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**ESMIS**

ENHANCE SUSTAINABLE MEASURES  
IN SPORTS FACILITIES

# Enhance Sustainable Measures In Sports Facilities (ESMIS)

## Deliverable D4.1 – Guideline to boost sustainable sports facilities in Europe

Here you can find [Spanish](#), [Dutch](#), [German](#) and [Greek](#) versions of the sustainability guidelines

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## 1. Introduction:

This guideline aims to serve as an inspirational roadmap to sustainability for European sports facilities.

The main 4 pillars that the ESMIS project defined are: **energy, water, materials and governance**. We will provide real-life examples of sports facilities across Europe, which can be set as an example for one of those topics. Some of them are applicable to specific countries due to their specific climate, geography, population or city, and some of them may be applied generally.

This guideline is intended for a wide range of stakeholders, including city councils, sports facility managers, architects, construction companies, and sports practitioners. It intends not only to highlight innovative strategies and technologies but also to demonstrate the long-term benefits of adopting sustainable approaches in terms of cost efficiency, environmental impact, and social well-being. By illustrating concrete examples, the document encourages stakeholders to move beyond theoretical discussion.

In addition, the guideline stresses the importance of aligning sustainability in sports facilities with broader European policy goals, such as the European Green Deal, the Agenda 2030 for Sustainable Development, and the Paris Agreement commitments. Sports facilities, given their visibility and social relevance, have a unique capacity to act as role models for sustainable transformation in other sectors. Moreover, their influence extends beyond operational practices, as they can foster a culture of environmental responsibility among athletes, fans, and local communities.



## 2. Necessity of Sustainable Practices in Sports Facilities

The traditional model of sports facilities has been the object of discussion in the last few years. The need to advance towards more sustainable management of sports facilities has become a key objective in the light of recent circumstances that have negatively impacted the sports sector across Europe (EPAS, 2020). In this context, it has been shown the weakness of the traditional sports facilities model to address these challenges (EPAS & Council of Europe: 2020). For instance, a single stadium with a capacity of approximately 70,000 spectators has been estimated to consume between 10,000 and 20,000 kilowatt-hours of electricity per day—roughly ten times the average household’s monthly consumption. At the European level, the 4,000 stadiums currently in operation, most of which still rely on fossil fuels, collectively consume nearly 40 terawatt-hours of electricity annually. These figures underline the urgent need for systematic strategies to improve the energy efficiency and sustainability of sports infrastructures.

This situation has been aggravated by the increase in energy prices over the last two years, driven by higher oil prices and regulatory changes following the war in Ukraine. Between July and September 2022, energy prices in Europe increased by 25% to over 300%. Sports structures, especially indoor facilities, feared severe operational disturbances.

<https://www.easesport.eu/ease-talks-n5-update-on-the-energy-costs-crisis-and-its-impact-on-the-european-sport-sector>)

Water scarcity and drought have become increasingly frequent and widespread across the EU, severely disrupting the operations of sports facilities—especially those with high water requirements, such as pools, grass pitches, and locker rooms. Between 2019 and 2023, nearly 29% of EU territory and 38% of its population were affected by water scarcity, costing the economy between €2 to 9 billion annually. (<https://environment.ec.europa.eu/>).



One example of the problem of water scarcity is that Catalonia declared a drought emergency in 2024, when its reservoirs fell below 16% capacity, marking the worst drought in modern history. Restrictions included bans on watering parks and closing public and private swimming pools, with limited exceptions for sports centres.

The increasing frequency and severity of droughts across Europe, particularly in southern regions, directly threaten the operability and sustainability of sports facilities. Without strategic investments in water efficiency, reuse, and digital innovation, sports infrastructure remains vulnerable to supply interruptions. Integrating proactive water management strategies is therefore essential for ensuring these facilities remain viable, resilient, and environmentally responsible.

### 3. Societal, economic, and environmental relevance of sport

Given these challenges, it is essential to develop viable solutions that transform sports facilities and the broader sports sector from contributors to global warming into **key drivers of sustainability across economic, social, and environmental dimensions.**

Addressing this challenge is crucial due to the relevance of the sports sector in Europe and of the sports' capacity to influence people's attitudes (UN, 2022), and therefore, of its capacity to influence other sectors:



### **3.1 Sport is vital for well-being and physical and mental health.**

Different studies agree that the practice of sport is associated with improved social and psychological health, independent of team sport type, age, or somatic or mental health problems. In addition, Youth Sport Trust affirms that “Taking part in physical activity and sport provides an opportunity to build social connections, in real life, with the opportunity to work as part of a team and meet people outside of our usual social circles. It can help children and young people develop social skills, self-esteem, and pro-social behaviours”. The socialisation occurring at sports facilities is therefore an important part of mental health and strengthens the sense of belonging to a community.

### **3.2 Sport is an important economic sector in the EU.**

With a share in the national economy, which is comparable to agriculture, forestry and fisheries combined. In 2021, almost 1.4 million people worked in the field of sport in the EU, reaching the pre-pandemic level (Eurostat, 2021).

### **3.3 Sport is a driver to promote a more sustainable European society and economy.**

This role acquires especially relevance given to the cross-sectoral nature of the sports. Thus, any impact on the sports industry, whether direct or indirect, also affects other sectors. This strong cross-sectoral dimension of the sport sectors is reflected in the broad definition of the sports industry proposed by the Vilnius Declaration, which takes into account the upstream and downstream industries related to sport: chemistry, food, metal, service providers, travel agencies, water treatment, footwear, textile, leather, construction, transport, media and events, etc.



## 4. Policy and Strategic Frameworks

### 4.1 European context

The relevance of Sport to achieve sustainable development and a more social and cohesive Europe is reflected in some European policies.

**4.1.1 The EU Work Plan for Sport 2021-2024** was focused on three priority areas: protected integrity and values in sport, socio-economic and environmental dimensions of sport and promotion of participation in sport and health-enhancing physical activity. The Work Plan has recently established a Green Sport XG working group with the mandate to develop on a common framework for sustainable sport and establish the next key elements for this common framework:

- Sport infrastructure: maintenance, construction, impact of climate change on sport infrastructure.
- Sport events.
- Innovative cross-sectoral solutions.

Capacity building, education and promotion of sustainable sport practices.

**4.1.2 In December 2023**, the group published a comprehensive **playbook 2023** (<https://op.europa.eu/s/z8zl>), a sport sector guide offering:

- Policy recommendations for public authorities, to encourage national sustainable sport strategies.
- Guidance to sports organisations to measure carbon footprints and integrate environmental planning into their plans.



#### 4.1.3 The Water Framework Directive and related guidance.

- The overall objective of EU water policy is to ensure access to good-quality water in sufficient quantities for all Europeans, economic sectors and the environment, and to ensure the good status of all water bodies across Europe. Therefore, policies and actions are in place to prevent and mitigate water scarcity and drought situations. The priority is to move towards a water-efficient and water-saving economy.

<https://environment.ec.europa.eu/>

#### 4.2 International Context

##### 4.2.1 UN and United Nations Framework Convention on Climate Change (UNFCCC)

**Sport is also an important enabler of sustainable development (UN, 2015)** helping to achieve at least 9 of the 17 SDGs of the Agenda 2030 (3 Good health and well-being, 4 Quality Education, 5 Gender equality, 8 Decent work and economic growth, 10 Reduce inequalities, 11 Sustainable cities and communities, 12 Responsible consumption and production, 13 Climate action, 16 Peace, justice and strong institutions).

Aligned with the SDGs, the United Nations Framework Convention on Climate Change (UNFCCC) has created a '**Sports for Climate Action Framework**' that gives sports organisations a way to take action, evaluate their efforts, and report on their progress. Signatories are requested to commit to achieving specific climate goals of halving emissions by 2030 and to aim for net-zero by 2040.

