seteo

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MAGAZINE #46

Resource saving

Resource *sobriety* at every stage of the project lifecycle

editorial

Part 1

Initial need: to *question* and to *transform*

Long considered unlimited, natural resources are now a source of tension: in a world that continues to produce increasingly more, the availability of materials, energy and water can no longer be taken for granted. At **setec**, we consider this the central theme of our engineering approach: sobriety, sustainability and respect for the environment guide our choices as we question what is truly necessary, design using fewer materials and aim for sustainable solutions. The figures[1] show that in France, the 2050 target set out in the National Low-Carbon Strategy[2] foresees a 39% reduction in final energy consumption between 2022 and 2050; in 2022, 99.7% of the metallic mineral resources used will be imported; and water resources are declining (−14% in metropolitan France between 2002 and 2022). These are all pressures affecting ou activities, from design to operation.

This 46th issue of the **setec Mag** is organised into four sections, focusing on the stages at which resource decisions are made. First, 'The Initial need': a focus on soil restoration along the A13 in France, or the strategic planning of the Eastern & Jazan region in Saudi Arabia, to limit the impacts of urbanisation on key resources. Then 'Design and size': meeting demands whilst reducing impact, through practical trade-offs such as the eco-design of ventilation systems at La Défense in Paris. The third section, 'Building and delivering', highlights resource sobriety in practice: a rainwater reuse system implemented by our teams in Brazil, or a responsible construction site prioritising reuse in Lyon, on the 233 Lafayette project. Finally, 'Operation, maintenance and end of life': repairing, extending the lifespan of projects, adapting — expertise provided in particular by **setec diadès** and **setec lerm**. All these case studies demonstrate that sustainable engineering is not a restriction: it is a way of making better decisions, from the very first stage right through to the asset's second life.

We hope you enjoy the read,
Anne-Marie Choho, Michel Kahan

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Before construction begins, a detailed needs analysis is a crucial step in ensuring that resource sobriety is incorporated from the very earliest stages of the project. The aim is to align the intended uses with the available resources, and to guide the preliminary studies towards technical solutions that are most economical in terms of both material and financial resources.

[1] Source: High Commission for Sustainable Development (CGDD), 'Natural Resources: Key Figures', State of the Environment in France (2024 report), Notre-environnement.gouv.fr (https://www.notre-environnement.gouv.fr/l-etat-de-l-environnement-en-france/toutes-les-ressources-en-ligne/article/ressources-naturelles-chiffres-cles).
[2] National Low-Carbon Strategy 2

Restoring fertile land on the site of former roads and toll booths: this is the project being led by **setec** on behalf of Sanef, as part of the transition to free-flow traffic on the A13.

Regeneration

A *method* for revitalising soils

Lina Bouvet, Project manager for environmentally regulated facilities-environmental assessment, **setec énergie environnement**

Xavier Fresneau, Project Director, **setec international**

Floréane Liège, design engineer, **setec lerm**

Between Paris and Normandy, the dismantling of the A13 motorway toll booths and associated infrastructure is allowing 28 hectares to be returned to nature. The Sanef motorway group has commissioned **setec** to experiment with creating fertile soil on part of these sealed surfaces, before launching a larger-scale regeneration programme. "The aim was to adopt a resource-efficient approach, avoiding the import of topsoil from agricultural land. Our proposal was to organise soil treatment on-site, incorporating inert materials from the demolition work to also limit outbound waste flows," explains Xavier Fresneau, project manager at **setec international**.

Organic inputs

Two pilot sites have been identified: Buchelay in the Yvelines, and Dozulé in Calvados. After stripping and removing the asphalt and bituminous layers, the **setec** teams are reworking the existing soil, which consists mainly of inert excavated material. This work involves adding compost produced from green waste to the top 30 cm layer. "These additions provide the nutrients necessary for plant growth. To design these mixtures, we carried out analyses to determine the physico-chemical behaviour of the existing materials and adjust the percentage of compost," explains Floréane Liège, a design engineer at **setec lerm**.

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Local resources

Over a period of one and a half years, several formulations were tested to determine the mixtures best suited to each site. "We also checked the compost production capacities of local producers: soil regeneration will require significant volumes, so the idea is to work within a short supply chain to improve the carbon footprint of the project," reports Lina Bouvet, Project manager for environmentally regulated facilities-environmental assessment at **setec énergie environnement**.

Four sites soon to be under construction

By 2025, the results of the trial had enabled the regeneration programme to be extended to a total of four sites. Responsible for drafting the technical specifications for the works contract, the **setec** teams were able to draw up recommendations for each of these sites regarding compost amendments, the mixing process and the phasing of planting: work is due to start in the summer of 2026.

Take action upstream

Spatial planning as a lever for *sobriety*

Alexis Mariani,
Deputy Managing Director,
setec organisation

In Saudi Arabia, **setec** is involved in the Jazan and Eastern regions early on in the process: at this point, key decisions have not yet been finalised, and we have numerous levers at our disposal to steer these regions towards more sustainable development pathways.

Two examples of very large-scale spatial planning

Since 2023, **setec** has been supporting Saudi Arabia in defining long-term spatial strategies for these regions with very contrasting profiles: Jazan and the Eastern Province. Two regions, one shared ambition: to organise their development up to 2050 against a context of strong population growth.

"We get involved at a very early stage. It is precisely at this point that the levers for action are the most powerful," emphasises Alexis Mariani, Deputy Managing Director of **setec organisation**. Spatial planning does indeed make it possible to examine needs and solutions across an entire region.

Jazan: harnessing the resources of a region with high potential

Located along the southern coast of the Red Sea, the Jazan region stretches for nearly 300 km and is home to over 1.4 million people. A mountainous, agricultural region, it boasts significant assets.

As the lead contractor, **setec** is responsible for the management and technical coordination of the regional strategy, alongside partners such as the Institut Paris Region, Beyond, Alpin and CLS. Thanks to its expertise in urban planning, urban programming and project management, **setec organisation** acts as the coordinator among the other subsidiaries and partners.

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Eastern Region: anticipating the development of a strategic territory

The Eastern Province is a region on a completely different scale. A key industrial region within the Saudi ecosystem, it is home to over five million people today and is experiencing rapid population growth: 10 million are projected by 2050. The planning challenges there are considerable.

