset managers... that's why we deliver our intentions and our commitments through this manifesto in the hope that it will rally or be part of an overall movement.

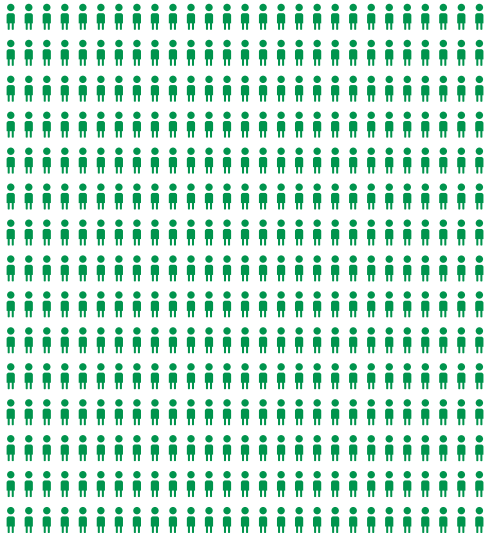
Recognising the impact of choices in construction?

Embedding our approach in a societal logic

Proposing a 360° low-carbon approach

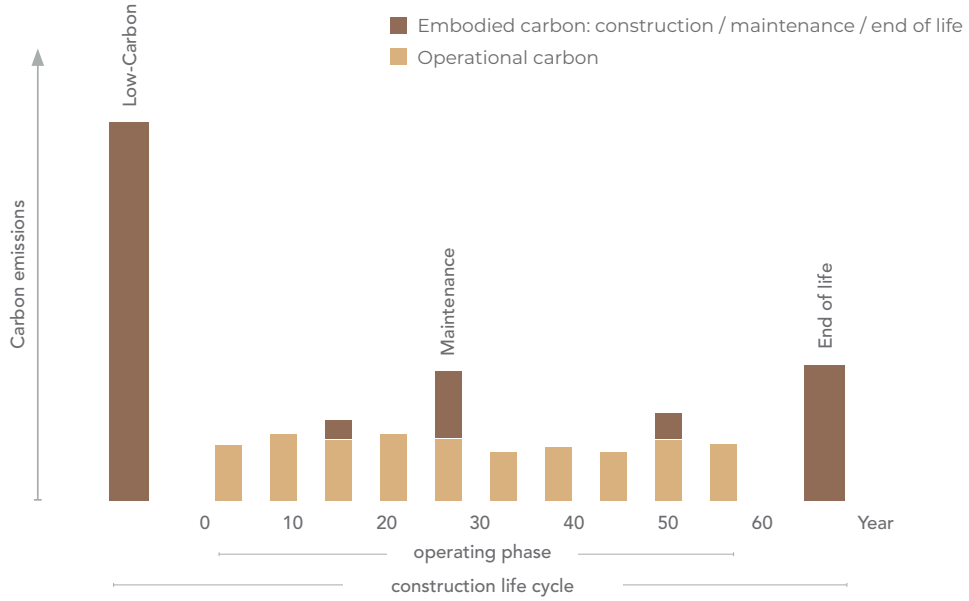
Providing sustainable construction through eco-design and low-carbon material

Being active in the development of our professions



1000 French who each emit about 12 tonnes of CO_2 equivalent per year

1 construction engineer whose proposed technical solutions influence future carbon emissions by a factor of 100 to 1000



Carbon emission over the life of a work, ***Embodied Carbon Primer***, LETI.

Recognising the impact of choices in construction

Declaring a climate emergency

Gigantic fires, repeated heat waves, milder winters, migration of species and vegetation to the poles, extreme droughts and population movements: all of these recent events are expressions of climate change and the destabilisation of ecosystems.

The **setec** group bases its engineering approach on improving the quality of life of human societies as a whole. In 2019, **setec** joined the Engineers Declare initiative and the Syntec-Engineering Climate Charter.

Construction, one of the central issues of our lifestyles

Understanding of climate change issues is growing within society. The perception of the urgency to act already influences our choices as individuals. An awareness specific to our business is also growing: One of the essential messages carried by Engineers declare and the Syntec Charter for Climate, is to recognise that engineering prescribes solutions that have a significant impact in terms of carbon footprint.

Indeed, building passes most of the time by a process of transformation of matter – extracting resources, modifying them – to make it conform to our needs and improve our quality of life.

The role of the engineer has been at the heart of this approach since the 18th century.

A sector durably marked by the choices of the XX century

The socio-political choices of the XX century such as industrialisation, functionalist urbanism, the individual car, large housing estates and suburban housing, have transformed our environment and have structured both our construction techniques and our lifestyles. However, these choices and developments, independently of demographic growth, have led to an explosion in the sector's consumption of surface area, materials and energy, as well as in waste production and greenhouse gas emissions.

