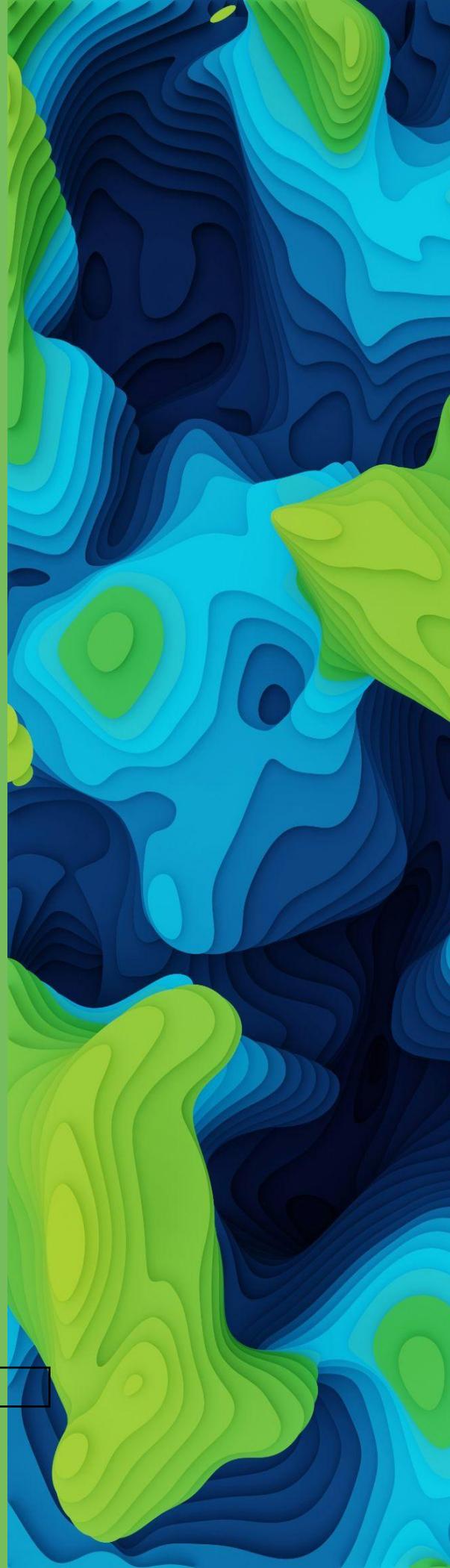


# Smart Flooring's Role in Decarbonizing the US Building Sector

By Scanalytics  
Spring 2024



On April 2, 2024 the US Department of Energy released the first ever blueprint for decarbonizing the US building stock by 2050. This aggressive plan recognizes the central role that buildings play in achieving nationwide climate goals while balancing comfort, health, and cost considerations for building owners, operators, and occupants.

As we reflect on the various Earth Day 2024 announcements and commitments around the globe, we found it fitting to provide a high-level summary of what these efforts mean for the revised role that flooring is playing in the fight against emissions.

We start with a brief overview of the Decarbonization Blueprint, the specific portions of the Blueprint that smart flooring enables, then cover how flooring is participating in the acceleration of building decarbonization, and spotlight two of our key flooring partners and their innovative sustainability programs.



# What is the National Blueprint for Decarbonizing the US Building Sector?

Achieving the vision that this Blueprint sets out to decarbonize U.S. buildings in just a few decades requires bold and coordinated action to address how buildings are sited, designed, built, operated, and retrofitted.



Source: DOE Blueprint

## DECARBONIZING THE U.S. ECONOMY BY 2050

A National Blueprint for the Buildings Sector

April 2024

### Overview

- Buildings are significant contributors to GHG emissions in the U.S., accounting for over one-third of total emissions.
- The blueprint targets a 65% reduction in GHG emissions from buildings by 2035 and a 90% reduction by 2050, compared to 2005 levels.
- This reduction is seen as critical to achieving net-zero emissions across the entire economy by 2050.

### Key Challenges & Goals

- Buildings consume 74% of U.S. electricity and their heating and cooling demands drive peak electricity usage.
- Improving building efficiency is pivotal, targeting reduced energy consumption and integrating clean energy technologies.
- The blueprint emphasizes equity, affordability, and resilience, aiming to ensure that decarbonization efforts benefit all communities, particularly those that are economically marginalized.