"In both projects, our approach is based on scenarios," explains Alexis Mariani. Following a detailed assessment and a "business as usual" scenario, several alternative trajectories are developed. "By working on these parameters from the outset, we can avoid urban sprawl, limit oversized infrastructure and preserve critical resources such as water."

Setting the stage for sustainability

These projects draw on a wide range of expertise: urban planning, demography, economics, water, infrastructure, mobility, the environment, energy and waste. "We bring together highly specialised skills to build a global territorial vision," summarises Alexis Mariani.

Beyond Jazan and the Eastern Region, these projects illustrate a firm conviction: **sobriety hinges on early-stage decisions**. "At this stage, nothing is set in stone. This is where engineering can really influence the direction things take."

The role of setec KSA's local teams is also central to these projects. They handle operational coordination, client relations, data collection and analysis, GIS tool management, and stakeholder management. At least ten (10) **setec** employees are working on a full-time basis.

Major Projects

Optimising the management of excavated materials

Major projects generate millions of cubic metres of waste, but they are increasingly working to reduce their environmental footprint. For the Lyon–Turin tunnel project, the **setec** teams are working to recycle excavated material into aggregates which can be used for the project's concrete structures.

Isabelle Moulin,
Director of Development,
setec lerm

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"We need to work differently from how we usually do, whilst ensuring the quality of the concrete and maintaining the site's production rates"

The 57 km of the Lyon-Turin Euralpin Tunnel (TELT) project have been divided into several operational sites, one of which is specifically responsible for managing excavated materials. The aim is ambitious: to recycle at least 50% of the 37 million tonnes of material that will be excavated, primarily in the form of aggregates for the project's concrete structures.

As lead representative of the design & construction supervision consortium for the CO6/7 civil engineering works site, the **setec** group is contributing to this circular economy initiative. "A major challenge lies in controlling the quality of materials produced from a heterogeneous source: the key is to determine what types of materials are being excavated, in what quantities and at what stage. These must then be sorted, processed and matched to the site's requirements," emphasises Isabelle Moulin, Director of Development at **setec lerm**.

A site-specific approach

setec's expertise in materials, particularly in concrete and its durability, has enabled the company to propose a site-specific approach to promote the use of excavated materials as aggregates.

"We need to work differently from the usual approach, whilst ensuring the quality of the concrete and maintaining the site's pace," points out Isabelle Moulin. Working in collaboration with the consortium of contractors awarded the contract and the project owner, we proposed a methodology tailored to the project's specific context, allowing us to incorporate the particularities of aggregate production and the potential need to adapt concrete mix designs during the construction phase. All of this is based on recent developments in concrete standards. "This approach should also facilitate a shared sense of responsibility among the various parties involved in the project."

50 %

The aim is to recover materials from the excavation site, particularly aggregates.

HYDRATEC

Lyon Metropolitan Area

Anticipating needs to improve how water is shared

Céline Truffier,
Business Manager,
setec hydratec

As the Saône's final tributary, the Ruisseau des Planches (Planches stream) is a fragile water source for several municipalities in western Lyon, in France, which lack groundwater reserves. In 2024, the Lyon Metropolis commissioned **setec** to carry out a study to better assess the water resource and the volumes available for various uses.

"The first step was to assess the stream's minimum natural flow and the needs of aquatic ecosystems: the difference gives us the quantities available for human use," explains Céline Truffier, project manager at **setec hydratec**.
The study then looked at the various water management tools in the region. "The aim is to build consensus around the resource. Local stakeholders agree, for example, on maintaining water reservoirs for market gardening activities that supply the city: the challenge is to ensure that the necessary volumes are drawn from the stream in winter, to maintain sufficient flow for natural habitats in summer," explains Céline Truffier.

In an urbanised environment, the challenge is also to reduce soil sealing. "Our study recommends separating the networks dedicated to wastewater and stormwater management, so that the latter can return to the natural environment or be used for domestic watering instead of being collected and sent to a treatment plant."

Decision-making support

Finally, by modifying the morphology of the watercourse, it is possible to create safe havens for species during periods of drought and create a more resilient environment. "These proposals serve as decision-making tools for the local authority and provide a basis for consultation with local stakeholders," concludes Céline Truffier.

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Part 2

Design & *size* to minimise impact

The design phase is critical for defining the most resource-efficient solutions. Bio-based materials, passive design solutions, streamlined structures and energy systems, and the use of traditional techniques: the **setec** teams have a wide range of solutions at their disposal to reduce the environmental footprint throughout a project's lifecycle, from construction through to operation.

La Défense

A ventilation system that combines safety with energy efficiency

Mohamed El Madrab,
Fire Safety and Ventilation Engineer, **setec tpi**

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In La Défense, *the Voie des Sculpteurs* is one of 14 covered walkways serving the business district. In the summer of 2026, this 650-metre-long walkway will be fitted with a new ventilation system, designed to improve user safety.

"At the request of the client, PARIS LA DEFENSE, we focused the design on natural ventilation for air renewal and smoke extraction in the event of a fire. And we drew on our expertise in aerodynamics and modelling to ensure the system's reliability was in line with regulatory requirements, which are very strict for road tunnels," reports Mohamed El Madrab, fire safety and ventilation engineer at **setec tpi**, the lead contractor for design & construction supervision.

Seven times fewer greenhouse gases

Several design options were explored, resulting in a proposal for four openings distributed along the entire length of the cycle path. These openings in the deck therefore provide air circulation and natural light: two essential conditions for making the covered cycle path accessible to cyclists, as requested by the client.
From an environmental perspective, opting for a natural ventilation system helps to reduce the project's carbon footprint not only during construction but also throughout its entire lifecycle. "Our projections show that, over the 50-year operational period, greenhouse gas emissions will be seven times lower than with a mechanical ventilation system, mainly due to energy savings," points out Mohamed El Madrab.

Vitrolles, France

A pioneering project promoting low-carbon offices

Due for completion in 2025, the Griffon II will house **setec**'s southern France teams across 5,100 m². The building has been designed to showcase the group's expertise in innovation, multidisciplinary design, and BIM coordination and integration. It also serves as a demonstration of environmental performance.