A major part of the global carbon footprint

The construction sector consumes about 45% of the energy in France and emits 1/3 of the greenhouse gases*, with two distinct components:

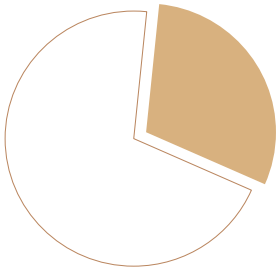
> the greenhouse gases resulting from the construction of a project, its maintenance and its end of life, known as grey carbon
> greenhouse gases resulting from the operation of a project, its uses, such as heating and air conditioning a home, or car traffic a highway, often called carbon operations.

By intervening both on the choice of constructive systems and on the operating conditions of a project, engineers have a significant impact on

the contribution of the construction sector to climate change.

Today, if a French person emits an average of 12 tonnes of CO_2 equivalent by his consumption habits, the technical solutions proposed by the engineer influence carbon emissions 100 to 1000 times higher.

Materials such as concrete and metals, for example, have fascinating technical performances, but their production processes have so far been highly emitting greenhouse gases. Globally, concrete



construction, materials, exploitation.

Putting our approach within a societal logic

As a multidisciplinary engineering group, **setec** designs and implements complex and innovative construction projects. The major contemporary challenges are at the heart of our activities on a daily basis: developing and improving mobility and transport, adapting infrastructures to new uses, strengthening eco-construction and the circular economy, preparing for energy and environmental transitions, making sustainable and resilient cities possible, improving the efficiency of industrial projects.

As citizens, **setec** engineers are concerned about these major issues. Faced with the urgency of climate change, **setec** wants to design projects that are part of this process of improvement by setting territorial development on the path to carbon neutrality through visionary and operational engineering.

As engineers, **setec** employees develop solutions with a scientific mindset, focusing on technical excellence and efficient project management. This has been **setec**'s main focus and part of its DNA for over 60 years. This excellence is what makes the group so attractive to clients and is what all who join **setec** value.
Today, **setec** wants to make the objective of carbon neutrality the baseline of its decision-making, in order to place its technical know-how at the service of the challenges of the 211st century.

We understand this challenge, and we have committed to accelerating the training of our employees on the challenges of low-carbon transition.

This manifesto is therefore a continuation of the work already undertaken. It is intended to highlight in a more global vision the strategies **setec** is committed to, in order to "decarbonise" clients'. It is aimed at all those involved in the construction industry, clients, project owners, designers, managers, companies, etc. We are convinced that achieving the low-carbon objective requires a collective ambition, in which everyone has a role to

We are basically aiming to make three

Providing a 360° low-carbon vision by explaining the choices we make regarding our operations, through an overall analysis of needs and impacts

Eco-designing and decarbonising construction by systematically proposing low-carbon constructive alternatives at all stages of the project

Playing an active role in the development of our activities by pursuing our **R&D** efforts and by improving our calculation and decision-making tools

*GES emissions in France - source : Citepa

Proposing a 360° low-carbon vision

Establishing common goals

In order to assist our clients and partners in tackling carbon impact, we commit to a systemic approach, adopting the principles of valuing the existing, adapting to the site, sobriety, efficiency and eco-design, and defending a global approach. Together we define achievable and measurable low-carbon performance objectives, identifying the most significant programmatic and design orientations in terms of impact.

The multi-disciplinary team that we put in place must, during regular design reviews with our clients and partners, oversee the evolution of the project with regard to the carbon reduction objectives that have been defined. The quest to reduce greenhouse gas emissions is therefore carried out within a shared context and adjusted as the project develops.

Consolidating the expression of need to rationalise projects and bring out the most sustainable solutions

Reducing carbon footprint also requires defining the project as precisely as possible. It is therefore necessary to assist the client in defining their needs during the preliminary phase, distinguishing between the technical solutions proposed. The many areas of expertise make it possible to promote the flexibility and depth of vision necessary during these phases, and to take the audacious steps right from the start of the project. We particularly consider the possibility of sharing practices, the opportunities that could arise by broadening the initial scope of the project, and the evolution of needs.

We guarantee the continuity of this understanding of needs and orientations throughout the development of the projects. We share the interpretation of these invariants by clearly distinguishing them from the answers that are progressively imagined and met.

Informing the decision process

In order to advise our clients, multi-criteria analysis is becoming increasingly important. It is therefore a question of combining different evaluation parameters, such as the relevance of the project's solution to the need, the resilience of the structures to the consequences of climate change and the control of the environmental impacts of the projects.