## What is the National Blueprint for Decarbonizing the US Building Sector? (cont.)



**Buildings account for about 74% of U.S. electricity use**

### Strategic Objectives

1. **Increase Building Energy Efficiency:** The blueprint aims to decrease overall energy demand in buildings through enhancements in building designs and systems.
2. **Accelerate On-Site Emissions Reductions:** This includes switching to electrified systems for heating and cooling and minimizing refrigerant emissions.
3. **Transform the Grid Edge:** Enhance the interaction of buildings with the power grid through smart systems and energy storage to help manage electricity demand and reduce infrastructure costs.
4. **Minimize Embodied Life Cycle Emissions:** Focus on reducing emissions involved in the production and transport of building materials.

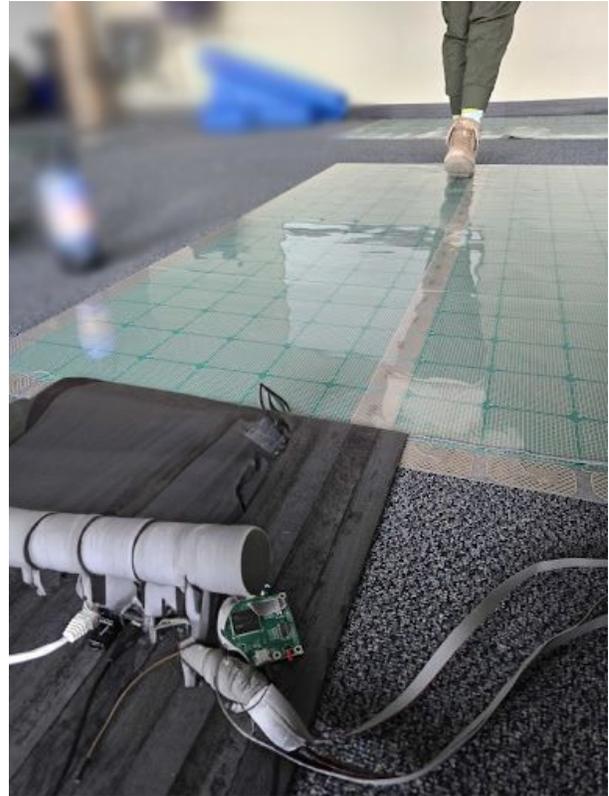
### Implementation Strategies

- The plan details a phased approach to implementation, emphasizing the rapid deployment of technology, policy reforms, and incentives.
- It suggests leveraging federal actions to promote energy-efficient designs and technologies, including setting ambitious building codes and standards.
- Key to the strategy is enhancing the energy workforce through training and development, ensuring the creation of high-quality jobs in the energy sector.

### Social & Economic Impacts

- By improving building efficiency and reducing reliance on fossil fuels, the blueprint aims to lower energy costs, improve public health, and promote economic stability in communities, especially those facing high energy burdens.

# What is Floor Sensor Technology & How Does It Advance the U.S. Decarbonization Goals?



Scanalytics is a US Department of Energy ARPA-E funded technology company that developed a material and software platform for turning the floor into a sensor that building owners and operators can use to more intelligently and profitably manage their spaces.

Scanalytics provides the most future-proof analytics delivery system for the built environment using a patented three component platform:

1. Modular, incrementally deployable sensors that can be installed on-top of or underneath existing and new flooring to provide a continuous readout of precise occupancy and activity within buildings
2. An AI software platform that translates the raw sensor data from the floor sensors into actionable information that customers can access through various dashboards, reporting, and predictive analytics tools
3. A growing marketplace of software applications akin to an 'App Store' for buildings that customers can access as new software use cases are developed and published, for example, predictive wear & tear, leak and fire detection, senior living fall detection and fall prevention, and more.



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## 6 Floor Sensor Tech (cont.)