Sandy Berbigette Cottret,
Director Fluids and Thermal Division, **setec gl ingénierie**

"Energy sobriety was a priority from the design stage onwards, with a holistic approach to the building's life cycle," says Sandy Berbigette Cottret, Director of the Fluids and Thermal Engineering Division at **setec gl ingénierie**. "During the structural works, we focused not only on structural optimisation but also on the choice of materials."
No less than 80% of the concrete used features low-carbon formulations, resulting in an average 40% reduction in emissions. To reduce energy requirements, particular attention was paid to the exterior of the building, with insulation averaging 180 mm in thickness and the use of low-carbon materials such as wood fibre and cotton wool insulation.

Passive cooling

In terms of equipment, priority was given to passive solutions. "There is no air conditioning in this building: a 15,000 m³/h air shaft coupled with a dual-flow ventilation system allows fresh air to be cooled in summer and heated in winter," explains Sandy Berbigette Cottret. This system is supplemented by an air-to-water heat pump combined with radiant panels to provide additional heating and cooling when necessary.

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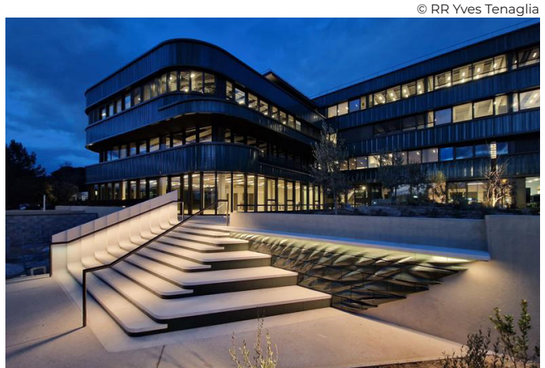

Controlling the environmental footprint of concrete while integrating its structural role and sustainability requirements: this is the aim of a study led by **setec** for the Orano Group.

R&D

High-performance, low-carbon concrete

Isabelle Moulin, Director of Development, **setec lerm**
Romain Beaudouin, Business Director, **setec nucléaire**

The study forms part of the 'Aval du Futur' programme, which involves the creation of nuclear fuel processing and production facilities. This amounts to approximately 100,000 m² of buildings to be built between 2030 and 2055 for Orano. "This represents substantial volumes of concrete and therefore a challenge in terms of resource efficiency. At the same time, these buildings meet the ASNR's requirements for facility safety," notes Romain Beaudouin, business director at **setec nucléaire**.

Anticipating future supply

Orano has commissioned setec to review the company's concrete specification document. It has two requirements: to adopt a performance-based approach to addressing the project's specific durability challenges, and to optimise the material's environmental footprint. "One initial challenge is to be able to justify concrete durability over 100 years, something no existing standard provides for. Another is to anticipate the range of cements and concrete additives available on the market in 15 to 20 years' time, against a context of rapid change in the hydraulic binders sector," notes Isabelle Moulin, Director of Development at **setec lerm**.

A practical tool

Setec's engineers rely on the group's exclusive modelling and decision-support tools. Their study proposes a methodology for managing the project's specific durability challenges and the environmental impact of material choices, which can be incorporated into tender documents. "We are creating a framework that will contractually guarantee an extended service life for concrete and efforts to reduce the carbon footprint, whilst remaining realistic in relation to the restrictions around the construction site – scheduling, implementation and material supply," concludes Isabelle Moulin.

100 years
This is the target lifespan sought for the concrete to be used in this project.

Monaco

A lightweight structure for pop-up boutiques

In the heart of Monaco, the Société des Bains de Mer commissioned **setec** to design boutiques to house luxury brands with the requirement to keep the weight to a minimum. **setec** met this challenge with a minimalist structure that reduces material usage.

Adnane Berrazeg, Head of the Structural Engineering Department, **setec bâtiment**
Vincent Baumann, Senior Engineer, **setec bâtiment**

In 2014 in Monaco, the renovation of the Hôtel de Paris meant that about twenty prestigious boutiques had to be relocated to temporary pavilions in the historic Jardin des Boulingrins. The problem was that the site was situated on a car park that could not bear excessive loads. "We also had to take into account the logistical challenges of Monaco's city centre, where deliveries could only be made using small utility vehicles," adds Adnane Berrazeg, Head of the Structural Engineering Department at **setec bâtiment**.

To create the futuristic pavilions designed by Affine Design, **setec** used 3D parametric geometry tools. The engineers designed a lightweight shell, made of thin sheet metal, insulated and clad in aluminium scales. This structure is prefabricated in the form of easily transportable sections (2m wide by 2 to 10m long) that simply need to be assembled on site.
"The limitations of the construction site meant that material had to be used efficiently: the very shape of the hulls enhances their mechanical performance. "We took the minimalist approach a step further by leaving the structure visible from inside the boutiques, using high-quality finishing materials," explains Vincent Baumann, senior engineer at **setec bâtiment**.

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Morocco

Traditional values promoting simplicity

At the heart of the Greater Casablanca urban development programme, the Zenata eco-city is set to be home to 300,000 residents by 2030. It is in this new town, designed as a model of excellence in terms of services and environmental footprint, that **setec** has supported a pilot project for rainwater recycling

Rabab Amajjout,
Manager of Cities and Regions, **setec Maroc**

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"Since the creation of sewerage networks in the last century, rainwater has been treated as a risk to be contained. With rainfall becoming increasingly scarce, it is now recognised as a precious resource," emphasises Rabab Amajjout, head of the Cities and Regions division at **setec Maroc**.

Conserving drinking water

The **setec** teams designed a rainwater harvesting system for Tanmia Secondary School, drawing inspiration from traditional local hydraulic expertise, where each household had its own storage facilities. Their studies led to the installation of a system to collect water from roofs and open spaces: the water is channelled into three underground tanks with a total capacity of 150 m³, to be used in place of drinking water for flushing toilets, cleaning surfaces and watering green spaces. This is expected to save at least two months' worth of annual consumption, according to initial projections.

The **setec** group also oversaw the construction work and commissioning of this demonstration project, which highlights the region's commitment to adaptation and resilience in the face of increasing aridity. "We have demonstrated that it is possible to carry out work on an existing building at a controlled cost to implement an effective solution. Not to mention that installing this system in a secondary school has significant educational value in terms of the need for sustainable water management," concludes Rabab Amajjout.

Cameroon

Optimised methods for waste treatment

Karine Escande, Project Manager **setec énergie environnement**

Whilst Cameroon's major cities already have waste collection infrastructure in place, sorting and treatment capacities are more limited, or even non-existent, in medium-sized towns. The Cameroonian government has commissioned **setec** to carry out a study to assess needs and propose operational solutions for these local authorities.

