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Deliverable 3.1 Report on best practice for sustainability

Co-funded by the European Union

Summary

INTRODUCTION

The EE4HORECA project brings together 12 partners from 7 countries and focuses on the value chain approach to test and validate the economic viability of collaborative models in greening value chains and to propose benchmarks and standards inputting regulatory and policy improvements. All the activities are focused on supporting companies and staff in the implementation of energy efficiency measures, business models, and benchmarks for greening the HORECA value chain.

The project focuses its activities in the following NACE sectors: accommodation and food service activities (NACE Code: I55 to I56.3.0)

The present work is part of the WP3 that will propose business models and benchmarking for improving the sustainability of the value chain of the HORECA sector.

The overall objectives of the present WP aim to:

- Assess the relevant resource flows of the supply chain and define best practices to improve their sustainability.
- Develop an integrated economic model through a life cycle perspective with considerations of the non-energy benefits.
- Evaluate the untapped potential of energy efficiency and renewable at each step of the value chain once gathered data directly from the supply chain investigated.
- Create a benchmarking tool focused on energy use at the value chain level.

The present work investigates the relevant resource flows characterizing the HORECA value chain, proposes Key Performance Indicators (KPI) for sustainability performance assessment, and identifies and categorizes sustainability best practices along the value chains.

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RELEVANT RESOURCES FLOWS

The HORECA sector, encompassing Hotels, Restaurants, and Catering Service Providers, relies on a complex and interconnected network of resource flows. This analysis delves into the key resources that move through the Horeca value chain, categorized by inbound and outbound movements. The main inbound natural resources are food and beverage products, equipment, other supplies of services and non-biodegradable products, energy and other utilities, and water. Sourcing strategies determine the origin and type of food and beverage products used and affect the transportation of the goods. Fresh produce, ranging from fruits and vegetables to dairy, meat, and seafood, can be local, regional, national, or international, with factors like seasonality, cost, and desired quality influencing the choices. Pre-packaged items like bread, condiments, canned goods, and bottled drinks offer convenience and consistency but may require less culinary expertise. Selecting these products involves considerations of brand, quality, and potential cost savings. The sourcing and regulations for alcoholic beverages, such as beers, wines, spirits, and liqueurs, vary significantly depending on the geographical location. Understanding legal restrictions and responsible purchasing practices is essential. A diverse range of equipment is necessary for the Horeca operations. Kitchen equipment encompasses ovens, stoves, refrigerators, freezers, dishwashers, food processors, blenders, and specialized tools, with a specific mix depending on the type of cuisine and service offered. Restaurant supplies include plates, cutlery, glassware, napkins, tablecloths, serving utensils, cleaning products, and personal protective equipment. Choosing durable and cost-effective options is vital. Hotels require additional supplies like beds, linens, towels, toiletries, cleaning supplies, and maintenance tools to ensure a comfortable and hygienic guest experience. Optimizing procurement and inventory management of these supplies is crucial. Horeca businesses rely heavily on electricity to power lighting, refrigeration, cooking equipment, ventilation systems, and IT infrastructure. Energy efficiency measures can significantly reduce costs. A reliable supply of clean water is essential for sanitation, food preparation, and beverage service, necessitating water conservation practices for environmental responsibility. Gas, while not ubiquitous, is used for cooking in some establishments, particularly those specializing in specific cuisines. Evaluating the cost-benefit of gas compared to electric alternatives is important. Finally, standardized recipes are critical for ensuring consistency and quality of food across multiple locations. Recipe management systems can streamline development, communication, and adherence to established standards. Physical or digital menus showcase culinary offerings and inform customer choices, requiring clear, concise, and visually appealing design. Real-time or periodic tracking of stock levels through inventory management systems helps with informed ordering decisions and minimizes waste. Customer data on preferences, reservations, and loyalty programs can be used for personalized marketing and service enhancements, with secure data storage and responsible use practices being essential.

The main outbound natural resources are prepared food and drinks, and waste. Horeca establishments deliver a variety of prepared food and drinks to customers. Entrees, the main courses that form the centerpiece of a meal, are complemented by appetizers and sides to enhance the dining experience. Desserts offer a satisfying and memorable finish. Alcoholic and non-alcoholic beverages are offered to accompany meals or enjoyed separately. Several types of waste are generated throughout the Horeca value chain. Food waste encompasses spoiled or uneaten food scraps produced during preparation, cooking, and customer consumption. Implementing food waste reduction strategies is essential for

sustainability and cost control. Packaging waste includes discarded containers, wrappers, and other packaging materials. Utilizing environmentally friendly packaging options and exploring recycling opportunities are important considerations. Operational waste, consisting of used paper towels, cleaning products, and other waste generated from daily operations, necessitates waste minimization practices and exploration of responsible disposal methods.

Concerning financial resources, revenue is generated from customer payments for food, drinks, and services like accommodation. Effective marketing and customer service strategies are essential for driving revenue growth. Payments encompass outgoing costs for supplies, equipment, utilities, labor, rent, and other operational expenses. Cost management practices and efficient resource allocation are critical for financial sustainability.