Buildings that have access to the spatial intelligence and precise occupancy provided by our technology are able to autonomously adjust energy-hungry operations like HVAC far more effectively and realize the cost and energy savings that come as a result. Although the building sector is familiar with tools like motion detectors, there is an important difference between mere motion detection and precise occupancy. Additionally, unlike cameras, a flooring system is inherently anonymous and private.

Traditional motion detectors have long been the standard for automating lighting and HVAC systems in buildings. These systems rely on detecting movement to decide whether a space is occupied, triggering heating, cooling, or lighting accordingly. However, motion detectors have a critical limitation: they lack the context and precision necessary for optimal energy management. They can only detect whether there is movement, not how many people are present, their location within a space, or whether they are merely passing through or settling in for a period.

### Key Benefits of Precise Occupancy Data for Energy Efficiency:

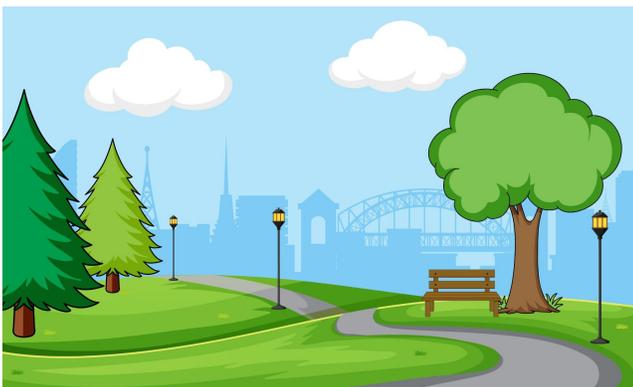
- 1. Targeted HVAC Control:** By knowing exactly how many people are in each area of a building, HVAC systems can adjust their output to match the specific needs of those spaces. For example, a conference room with 10 people will need more cooling than one with just 2 people. Smart flooring ensures that the environment is tailored to the actual occupancy, avoiding overcooling or overheating, which are common issues with systems guided by motion detectors.
- 2. Reduction in Energy Waste:** Motion detectors can mistakenly activate HVAC systems even when a space is not in use for long periods – for instance, when someone just walks through a room. Smart flooring eliminates this inefficiency by providing continuous, accurate data, ensuring that energy is used only when and where it is truly needed.
- 3. Enhanced Comfort and Productivity:** Accurate data on room occupancy allows for the creation of an environment perfectly balanced for comfort based on actual usage patterns. This leads not only to energy savings but also to enhanced occupant comfort, which can boost productivity and satisfaction in workplaces.
- 4. Dynamic Energy Management:** Smart flooring can integrate with other building management systems to provide real-time insights into how spaces are used throughout the day. This integration allows for dynamic adjustments, which can lead to further efficiencies that are not possible with the static, binary input from motion detectors.



The DOE Blueprint identifies the major categories of technical solutions for building decarbonization that will make the biggest impact and receive the strongest administrative support. Smart flooring fits neatly into two of these categories; **building upgrades** and **smart controls**.

# Building Upgrades

**Building Upgrades** involve retrofitting and renovating existing structures with the aim of reducing energy consumption and enhancing overall building performance. Key elements of this category include:



These upgrades not only improve the energy performance of buildings but also enhance occupant comfort and building value, aligning with the blueprint's goals of sustainable and resilient building practices.

- 1.** **Insulation and Weatherization:** Improving the building envelope by upgrading insulation and sealing leaks to reduce heat loss and gain, which helps in maintaining comfortable indoor temperatures with less energy.
- 2.** **Window Replacements:** Installing double or triple-pane windows that offer better insulation and reduce energy loss, thus contributing to lower heating and cooling demands.
- 3.** **Lighting Upgrades:** Transitioning to energy-efficient lighting systems, such as LED technology, which significantly cuts down electricity use and costs.
- 4.** **Renewable Energy Installations:** Incorporating renewable energy sources like solar panels or small-scale wind turbines to generate clean energy on-site, thereby reducing dependence on grid-supplied electricity.
- 5.** **Water Efficiency Improvements:** Implementing low-flow fixtures and efficient water heating technologies to reduce both water usage and the energy required for heating water.