"We began by carrying out a detailed analysis, with a 20-year forecast: some towns are already experiencing rapid population growth, while others will see more limited waste volumes," says Karine Escande, project manager at **setec Énergie Environnement**.

The next challenge was to define the infrastructure suited to these different needs, with a roadmap adapted to each town. "The final report, issued in 2025, proposes a modular solution that allows for a gradual increase in sorting and recovery capacity in line with population growth," continues Karine Escande. "This staged approach allows the local authority to train teams in collection and sorting tools using small volumes, before increasing the quantities if necessary." From a financial perspective, the method also has the advantage of distributing investments over time and optimising operating costs.

The **setec** report also lays the foundations for a strategy to recover this waste, which is mainly organic. "Cameroon is an agricultural country where there are already advanced composting initiatives: we have studied the feasibility of deploying these practices nationwide to produce local compost as an alternative to chemical fertilisers imported from abroad," says Karine Escande.

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Diriyah Gate

combining heritage, engineering and resource sobriety

At Diriyah Gate in Saudi Arabia, sobriety is an intentional design choice. This project demonstrates how the use of traditional materials, combined with rigorously applied engineering, reduces the project's environmental footprint whilst meeting contemporary requirements.

Ibrahim Elzanaty,
Director
Design Management,
setec KSA

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An emblematic project of Saudi Arabia's Vision 2030

Located in Diriyah, the Kingdom's first capital city more than 300 years ago, this major project aims to transform a UNESCO World Heritage Site into a cultural and tourist hub of international stature.

Beyond its sheer scale, Diriyah Gate carries a strong symbolic significance. "The ambition is not to recreate the past, but to bring it back to life," explains Ibrahim Elzanaty, Director of Design Management at **setec KSA**. The architecture draws inspiration from the traditional Najdi style to preserve the site's identity, whilst incorporating contemporary uses and demanding technical standards.

setec was involved in the Diriyah Gate South Cultural District as a project management consultant, working in a joint venture with Egis. "Our role was not to design the buildings, but to manage and oversee the entire engineering process on behalf of the client," explains Ibrahim. The teams coordinated numerous international designers and supported the project from the conceptual phases through to the detailed design stage.

Resource sobriety, an integral feature of the project

The use of traditional materials, such as mud bricks and local limestone, was a key feature throughout the programme. "These materials have a low carbon footprint and excellent thermal performance," emphasises Ibrahim.

This sobriety is also the result of exceptional methodological discipline. Each building underwent as many as twelve successive control stages, covering costs, material usage, carbon efficiency and overall performance. "Nothing was approved without demonstrating that the project met these criteria. This level of demand is rare, but it ensures that no resources are wasted."

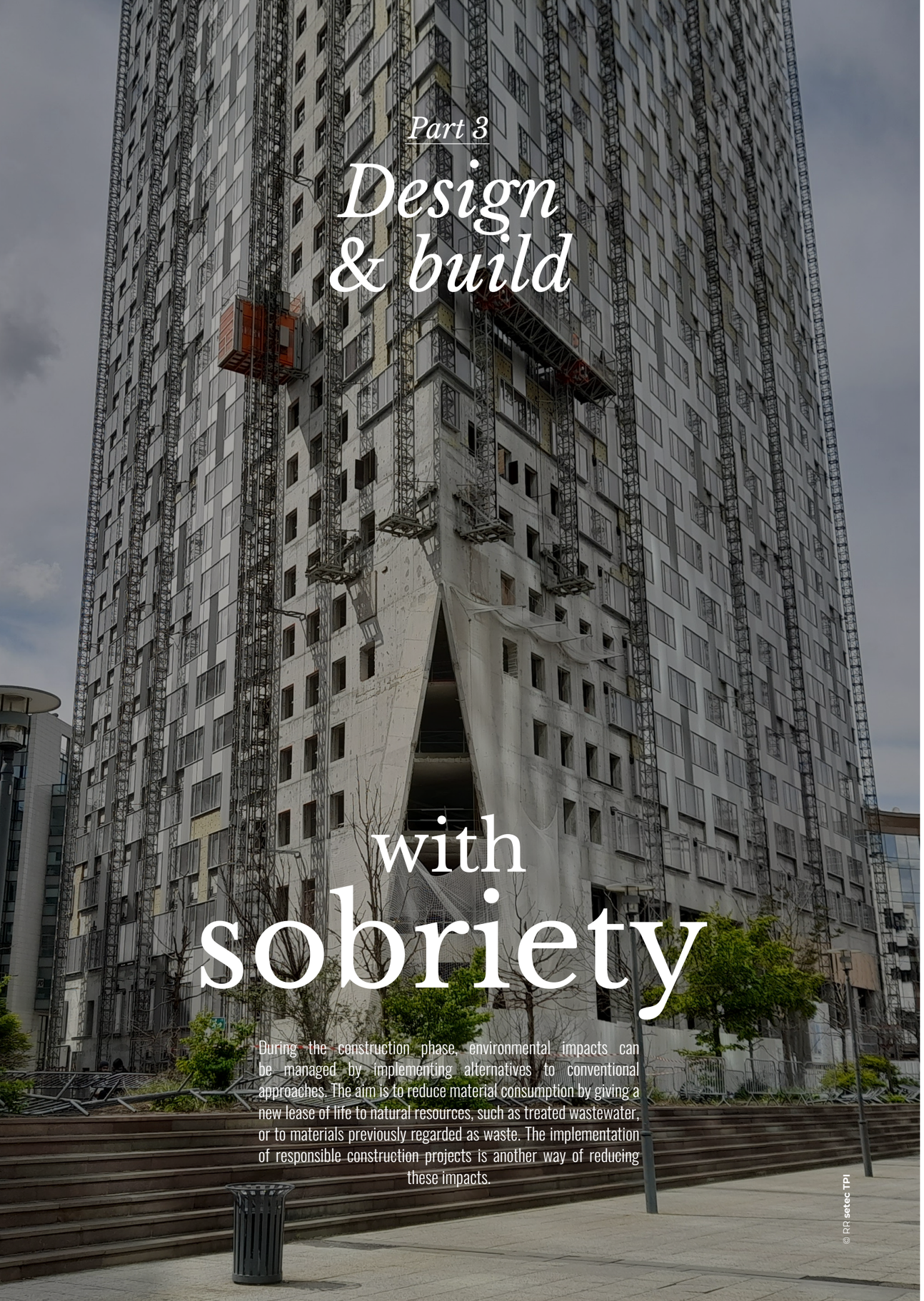
According to Ibrahim, Diriyah Gate embodies a sense of simplicity based on precision and discipline. "The challenge was to produce buildings with a traditional appearance, whilst meeting current standards for safety, comfort and performance."