Additionally, skilled personnel are essential for the smooth operation of any Horeca establishment. Key roles include chefs, cooks, waitstaff, bartenders, housekeeping and maintenance staff, and management. Recruitment, training, and employee engagement are crucial for a high-performing workforce. Technological advancements are transforming the Horeca landscape. Point-of-sale systems, reservation platforms, kitchen display systems, delivery partnerships, and inventory management software all play a role in optimizing operations and enhancing the customer experience.

KPI FOR SUSTAINABILITY PERFORMANCES

The HORECA sector faces a growing need to implement sustainable practices and improve energy efficiency. Here are some key performance indicators (KPIs) to track progress in these areas:

- Energy Consumption:
  - *Energy Intensity:* This measures energy consumption per unit of output, such as kWh/occupied room night for hotels or kWh/customer served for restaurants.
  - *Percentage Change in Energy Consumption:* Track year-over-year changes to monitor progress on reduction goals.
  - *Energy Consumption by Source:* Identify areas for improvement by analyzing the breakdown of energy use (electricity, natural gas, etc.).
- Renewable Energy Integration:
  - *Percentage of Energy from Renewable Sources:* Track the portion of the energy consumption met by renewable sources like solar, wind, or geothermal.
  - *On-site Renewable Energy Generation:* Monitor the efficiency and energy output of renewables.
- Water Usage:
  - *Water Intensity:* Like energy, this measures water consumption per unit of output, such as m^3/occupied room night or m^3/customer served.
  - *Percentage Change in Water Consumption:* Track year-over-year changes to monitor progress on reduction goals.
  - *Leak Detection and Repair Rate:* Monitor the efficiency of leak detection and repair efforts to minimize water waste.
  - *Percentage of Graywater Used for Irrigation or Other Non-Potable Applications:* Graywater refers to gently used wastewater from sinks, showers, and washing machines, excluding toilets. Reusing it for non-potable purposes reduces reliance on freshwater resources.
- Waste Management:
  - *Waste Diversion Rate:* This measures the percentage of waste diverted from landfills through recycling, composting, or other means.
  - *Food Waste Reduction:* Track the amount of food waste generated.
  - *Percentage of Reusable or Biodegradable Packaging:* Monitor the share of eco-friendly packaging materials used.
- Sustainable Procurement:
  - *Percentage of Locally Sourced Food:* This metric monitors the share of locally sourced food supporting local agriculture and reducing transportation emissions.
  - *Energy Star Certified Equipment:* Track the percentage of equipment meeting energy efficiency standards.
  - *Sustainable Supplier Practices:* Evaluate and partner with suppliers who share the commitment to sustainability.
- Employee Engagement:
  - *Number of Employee Sustainability Trainings:* Track employee participation in sustainability training programs to promote awareness and behavior change.
  - *Employee Suggestions for Sustainability Improvements:* Encourage employee involvement by collecting and implementing suggestions for improving sustainability practices.
- Financial Performance:

  - *Return on Investment (ROI) for Sustainability Initiatives:* Evaluate the financial benefits of sustainability efforts by measuring the cost savings or revenue generated.
  - *Customer Willingness to Pay for Sustainable Practices:* Gauge customer preference and potential price premium for eco-friendly options through surveys or market research.
  - *Reduction in Environmental Risk Exposure*: assesses how a company's sustainability efforts decrease its vulnerability to environmental risks. It's measured by considering factors like regulatory compliance, resource dependency, supply chain vulnerability, climate change impact, insurance premiums, and investor risk assessments.
- Community Engagement:
  - *Number of Partnerships with Local Sustainability Organizations:* Track collaboration efforts with local organizations to promote sustainability within the community.
  - *Community Outreach and Education Programs:* Monitor the reach and impact of community engagement initiatives related to sustainability.
- Transportation:
  - *Electric Vehicle (EV) Charging Station Availability:* If the business caters to guests or customers arriving by car, this KPI meacsures the commitment to supporting sustainable transportation options.
  - *Percentage of Deliveries Made by Sustainable Modes:* Track the portion of deliveries made through bicycles, electric vehicles, or other low-emission methods.
- Biodiversity and Ecosystem Services:
  - *Habitat Restoration or Creation Projects:* Monitor the impact of initiatives to restore or create natural habitats on the property, promoting biodiversity and ecosystem health.
  - *Water Conservation Landscaping Practices:* Track the implementation of water-efficient landscaping techniques that reduce irrigation needs and promote native plant species.
- Guest/Customer Engagement:
  - *Guest/Customer Opt-in for Sustainable Practices:* This measures the rate at which guests choose eco-friendly options, such as opting for towel/linen reuse or using energy-saving features in their rooms.
  - *Customer Satisfaction with Sustainable Menu Options:* Track guest/customer feedback on vegetarian, vegan, or locally sourced food options to understand their preferences and potential impact on food waste reduction.
  - *Guest/Customer Satisfaction with Sustainability Initiatives:* Gauge the effectiveness of sustainability efforts by understanding guest/customer perception.
- Additionally:
  - **Carbon Footprint:** Track the overall greenhouse gas emissions to understand the environmental impact.
  - **Number of Sustainable Practices Implemented:** This helps track the scope and diversity of sustainability efforts.

Figure 1 presents a synthesis of the most relevant KPIs for the sustainability performances assessment.