# Smart Controls

Smart Controls leverage advanced technologies to optimize building operations and energy use, making buildings more intelligent and responsive to the needs of occupants and the grid. Key components include:



1. **Building Automation Systems (BAS):** These systems automate various building operations, including HVAC, lighting, and security systems, improving comfort, energy efficiency, and reducing human error.
2. **Energy Management Systems (EMS):** EMS monitor and control the energy consumption of building systems, identifying opportunities for savings and optimizing energy use in real time.
3. **Smart Thermostats and Sensors:** These devices can adjust heating and cooling based on real-time data such as occupancy and weather conditions, significantly improving HVAC system efficiency.
4. **Demand Response Technologies:** These allow buildings to automatically adjust their energy usage during peak demand periods based on signals from the utility company, helping to stabilize the grid and reduce utility costs.
5. **Advanced Metering Infrastructure (AMI):** AMI provides detailed, real-time data on energy consumption patterns, helping building managers and occupants make informed decisions about energy use.
6. **Integration with Renewables:** Smart controls can be integrated with on-site renewable energy sources to optimize the production and consumption of clean energy, further enhancing energy savings and sustainability.

## Smart Controls (cont.)

The focus on smart controls not only contributes to reducing operational costs and environmental impact but also plays a critical role in transforming buildings into dynamic entities that can interact efficiently with the grid and adapt to changing environmental conditions.

Together, building upgrades and smart controls form a comprehensive approach to modernizing existing buildings and making new constructions more sustainable, directly contributing to the goals of the Decarbonization Blueprint by reducing energy consumption and greenhouse gas emissions.

In the pursuit of decarbonizing building operations, one often overlooked yet pivotal aspect is the flooring system. Smart flooring technology is uniquely positioned for building upgrades and smart controls by integrating advanced sensor technology directly into commercial flooring—a component frequently updated during building retrofits.

### **Seamless Integration with Routine Upgrades:**

Commercial buildings periodically retrofit their flooring systems either to modernize aesthetics or to comply with new building codes and standards. Our technology capitalizes on these routine renovations by embedding sensors into new flooring installations with minimal disruption to existing operations. This approach ensures that buildings are not just aesthetically upgraded but are also transformed into intelligent environments that contribute to energy efficiency goals.

**Enhanced Building Performance:** By integrating our smart flooring during the retrofitting process, buildings gain a dual benefit—new flooring that meets modern design standards and a built-in system for monitoring and managing occupancy and environmental conditions. This integration is crucial for optimizing building performance without the need for additional intrusive sensors or significant alterations to existing infrastructures.

**Real-Time Data Utilization:** The high-resolution sensors embedded in our flooring provide real-time data on occupancy and foot traffic patterns. This data is invaluable for adapting heating, ventilation, and air conditioning (HVAC) systems to actual usage patterns, significantly reducing unnecessary energy consumption and enhancing the overall efficiency of the building. This capability aligns directly with the energy conservation goals of building upgrades by allowing for more precise control and reduction of the building's operational energy demands.

**Proactive Energy Management:** Our smart flooring technology goes beyond traditional reactive systems by providing predictive insights based on continuous data collection. This proactive approach enables building managers to anticipate changes in occupancy and adjust systems accordingly, minimizing energy waste and optimizing environmental controls. This not only supports immediate energy reduction but also contributes to long-term sustainability objectives by ensuring that buildings operate at peak efficiency.

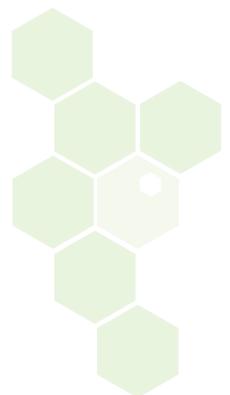
**Cost-Effective Upgrade Solution:** Integrating our smart flooring during the retrofitting phase is cost-effective, as it merges the flooring upgrade with the installation of advanced sensor technology. This consolidation reduces the overall cost and complexity of building upgrades, providing a smart, future-proof investment that pays dividends in energy savings and operational efficiency over the lifespan of the flooring.

Our **smart flooring technology** is not just an upgrade to the physical infrastructure of a building; it is a strategic enhancement to its core operational systems, making buildings smarter, more energy-efficient, and aligned with the ambitious targets of the Decarbonization Blueprint. By choosing smart flooring technology for commercial flooring retrofits, stakeholders are not merely updating their spaces—they are stepping into the future of sustainable building management.