Expected visitors:
over 25 million
per year by 2030

Residential capacity:
over 100,000 residents

Area:
14 km² of mixed-use development

Energy efficiency and carbon reduction:
the project incorporates measures to reduce energy requirements right from the building design stage, with the aim of achieving net zero.



Part 3

Design & build

with sobriety

During the construction phase, environmental impacts can be managed by implementing alternatives to conventional approaches. The aim is to reduce material consumption by giving a new lease of life to natural resources, such as treated wastewater, or to materials previously regarded as waste. The implementation of responsible construction projects is another way of reducing these impacts.

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Hopen Tower

renovate, rise, recycle

With resources becoming increasingly scarce, transforming existing buildings is becoming a major factor in promoting resource sustainability. In La Défense district in Paris, the Hopen Tower (formerly the Technip Tower, then the Adria Tower, now the Hopen Tower) has been renovated and raised rather than demolished. Camille Carême, structural engineer at **setec tpi** and project manager (between 2019 and 2023), provides an update on this project from the perspective of resource sobriety.

Camille Carême,
General Secretary,
setec tpi

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Renovation and raise: the existing structure as a resource

Rather than demolishing and rebuilding, the project made the most of the structural framework: preserving the shell and a large proportion of the floors — amounting to 50,000 m³ of concrete — reduced waste, disruption and material consumption. The tower was transformed by adding storeys, a lateral extension and a large opening in the façade leading into the lobby.

Optimising load-bearing capacity to minimise the need for reinforcement

The additional storey and the side extension were constructed using a steel structure in order to limit the loads placed on the existing structure and ground settlement. “We sought to minimise all loads as much as possible, to reduce the need for reinforcement,” summarises Camille. The guiding principle adopted was to limit the increase in loads to 5% on the load-bearing structures; beyond that, a recalculation is required, which may lead to structural reinforcement (and therefore more material being added). Accurately calculating the required reinforcement called for phased calculations: in renovation projects, each demolition and reconstruction phase redistributes the loads. The large opening at the base of the tower presented a challenge: the perforated curtain wall contributes to the building’s stability, and this large opening required precisely dimensioned reinforcement to minimise deformation to the remaining structure.

The **setec** teams had to recalculate a structure that had already been built (despite the absence of all the original design calculations) and carry out extensive investigations: 350 drill holes and core samples, with the support of the **setec lerm** teams and experts from the Gustav Eiffel University. “In renovation works, we verify the quality of the initial design and construction as much as possible, and there can be surprises,” notes Camille Carême, such as concrete found locally to have almost half its theoretical strength. A better assessment of the existing structure avoids over-reinforcement. New wind tunnel tests have also made it possible to optimise wind loads by around 20% despite the building’s height increase. As for the foundations, reinforcing the ground slab was sufficient, without the need for deep foundations. In terms of reuse, almost all of the raised floors (slabs on jacks) were reused. “Avoiding heavy materials and new construction saves resources.”

50 000 m³

of concrete retained: the most sustainable resource is what already exists.

Life cycle approach: measure to improve durability

To gain maximum benefit from the analysis of the existing structure, the team fully equipped the tower with monitoring devices (in collaboration with **setec lerm** and Phimeca) to calibrate the calculation model against the tower’s actual behaviour, particularly in relation to wind loads (accelerations, stresses, etc.), and to explore avenues for predictive maintenance. “Instrumentation means having the means to verify our calculations, to experimentally capture the behaviour of the actual structure, then to detect deviations over time and to intervene earlier and more subtly if necessary — provided we accept monitoring during the building’s operational life.”

This project demonstrates that value can be created by conserving materials: diagnosing, reducing weight, optimising wind loads, controlling stresses and encouraging reuse, in order to intervene as minimally as possible. “Resource saving levers were decided from the start: involving the client and aiming for the minimum necessary reinforcement,” concludes Camille.

Materials

Bottom ash: an effective alternative for roadworks

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Jérôme Fillon,
Project Manager,
setec international

Antoine Schweisguth,
Project Director,
setec als

20,000 tonnes

of bottom ash used on a motorway construction site in Chalon, with the support of **setec** engineers.

Produced as a result of the incineration of household waste, bottom ash can be used as a substitute for quarry materials. This is provided that the compliance of these products and their application can be verified, as the teams at **setec** have done on two recent projects.

North of Chambéry, the construction of a new interchange between the A43 and the A41 motorways required the widening of an existing slip road. Engineers from **setec** assisted the construction company in using an innovative material: bottom ash, a material produced from the incineration of non-hazardous waste. “These waste materials can be used as an alternative to quarry aggregates, thereby reducing extraction from natural resources,” explains Jérôme Fillon, project manager at **setec international**.

“As the design & construction supervisor, we first verified the quality and compliance of the materials before carrying out load-bearing tests and density measurements.” These tests confirmed the solution’s viability: 20,000 m³ of bottom ash was successfully redeployed, “using the same application methods as a quarry product,” notes Jérôme Fillon.

A treatment-free solution

setec engineers also assisted with the use of bottom ash north of Chalon for the construction of a slip road on the A6 motorway. “Together with the client, APRR, we challenged contractors to use alternative materials to quarry products,” explains Antoine Schweisguth, project director at **setec als**.

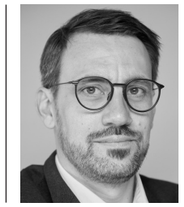
Selected for this contract, Bouygues Travaux Publics proposed the use of bottom ash for the sub-base layer of the slip roads. Here too, the **setec** teams carried out the technical and environmental characterisation of these alternative materials. During the works, an update to the road earthworks guide helped to facilitate their implementation. “We were able to lay the sub-base without having to treat the bottom ash with cement or lime, which also contributes to an eco-design approach,” says Antoine Schweisguth.

Reuse

A new lease of life for demolition materials

Reducing the carbon footprint of buildings and minimising waste: with this goal in mind, the **setec** group has expanded its expertise in the field of reuse.