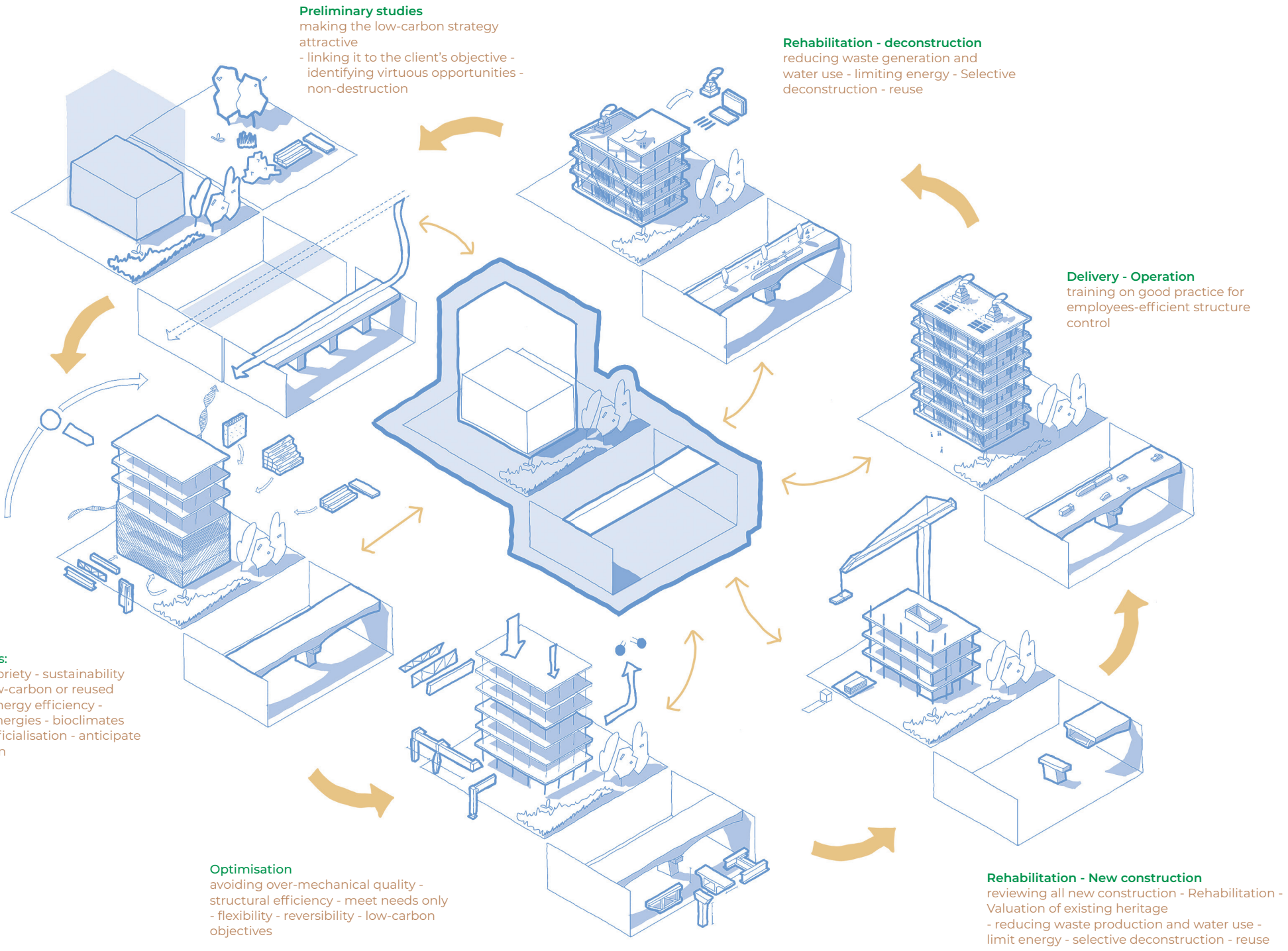
We wish to continue to develop this cross-disciplinary approach to analysing the overall relevance of our projects, from preliminary studies to operational supervision, and throughout the course of the project's implementation.

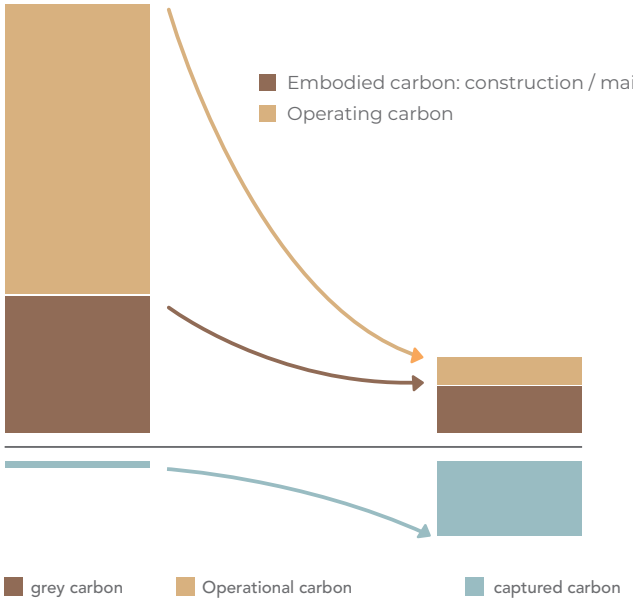
Reinventing project methodologies to build collectively

The project is not just about adopting the best possible solution, because there are a multitude of solutions for a particular challenge, with various ways of achieving results.