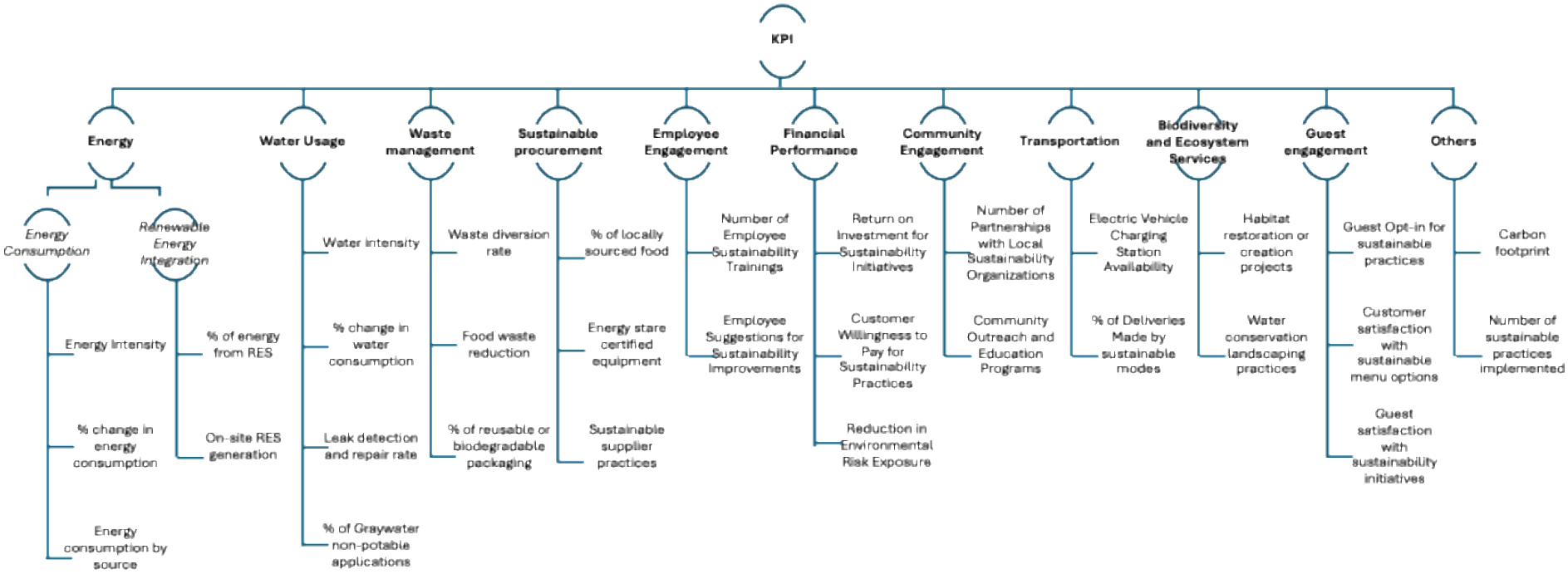

Figure 1. KPIs for sustainability performances assessment

The success of the sustainability journey hinges on identifying the most fitting (KPIs). These indicators, tailored to the specific business and its sustainability goals, act as a compass, guiding towards improvement. Through consistent monitoring and analysis of these KPIs, it is possible to pinpoint areas where practices can be refined and celebrate progress made over time. Transparency is key. Openly communicating the sustainability initiatives with stakeholders fosters trust and allows them to see the commitment first-hand. It's important to remember that the ideal KPIs are not one-size-fits-all. The unique characteristics of the business, the resources available, and the specific sustainability goals will all influence which metrics are most relevant. Regularly revisiting and updating chosen KPIs ensures they remain aligned with the evolving priorities and reflect the best practices within the industry. Finally, the organization's commitment to sustainability extends beyond internal implementation. A crucial aspect involves the dissemination of achievements through the utilization of formal reports, targeted marketing materials, and strategic social media engagement. This multifaceted approach fosters transparency, inspires external stakeholders, and encourages broader participation in creating a more sustainable future.

SUSTAINABILITY BEST PRACTICES

Hotel value chain

The hotel industry is a significant contributor to the national economy, generating revenue and employment opportunities across the country. However, it also faces challenges in terms of sustainability, with energy consumption being a major concern. Sustainability is a much broader concept than just energy efficiency. While energy efficiency is a crucial component, it's just one piece of the puzzle. Some other key aspects of sustainability are:

- **Resource conservation:** This encompasses everything from using less water and raw materials to minimizing waste generation and promoting responsible consumption.
- **Environmental protection:** This focuses on minimizing negative impacts on the environment, such as pollution, habitat destruction, and biodiversity loss.
- **Social equity:** This ensures that sustainability efforts benefit all stakeholders, including fair labor practices, community development, and responsible supply chains.
- **Economic viability:** Sustainable practices should be financially sound and contribute to long-term economic growth.