Aziz Atiyeh,
Head of the Deconstruction and Reuse Dept.,
setec bâtiment



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setec teams can assist clients at various stages of their projects. “Prior to construction, we carry out resource assessments to evaluate the potential for reusing materials and equipment, and to identify ways to recover value. We also help project owners organise the careful dropping off of these components,” explains Aziz Atiyeh, Head of the Decontamination, Deconstruction, Dismantling and Reuse department at **setec bâtiment**.

During the design phase, the **setec** teams can identify the most suitable materials for reuse and adapt the specifications whilst remaining within the legal framework of the projects. “This requires a great deal of consultation with the design teams and contractors. It is not always easy to have the reused items available when they are needed on site,” notes Aziz Atiyeh.

Avoiding dump disposal of waste

Year after year, the construction sector is developing strategies around these issues. And the **setec** group is contributing to this with a multidisciplinary approach that is quite unique in the market. “For example, we are able to offer the reuse of building materials on urban development sites,” notes Aziz Atiyeh. “And we are continually refining our expertise in safe removal, storage and the identification of sources to increase the proportion of products that are given a second life, thereby avoiding waste disposal.”

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Water sobriety

restoring *value* to rainwater

In response to Brazil's water stress and the challenges associated with resource consumption, **setec** is implementing a practical solution to save water: the reuse of rainwater. A local, sustainable and circular project that adapts usage to actual needs, reduces drinking water consumption and enhances the resilience of buildings. An interview with Daniel Augusto, civil engineer at **setec hidrobrasileira**.

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Daniel Augusto,
Civil Engineer,
setec hidrobrasileira

"By adapting water use to actual needs, the project demonstrates that small changes to infrastructure can generate lasting impacts in terms of water savings and resilience. At **setec**, *we encourage dialogue and innovation so that, together, we can address climate and environmental challenges."*

When water shortages become a source of motivation

The rainwater reuse project emerged from a collective brainstorming session held during a *Climate Fresco* workshop with employees of **setec hidrobrasileira**. Among the measures proposed to reduce the building's environmental footprint, rainwater recovery stood out as a local, practical solution with a direct impact.

This initiative is set against a Brazilian backdrop marked by recurring droughts, such as that of 2014–2015, which severely affected the water supply. Faced with the risk of further water shortages, the project addresses the need to secure water supplies and adapt to climate change.

Turning a natural resource into a practical solution

At the headquarters of **setec hidrobrasileira**, a fully integrated system collects rainwater from the building's roof, filters it, channels it into storage tanks and redistributes the water for uses that do not require drinking-quality water.

Before the tanks, a filtration system removes the main impurities, whilst controlled chlorination ensures microbiological safety during storage.

The building's plumbing system has been adapted to separate drinking water from rainwater. The latter is now used for sanitary facilities, cleaning outdoor areas and irrigation, while water from the public main supply is reserved for high-quality uses.

A circular approach to enhance resilience

By replacing part of the treated water used with a free and renewable resource, the system reduces the use of drinking water by 30 to 40% during periods of rainfall.

This approach eases the pressure on water resources in the São Paulo metropolitan area and reduces the energy required for their treatment.

Beyond the savings generated, the project enhances the building's water security and is fully in line with a circular economy approach, by recovering a resource that is usually discharged into the urban drainage network and reintegrating it into the building's water cycle.

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Treated wastewater: a potential to be explored

Virginie Mevel,
Chief Engineer,
setec hydratec

Pierre Vergoz,
Hydraulic Engineer,
setec hydratec

Identifying new uses for treated wastewater from sewage treatment plants: this is the aim of two studies led by the **setec** teams for the Aix Marseille Provence metropolitan area. These projects form part of an overall objective to conserve (and preserve) drinking water resources.

In 2023, the Water Plan identified the reuse of treated wastewater as a key strategy for conserving freshwater resources. Among the local authorities involved in this initiative, the Aix Marseille Provence metropolitan area commissioned **setec** to carry out a feasibility study on two of its wastewater treatment plants, to explore the various technical solutions and associated costs.

Finding the economic balance

The first project concerns the Martigues plant, where the treated water would primarily be supplied to industrial clients. "The first step is to work with them to define their needs in terms of flow rates and uses: depending on how the water is used, different quality levels are required," explains Pierre Vergoz, hydraulic engineer at **setec hydratec**. "Based on their requirements, we will be able to identify the necessary treatments, the direct impact on the volumes that can be produced, and the associated costs."

This technical analysis is therefore accompanied by an economic dimension: water supply is currently inexpensive for industrial clients, thanks to the proximity of the Verdon and the La Crau catchments. We must therefore offer them acceptable price levels and highlight the comparative advantages of reuse. "With freshwater resources becoming increasingly scarce, the use of treated wastewater enables industrial companies to secure the water flows required for their operations and to ensure a consistent quality for their purposes," points out Pierre Vergoz.

Anticipating new regulations

In Martigues, the reuse of treated wastewater is being considered as part of the refurbishment of the treatment plant. For the metropolitan area, this presents an opportunity to optimise investment costs whilst anticipating future regulatory obligations. "The new European directive on urban wastewater will require strict standards on the treatment of micropollutants by 2027, which will facilitate the reuse of treated wastewater once the legislation has been transposed into French law," notes Virginie Mevel, chief engineer at **setec hydratec**.

The second study led by **setec** concerns the Fos-sur-Mer wastewater treatment plant. The context is different here, as the equipment is virtually brand new following the site's overhaul in 2023, and the identified applications cover a range of uses (irrigation, street cleaning, etc.). "Every project is different and requires in-depth consultation with users. But we sense a desire among local authorities and private stakeholders to move towards sustainable processes," notes Virginie Mevel.

Sustainable construction site

233 Lafayette, Lyon

Léa Bosquillon,
SSC Coordinator,
setec opency

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On a challenging construction site in the heart of the Part-Dieu district in Lyon, **setec** used its expertise to minimise disruption and coordinate contractors in managing incoming and outgoing movements.

In the Part-Dieu district of Lyon, the redevelopment of the former Axa building required extensive works across 14,000 m². The site[1] is located right in the city centre, on Cours Lafayette: minimising disruption and managing traffic flows were key priorities. “Right from the site organisation stage, we worked with the project’s HQE design office (C+POS) to incorporate the requirements of the Low-Impact Construction Site Charter,” says Léa Bosquillon, Scheduling, Steering and Coordination coordinator at **setec opency**.