# Transforming Flooring's Role in Building Decarbonization

In the realm of building design and construction, the focus on energy efficiency has predominantly highlighted the roles of windows, walls, and roofs. These components, acknowledged as integral to the insulating envelope, have been the beneficiaries of extensive innovation, subsidy programs, and regulatory incentives. Yet, an overlooked opportunity lies beneath our feet—commercial flooring. Traditionally viewed as a passive element, commercial flooring has remained on the periphery of discussions about energy conservation. However, with the advent of cutting-edge sensor technology that can embed directly into commercial flooring and underlayments, this perception is changing rapidly.

The Scanalytics technology transforms ordinary floors into interactive surfaces akin to large "touchscreens" allowing the floor to operate like a digital skin for the building. By doing so, it equips the flooring with the capability to reconstruct occupant behaviors and measure precise occupancy within the building. Unlike conventional methods that rely on estimates or periodic measurements, this technology offers real-time, historical, predictive, and anonymous data on how spaces are used. This precise occupancy detection enables a more intelligent control of heating, ventilation, and air conditioning (HVAC) systems, leading to significant reductions in energy waste.



Consider the conventional focus on windows as part of the building's insulating envelope. Windows have received attention for their role in heat loss and gain, leading to advancements in double-glazing, low-emissivity coatings, and other energy-efficient technologies. Manufacturers of such dynamic window technology have benefited from government subsidies and incentive programs that recognize and encourage their contribution to reducing a building's carbon footprint. Similarly, smart flooring technology stands to redefine the role of commercial floors from passive elements to active participants in energy management.

The integration of this sensor technology into flooring not only elevates the function of an underutilized surface but also creates a paradigm shift in how building emissions are understood and managed. By leveraging floors, which cover every square inch of a building's interior, as active tools for energy efficiency, we unlock a substantial and untapped potential to contribute to environmental sustainability.

This sensor technology presents a unique opportunity for stakeholders in the construction and building management sectors to drive forward a sustainable and efficient future. By redefining commercial flooring's role from a mere aesthetic element to a core component of the building's energy strategy, we are paving the way for smarter, more responsive building environments that dynamically adjust to their occupancy patterns, thereby optimizing energy usage and reducing unnecessary waste.

Just as window technology evolved to become a pivotal part of the building's insulating envelope, so too can flooring ascend to a similar status, transforming every step within a building into a step towards sustainability.

### Partner Spotlight:

## Mannington Commercial

Mannington's contributions to advancing smart flooring go beyond a single use case - they have a unique ability to help building owners across many segments extract value from smart flooring as an extension of their intimate understanding of each customer needs.

Scanalytics is collaborating with a select group of organizations in the flooring industry that share similar values of a more sustainable built environment. These partners have demonstrated a commitment to sustainability and decarbonization that stands out among industry peers.

We are excited to share more information on these key partners and their extensive efforts. Not only will you find a portfolio of smart-flooring compatible product lines, you will benefit from their broader decarbonization and environmental goals that are deeply integrated with their corporate culture.



### Commitment to Carbon Neutrality

Mannington has pledged to achieve net zero greenhouse gas emissions by 2050. They are actively taking steps to reduce their environmental footprint by offsetting 105% equivalent of the carbon emissions from their domestically manufactured products, going beyond neutrality to a net positive impact for projects using their flooring. To help bring this initiative to reality, in 2023, Mannington announced its partnership with Appalachian Carbon Exchange (ACE), a non-profit initiative of the Tennessee River Gorge Trust.

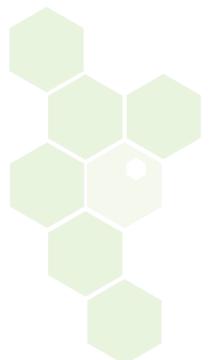
### Environmental and Quality Standards

Mannington adheres to international environmental and quality standards to guide their manufacturing processes, ensuring reduced environmental impacts and waste. They actively engage in nature-based solutions like habitat restoration and sustainable waste management.