By considering all these aspects, we can achieve a truly holistic approach to sustainability. Here's a breakdown of the key areas where sustainability efforts are being made [1-3]:

1. Buildings and Infrastructure:

- *Renovation and retrofitting:* Many hotels are upgrading their buildings with energy-efficient materials, appliances, and lighting systems. This can include installing LED lights, upgrading insulation, and replacing old air conditioning units with more efficient models. For instance, insulation upgrade leads to improved thermal performance reducing heating and cooling demands; while turning off or dim lights in communal areas, using sensors in light, ventilation, heating and cooling systems, and using a Key Card System allow to reduce or even shut down power when guests leave a room.
- *Renewable energy:* Some hotels are investing in renewable energy sources such as solar panels and geothermal systems to generate their own electricity or hot water reducing reliance on fossil fuels.
- *Smart building technologies:* Implementing smart building technologies like building management systems (BMS) can help hotels optimize energy use by automatically adjusting lighting, heating, and cooling based on occupancy and weather conditions.
- *Bioclimatic design:* Consider passive design principles that maximize natural light and ventilation, minimizing reliance on mechanical systems.
- *Local and sustainable materials:* Use locally sourced and recycled materials for construction and maintenance to minimize transportation emissions and environmental impact.

2. Operations and Management:

- *Staff training and engagement:* Train staff on energy-saving practices and foster a culture of sustainability within the hotel. This can include simple measures like turning off lights and electronics when not in use and using laundry machines at full capacity.
- *Guest information and engagement:* Provide guests with clear information about sustainability initiatives and encourage participation in eco-friendly practices like towel reuse and responsible resource use.
- *Data analysis and monitoring:* Hotels are increasingly using data analytics tools to track their real-time energy consumption and identify areas for improvement. This

data can be used to set targets, measure progress, and make informed decisions about future investments.

- *Water conservation:* Install low-flow fixtures, implement rainwater harvesting systems, towels reuse program, and promote water-saving practices for instance through leaflets encouraging guests to save water.
- *Waste management:* Implement composting programs, recycle materials (e.g., sorting of waste in guest rooms, offices, and kitchens), and minimize waste generation through responsible purchasing and food waste reduction strategies.
- *Food waste reduction:* Implement various strategies to minimize food waste, including menu planning based on seasonal availability, offering smaller portion options, and donating surplus food to local charities.
- *Electric vehicle charging stations***:** Offer charging options powered by renewable energy sources to cater to eco-conscious travellers.
- *Sustainability report:* publishing a comprehensive sustainability report outlining the hotel's sustainability goals, progress, and achievements.

3. Supply Chain:

- *Sustainable procurement:* Choosing suppliers who prioritize sustainability in their own operations can help hotels reduce their direct and indirect emissions, and adopting suppliers audit programs.
- *Sustainable Certifications:* Prioritizing ingredients with certifications like MSC (Marine Stewardship Council) or Aquaculture Stewardship Council (ASC) for sustainable seafood or RSPCA (Royal Society for the Prevention of Cruelty to Animals) for ethically sourced meat.
- *Food waste reduction:* Food waste is a major issue in the hospitality industry and reducing it can also lead to energy savings. This can be achieved through better menu planning, portion control, and composting initiatives.
- *Local sourcing:* Prioritize sourcing food and beverage items from local producers to reduce transportation distances and support the local economy.
- *Sustainable packaging:* Seek suppliers who utilize eco-friendly and/or reusable packaging materials to minimize waste and environmental impact.
- *Bulk purchasing:* Negotiate bulk purchases of cleaning products and other supplies to minimize packaging waste and transportation emissions.
- *Direct partnerships with local farmers:* Collaborate directly with farmers and producers to ensure freshness, reduce intermediaries, and support the local economy.
- *Reduced paper usage:* Digital communication and guest information are prioritized, minimizing paper consumption.
- *Green logistic process management:* using fuel-efficient vans and vehicles, using electrical vans and vehicles, shipping goods less often, using shorter transportation routes, and using optimized routing.

4. Initiatives and Certifications:

- EMAS (Eco-Management and Audit Scheme): A European Union eco-management and audit scheme that helps organizations improve their environmental performance.
- ISO 14001: An international standard that specifies requirements for an environmental management system.
- LEED (Leadership in Energy and Environmental Design): A green building rating system that promotes sustainable design and construction practices.
- Green Globe: A global sustainability certification program for travel and tourism.

- EarthCheck Certification: Participating in EarthCheck, a leading sustainability certification program for the hotel industry.
- Partnership with Too Good To Go: Reducing food waste through a program that allows guests to purchase leftover food at a discounted price.

Additionally, engaging with industry associations, participating in workshops, and sharing the sustainability journey allow inspiring others and fostering collaborative action towards a more sustainable tourism industry.

Investing in energy efficiency and sustainability can bring many benefits to hotels, including:

- **Reduced operating costs:** Lower energy bills can lead to significant financial savings.
- **Improved brand image:** Consumers are increasingly looking for sustainable businesses, and hotels that demonstrate a commitment to energy efficiency can attract more customers.
- **Reduced environmental impact:** By using less energy, hotels can help to reduce their greenhouse gas emissions and other environmental impacts.