Objectives and principles of the Sport for Climate Action:

- Objective 1: Achieving a clear trajectory for the global sports community to combat climate change
- Objective 2: Using sports as a unifying tool to drive climate awareness and action among global citizens



- Principle 1: Undertake systematic efforts to promote greater environmental responsibility
- Principle 2: Reduce overall climate impact
- Principle 3: Educate for climate action
- Principle 4: Promote sustainable and responsible consumption
- Principle 5: Advocate for climate action through communication

Source: <https://unfccc.int/climate-action/sectoral-engagement/sports-for-climate-action>

According to the UN, improving energy efficiency is fundamental to meeting global climate goals (UN,

2022). This sustainable approach makes references not only to the reduction of energy consumption but also to all the features that encompass, in this case, the sport facility. Building materials and components, design of the space, optimisation of natural resources (air, lighting, water, etc.), the use of recycled and composting materials, etc. have a direct impact on energy consumption. Thus, sustainable sports facilities go beyond reducing energy consumption. Sustainable facilities must be characterised not by the implementation of ad-hoc measures but for the implementation of holistic and long-term sustainable strategies. Therefore, the project will pay special attention to:

- Healthy and sustainable buildings, materials and components
- Accessibility and age-friendly sports facilities
- Sustainable design and eco-design
- Ecological traceability and sustainable materials and components, and free of toxic substances through AI
- Energy efficiency and sustainable construction and design of the sports facilities (including thermal comfort, Air quality, lighting control and natural light, etc.).
- Use of natural and renewable energy resources (solar panels, Stormwater Management, etc.)



- Use of recycling and composting materials and components that lead towards efficient waste management and sanitation.
- Optimisation and preservation of natural resources (light, water, etc.) and tracking of energy consumption patterns using new technologies.
- Waste management and recycling.
- Isolation of indoor facilities
- Multipurpose facilities for reducing land consumption
- Consideration of sustainable procurement for the purchase of goods and services
- Sustainable crowd and fan management
- Contribution to biodiversity: Opportunities to integrate vegetation or other features for biodiversity into built structures, such as green walls and green roofs, not only for energy efficiency but also to provide habitat for fauna (birds).
- Sports facilities go beyond buildings and also impact the surroundings. Many sports facilities are built in the middle or close to cities and towns, impacting the environment.

Sustainable management also considers traffic, sidewalks and pathways. It can also imply urban. In the European Union, the environmental impact of sport will vary from one member state to another and from one sporting discipline to another. However, most sports organisations and supporters would today agree that sports, with accompanying travel, energy use, construction, catering, and other activities, have major environmental impacts.

Some sports, such as swimming, often depend on energy intensive infrastructures, for water and space heating as well as pumps, filters, and lighting. Reducing the energy consumption of infrastructures and ensuring their energy efficiency are key elements in advancing towards a more sustainable sport practice. This is particularly relevant for indoor sports where the energy consumption of facilities and arenas can represent a significant proportion of carbon emissions.



Sport can make an important contribution addressing these impacts, within sport and beyond.

**The 2030 Agenda for Sustainable Development 17 explicitly emphasises the role of sport in achieving the United Nations (UN) Sustainable Development Goals (SDGs).**

- Goal 6 – Clean Water and Sanitation.
- Goal 7 – Affordable and Clean Energy.
- Goal 9 – Industry, Innovation and Infrastructure.
- Goal 11 – Sustainable Cities and Communities.
- Goal 12 – Responsible Consumption and Production.
- Goal 13 – Climate Action.
- Goal 14 – Life Below Water.
- Goal 15 – Life on Land.

Wherever sports take place, there are infrastructure issues and challenges to contend with, from design specifications for a new pitch to the supply of clean energy for city centre stadia, to the safe installation of showers and washrooms at a temporary waterside event..

The ISO 20121 framework is increasingly used for larger events, and the UNFCCC Sports for Climate Action Framework aims to move all sizes of sports organisations to robust and comparable methodologies for calculating their climate impact.

#### **4.2.2 The International Olympic Committee (IOC)**

The International Olympic Committee (IOC), as one of the key players in the world of sports, has developed a sustainability strategy in line with the “**IOC strategic roadmap Olympic Agenda 2020+5**”, which is focused on these five areas:

- Infrastructure and natural sites: Development of operations of indoor and outdoor sites and administrative structures
- Sourcing and resource management: Sourcing of products and services and management of material resources during their lifecycle
- Mobility: Mobility of people and goods, locally and globally.



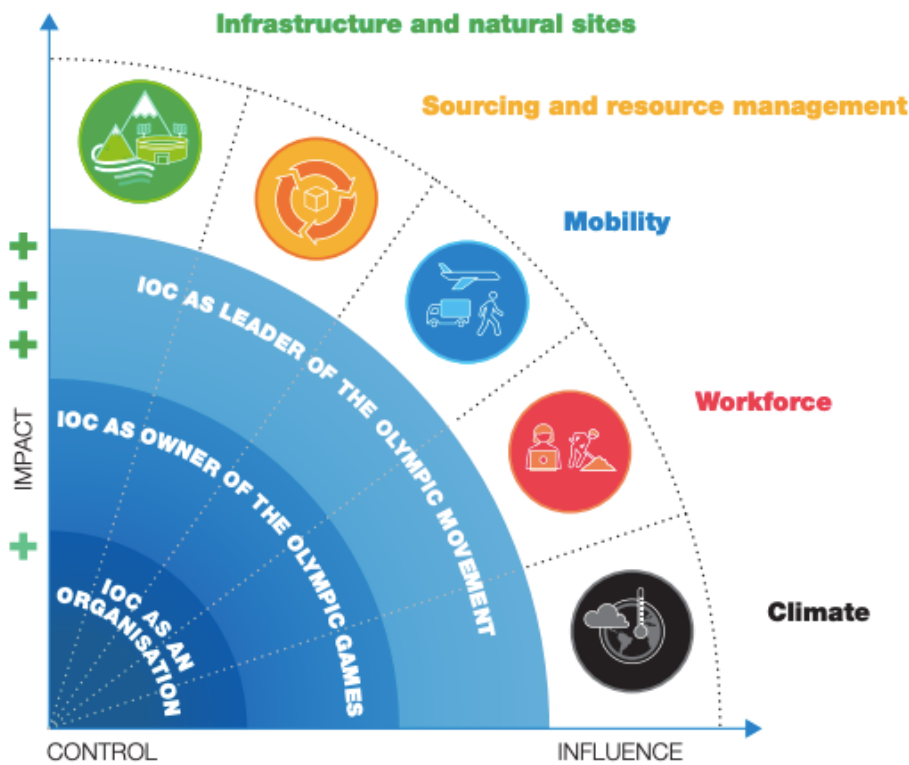
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- Workforce: Working conditions and opportunities
- Climate: Management of (in)direct GHG emissions and adaptation to climate change

Source: <https://www.olympics.com/ioc/sustainability>

**The IOC Sustainability Strategy is framed around three spheres of responsibility and five focus areas**





#### 4.2.3 International Organization for Standardization (ISO 20121): guidelines for sustainable events

ISO 20121 is a key sustainability standard for the global event industry, created by sector representatives at an international level. It addresses economic, environmental, and social challenges across the entire event supply chain. The framework applies to all stakeholders—clients, suppliers, and event managers—and is suitable for events of any scale, from small conferences to major sporting competitions. Its adoption fosters better communication and awareness within the industry on sustainability practices and impacts.

## 5. ESMIS sustainable guidelines

### How does ESMIS help us reach more sustainable sport facilities?

The main part of ESMIS is embedded in the interactive sustainable map and environment of knowledge designed to show best practices in the sustainability of sports facilities across Europe. It will allow the facility managers, public bodies and other stakeholders to discover real life examples of sustainable measures that are already working. In addition, it will be possible to access guidelines and recommendations adapted to several challenges that sports facilities are facing such as energy efficiency, water saving, materials recycling, and governance. But this is not all, the platform will also allow the users to contact other facilities to exchange knowledge and collaborate towards the common sustainability goals. In addition, the tool incorporates filters to find the solutions more easily.

- a) by creating a clear methodological framework to identify and map innovative sustainability measures across Europe, and by setting up the process for applying them in sports facilities.
- b) by producing a practical guideline with recommendations and best practices that inspire and assist sports facilities on their journey towards sustainability, building on the lessons learned during the project.