Reduced consumption

The creation of an exemplary site camp was one of the first measures undertaken. The site, which accommodated up to 120 workers at peak times, was fitted with water leak detectors in the toilets and motion sensors to reduce lighting consumption. To limit noise, contractors were required to schedule heavy-duty work during pre-defined time slots.
Waste management was another challenge, given the very limited space available: only a single fixed skip could be installed on site. In the initial phase, the **setec** teams devised a system of wheeled bins, which could be transported to the upper floors via a construction hoist, enabling the sorting of different waste types directly at source. Once the permanent facades were in place, this temporary lift had to be dismantled: a contractor was selected to organise off-site sorting on an external platform. “These solutions enabled us to maximise the volume of waste recycled despite the site’s constraints,” says Léa Bosquillon.

Logistic management

Supply logistics presented another challenge: a delivery area was set up, but it can only accommodate one vehicle at a time. And the site must comply with the **Reguly System** specific to La Part-Dieu: contractors must book a delivery slot and follow designated routes. Although it may seem restrictive, this just-in-time system “has helped avoid congestion and the simultaneous presence of several lorries with their engines running whilst waiting to access the site,” points out Léa Bosquillon. SPL Grand-Lyon estimates that this system has prevented 130 hours of lorry traffic per month, with the associated carbon savings.
This exemplary management has enabled the project to secure several environmental certifications: HQE and Bio-based labels, and an ‘Outstanding’ rating under the BREEAM scheme, which places significant emphasis on the construction phase.

360 tonnes
of CO_2
reduced thanks to the reuse schemes implemented on site – that’s equivalent to 189 flights between Paris and New York.

[1] Delegate owner: Sogelym Dixence
Client: BNP Paribas Asset Management
Architect: Soho

Part 4

Operation maintenance & end of life

© RR **setec diadès**

Sobriety should be considered throughout the entire lifecycle of projects. A maintenance strategy backed by comprehensive assessments can help extend the lifespan of structures, rather than leading to the construction of new infrastructure, whilst waste management can facilitate the adoption of circular economy principles. Commissioning is another tool that helps project owners manage their resource consumption.

Engineering Structures

Repair, extend, adapt

An important factor in resource savings, extending the service life of structures requires regular monitoring of these structures and the development of an appropriate maintenance policy. **setec** applies this expertise to a wide range of critical infrastructure.

Structural assessment, a speciality of **diadès**

Renaud Leconte,
Technical & Innovation Director,
setec diadès

Opened in 2016, the third bridge over the Bosphorus is a major structure that holds the world record for the tallest pylons (322 m) on a cable-stayed bridge. The teams at **setec diadès** carry out the annual inspection of the bridge's structure. "We perform a complete monitoring cycle, including more detailed inspections at regular intervals to inspect areas that are difficult to access. To verify the condition of the pylons and cables, we most often use rope access technicians," explains Renaud Leconte, Technical & Innovation Director at **setec diadès**.

For several years now, drones have been used as part of the inspection process: they have been used to create a complete 3D model of the pylons, which is useful for monitoring the progression of any potential damage over time. Due to the bridge's size and its location in a seismic zone, it is also subject to live monitoring. Temperature sensors, GPS beacons, accelerometers, inclinometers, etc., the data collected is analysed to monitor the structure's behaviour, anticipate deviations that may indicate structural issues, and correct them in advance. In the long term, it is possible to move towards predictive maintenance for this exceptional structure.

Taking a preventive approach

"More generally, our mission is to support asset owners in their maintenance strategy: assessing the condition of structures, identifying necessary actions and prioritising interventions whilst taking a preventative approach, before deterioration occurs," explains Renaud Leconte. These interventions contribute to the durability of the structures. "Our regular monitoring of the Tancarville Bridge enables us to identify damage and recommend repairs at the right time. Thanks to these measures, it is possible to extend the structure's lifespan," says Renaud Leconte.

Anticipating corrosion: **lerm**'s expertise

Safely extending the lifespan of a nuclear power station: this is the aim of a study carried out by **setec** on behalf of a European operator. This assessment focused on a cooling tower. "The challenge was to determine whether the condition of the concrete would allow the structure's lifespan to be extended without causing corrosion of the reinforcement," explains Isabelle Moulin, Director of Development at **setec Lerm**.

The study combined on-site measurements with laboratory analyses. The data collected fed into a modelling tool, exclusive to the **Lerm**, which predicts the long-term effects of chlorides, the main factor in corrosion. These simulations demonstrated that the service life of the concrete could be extended by up to 24 additional years. The teams at **setec Lerm** are continuing to develop these concrete service life modelling tools in order to broaden their use and enhance their relevance. The aim, as Isabelle Moulin summarises, is "to provide project owners with decision-making tools for the maintenance of their infrastructure".

Energy

Extending the lifespan of nuclear power stations

Benoît Sudre,
Operations Manager,
setec eocen

Laura Roussillon,
Business Manager,
setec eocen

© RR **setec eocen**

setec's teams are working with EDF on the Grand Carénage programme to operate nuclear reactors beyond their planned 40-year lifespan. This operational and methodological support helps the operator plan its works strategy and assess the associated costs.

With the aim of extending the lifespan of nuclear power stations, the ten-yearly inspections authorised by the French Nuclear Safety and Radiation Protection Authority (Autorité de Sûreté Nucléaire et de Radioprotection - ASNR) represent a decisive step: it is these inspections that enable the reactors to continue operating for a further 10 years. In the run-up to these inspections, **setec**'s teams support EDF in monitoring compliance with ASNR requirements.

Optimisation challenge

"Our engineers oversee the management of studies covering all power station components: buildings, pumps and valves, the reactor vessel, control and monitoring systems, etc. These studies have several objectives: to re-qualify equipment by demonstrating that it remains fit for purpose beyond the planned 40-year lifespan, to plan for its replacement, or to enhance the efficiency and safety of certain components," summarises Benoît Sudre, Operations Manager at **setec eocen**.

The **setec** teams provide support for managing costs and deadlines. With a focus on optimisation: "When we identify a modification to be made to a reactor, it must be deployed to all other power stations of the same generation. Feedback from experience enables us to create standard intervention schedules, so that each site can replicate methodologies that have been tried and tested elsewhere," explains Benoît Sudre.