### Sustainable Practices & Certifications

- **Renewable Energy:** Mannington generates significant renewable energy through 3,900 solar panels at their New Jersey facility, which produced 707,297 kilowatt hours in 2022.
- **ISO Certifications:** Several of their facilities are certified under ISO 14001 for environmental management, reducing environmental impact and waste.

**For more information,** please visit: [ACE](#) and [Mannington Foundational Partnership](#).



## Social Responsibility and Community Engagement

- **Philanthropy:** Mannington supports various charitable initiatives, including Habitat for Humanity and Mercy Medical Angels, which aligns with their commitment to community stewardship.
- **Education and Development:** They invest in educational programs and scholarships, enhancing community education and development.
- **Corporate Responsibility:** In 2023, Mannington Mills announced that Mannington has eliminated PFAS, ortho-phthalates and other chemicals of concern from their products and is actively working to reduce the use of other harmful substances in their manufacturing processes. It has signed onto the United Nations Global Compact (UNGC), demonstrating its commitment to advancing best practices concerning human rights, labor, the environment and anti-corruption.

## Innovation in Product Sustainability

Mannington has eliminated PFAS, ortho-phthalates and other chemicals of concern from their products and is actively working to reduce the use of other harmful substances in their manufacturing processes.

## Transparency and Accountability

They provide detailed environmental product declarations and health product declarations on their website, showing a commitment to transparency about the environmental impact of their products.



**“Mannington is proud to partner with Scanalytics as we specialize in creating performance products. The creation of smart flooring is a natural fit beyond the emissions advantage gained through sensor technology. We see endless opportunities for data that can be captured to assist building owners in areas for safety in schools, gait monitoring for our aging population, disaster management, leak detection that would normally be hidden.”**

**—Keith Barbaree, Vice President Strategic Accounts, Mannington**

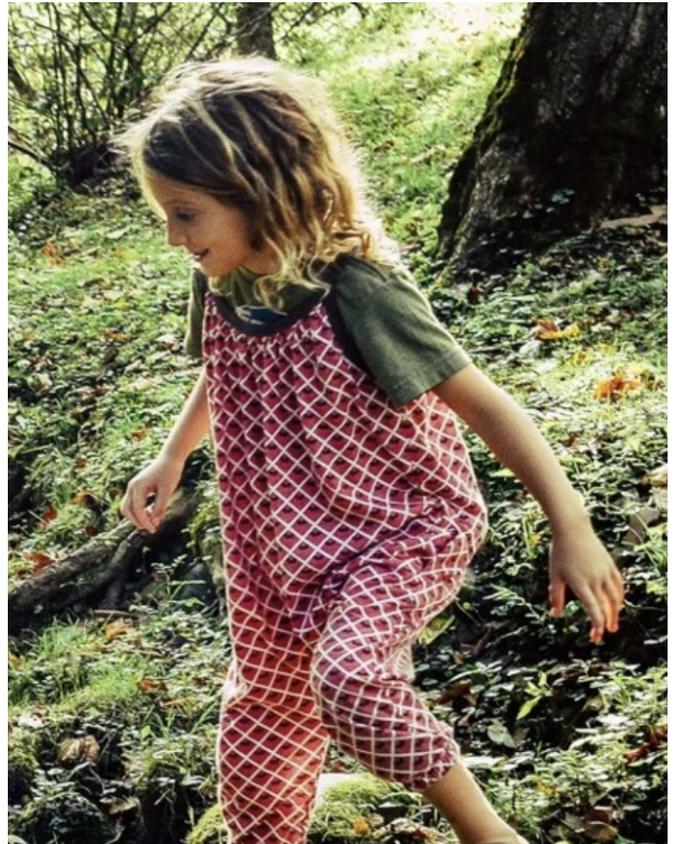


## Partner Spotlight: **Tarkett**

Tarkett's sustainability efforts are robust and aligned with global sustainability goals, showcasing a comprehensive approach to corporate social responsibility.

### Commitment to Sustainability

- Tarkett Human-Conscious Design®: This approach embodies their commitment to sustainability, emphasizing the creation of flooring and sports surfaces that are beneficial for both people and the planet.
- Circular Economy: Tarkett is committed to changing the game with circular economy principles, aiming to recycle and reuse materials, thus reducing waste and environmental impact.