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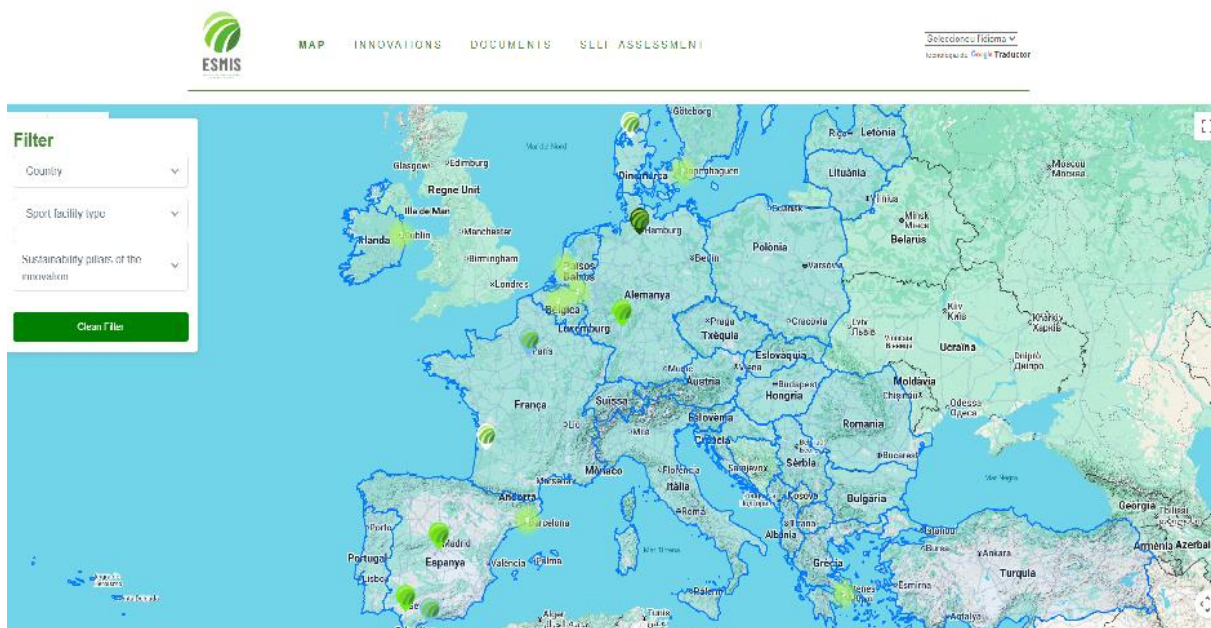


- c) by developing an interactive map showcasing the most relevant sustainability examples in Europe, allowing stakeholders to easily find ideas and detailed information to replicate these initiatives.
- d) by designing a practical toolkit that supports sports facilities in creating sustainable, safe, and inclusive spaces, generating a positive impact on both the environment and the community.
- e) by sharing knowledge and proven practices through hands-on activities such as technical workshops and pilot tests of the toolkit.

As a municipality, sports club, or entrepreneurial sports provider, you'll find on the ESMIS mapping platform all the independent resources you need to make your sports facility more sustainable. The site offers:

- Inspiring case studies from across Europe
- An interactive map to explore sustainability innovations—filtered by country, facility type, and thematic pillars like energy, water, materials, and governance—allowing you to easily discover and replicate best practices in sports infrastructure.

<https://mappingesmis.com/>





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Through this mapping, facilities can gain access to rich, evidence-based insights, enabling them to confidently integrate green strategies into facility planning, design, and operations.

This guideline brings together the latest knowledge, experiences, and examples of sustainable innovations already being implemented in sports facilities across Europe. It is designed to inspire and support municipalities, sports clubs, and sports-related businesses in making their facilities more environmentally friendly, socially responsible, and economically viable.

Through research and mapping initiatives such as ESMIS, we can see how forward-thinking facilities are taking action in four key areas:

## 1. Energy Efficiency

Energy efficiency in sports facilities is increasingly recognized as a critical component of sustainable building management. These facilities often have high energy demands due to lighting, HVAC systems, and water heating, particularly in indoor arenas and swimming pools. Implementing new energy-efficient technologies, such as improved LED lighting, motion sensors, and high-efficiency HVAC systems, can significantly reduce operational costs and environmental impact. These measures not only reduce operating costs but also significantly cut greenhouse gas emissions, helping facilities align with climate action goals.

Innovative solutions found might include:

- Installation of LED lighting with smart controls to adapt brightness to usage.
- High-performance insulation and energy-efficient glazing to reduce heat loss or gain.
- Integration of renewable energy systems, such as solar photovoltaic panels, integrated into the roof.
- Use of passive design strategies, including natural ventilation and daylighting, to reduce dependence on mechanical systems.
- Monitoring CO<sub>2</sub> levels in indoor environments is essential for maintaining air quality and occupant comfort. Integrating this monitoring with automated ventilation systems





enables efficient use of free cooling strategies. This approach optimizes energy consumption while ensuring a healthy indoor atmosphere.

- Replacement of thermal energy production from natural gas with aerothermal technology was implemented, alongside primary cold and heat storage through stratified accumulators.

Innovative Measure	Description & Benefits	Examples
<b>LED lighting with smart controls</b>	LED systems with occupancy sensors and automatic dimming. Energy savings and reduction of light pollution.	UAB – SAF (Catalonia), Philips Stadion (Netherlands), Telenor Arena (Norway)
<b>High-performance insulation and glazing</b>	High-efficiency panels and double/triple glazing. Reduction of thermal losses and improved comfort.	CEM Corxera (Catalonia)
<b>Integration of renewable energies</b>	Photovoltaic solar panels on the roofs of stadiums and sports pavilions. Generation of clean energy and reduced grid dependency.	CEM Corxera (Catalonia), CEM Joan Miró (Catalonia)
<b>Passive design strategies</b>	Natural ventilation, skylights, and optimal building orientation. Lower dependence on mechanical HVAC systems and artificial lighting.	Løgstør Sports Hall (Denmark)
<b>CO<sub>2</sub> monitoring with automated ventilation</b>	Sensors in courts, gyms, or indoor pools connected to smart ventilation systems. Improved air quality and energy consumption optimization.	CEM Joan Miró (Catalonia)
<b>Gas substitution with aerothermal + storage</b>	Heat pump systems (aerothermal) combined with hot/cold thermal storage tanks. Decarbonization and more efficient HVAC management.	Tottenham Hotspur Stadium (United Kingdom), Continassa (Italy)



## 2. Water Management

Water scarcity and rising costs make it essential for sports facilities to adopt responsible water use practices. Those measures reduce the environmental footprint and can also improve resilience against droughts and water restrictions.

Leading examples include:

- Rainwater harvesting systems to collect and store water for irrigation or cleaning.
- Greywater recycling for use in toilets and pitch watering.
- Low-flow fixtures and sensor-based taps and showers to minimize wastage.
- Advanced pool filtration systems that require less water for backwashing.

Innovative Measure	Description & Benefits	Examples
<b>Rainwater harvesting systems</b>	Collection and storage of rainwater from stadium roofs for field irrigation or cleaning.	CEM Claror (Catalunya), Ciutat Esportiva Joan Gamper (Catalunya)
<b>Greywater recycling</b>	Reuse of wastewater from showers and sinks for toilet flushing and field irrigation.	Hydraloop (Netherlands)
<b>Low-flow and sensor-activated taps/showers</b>	Smart taps, low-flow showers and sensor-activated systems in gyms and changing rooms.	CEM Can Felipa (Catalunya)
<b>Advanced pool filtration systems</b>	Modern pool filters that reduce water consumption by minimising backwash requirements.	Universitat Autònoma de Barcelona – SAF (Catalunya)



### 3. Governance

Sustainability is not only about technology—it’s also about how facilities are managed and how decisions are made. Strong governance ensures that sustainability is embedded in the daily operations and long-term strategy of the facility.

Innovative governance in sports facilities involves:

- Adopting clear sustainability policies and measurable objectives.
- Engaging local communities and stakeholders in decision-making.
- Providing transparency through sustainability reporting.
- Training staff and volunteers to understand and implement sustainable practices.