When implementing sustainability strategies in hotels across the European Union, it is crucial to acknowledge regional variations. Climatic differences necessitate a tailored approach. Hotels in colder regions, like those in Scandinavia, may prioritize energy-efficient heating systems to minimize their environmental footprint. Conversely, hotels situated in warmer regions, such as Greece or Spain, might focus on implementing effective cooling strategies to reduce energy consumption. Furthermore, navigating the regulatory landscape is essential. EU countries may have additional regulations or specific requirements concerning energy efficiency, waste management, and sustainable practices in general. Hotels should remain updated on relevant regulations at both the EU and national levels to ensure compliance and responsible operation. Cultural factors also play a significant role. It's important to adapt sustainability practices to local cultural norms and preferences. For instance, guest expectations regarding towel reuse or water consumption might differ considerably across regions. By demonstrating sensitivity to these variations, hotels can foster a more positive guest experience while promoting sustainable behavior. Beyond these regional considerations, the EU offers additional opportunities for hotels to contribute to broader sustainability goals within the European tourism sector. Participating in initiatives like the European Tourism Manifesto for Sustainability or pursuing the Green Tourism Label demonstrates a commitment to collective action. Additionally, embracing circular economy principles throughout the supply chain can further enhance a hotel's sustainability efforts. This approach focuses on extending the lifespan of products and materials, promoting reuse, and implementing responsible recycling practices. Finally, encouraging sustainable mobility options for guests is another way hotels can contribute to a more sustainable tourism industry. Providing guests with access to public transportation information, offering bicycle rentals, and establishing partnerships with local car-sharing services are all effective strategies in this regard.
Table 1 showcases a variety of eco-friendly sustainable practices implemented by hotels around the world.

Table 1. Examples of sustainable initiatives in the hotel industry.

Ref.	Location	Buildings and Infrastructure	Operations and Management	Supply Chain	Initiatives and certifications

[1]	Italy	• Renewable energy (geothermal power, solar panels) • Green building design (natural ventilation and insulation) • Smart technology implementation (smart rooms controls)	• Water conservation (low-flow showerheads and faucets, towel reuse programs) • Waste management (composting food scraps, recycling various materials)	• Local sourcing • Sustainable partnerships (eco-friendly packaging and materials) • Energy-efficient equipment	• Industry recognition (attracting environmentally conscious travellers)
[2]	Borgo Egnazia (Italy)	• Adaptive reuse of historical buildings (minimizing construction-related energy expenditure) • Local materials • Passive design principles (natural ventilation and lightning)	• Smart water management (low-flow fixtures, rainwater harvesting systems) • Composting (on-site plant fertilization) • Guest education	• Local sourcing • Direct farm partnerships • Supplier selection with energy-efficient appliances	-
[3]	Venice (Italy)	• Energy-efficient lighting • Smart controls (occupancy sensors in rooms controlling lighting and air conditioning) • District heating and cooling	• Staff training and engagement • Guest information and engagement • Water conservation (low-flow showerheads and faucets, water-savings features in toilets)	• Local sourcing • Sustainable packaging • Bulk purchasing of cleaning products and other supplies	• Industry recognition
[4]	Dolomites (Italy)	• Bioclimatic design (passive heating and cooling) • Local and sustainable materials • Renewable energy (solar panels and biomass boiler)	• Water-saving technologies • Composting and organic waste management • Electric vehicle charging stations	• Direct partnerships with local farmers • Eco-friendly cleaning products (products with biodegradable formulas and minimal packaging) • Reduced paper usage	• Industry recognition

[5]	Vienna (Austria)	• Renewable energy (geothermal, solar panels) • Green roof	• Staff training on sustainability • Guest engagement programs • Water-saving measures • Extensive waste reduction initiatives	• Local sourcing of food and beverage • Partnerships with suppliers who share sustainability values • Minimizing packaging waste	• LEED Gold certificate
[6]	Oslo (Norway)	• Upgraded building envelope • Energy-efficient lighting and appliances • District heating and cooling systems	• Smart technology to optimize energy use • Electric vehicle charging stations • Encouraging sustainable guest practices	• Local and seasonal sourcing • Bulk purchasing • Food waste minimization through smart planning and partnerships with local food banks	-
[7]	Paris (France)	• Green roof for insulation and stormwater management • Rainwater harvesting systems • Energy-efficient lighting systems	• Staff trained on eco-friendly practices • encouraging responsible water and energy use by guests • Educational activities on sustainability	• local and organic food sourcing • eco-friendly cleaning products • minimizing single-use plastics	-
[8]	Empordà Region (Spain)	• Restoration using local and recycled materials • Passive heating and cooling design • Renewable energy (solar panels)	• Water-saving measures • Composting and organic waste management • Electric vehicle charging stations	• Direct partnerships with local farmers and producers • Minimizing food miles • Supporting local economy	-
[9]	Copenhagen (Denmark)	• Natural light and ventilation • Energy-efficient technologies • Green rooftops	• Smart room controls • Water-saving fixtures • Carbon offsetting options offered to guests	• Local and seasonal food sourcing • Responsible waste management practices • Partnerships with sustainability-focused suppliers	-