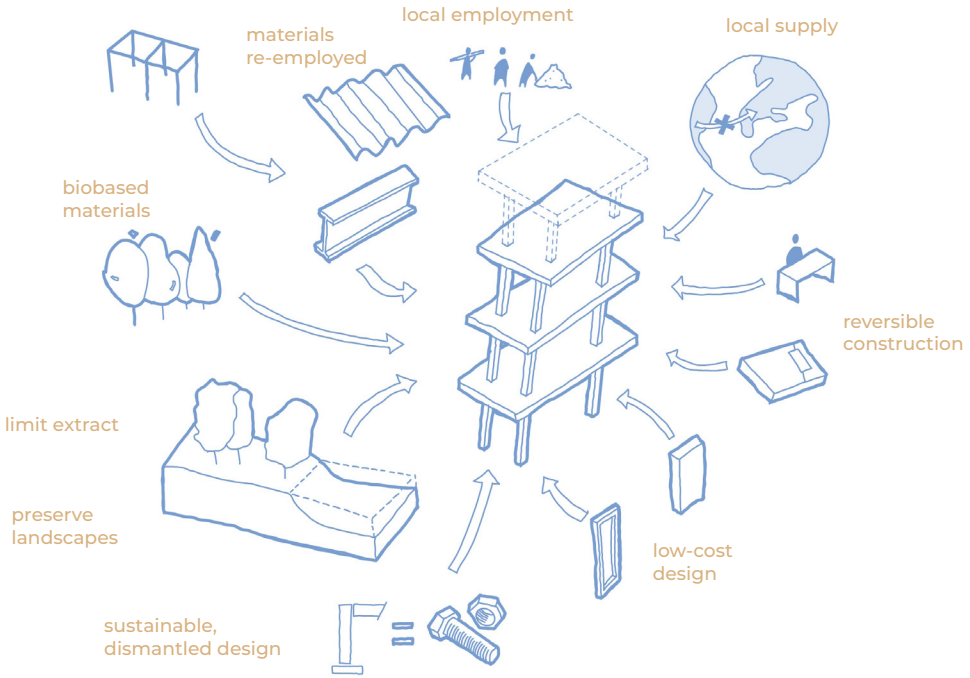
We are convinced that the optimal solution in terms of carbon costs will come from a close collaboration between architecture, planning and engineering on the one hand, and between the design team, the construction companies and the client on the other.

We are committed to developing our collaborations with partners in engineering, architecture, urban planning and landscape design, in order to activate levers that go beyond the scope of our engineering mission, advocating circularity, simplicity and sobriety.


Preliminary studies
making the low-carbon strategy attractive
- linking it to the client's objective - identifying virtuous opportunities - non-destruction
Rehabilitation - deconstruction
reducing waste generation and water use - limiting energy - Selective deconstruction - reuse
Delivery - Operation
training on good practice for employees-efficient structure control
Design studies:
simplicity - sobriety - sustainability
- biobased, low-carbon or reused materials - energy efficiency - renewable energies - bioclimates
- avoiding artificialisation - anticipate deconstruction
Optimisation
avoiding over-mechanical quality - structural efficiency - meet needs only - flexibility - reversibility - low-carbon objectives
Rehabilitation - New construction
reviewing all new construction - Rehabilitation - Valuation of existing heritage
- reducing waste production and water use - limit energy - selective deconstruction - reuse



Reducing embodied carbon and operating carbon
Increase capture through carbon wells



Eco-design and decarbonise construction

Extending the scope of possibilities

We are committed to providing, at all stages of the project, low-carbon scenarios in addition to traditional solutions. This leads to a reflection concerning the site, on the resources it possesses, and on the way in which building systems can be designed more intelligently than before.

Enhancing the heritage and adapt to the site

Decarbonised design requires that we begin by changing the way we look at territories. The idea is to see built heritage and built-up land as a local resource, as «carbon expenditure» that has already been achieved and which should be reused as much as possible. The knowledge and characterisation of buildings, infrastructures and urbanised areas, whether they are in use or in a state of disuse, is fundamental. Therefore, our diagnoses are improved by a complete chart - technical, capacity and use-oriented - in order to identify opportunities to meet the needs that have been identified, by increasing the density of use or adapting the construction already in place.

This is essential for the preservation of natural, agricultural and forest areas. This is a priority of the French National Low Carbon Strategy, as they are carbon wells, suppliers of bio-based and renewable materials, and their destruction has related effects.

At the scale of a given site and at any level of study, we integrate the existing ecosystem into our design and we adapt accordingly. Our development strategy values the natural and already artificial characteristics of the site, and adapts the levelling to the topography to limit the movement of materials.