Innovative Measure	Description & Benefits	Examples
<b>Clear sustainability policies and measurable targets</b>	Definition of CO <sub>2</sub> reduction targets, energy savings and zero-waste commitments for stadium operations.	Tennis Club Strasbourg (France)
<b>Community and stakeholder engagement</b>	Involvement of fans, local residents, councils and other stakeholders in planning and decision-making.	Ciutat Esportiva Joan Gamper (Catalunya)
<b>Transparency through sustainability reporting</b>	Publication of annual sustainability reports tracking progress on energy, water and waste management.	Tottenham Hotspur Stadium (United Kingdom)





## 4. Circularity

Circularity focuses on keeping materials and products in use for as long as possible, reducing waste, and promoting reuse. By adopting circular economy principles, sports facilities help reduce the depletion of natural resources and the amount of waste sent to landfill.

Some measures are:

- Using recycled and recyclable materials in construction and renovations.
- Implementing repair and reuse programs for sports equipment and furniture.
- Partnering with local suppliers who follow sustainable production practices.
- Setting up waste separation systems to maximize recycling and composting.

Innovative Measure	Description & Benefits	Examples
<b>Recycled and recyclable materials</b>	Use of recycled steel, reclaimed wood or recyclable composites in stadium construction and renovation.	Paris 2024 Olympic Aquatic Centre (France)
<b>Repair and reuse programmes</b>	Extending the lifespan of sports equipment (balls, nets, gym machines) and furniture through restoration.	Luola Sports and Events Centre (Finland)
<b>Local and sustainable suppliers</b>	Collaboration with regional suppliers of uniforms, catering or materials following eco-friendly production practices.	Løgstør Sports Hall (Denmark)
<b>Waste separation and recycling systems</b>	Installation of bins for plastics, paper, glass and organic waste at courts and training centres.	Aviva Stadium (Ireland)





## 6. Conclusions and Recommendations

This guideline serves as a practical tool for sports sector stakeholders to identify proven, replicable solutions. The innovations presented, from advanced energy systems to community-driven governance models, demonstrate that sustainability and performance are compatible. By applying real-world examples, sports facilities of any size can take effective steps to become greener, more efficient, and more resilient.

Sports infrastructures in Europe consume large amounts of energy and water, generate waste, and contribute to carbon emissions through construction and operation. However, sport also serves as a powerful platform for education, community engagement, and behavioural change. As a result, sports facilities can play a key role in promoting environmental awareness and driving sustainable transformation.

This guideline provides recommendations to key decision-makers in the sport sector at European, national and local levels. These recommendations aim to set the agenda towards a greener sport sector across Europe, with the aim that this will spread good practices across a broad range of actors.

These recommendations deal with issues and approaches that affect environmental sustainability as a whole.

- Case studies show that sustainability requires a holistic approach rather than isolated measures. Energy efficiency, water conservation, circular material use, and governance practices should be integrated into a long-term strategy. Facilities that adopt this approach are better equipped to address rising energy costs, climate change, and regulatory requirements.



- The design and construction of sports facilities can affect energy consumption, waste production, and carbon emissions.
- Sport facilities can reduce water usage by implementing measures to manage stormwater runoff and by using water-saving technologies.
- Apply passive design strategies such as natural ventilation, daylighting, insulation, and shading to reduce reliance on energy-intensive systems. Integrating renewable energy sources, including solar panels, geothermal energy, or heat recovery systems, can further reduce dependence on fossil fuels and support climate neutrality goals.
- Adapt sports facilities to local climate conditions by incorporating shading, greenery, and reducing surface sealing.
- Water management is increasingly important, especially in areas facing drought and water scarcity. Solutions such as rainwater harvesting, greywater recycling, smart irrigation, and low-consumption fixtures can significantly reduce water demand while maintaining high service quality.
- Clear sustainability policies, measurable targets, transparent reporting, and staff training can embed sustainable practices into daily operations.

Achieving sustainable sports infrastructure requires innovation and commitment. Projects like ESMIS support this by sharing best practices, offering practical guidance, and fostering collaboration across Europe. By learning from successful initiatives and adapting them locally, sports facilities can continually improve their environmental performance.

In conclusion, sustainable sports facilities are both an environmental necessity and an opportunity to improve economic efficiency, social value, and community engagement. Through strategic planning, technological innovation, and strong governance, the sports



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sector can support Europe's sustainability objectives and help build more resilient, inclusive, and environmentally responsible communities.





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## Examples of Best Practices:

Below is a table of real-life examples that are already implementing different measures to be more efficient. The table is structured as follows: name of the facility, country in which it is located, scope of the innovation (energy/water/materials/governance), and a description of the innovation.

Examples of best practices:

### Sport Ireland National Aquatic Center

Picture:



#### Sport Ireland National Aquatic Centre

- **Country:** Ireland
- **Short description of the facility:** The National Aquatic Centre (NAC) is one of the world's largest indoor water centres. It comprises:

A 10-lane 50-metre x 25-metre international-standard swimming pool with two moveable floors which will allow it to be reconfigured for other uses; A 25-metre international standard diving pool/warm-up pool; Seating for 2.500 spectators;





Extensive leisure waters (AquaZone) including adventure water rides, with children's play pool and wave pool; A fitness centre; Café and Reception Area.

This is a National Sports Campus that is the home of Irish sport. It is for all sectors of society from elite/Olympic athletes to kids learning to swim. It is a 550 acre campus which has significantly developed over the last 25 years and plans to grow even more in the future.

- **Owner of the sports facility:** Sport Ireland
- **Manager of the sports facility:** Sport Ireland Facilities DAC
- **Year of building:** 2003
- **Size:**
  - Space indoor: 15.180 m<sup>2</sup>
  - Space outdoor: 0 m<sup>2</sup>
- **Sustainability pillar:** Water
- **Subcategory that better defines the innovation:**
  - Water savings: Measures for water saving or rainwater recovery. Measures to improve wastewater quality.
- **Description of the innovation:** A project was developed to tap into the boreholes on the campus. Two boreholes were identified as having sufficient capacity to supply the NAC with over 85% of the water required. A full treatment plant was installed to ensure the water reached a sufficient quality to be used in the swimming pools, showers, sinks, toilets and wash down stations. The boreholes were tapped into and piped back to the main plant room. From there, the water treatment plant cleans the water and pumps it to the cold water storage tanks. Once there, the demand for water causes the valves to open, providing the necessary supply.



- **Pros and cons of the innovation:**

**PROS**

- Reduces the demand for water from the public system
- Saves money on the water bill
- Because of its location (Ireland) there will rarely be a shortage of water in the borehole

**CONS**

- There are many complexities to sinking wells and getting the pipework configured
- The mineral content of the water from the well can mean additional works are required
- Any issues with the pumps can mean significant ground works to fix

- **Approximate cost of the investment (in €, excluding VAT): 200.000€**

- **Indicators:**

- Uses per year: 1.400.000
- Water consumption per year (liters/use): 0,05
- Estimation of % of water saving related to the innovative solution: high (more than 70%)
- Years for the return on investment (ROI): 2,5 years

- **Other relevant information:** Water is not only charged for consumption but also for discharge. As the water from the pool is now being reused, the bill for the m2 of discharge water is reduced.



## Football field of football club SV Donk

Picture:



### Sportvereniging Donk

- **Country:** The Netherlands
- **Short description of the facility:** It is a football complex. With 3 artificial football fields. One of them has innovation, whereas the natural warming of the field, heads up the piping that has been laid in the field, which in return gives a clean source of energy.
- **Owner of the sports facility:** Sport Gouda
- **Manager of the sports facility:** Football Club SV Donk
- **Year of building:** 2009
- **Size:**
  - Indoor space: 0 m<sup>2</sup>
  - Outdoor space: 38.500 m<sup>2</sup>
- **Sustainability pillar:** Energy
- **Subcategory that better defines the innovation:**



- Heating and cooling systems: Solutions to optimize the use of heat or cold for space conditioning or water vessels.
- Specific Technologies: Solutions such as waste heat recovery, thermal or electrical energy storage, and more.
- **Description of the innovation:** The heat recovery system, which has been installed under the recently renovated artificial grass field of SV DONK, is according to the municipality 'a world first'. This unique system, which works like reverse floor heating, will help the club to save considerably on energy costs by extracting heat from the artificial grass, especially on warm days. With an expected 80% reduction in gas consumption, SV DONK is taking a big step towards a sustainable future.