Long-term interventions

setec's strength lies in its experience in the French nuclear market: teams have been working with EDF since the operational launch of the Grand Carénage programme in the mid-2010s. "All our projects are documented: our engineers can draw on the knowledge accumulated over more than a decade, delivering greater efficiency and safety for our client," says Laura Roussillon, business manager at **setec eocen**.

As part of the Grand Carénage programme, the work is planned for the long term: it can sometimes take 20 years from the start of the studies to the completion of the works on all of the reactors concerned. But the results are clear, with a first generation of reactors whose lifespan has been extended to 50 years and plans to extend operations to 80 years. "Closing a power station takes decades and requires significant financial resources: extending the service life remains the more rational approach in terms of resource management," notes Laura Roussillon.

Solution

Managing waste to *maximise* its value

The **revoco by setec** platform brings together all waste data, from collection to dispatch to specialist processing channels. A solution that simplifies day-to-day operations for professionals and enables greater recovery.

Charles Cantogrel, co-founder and managing director, **revoco by setec**

Karen Diard, co-founder and managing director, **revoco by setec**

Dalila Feddal, Account Manager, **opency**

Subject to traceability and sorting requirements, professionals now have a centralised solution for managing their waste with **revoco by setec**. “We designed the platform to meet our clients’ need for a single tool to track all their waste flows. We are in the process of digitalising waste bins to provide reliable and comprehensive data, from collection to dispatch to specialist recycling channels,” explains Charles Cantogrel, co-founder of **revoco**.

The platform’s primary user is the waste producer, where they can enter the different containers installed on-site (skips, big bags, etc.) and the associated materials. The tool allows them to organise collections and automatically retrieve data on collected and recycled waste. “The time savings are enormous for waste managers, both in their dealings with service providers and in reporting information,” emphasises Karen Diard, co-founder of **revoco by setec**. “The platform also allows them to track their performance indicators and centralises all their regulatory documents.”

Greater reactivity on site

This real-time monitoring enables a rapid reaction in the event of a problem with waste collection. In Orly, the **opency** teams used **revoco** for the construction site of the future Line 18 metro station. “If sorting has been done incorrectly and a container has been declassified, we are immediately informed, and we can take corrective action with the contractors,” explains Dalila Feddal of **opency**. “On this site, for example, we adapted the containers for cardboard to protect them from the rain and worked with the teams to improve the sorting of different types of wood waste.”The impact is immediate in terms of processing costs, which are significantly lower when waste is recycled through specialised channels. But there are environmental benefits too. “In 2025, contractors produced 294 tonnes of waste at the Orly site: the recycling rate reached 98%, well above the initial target of 85%. “The difference stems largely from the quality of monitoring,” says Dalila Feddal. “Most often, companies collect around ten types of material, the most common in their line of work: beyond that, the administrative burden becomes too great. By simplifying waste management, we encourage them to take the circular economy approach further by sorting new waste flows, whilst keeping costs under control,” concludes Charles Cantogrel.

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Reuse

Two waste management sites anchored in the *circular* economy

In the Loire Valley region, two construction sites have successfully recycled end-of-life materials. These initiatives were supported by the **setec** group to facilitate involvement by contractors.

Hélène Braconot, Head of Waste Management and Circular Economy, **setec énergie environnement**

Thomas Delplace, Project Director, **setec énergie environnement**

When the project for the new waste transfer centre in Angles (85) began, one of the main challenges was to raise the site by just over a metre to mitigate the risk of flooding. “That amounted to nearly 3,000 m³ of materials just to raise the new road platform. Rather than extracting new aggregates, we came up with the idea of recycling rubble, by mobilising all the waste collection centres in the Vendée department,” says Thomas Delplace, project manager at **setec énergie environnement**.

Identical qualities

Organised during the project’s design phase, the supply process took several months to gather the required volumes. Slab tests carried out with the construction company confirmed the mechanical properties of the rubble, which behaved in the same way as the new aggregates used beneath the centre’s buildings. Eight years after the completion of the works, the solution has proven to be effective. “We have observed no differential settlement between the road platform raised with rubble and the building area raised with new aggregates. This result is also due to the quality of the sorting carried out by the waste collection centres in the Vendée, which prevented the rubble from being mixed with less resistant materials such as steel or plastics,” notes Thomas Delplace.

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More reuse in finishing works

In La Montagne, near Nantes, the waste collection centre completed in 2025 also recycled end-of-life materials. “The client, Nantes Métropole, had high expectations regarding the project’s carbon footprint. And we found it interesting to apply the principles of the circular economy, which we promote in waste collection centres, particularly through reuse zones, to the construction site,” points out Hélène Braconot, Head of the Circular Economy and Supply Chains division at **setec énergie environnement**.

The setec teams supported the client in defining the reused supplies to be used on site and in drafting contract clauses allowing for modifications to the products in line with technical or supply constraints. Suspended ceilings, cable trays, lighting fixtures, sanitary ware: second-life products are used extensively in certain areas. “Dialogue with the architect and contractors was crucial in identifying available sources, as was the presence in Nantes of a fairly well-structured ecosystem for reuse,” emphasises Hélène Braconot.

Middle East

Certifications designed to encourage the market towards energy *sobriety*

A member of the **setec** group since 2020, **Alpin** has developed a unique business focus in the Middle East: sustainable development consultancy. They provide commissioning services that ensure property developers' projects meet performance standards, benefiting both occupants and the environment.

Nareg Oughourlian, General Director **Alpin**

The commissioning service offered by **Alpin** is independent and multi-criteria. They assess a building's technical performance as well as the quality of use and the environmental footprint. "Certifications are an effective tool for assuring our clients that they will have met all the key sustainability indicators: energy, water, waste management, occupant comfort, etc. It is a lever for improving the quality of the building and its performance over the long term," says Nareg Oughourlian, Managing Director of **Alpin**.

Towards energy efficiency

The use of commissioning also helps to encourage resource and energy saving measures in countries where the abundance of fossil fuels may have delayed consideration of resource conservation. Certifications such as LEED specifically promote energy efficiency. "Our aim is to convince developers that if they invest a little more in design and construction, they will save money on their operating costs. This approach is better understood today as governments in the Middle East prepare their economies for the post-oil era," says Nareg Oughourlian.

Learn more:
Our *Manifesto* on the Circular Economy will be available soon.

setec magazine

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