Assessing resource availability and reduce the impact of high-carbon materials

By changing the way we look at existing buildings and anthropised soils, they become a resource of materials in their own right. This is why they must be considered at the design stage, and valorised. We need to include the principles of rehabilitation and the circular economy by encouraging the use of existing buildings and materials on-site or nearby. By reusing or elevating an existing structure, for example, we limit the use of material and additional soil artificialisation. These are also opportunities to put in place a superstructure that is more virtuous than the original building and to redesign the exterior.

If the existing building is deemed unusable for the purpose of the proposed redevelopment, it should no longer be demolished, but the possibilities for reuse of the material should be examined, by deconstructing and building on the existing foundation.

If the resource is not sufficient, we give priority to: re-used materials offered by dedicated platforms, bio-sourced materials, local low-carbon materials or materials with a high recycled content, which reduce the carbon content of production and transport and limit the scarcity of resources.

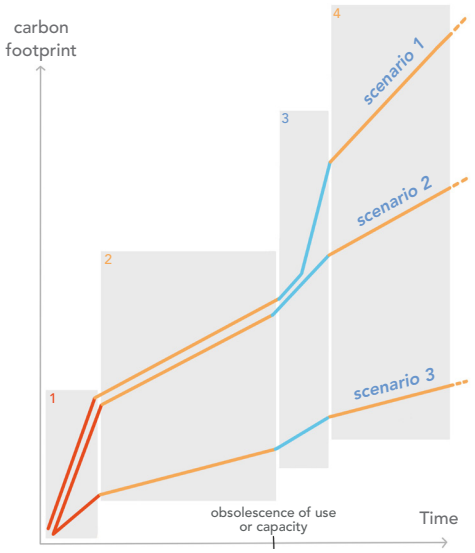
Economical design, efficient and adaptable design

Low-carbon design implies to integrate concepts of common-sense, efficiency and optimisation. Reduce grey carbon by simplifying the design and avoiding over-prescription. Eliminating overly conservative hypotheses in the choice of charges and coefficients is an effective way of reducing the carbon footprint by adapting the answer to the structure's use.

By nature, we structurally optimise our works and de facto limit their footprint through a more economical and reasoned use of materials. With the help of carbon quantification or LCA tools, we carry out environmental optimisations by making more virtuous construction choices, such as low-carbon materials or more efficient mixed and prefabricated systems, including assemblies that anticipate future reuse.

Understanding the materials and mechanical characteristics allows for the selection of higher carbon materials when necessary, when the span and load constraints become too great. Because economy is also an energy issue, we improve the efficiency of systems, we take advantage of the climate by thinking in terms of bioclimatic design and we substitute fossil fuels with low-carbon energy. From engineering of materials to the design of structures, the synergy of **setec**'s know-how is an asset for a virtuous design.

Examples of three carbon expenditure scenarios , applied to a civil engineering structure and a building



1. new construction
2. first stage of operation
3. rehabilitation or demolition/reconstruction
4. second stage of operation

Scenario 1

This scenario induces, through programming and design, significant carbon emissions. When capacity or use becomes obsolete, the lack of structural evolution of the structure/building, the absence of systemic reflection, and the minimisation of the study phase, lead to the demolition of the existing building and its replacement by a type of construction that is just as carbon based.

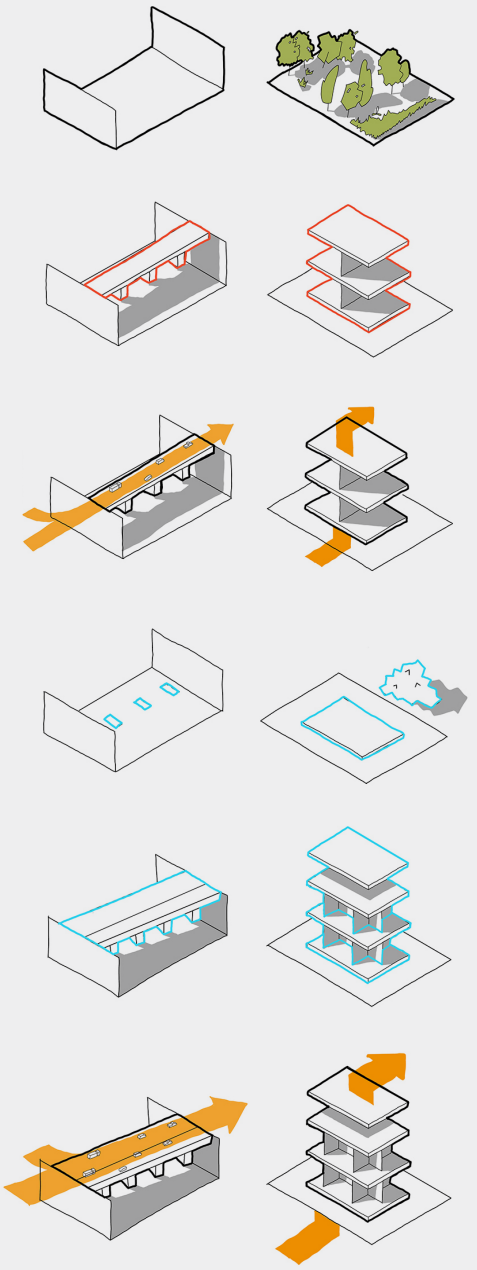
Scenario 2

This scenario shows the virtues of rehabilitation and reversibility. Even if the initial state is high in carbon, the analysis of needs, combined with the evaluation of the existing situation, makes it possible to include the « existing » in a virtuous scenario. This implies a change of posture in project design and operation.