Aendless Energy is an intensive collaboration that was established specifically for this innovation to ensure that the energy that is generated is used as a heat source in the right way. Within this collaboration, Aendless and Antea Sport join forces: Antea Sport as a specialist in building high-quality sports fields and generating heat from the field and Aendless as a specialist in transporting this energy to the end users. Thanks to this intensive collaboration, both parties ensure that the dual function of the sports field is optimally utilized.

The investment was done to only a quarter of a field because that was enough for the entire sports accommodation. The improvement was not made considering ROI as a factor.



- **Pros and cons of the innovation:**

**PROS**

- Heating through a natural resource (sun)
- No more use of gas as a resource
- In combination with solar panels, it could be an energy equal innovation

**CONS**

- Still an innovation, so not all data is here
- Best practice with a fairly new building with good isolation
- Quite an investment beforehand

- **Approximate cost of the investment (in €, excluding VAT): 300.000€**

- **Indicators:**

- Uses per year: 25.000
- Estimation of % of energy saving related to the innovative solution: high (more than 70%)

- **Other relevant information:** For this facility, it is not about the ROI in this case. We placed the innovation to learn and we want the innovation to be used as a test case for a bigger innovation. In 2026 we want to use the innovation for the 'Groenhovenbad'. We want it to be the first indoor swimming pool in the world to be heated from this innovation. The ROI will come into play within the business case for this project. We expect to have an ROI estimated between 7 to 10 years. The system is intended to work, with good maintenance, for at least 25 years.



## Sportpark Strijp

Picture:



### Sportpark Strijp

- **Country:** The Netherlands
- **Short description of the facility:** This multifunctional sports park features modern facilities. It is located next to the Christiaan Huygens College in Eindhoven. The tennis courts are rented by Tennis Club Engelsbergen. The sports complex consists of: football fields (2 grass, 2 artificial grass); 2 korfbal fields (1 artificial turf field with 3 fields, 1 grass); 2 handball fields; 3 all-weather tennis courts.
- **Owner of the sports facility:** Eindhoven Municipality
- **Manager of the sports facility:** Eindhoven Municipality
- **Year of building:** 2012
- **Size:**
  - Space indoor: 3.980 m<sup>2</sup>
  - Space outdoor: 4.200 m<sup>2</sup>
- **Sustainability pillar:** Energy



- **Subcategory that better defines the innovation:**
  - Heating and cooling systems: Solutions to optimize the use of heat or cold for space conditioning or water vessels.
  - Specific Technologies: Solutions such as waste heat recovery, thermal or electrical energy storage, and more.

- **Description of the innovation:** In early 2023, a collector field was installed under the artificial turf sports field at Sportpark Strijp. This field is connected to the municipal thermal energy storage system and provides sustainable heat that can be used to heat and cool homes in the future.

This is unique in the Netherlands: nowhere else has the combination of collectors and ground storage been used in this way. Multifunctional means that the top layer can be used for multiple sports, increasing the field's occupancy rate. A collector field is installed beneath the artificial turf. This is connected to the existing municipal aquifer thermal energy storage system (WKO). This could potentially heat approximately 100-150 homes in the future.

- **Pros and cons of the innovation:**

**PROS**

- The multifunctional use of the field creates added value. There is enormous potential to use sports fields to help make the built environment free of natural gas
- It allows athletes to exercise in cooler conditions, as the field is cooled during the summer
- Contributing to the sustainability of the energy supply and potentially reducing the energy costs for sports clubs

**CONS**

- The technology is not yet fully proven, so it must be taken into account additional learning costs and development risks
- The required sports performance standards must be carefully assessed
- The product still involves a lot of manual work, making the system not yet vandalism-proof. Users must consider the unique nature of the system, for example by avoiding anchoring objects into the field

- **Approximate cost of the investment (in €, excluding VAT): 480.000€**





- **Indicators:**

- Uses per year: 130.000
- Energy consumption per year (kWh/use): 1,54
- Estimation of % of energy saving related to the innovative solution: high (more than 70%)
- Years for the return of investment (ROI): Depending on the additional cost for the heating district network to the dwellings this ROI can be determined.



## Peace and Friendship Stadium

### Picture:



### [Peace and Friendship Stadium](#)

- **Country:** Greece
- **Short description of the facility:** The Peace and Friendship Stadium, or "Stadio Eirinis kai Filias" (SEF), is a premier multi-sport complex located in Neo Faliro, Piraeus, Greece. Managed by the General Secretariat of Sports, SEF is among Europe's most modern and versatile sports venues. It serves as the home for EuroLeague team Olympiacos and is the central venue of the Faliro Coastal Zone Olympic Complex. The stadium has a capacity of 11.600 seats for basketball games. It covers a total area of 288 hectares, with 43 hectares dedicated to buildings and 245 hectares for outdoor spaces, including walking areas, sports fields, restaurants, cafes, and playgrounds. SEF offers extensive indoor sports facilities, including courts for basketball, volleyball, handball, boxing, wrestling. The venue is easily accessible by car, bus, tram, and electric railway.
- **Owner of the sports facility:** Olympiacos B.C.
- **Manager of the sports facility:** Olympiacos B.C.
- **Year of building:** 1985



- **Size:**
  - Space indoor: 8.803 m<sup>2</sup>
  - Space outdoor: 43.544 m<sup>2</sup>
- **Sustainability pillar:** Energy
- **Subcategory that better defines the innovation:**
  - Lighting: Installation of LED lighting, presence or brightness control systems.
- **Description of the innovation:** At the Peace and Friendship Stadium, a Net Metering system was implemented enabling self-production of electricity and offsetting with the energy provider. The installation led to annual savings of approximately 276.138,3 kWh (7,9% reduction), significant CO<sub>2</sub> emission reductions, and a payback period of 12 years, with a 30-year lifespan and an overall ROI of around 5,5%.
- **Pros and cons of the innovation:**

**PROS**

- Energy: Reducing emissions and costs through renewables and energy-efficient systems
- Water: Significant water savings and reduction of operating costs
- Materials: Reducing the environmental footprint and improving the quality of spaces with the use of ecological materials

**CONS**

- Energy: High initial installation cost and dependence on weather conditions
- Water: Need for systematic maintenance and possible low yield in times of drought
- Materials: Increased purchase costs and limited availability in local markets

- **Approximate cost of the investment (in €, excluding VAT):** 30.000€
- **Indicators:**
  - Uses per year: 1.000.000
  - Energy consumption per year (kWh/use): 3,22
  - Estimation of % of energy saving related to the innovative solution: low (below 30%)
  - Years for the return of investment (ROI): 12 years





## CEM Claror

Picture:



### Claror Sardenya - CEM Claror

- **Country:** Spain
- **Short description of the facility:** Municipal sports center with activity rooms, fitness rooms, swimming pools and spa, and a sports hall.
- **Owner of the sports facility:** Ajuntament de Barcelona
- **Manager of the sports facility:** Fundació Claror
- **Year of building:** 1982
- **Size:**
  - Space indoor: 6.500 m<sup>2</sup>
  - Space outdoor: 0 m<sup>2</sup>
- **Sustainability pillar:** Water
- **Subcategory that better define the innovation:**
  - Water savings: Measures for water saving or rainwater recovery. Measures to improve wastewater quality.