[10]	Dublin (Ireland)	• Upgraded lighting and appliances • Installation of BMS • District heating and cooling systems • Water conservation (low-flow showerheads and faucets; rainwater harvesting for irrigation)	• Staff training and guest engagement on sustainability practices and initiatives (e.g., optional towel and linen reuse programs) • Wate management including food scraps and recycling various materials • Electric vehicle charging stations	• Local sourcing • Sustainable packaging • Responsible bulk purchasing • Participation in sustainability initiatives (Green Tourism program)	-
[11]	Ostuni (Italy)	• Bioclimatic design (passive heating and cooling principles) • Local and sustainable materials • Renewable energy (solar panels and geothermal energy)	• Water management (rainwater harvesting systems and low-flow fixtures) • Waste management (composting and organic waste management programs) • Electric vehicle charging stations	• Direct partnerships with local farmers • Sustainable practices in the supply chain (prioritizing energy-efficient equipment and appliances) • Reduced paper usage • Educational activities • Biodiversity conservation	• Industry recognition
[12]	Multiple Riga (Latvia)	• Upgraded lighting, appliances and HVAC systems • Renewables (Solar panels)	• Water conservation (e.g., low-flow faucets, showerheads, and efficient laundry practices) • Waste management (composting food scraps, recycling and minimizing waste generation) • Guest engagement	• Locally sourced food • Ingredients with sustainable certification (MSC and RSPCA) • Reduced single-use items • Community involvement (partnering with NGOs or local initiatives focused on environmental	• EarthCheck Certification • Partnership with Too Good To Go

			(towel and linen reuse programs, energy-saving options in rooms by turning off lights and adjusting thermostats, educational materials) • Employee engagement (training and incentives) • Sustainability report	preservation or community gardens)	
[13]	Palma de Mallorca (Spain)	• Renovations with improved insulation, LED lighting • BMS • Energy-efficient appliances	• Water conservation • Staff training on water-saving practices • Guest participation through towel and linen reuse programs • Food waste reduction (seasonal menu planning, smaller portion options,	• Sustainable procurement • Partnerships with local suppliers • Community involvemnt donating surplus food to charities	• EarthCheck Certification
[14]	Canarias (Spain).	• Renewable energy (solar panels) • Local and sustainable materials • Energy-efficient lighting and appliances • Smart controls	* Smart water management • Composting (on-site plant fertilization) • Water conservation • Staff training on water-saving practices • Guest participation through towel and linen reuse programs	• Direct partnerships with local farmers and producers, supporting local economy • Minimizing food miles • Sustainable packaging • Responsible bulk purchasing • Community involvement.	• Travelife Gold Certification • Industry recognition

[15]	Castilla y León (Spain)	• Adaptive reuse of historical buildings Bioclimatic design (passive heating and cooling) • Renewable energy (solar panels) • Smart controls • Energy-efficient lighting and appliances	• Smart Water conservation • Staff training on water-saving practices • Guest participation through towel and linen reuse programs	• Locally sourced food • Ingredients with sustainable certification • Community involvement (partnering with NGOs or local initiatives focused on environmental preservation) • Sustainable packaging • Responsible bulk purchasing	• Gourmet Sustainability Places • Industry recognition

Restaurant value chain

The restaurant industry has a significant impact on the environment and society. From sourcing ingredients to managing waste, there are many opportunities for restaurants to adopt sustainable practices throughout their value chain. Here's a breakdown of key areas [4-6]:

- Sourcing and Procurement:
  - *Local sourcing:* Prioritize purchasing ingredients from local farms and producers to reduce transportation emissions, support the local economy, and promote freshness.
  - *Sustainable Certifications:* Prioritizing ingredients with certifications like MSC (Marine Stewardship Council) or Aquaculture Stewardship Council (ASC) for sustainable seafood or RSPCA (Royal Society for the Prevention of Cruelty to Animals) for ethically sourced meat.
  - *Reduce food waste:* Implement strategies like smart menu planning, portion control, efficient stock control and monitoring of food expiration, and composting food scraps to minimize waste throughout the supply chain.
  - *Responsible packaging:* Choose suppliers who use eco-friendly, long-lasting, reusable or recyclable packaging materials for deliveries and take-out orders.
- Operations and Management:
  - *Energy efficiency:* Upgrade equipment to energy-efficient models and implement practices like using LED lighting, turning off equipment when not in use, and optimizing cooking processes to reduce energy consumption.
  - *Water conservation:* Install low-flow faucets and dishwashers, fix leaks promptly, and utilize water-saving practices like rinsing dishes in a bus tub instead of under running water.
  - *Waste management:* Implement recycling and composting programs to minimize waste sent to landfills.
  - *Sustainable cleaning products:* Use eco-friendly cleaning products that are safe for both the environment and human health.
  - *Green menu planning and cooking:* processes of green purchase, green menu, green storage, and green cooking in the middle stream. For instance, healthy

cooking; adopting less consumption of energy for cooking like blanching, steaming, boiling, or cold salad; appropriate way to clean and defrost (e.g., avoid using running water to defrost); choosing appliances not leaching chemicals or toxic metal particles when cooking; conserving energy and food materials when cooking (e.g., turn off cooking hoods when not in use or avoid wasting food materials).