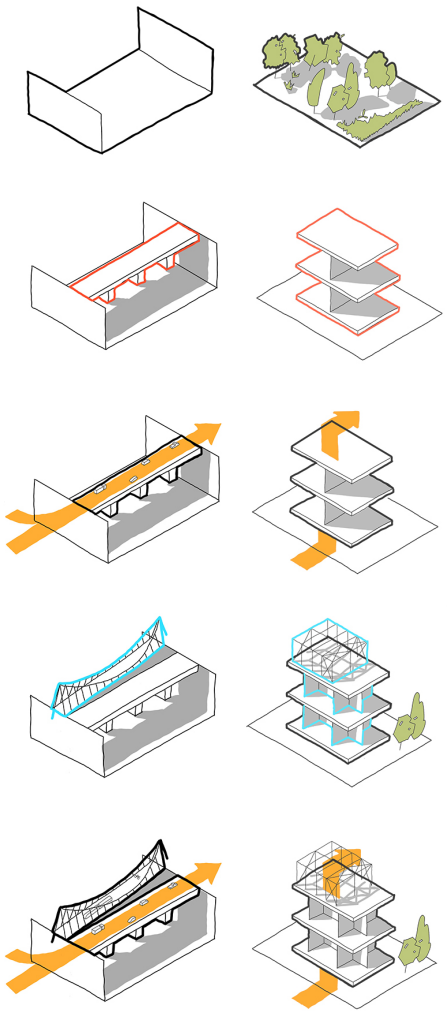
Scenario 3

The low-carbon approach limits emissions over the entire life cycle and activates all the levers of decarbonisation of construction. The associated eco-design is intended to be simple, circular, designed within the environment and adjusted to requirements in order to be able to evolve at a lower cost toward uses that are less carbon based

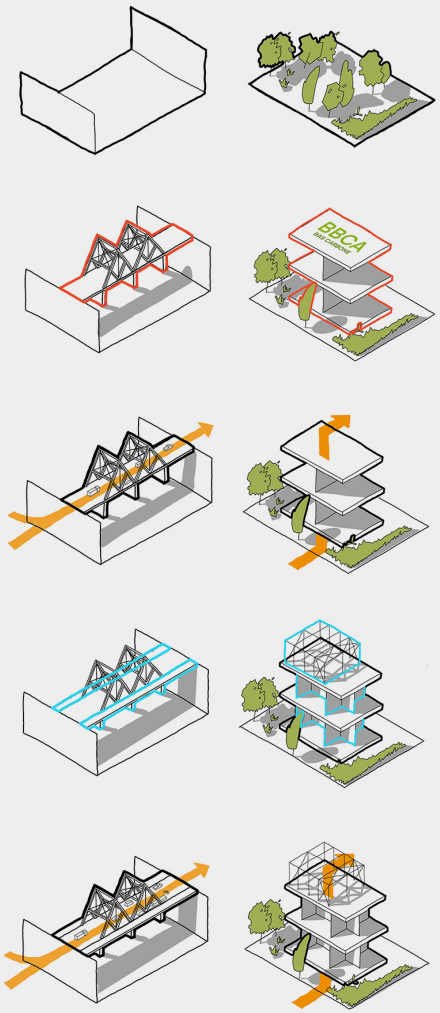
Scenario 1:
build-demolish-rebuild



Scenario 2:
building and then rehabilitating in a virtuous



Scenario 3:
low-carbon and progressive



Being an essential force in the development of our professions.

A shared carbon culture

Our ability to propose a low-carbon design approach is based on a solid knowledge foundation and adaptation at all levels.

Several initiatives are already in place to train and build the internal capacity of design teams on the implications of carbon impact on the scale of construction projects. One of the objectives is, for example, to train all employees on the Climate Fresk, which is a good starting point for raising awareness and acquiring basic knowledge on environmental issues.

In order to go further, conferences are regularly organised on themes such as climate change, the circular economy, or the timber industry: led by **setec** engineers or external speakers, they provide an opportunity to address the issues in a practical way and to discuss with recognised experts.

To ensure a unified and consistent approach, these initiatives are complemented by the availability of practical low-carbon design guides, together with training modules for their use. The aim is to give each employee, in their everyday work place the means to identify what is available to them to reduce the environmental impact of projects and adapt their design accordingly.