- **Description of the innovation:** In a 25m x 12m swimming pool and based on the actual data we already have, we estimate a 75% saving in network-supplied water, which equals 1.100.000 liters per year.
- **Pros and cons of the innovation:**

#### PROS

- Water and gas savings, since the reused water is already heated
- If the pool is disinfected with saltwater electrolysis, the salt addition is minimal because the reused water is already saline

#### CONS

- A space is required to install the GAR system

- **Approximate cost of the investment (in €, excluding VAT):** 100.000€
- **Indicators:**
  - Uses per year: 487.164
  - Energy consumption per year (kWh/use): 4,38
  - Estimation of % of water saving related to the innovative solution: high (more than 70%)
  - Years for the return of investment (ROI): 20 years



## CEM Joan Miró

Picture:



### CEM Joan Miró

- **Country:** Spain
- **Short description of the facility:** It is a facility with 2 indoor swimming pools, one heated pool suitable for swimming and another for other aquatic activities; A spa area with a pool, steam bath, ice cabin, and dry sauna; 3 strength and cardiovascular training areas, equipped with network-connected machines; 6 rooms for group activities, such as yoga, pilates, aerobics, and other disciplines; An indoor padel court; A terrace with grass and sun loungers, allowing visitors to sunbathe and engage in light activities.
- **Owner of the sports facility:** Ajuntament de Barcelona
- **Manager of the sports facility:** AE Central
- **Year of building:** 1991



- **Size:**
  - Space indoor: 3.250 m<sup>2</sup>
  - Space outdoor: 235 m<sup>2</sup>
- **Sustainability pillar:** Energy / Water
- **Subcategory that better define the innovation:**
  - Lighting: Installation of LED lighting, presence or brightness control systems.
  - Heating and cooling systems: Solutions to optimize the use of heat or cold for space conditioning or water vessels.
  - Insulation: Efficient insulation systems for walls or windows
  - Specific Technologies: Solutions such as waste heat recovery, thermal or electrical energy storage, and more.
  - Water savings: Measures for water saving or rainwater recovery. Measures to improve wastewater quality.
  - Data and monitoring: Systems to improve data collection and monitoring.
- **Description of the innovation:** In 2011, a decarbonization process was initiated with the implementation of a geothermal system, later reinforced with aerothermal technology. Through automated monitoring and control, this system is expected to enable independence from fossil fuels by 2026.
- **Pros and cons of the innovation:**

#### PROS

- Environmental benefits CO2 reduction and enhanced sustainability
- Decrease in energy consumption costs

#### CONS

- Higher maintenance requirement
- Not relying on fossil fuels means there are fewer easy alternatives in case of energy supply issues



- **Approximate cost of the investment (in €, excluding VAT):** 1.000.000€
- **Indicators:**
  - Uses per year: 500.000
  - Water consumption per year (litters/use): 2
  - Estimation of % of water saving related to the innovative solution: low (below 30%)
  - Estimation of % of energy saving related to the innovative solution: medium (between 30 and 70%)
  - Years for the return of investment (ROI): 15 years
- **Other relevant information:** It features a geothermal energy system for climate control and domestic hot water (DHW) utilization.



## Ciutat Esportiva Joan Gamper

- **Picture:**



### Ciutat Esportiva Joan Gamper

- **Country:** Spain
- **Short description of the facility:** The Ciutat Esportiva Joan Gamper has significantly improved its water efficiency through the use of regenerated water, smart irrigation systems, optimization of turf management, and adherence to drought protocols. These measures have resulted in a demonstrable reduction in water consumption (approximately 38% per visitor and over 20% reduced irrigation for natural turf) and position FC Barcelona as a proactive actor in environmental sustainability.
- **Owner of the sports facility:** FC Barcelona
- **Manager of the sports facility:** FC Barcelona
- **Year of building:** 2006
- **Size:**
  - Space indoor: 13.095 m<sup>2</sup>
  - Space outdoor: 123.744 m<sup>2</sup>
- **Sustainability pillar:** Water
- **Subcategory that better define the innovation:**



- Water savings: Measures for water saving or rainwater recovery. Measures to improve wastewater quality.
- **Description of the innovation:** The Ciutat Esportiva Joan Gamper has significantly improved its water efficiency through the use of regenerated water, smart irrigation systems, optimization of turf management, and adherence to drought protocols. These measures have resulted in a demonstrable reduction in water consumption (approximately 38% per visitor and over 20% reduced irrigation for natural turf) and position FC Barcelona as a proactive actor in environmental sustainability.

- **Other relevant information:**

1. Use of Regenerated Water for Irrigation

- The club has implemented a water treatment plant that uses regenerated (recycled) water for irrigating the pitches at the Ciutat Esportiva Joan Gamper (CEJG).
- Water is transported from wastewater treatment plants in El Prat and Gavà to the CEJG by tanker trucks.
- At the facility, the water undergoes pre-filtration, reverse osmosis, and ozone disinfection, and is stored in large-capacity tanks (320 m<sup>3</sup> + 60 m<sup>3</sup> underground, plus surface tanks of 50 m<sup>3</sup> each) for irrigation purposes.
- A complete water management system has been installed, including soil sensors, volumetric flow meters, cameras to detect moisture deficit, and upgrades to irrigation sprinklers.

2. Reduction in Water Use:

- Thanks to these measures, the club achieved a 38% reduction in water consumption per visitor at the CEJG.
- Irrigation of natural grass pitches has already been reduced by over 20%, with expectations of further improvement, especially during the summer months.



- In 2024, the club committed to reducing groundwater consumption by at least 50% within the year.

### 3. Irrigation Strategy Changes:

- Irrigation has been eliminated for artificial turf pitches during training sessions for teams such as Juvenil A, Juvenil B, and the Women's B team.
- For natural grass pitches, irrigation has been reduced to a single cycle one hour before matches for the main teams.
- The grass regeneration strategy was modified: instead of full regeneration during summer, the club now performs partial regeneration in spring and autumn to reduce water demand.

### 4. Response to Drought Regulations:

- These actions were taken in alignment with water restrictions declared by the Government of Catalonia due to drought emergency conditions.
- Although a 38% reduction per visitor is reported, the sources do not specify the exact baseline in terms of absolute consumption (liters or cubic meters).
- The 20%+ irrigation reduction figure specifically relates to natural grass pitches.
- These measures have been progressively implemented since 2021 as part of the club's sustainability strategy.
- Some actions are mandatory due to regional drought regulations, such as limiting irrigation to 200 m<sup>3</sup> per hectare per month.

## Annex 1: List of facilities that are implementing sustainable innovations.



Facility	Country	Scope	Main innovations
CEM Claror	Spain	Water	Measures for water saving or rainwater recovery
Universitat Autònoma de Barcelona (SAF)	Spain	Energy / Water	<p>Energy:</p> <ul style="list-style-type: none"> <li>- Installation of a biomass boiler that provides 50% of the facility's energy needs</li> <li>- Installation of LED lighting across all facilities (including the football field, 5 tennis courts, 4 padel courts, and the indoor swimming pool)</li> <li>- CO2 level monitoring in internal spaces linked to automated ventilation systems (free cooling)</li> <li>- Heat recovery systems installed in all areas with significant heat loss</li> </ul> <p>Water:</p> <ul style="list-style-type: none"> <li>- Recycling pool filter backwash water to irrigate landscaped areas</li> <li>- Reducing the frequency of pool filter cleaning by using crushed glass media in the filters and automating cleaning processes based on filter pressure</li> <li>- Installing aerated showerheads in all showers (over 80 units), reducing shower water consumption by 50%</li> <li>- Lowering water pressure from 5 to 3 atmospheres</li> <li>- Installing a saline treatment system for disinfection, which reduces free chlorine use and minimizes filter cleaning frequency</li> </ul>
Club Natació Sant Andreu	Spain	Energy / Water	Implementation of a water reuse system that collects water from the pool filter cleaning process for irrigating the clay tennis courts. A reservoir is built beneath the pool basin to collect the wastewater, which is then treated with BIO products. The treated water is stored and distributed through an irrigation system to all the courts.
CEM Corxera	Spain	Energy	Replacement of thermal production (natural gas fossil fuels) with aerothermal energy. Primary cold and heat storage using stratified accumulators. Installation of 185 kW of photovoltaic panels. The innovation provoked a 90% reduction in fossil fuel use and it also reduced risk of Legionella by eliminating domestic hot water (DHW) accumulation in the secondary circuit.