**For more information, visit the  
Tarkett Commercial Sustainability  
Program**

## Tarkett, contd

### Climate Strategy and Emissions Reduction

- Science-Based Targets: Tarkett's climate targets have been approved by the Science Based Targets initiative (SBTi), aiming to reduce greenhouse gas emissions by 30% across their value chain by 2030.
- Renewable Energy and Efficiency: Projects to optimize energy consumption at their plants include the use of solar panels, biomass boilers, and renewable electricity contracts.

### Sustainable Products and Innovation

- Eco-Design: Tarkett applies Cradle to Cradle® principles to their product designs, focusing on sustainable materials that are health-conscious and environmentally friendly.
- Indoor Air Quality: They strive for products that contribute to healthier indoor environments, with 99% of their flooring solutions characterized by low emissions of volatile organic compounds (VOCs).

### Social Responsibility

- Community Engagement: Through the "Tarkett Cares" program, the company engages in various community support and philanthropic activities.
- Employee Well-being and Safety: Tarkett places a strong emphasis on the safety and health of their workforce, aiming to continually improve their safety culture and reduce accident rates.

### Recognition & Achievements

- Sustainability Ratings: Tarkett has been recognized for their environmental leadership, including a leadership level "A-" score for Climate Change disclosure by CDP and a high EcoVadis Sustainability rating.





**“ We shape our buildings;  
thereafter, they shape us.”**

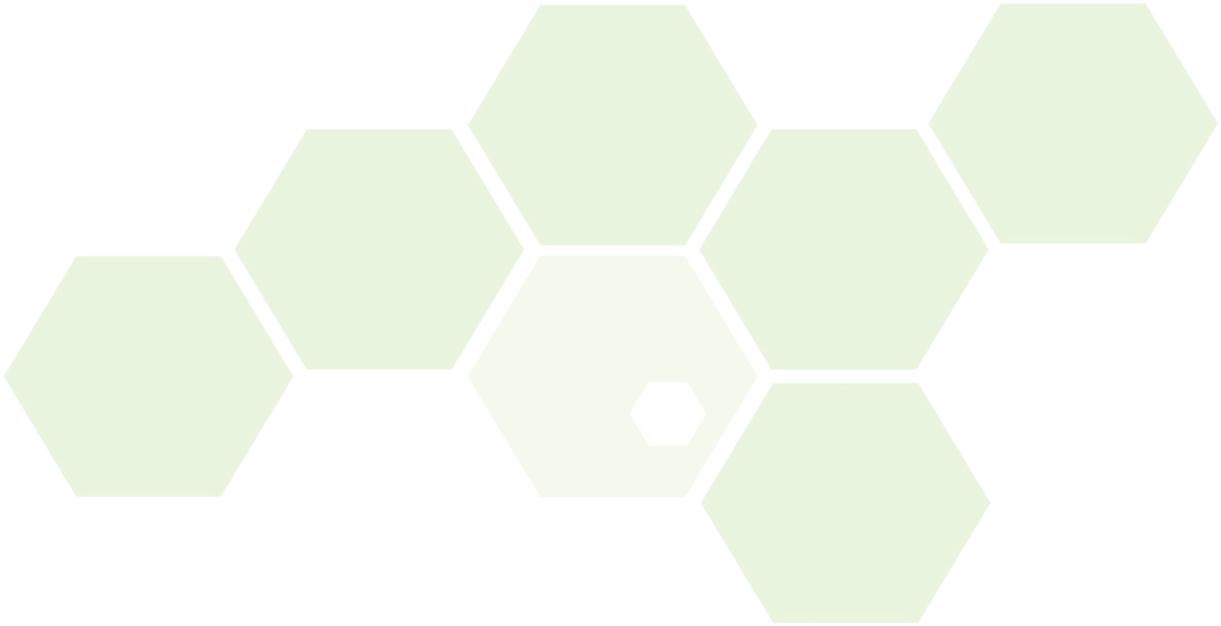
**—Winston Churchill**



**Thank you!**

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