Continuous research and innovation

In addition to these training courses, research and development projects are carried out through thesis work, the creation of interdisciplinary working groups, and training courses dedicated to low-carbon issues.

Furthermore, **setec** Labs, innovation incubators established several years ago within the group, are another opportunity offered to employees to propose ideas and to develop engineering methods.

Made up of dozens of enthusiastic members from all of our subsidiaries, they develop and support innovative approaches to adapt to the context of our industry and the needs of our clients and partners. In recent years, several themes have been dealt with low-carbon such as non-construction engineering, low-carbon materials or biobased materials.

On the road to transition

Developing new metrics

Regulatory tools are the foundation for the transition and decarbonisation of the sector. Through the internal mechanisms that we develop and use, we seek to anticipate regulatory changes.

We already use life cycle analysis (LCA) software to assess the impact of a building on the environment. This impact includes the carbon footprint of the project, not only during its lifetime, but also during the extraction of raw materials at the time of construction, and up to the treatment of waste at demolition.

However, we note that there is still room for improvement in the project assessment process and in the way it is integrated into studies and public decision-making. Particularly in impact studies and socio-economic studies, the climate and carbon aspect deserves to be taken further to help projects progress towards ever more virtuous, sustainable and resilient solutions. We believe it is essential to work on the development of tools offering a better evaluation, while questioning the importance that should be given to them in the environmental analysis factors, and therefore ultimately in the appropriation of this analysis by the public in order to express an opinion.

This can be done by drawing inspiration from the most advanced areas of enforcement, such as the construction sector. Existing software, often developed primarily for this type of construction, should be extended to the evaluation of structures and infrastructure projects, whose carbon impact deserves to be better understood. In this sense, we develop our own tools and adapt them to these complex projects.

Then, it is essential that these tools are integrated into everyday working methods, to bring real added value to help low-carbon design throughout the project. For this reason, we adapt our own software internally, and make it compatible with early and continuous use on projects. Our goal is to have design assistance devices and methods to support the design of all types of works processed by **setec**, incorporating the general principle of circular economy and reuse.

Reducing the carbon impact of the Paris Olympics Games

As part of the Paris 2024 Olympic Games, **setec** is in charge of the design of Lot E of the Athletes' Village. Its collective housing program foresees a reduced carbon footprint of about 50% compared to conventional constructions, with 10 R+5 buildings in wood structure, And 5 R+10 buildings in so-called «low carbon» concrete structure.
In addition to these studies, an R&D project was carried out by our teams to go even further and seek a maximum reduction in the footprint of one of the R+10 buildings by maximising the use of wood, while respecting the strict criteria of the specifications in terms of fire and acoustic regulations.