Campo de fútbol Colegio Arenales de Carabanchel	Spain	Materials	This field has been built with an alternative technical filling made from recycled materials and complies with the new European regulations governing the use of microplastics. Specifically, it includes the ecolastene filling, which replaces the traditional rubber that is normally installed. Ecolastene comes from recycled materials and complies with the new legislation. This solution supports the principles of the circular economy and limits the release of plastics into the environment.
CEM Montserrat Canals	Spain	Energy / Water	Substitution of thermal production using fossil gas with biomass. Primary thermal storage in a stratified accumulator, UV lamp for the small pool, installation of a 100kW photovoltaic system.
CEM Joan Miró	Spain	Energy / Water	In 2011, CEM Joan Miró began a decarbonization process with the implementation of a geothermal system, which has since been reinforced with aerothermal technology. Thanks to automated monitoring and control, this system is expected to allow them to become independent of fossil fuels by 2026.
CEM Can Felipa	Spain	Energy / Water / Governance	<ul style="list-style-type: none"> <li>- Change of lighting to LED</li> <li>- Insulation of ACS and ACSH pipes</li> <li>- Water flow regulation using aerators</li> <li>- Boiler temperature regulation to meet Legionella reference temperatures for each season</li> <li>- Adjustment of WC flush water capacity by regulating the filling float and installing a dual flush system</li> </ul>
Ciutat Esportiva Joan Gamper (FCB)	Spain	Water / Governance	The Ciutat Esportiva Joan Gamper has significantly improved its water efficiency through the use of regenerated water, smart irrigation systems, optimization of turf management, and adherence to drought protocols. These measures have resulted in a demonstrable reduction in water consumption (approximately 38% per visitor and over 20% reduced irrigation for natural turf) and position FC Barcelona as a proactive actor in environmental sustainability.
Paris 2024 Olympic Aquatic Centre	France	Energy / Materials	Energy consumption is one of the big challenges for swimming pools, due to water treatment and high temperature demands. By reducing the energy demand and creating a smart energy system, 90% of the needed energy can be provided with renewable or recovered energy. The solar roof will be one of the biggest solar farms in France and will cover 20% of all required electricity production. 100% of the energy produced by the solar roof is utilised directly on-site. All tribune chairs are newly designed and made out of 100% recycled plastic collected from the neighborhood.



Tennis Club Strasbourg	France	Governance	<p>In 2018, it obtained level 3 (maximum) of the Alsace Eco-Events Commitment Charter, rewarding 80 eco-friendly actions put in place. They are one of the major sporting events that have signed the "Charter of 15 eco-friendly commitments" of the Ministry of Sports and the WWF. They have set up a reforestation project in the Mollkirch forest next to the tournament. This reforestation project has received the "Low Carbon" label from the Ministry of Ecological Transition. Thanks to its eco-friendly commitments, the tournament has reduced its carbon emissions by nearly 30% since 2010. Food Calculation of the carbon footprint of VIP meals. In 2022, the average CO2 emission per meal was 510g, compared to 2200g in a gourmet restaurant. Mobility Deduction of the price of the tramway ticket for spectators and Reduction on the price of the tournament ticket for all spectators coming by train. Carpooling operation: free and reserved parking spaces. Movement of players and officials only in hybrid and electric cars.</p>
Løgstør Sports Hall	Denmark	Energy / Materials	<p>The sustainability impact of Løgstør Sports Hall primarily focuses on energy savings and sustainable materials. The facility maximizes natural daylight through translucent panels and strategic openings in the corrugated steel exterior, significantly reducing artificial lighting demand. Additionally, passive ventilation helps maintain airflow, minimizing reliance on mechanical cooling. These measures contribute to lower energy consumption, reduced operational costs, and a decrease in CO2 emissions.</p> <p>In terms of materials, the facility follows the Meccano Concept, which prioritizes lightweight, standardized, and cost-effective construction materials. The use of corrugated steel panels enhances durability and recyclability, reducing overall material consumption and waste. This approach minimizes embodied carbon and extends the building's lifespan with minimal maintenance.</p> <p>From a governance and social sustainability perspective, the project was developed collaboratively with local stakeholders to ensure that it meets the needs of sports clubs, schools, and the community. Its modular and cost-efficient construction model makes it scalable for similar projects in other locations. This not only encourages community engagement but also provides a replicable, budget-friendly model for sustainable sports halls.</p>



<p>Luola Sports and Events Centre</p>	<p>Finland</p>	<p>Energy / Materials</p>	<p>At the core of Luolas sustainability strategy is energy efficiency, with the facility benefiting from Savilahtis cutting-edge lake cooling system, significantly reducing its carbon footprint and reliance on conventional heating and cooling methods. This integration of district heating not only optimizes energy consumption but also sets a precedent for sustainable urban development in sports infrastructure.</p> <p>The centre embodies circular economy principles, utilizing recycled materials in its construction while repurposing existing structures to minimize waste generation. By embracing adaptive reuse, Luola showcases how historical and industrial sites can be transformed into thriving, eco-friendly community hubs without excessive material consumption.</p> <p>Governance and sustainable urban development are integral to Luolas success, as it serves as a flagship project within Kuopios strategic initiatives for eco-conscious city planning.</p>
<p>Commerzbank Arena, Frankfurt (Deutsche Bank Park)</p>	<p>Germany</p>	<p>Energy / Governance</p>	<p>The innovative cyber-physical system (CPS) was implemented back in 2015 to enhance energy efficiency, particularly targeting the stadium's grass heating system. This system integrates advanced control strategies with the stadium's existing infrastructure to optimize energy consumption.</p> <p>Researchers developed and tested seven distinct control strategies for the grass heating system, each designed to respond dynamically to real-time conditions. By integrating the stadium's instrumentation into the CPS, these strategies could be flexibly deployed and adjusted based on factors such as weather conditions and usage patterns.</p> <p>During the winter season of 2014-2015, experiments demonstrated that these control strategies achieved up to a 66% reduction in median daily weather-normalized energy consumption. When extrapolated to an average heating season, this corresponds to annual savings of approximately 775 MWh and a reduction of 148 tons of CO2 emissions. In the following winter (2015-2016), additional predictive nighttime heating experiments targeted lower temperatures, further increasing the savings to up to 85, equivalent to 1 GWh (197 tons CO2) in an average winter.</p>



			<p>Beyond achieving significant energy savings, the control strategies met target temperature levels to the satisfaction of the stadium's operational staff.</p>
<p>Peace and Friendship Stadium</p>	<p>Greece</p>	<p>Water / Materials</p>	<p>Promoting Sustainable Mobility</p> <ul style="list-style-type: none"> <li>- Creation of cycle paths and cycle parking facilities.</li> <li>- Promote the use of public transport by offering discounts or incentives.</li> <li>- Facilitate pedestrian access with safe and comfortable pavements and crossings.</li> </ul> <p>Increase plant cover and biodiversity</p> <ul style="list-style-type: none"> <li>- Create green roofs and walls to reduce heat island and increase biodiversity.</li> <li>- Planting native and hardy plant species.</li> <li>- Creating green belts around pitches to enhance biodiversity and provide natural shade.</li> </ul> <p>Water collection and recycling</p> <ul style="list-style-type: none"> <li>- Installation of rainwater harvesting systems for irrigation and other uses.</li> <li>- Use of biofilters and water purification systems for reuse.</li> <li>- Promote water use with conservation systems such as two-way toilets and low-flow showers.</li> </ul> <p>Use of ecological materials</p> <ul style="list-style-type: none"> <li>- Construction with sustainable materials such as recycled wood, bamboo and recycled plastic.</li> <li>- Use of paints and coatings with low or zero volatile organic compounds (VOCs).</li> <li>- Preference for locally produced materials to reduce carbon footprint.</li> </ul>



			<p>Optimising energy efficiency</p> <ul style="list-style-type: none"> <li>- Use of energy efficient LED luminaires.</li> <li>- Installation of automated lighting and heating/cooling systems with motion and temperature sensors.</li> <li>- Insulation of buildings to reduce energy needs.</li> </ul>
Aviva Stadium	Ireland	Materials	<p>65000 cups were deployed for the Ireland – Scotland match before the test was repeated on 8 February 2020 during the Ireland – Wales match, again a 6 Nations Cup. At the very end of the Ireland - Scotland game, 52360 reusable cups were returned to the washing facility. If these 52360 were replaced with single-use plastic pint cups, they would amount up to 418.88 kg. In terms of CO2 savings, this pilot test achieved a saving of above 2 tonnes of CO2eq. This saving includes savings by avoiding incineration and manufacturing new single use cups and losses by not incinerating them and the emissions coming from washing.</p>
Hylliebadet swimming complex	Sweden	Energy / Governance	<p>Hylliebadets sustainability innovation focuses on energy efficiency, water management, and governance. The facility is designed to be one of Sweden’s most energy-efficient swimming complexes, with 700 square meters of solar panels on its roof, enabling partial energy self-sufficiency. Advanced heat exchangers and heat recovery systems allow up to 95% energy reuse, significantly reducing overall energy consumption and carbon emissions.</p> <p>In terms of water sustainability, Hylliebadet features a modern purification system with on-site chlorine production, minimizing the need for external chemical transportation while ensuring high water quality. This innovation not only reduces chemical use but also contributes to a safer and</p>



			<p>more sustainable water treatment process.</p> <p>From a governance perspective, the construction of Hylliebadet incorporated extra investments in energy and environmental efficiency, reducing long-term operational costs and reinforcing sustainable management practices.</p>
Johan Crujff Arena	The Netherlands	Energy / Governance	<p>The HiPster is an innovative measurement tool that monitors sports pitches on key parameters such as soil hardness, energy absorption, grass density, and vitality. The collected data is automatically transmitted to a dashboard, giving groundskeepers real-time insights into field conditions. This allows for more targeted and sustainable maintenance, resulting in better playing conditions and a lower environmental impact. Implementation requires purchasing the hardware and integrating it into existing maintenance processes.</p>
Tongelreep swimming stadium	The Netherlands	Energy / Water	<p>The swimming stadium's gas consumption will be reduced by approximately 450,000 m3 per year (80%). The new construction of the Tongelreep National Swimming Centre in Eindhoven will save approximately 300,000 m3 of gas per year. A total saving of 750,000 m3 of gas. This means a significant reduction in CO2 emissions. The water pumps no longer run on gas, but are powered by 3,400 solar panels that have been installed on the roofs. This fits in with the ambitious climate and energy plan with objectives to reduce CO2 emissions.</p> <p>The following activities have been carried out:</p> <ol style="list-style-type: none"> <li>1) Elaboration of design from DWA specifications.</li> <li>2) Linking the source water from Brabant Water to the energy supply for the Tongelreep.</li> <li>3) Installing a stainless steel TSA with the source water from Brabant Water on the primary side and the energy flow to the swimming pool on the secondary side.</li> <li>4) Installing 2 heat pumps with the connection to the low temperature network for heating the Tongelreep swimming pool.</li> </ol>



			<p>This makes the project not only sustainable, but also affordable. The annual savings on energy costs are greater than the annual costs of the investment. In addition, the solar panels that were installed as part of the Slim Verduurzamen Vastgoed project more than cover the additional electricity consumption of the heat pumps.</p>
Philips Stadion	The Netherlands	Energy	<p>The Philips Stadion has implemented energy efficiency practices such as:</p> <ol style="list-style-type: none"> <li>1. LED Lighting: Philips, as a sponsor of both the stadium and the club, has likely played an important role in upgrading the stadium's lighting systems to energy-efficient LED technology. LED lights are known for their energy savings compared to traditional lighting, as they consume less electricity while providing high-quality illumination.</li> <li>2. Lighting Controls: The implementation of lighting controls, such as occupancy sensors and automated lighting systems, optimizes energy use in the stadium. These controls ensure that lights are only activated when necessary, reducing unnecessary energy consumption.</li> </ol>



Tottenham Hotspur Stadium	United Kingdom	Energy / Governance	<p>The stadium stands out for its design focused on energy efficiency and sustainability, and it features several energy-efficient measures:</p> <ol style="list-style-type: none"> <li>1. Photovoltaic Panels: To harness solar energy and generate electricity that is used on-site during activity periods or sold to the public grid.</li> <li>2. Supplied Renewable Energy: The stadium is powered by 100% renewable energy providers.</li> <li>3. LED Lighting: LED lights save energy compared to traditional lighting, as they consume less electricity while providing high-quality illumination.</li> <li>4. Efficient HVAC Systems: The sports facility uses energy-efficient heating, ventilation, and air conditioning systems.</li> <li>5. BMS Control Systems: A Building Management System (BMS) developed by Schneider has been implemented across all properties. It automates mechanical, electrical, and technological systems such as climate control, lighting, public address, utilities, elevators, surveillance, and fire protection.</li> <li>6. Insulation: The building has been designed with high insulation to reduce heating and cooling demands.</li> <li>7. Transparent sustainability dashboards for public accountability (energy, waste, transport).</li> </ol>
Telenor Arena	Norway	Energy	<p>The energy efficiency measures implemented have been:</p> <ol style="list-style-type: none"> <li>1. Installation of solar panels: To harness solar energy and generate electricity that is used on-site during activity periods or sold to the public grid.</li> <li>2. Replacement of the lighting system with a more efficient LED system: The new LED lighting system alone has achieved an energy savings of 45%.</li> </ol>



Caldea	Andorra	Energy / Water	<p>The Caldea SPA in Andorra is a renowned thermal complex known for utilizing the area's natural thermal waters. The energy efficiency measures implemented to minimize energy consumption and reduce environmental impact include:</p> <ol style="list-style-type: none"> <li>1. LED lighting: As of 2020, 83% of the building's lighting systems used LED technology, which consumes less energy and has a longer lifespan compared to conventional lighting.</li> <li>2. Efficient HVAC systems: The heat exchangers were replaced with more efficient models.</li> <li>3. Improved roof insulation: In 2021, part of the roof was replaced with one offering greater thermal insulation, resulting in reduced heat loss and, consequently, lower energy demand for the building.</li> <li>4. Utilization of thermal water energy: Approximately 62% of the facility's thermal demand is met by harnessing the heat from the local thermal waters.</li> </ol> <p>These energy efficiency measures not only help reduce Caldea SPA's environmental impact, but also contribute to long-term operational cost savings. Moreover, they demonstrate the complex's commitment to sustainability and environmental protection.</p>
Duna Arena	Hungary	Energy	<p>The building includes several measures to minimize energy consumption and reduce environmental impact, such as:</p> <ol style="list-style-type: none"> <li>1. Heat recovery systems: These systems capture the heat generated by pool water and other equipment and reuse it to heat the building, warm the water in new pools, and produce hot water for showers and restrooms.</li> <li>2. District Heating: In addition, this sports facility is connected to a district heating system to meet its heating needs.</li> <li>3. LED Lighting: A low-consumption LED lighting system that not only reduces energy use but also provides excellent light quality for athletes and spectators.</li> </ol>



Sportkringpark	Belgium	Energy / Water	<p>The project will be fully powered by renewable energy and includes the following energy efficiency measures:</p> <ol style="list-style-type: none"> <li>1. Photovoltaic system: To harness solar energy and generate electricity that will be consumed on-site during periods of activity or sold to the grid.</li> <li>2. Riotermic system: Extraction of heat from wastewater in the city's main sewage collector.</li> <li>3. Rainwater collection and filtration systems: To collect and treat rainwater for reuse.</li> <li>4. Green roofs: Which serve as thermal insulators and help retain rainwater.</li> </ol>
Continassa	Italy	Energy	<p>Continassa has implemented various energy efficiency measures to optimize performance and reduce its environmental impact:</p> <ol style="list-style-type: none"> <li>1. HVAC systems: Integration of high-efficiency systems, including cogeneration and heat pumps.</li> <li>2. District heating: The facility is connected to the local district heating network, which uses a central heat production plant to generate heat that is then distributed through an underground pipe network to connected buildings.</li> </ol>