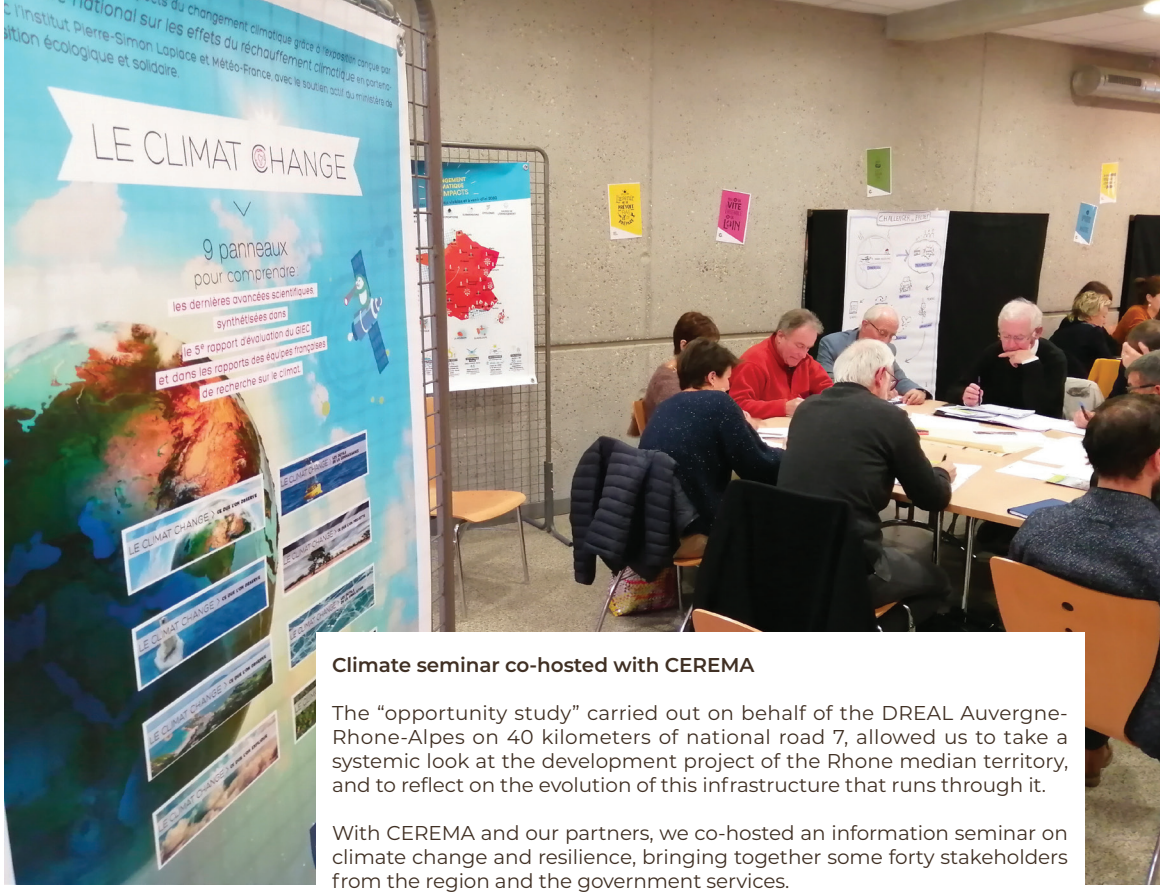
On the road to transition

Rehabilitating Lyon's architectural heritage

The Crystallin was built in the 1960s and was the former headquarters of a government agency. It was completely renovated and converted into an office building, where the Lyon-based teams of **setec** were once located.

The original building, whose facade has been renovated, has gained two thirds of its floor space through extension and heightening.
The ground floor will be used as an operational area and the basement will be used as a secure parking area for bicycles and shared vehicles.

As part of the heritage reuse operation via the evolving functional programme and the ambitious operating-maintenance specifications, our engineers continue to control the building's energy consumption and ensure compliance with the energy performance commitment agreed with the maintenance company.



Climate seminar co-hosted with CEREMA

The "opportunity study" carried out on behalf of the DREAL Auvergne-Rhone-Alpes on 40 kilometers of national road 7, allowed us to take a systemic look at the development project of the Rhone median territory, and to reflect on the evolution of this infrastructure that runs through it.

With CEREMA and our partners, we co-hosted an information seminar on climate change and resilience, bringing together some forty stakeholders from the region and the government services.

Alternatives to road widening have thus emerged, through the desire to preserve the natural resources of the valley and to enhance decarbonised uses.

Building bridges between communities in Rwanda

The NGO Bridges To Prosperity works to open up isolated communities through the design and construction of pedestrian bridges.

In 2019 we supported them in Rwanda as a sponsor of a structure suspended over the Rukarara River. Swollen during the 6-month rainy season, several people lose their lives each year while attempting to cross it. With strong social significance, the project also mobilised ten employees sent on site to help with construction alongside the Uwarukara community.

The bridge is low-tech (small tools for assembly and manual hoisting) and recycled material were used (main cables salvaged from cranes, metal hangers made of concrete reinforcing bars) as well as local resources (eucalyptus wood from Rwandan forests).

On the road to transition

Reversibility conference in Chicago

The reuse of building materials, to be clearly distinguished from recycling, has a significant environmental interest in preserving natural resources, reducing GHG emissions, avoiding waste generation and extending the life cycle. Designing durable structural elements and assemblies that can be easily dismantled for re-use becomes a major challenge.

To consolidate our commitment in this direction, we funded a dedicated thesis "Design of buildings ensuring their reversibility, deconstruction and reuse, monitoring methodology and environmental assessment on life cycles" conducted at the Navier laboratory of the Ecole des Ponts ParisTech. The conclusions in terms of reversible construction already feed into our practical low-carbon design guides.

An eco-friendly train station in Nimes

The Nîmes Pont-du-Gard station fits respectfully into the surroundings along the Nîmes-Montpellier rail bypass. The design combines the methodology of **setec** engineers with the architect-designer's committed approach to post-carbon construction.

The control of energy consumption and the use of photovoltaic panels minimise operating carbon. Significant work has also been done on grey carbon. The artificialisation of the soil has been limited and the project gives pride of place to bio-sourced materials: bamboo sun breakers and glued laminated oak shade posts from responsibly managed forests in the Vosges mountains. The building is certified «Mediterranean Sustainable Building» and «Occitanie Sustainable Building».

High-rise wood tower in Bordeaux

The use of wood is one of the levers to reduce greenhouse gas emissions and is therefore in line with the national objective of carbon neutrality by 2050. A prototype project for the «Low Carbon Building» label launched by the BBCA association, the Hyperion tower in Bordeaux is one of the first high-rise wooden buildings.

Our teams carried out the execution studies of this 57-meter high tower, composed of floors and peripheral beams made of glued laminated wood and a wooden frame facade. Representing an assembly of 1,500 factory-built parts, and also reducing the duration of the structural work by half, Hyperion was awarded the BIM d'Or 2019.

ENGINEERS & CITIZENS