- *Green cleaning and post-treatment*: using eco-friendly detergents and diluting, collecting waste fat, oil, and grease, and handing it to a qualified company to recycle or reuse, and collecting gray water or rain to reuse.
- *Green kitchen and dining environment*: replacing old equipment, selection of new appliances and utensils with Green Mark, ventilation and temperature control around 26-28°C, appropriate airflow, reducing refrigerator opening frequency, regular cleaning and maintenance, using sunlight as natural lighting, and planting trees.
- *Green corporation social responsibility:* participating in activities concerned about health, concern for the environment, and caring for the community, more than twice a year.
- *Staff management:* staff should be trained on sustainability, the restaurant should ensure all staff is paid fairly and accurately (e.g., for overtime work), and support a staff grievance policy and system for feedback. Moreover, it should be a socially inclusive recruiter.

- Guest Engagement:
  - *Communicate sustainability efforts:* Inform guests about the commitment to sustainability through signage, menus, or website, fostering transparency and trust. For instance, it provides guests with information about the origins of ingredients on the menu.
  - *Offer eco-friendly options:* Provide options like reusable straws, water filters instead of bottled water, and plant-based menu choices.
  - *Composting and recycling programs:* Offer compost bins and recycling bins for guests to use, making it easy for them to participate in sustainable practices.
  - *Encourage responsible consumption*: encouraging customers to take away uneaten dishes, making a reward policy to encourage customers' green behavior (such as having a discount for using personal chopsticks); making a slogan on the menu or putting posters to persuade customers to be a green consumer having green attitude and responsibility; promote green food concepts on the package for take-out; posters on restaurants and restrooms to encourage customers' power, water and energy saving behaviors or green dining behaviors.

Additional Considerations:

- **Sustainable dining ware:** Consider using reusable plates, cups, and cutlery instead of disposable options, especially for dine-in customers.
- **Energy-efficient transportation:** Explore options like using electric vehicles for deliveries or partnering with delivery services that utilize sustainable practices.
- **Support community gardens:** Partner with local community gardens to source ingredients or donate surplus food, fostering positive community connections and supporting local food systems.

By implementing these best practices, restaurants can significantly reduce their environmental impact, strengthen their brand image, and attract customers who value sustainability. Table 2 showcases a variety of eco-friendly sustainable practices implemented by restaurants around the world.

Table 2. Examples of sustainable initiatives in the restaurant industry

Ref.	Location	Sourcing and Procurement	Operation and Management	Guest Engagement
[1]	Copenhagen (Denmark)	• Local and seasonal ingredients	• Energy-efficient equipment • Composting • Responsible water use (low-flow fixtures and water-saving practices)	• Unique, plant-based tasting menu • Guests' education
[2]	Brighton (England)	• Use of surplus produce	• Food scraps composting • Materials recycling • Energy-efficient equipment and practices	• Encouraging responsible consumption (e.g., smaller portion sizes) • Containers for takeaway
[3]	London (England)	• Partnerships with local farmers and producers • Use of sustainable and ethically sourced ingredients	• Water and energy-saving measures • Use of eco-friendly cleaning products • Minimization of waste generation	• Events and workshops organization on sustainable food systems • Fostering education and community engagement
[4]	Lisbon (Portugal)	• Focus on local, seasonal ingredients • Supporting regenerative agriculture	• Waste minimization andupcycling • Energy and water efficiency • Composting and recycling	• Transparent and informative menus • Sustainable dining options • Educational experiences (workshops and events) • Supporting social responsibility
[5]	Milano (Italy)	• Seasonal, locally sourced ingredients (100 km radius)	• Food scraps composting • Energy-efficient equipment and practices	• Unique seasonal tasting menu
[6]	Modena (Italy)	• High-quality ingredients from trusted local producers focusing on ethical and sustainable practices	• Water and energy-saving measures • Eco-friendly cleaning products	• Encouraging responsible consumption (e.g., smaller portion sizes, local and seasonal options)
[7]	Roma (Italy)	• Partnerships with local producers who prioritizes sustainable practices for ingredients and minimizes waste	• Energy-efficient equipment • Water-saving measures	• Informative menu and service on the restaurant's commitment to sustainability and responsible sourcing
[8]	Roma (Italy)	• Seasonal and locally sourced ingredients from nearby markets supporting the local economy	• Minimize waste generation • Water and energy conservation measures	• Information on the ingredients' origins on the menu

Catering service value chain

Sustainable best practices in the catering value chain are crucial for minimizing environmental impact, reducing costs, and attracting eco-conscious customers. Here are some sustainability best practices for the catering value chain:

- Sourcing and Procurement:
  - *Locally sourced ingredients:* Prioritize sourcing ingredients from local farms and producers to reduce transportation emissions, support the local economy, and ensure freshness.
  - *Seasonal menus:* Design menus based on what's in season to minimize waste and utilize the freshest ingredients available.
  - *Sustainable Certifications:* Prioritizing ingredients with certifications like MSC (Marine Stewardship Council) or Aquaculture Stewardship Council (ASC) for sustainable seafood or RSPCA (Royal Society for the Prevention of Cruelty to Animals) for ethically sourced meat.
  - *Minimize single-use plastics:* Opt for reusable containers, compostable packaging, or encourage clients to bring their own containers for catering orders.
- Operations and Management:
  - *Reduce food waste:* Implement strategies like smart menu planning, portion control, and composting food scraps to minimize waste throughout the preparation and service process.
  - *Energy efficiency: U*tilize energy-efficient appliances and equipment, implement measures like turning off equipment when not in use, and consider using renewable energy sources like solar panels.
  - *Water conservation:* Install low-flow faucets and dishwashers, fix leaks promptly, and utilize water-saving practices during preparation and cleaning.
  - *Sustainable cleaning products:* Use eco-friendly cleaning products that are safe for both the environment and human health.
- Transportation and Logistics:
  - *Optimize delivery routes:* Plan efficient delivery routes to minimize travel distances and fuel consumption.
  - *Consider alternative transportation:* Explore options like using electric vehicles or bicycles for deliveries, especially in urban areas.
  - *Utilize reusable transport containers:* Invest in reusable containers for transporting ingredients and finished dishes, minimizing single-use packaging.
- Waste Management:
  - *Implement recycling and composting programs:* Establish clear guidelines for separating waste streams and ensure proper disposal and recycling practices.
  - *Partner with waste management companies:* Collaborate with companies that prioritize responsible waste management practices, including composting and recycling initiatives.
- Client Engagement:
  - *Communicate sustainability efforts:* Inform clients about the commitment to sustainability through marketing materials, event proposals, and website content.
  - *Offer eco-friendly options:* Provide options like reusable silverware, water filters instead of bottled water, and plant-based menu choices.
  - *Partner with sustainable event venues:* Choose venues that prioritize sustainability measures, such as energy-efficient buildings, water conservation practices, and responsible waste management.

- *Customization of catering options:* Collaborates with clients to understand their sustainability preferences and customize catering options accordingly.
- *Community Engagement:* Partners with local food banks and charities to donate surplus food and reduce waste.

Additional Considerations:

- **Support local communities:** Partner with local farmers' markets, community gardens, and food banks to source ingredients and donate surplus food, fostering positive community connections and supporting local food systems.
- **Offer educational workshops:** Organize workshops or training sessions for the staff on sustainable catering practices, fostering environmental awareness and responsible operations.

By implementing these best practices, catering companies can significantly reduce their environmental footprint, strengthen their brand image, and attract clients who value sustainability. Table 3 showcases a variety of eco-friendly sustainable practices implemented by catering services around the world.

Table 3. Examples of sustainable initiatives in the catering industry

Ref.	Location	Sourcing and Procurement	Operation and Management	Transportation and logistics	Waste management	Client engagement
[1]	USA	• Partnerships with local farms and producers • Sources MSC-certified seafood • Reusable transport containers	• Energy-efficient equipment • Practices water conservation • Food scraps composting	-	• Comprehensive recycling and composting	• Eco-friendly options (e.g., reusable tableware and plant-based menus) • Clients education
[2]	Global	• Local sourcing • Reduced single-use plastics • Partnerships with suppliers committed to sustainability	• Energy-saving measures • Water-efficient appliances • Renewable energy sources (i.e., solar panels)	• Optimal delivery routed • Electric vehicles for deliveries • Investment in electric charging infrastructure	• Partnerships with waste management companies that prioritize recycling and composting initiatives	-
[3]	USA	• Seasonal menus based on local options • Sustainable cleaning products	-	-	• Food waste reduction (e.g., menu planning and portion control)	• Reusable bamboo silverware and water filtration stations at events
[4]	UK	• Locally sourced ingredients	• Energy-efficient equipment	•	• Comprehensive recycling programs	• Customization of catering options

			• Water-saving measures			• Collaboration with food banks and charities
[5]	Netherlands	• Healthy and locally sourced ingredients	•	•	• Use of surplus food to create new dishes	• Collaboration with food banks
[6]	Sweden	• Sustainable, local and organic sourcing	•	•	• Prioritization of reusable packaging • Composting programs	•
[7]	Germany	• Local and seasonal ingredient	• Energy-efficient equipment	•	• Recycling programs	• Sustainable dietary choices
[8]	France	• Local and ethically sourced ingredient • Partnerships with local farms and producers • Minimization of single-use plastics		•	• Reusable tableware • Compostable packaging options	• Eco-friendly dining options
[9]	France	• Local and seasonal (100 km) • Sustainable farming	•	•	• Minimized food waste • Composting for fertilizing local farms (closed-loop system) • Eco-friendly packaging	• Collaboration with food banks
[10]	Genoa (Italy)	• Local and Hyper-Local sourcing • Partnership with small farms and producers • Seasonal menus	• Water conservation	•	• Minimized food waste (leftover ingredients creatively repurposed in new dishes) • Food scraps composted for local gardens and urban farming projects • Compostable packaging	• Community supported agriculture (CSA)

CONCLUSIONS

This report presents a comprehensive analysis of sustainability performance in the HORECA sector, with a specific focus on the hotel, restaurant, and catering service value chains. The primary objective of this deliverable is to develop a structured framework of relevant Key Performance Indicators (KPIs) for sustainability assessment and to identify best practices across the value chains. Rather than defining benchmarking or target values, the aim is to lay the groundwork for consistent evaluation.

Key findings are synthesized below to provide a comparative perspective and identify sector-specific priorities for enhancing sustainability within the HORECA value chain.

Key Sector-Specific Insights:

- **Hotel Value Chain:** The hotel industry is characterized by intensive energy consumption, making energy efficiency a primary concern. KPIs such as specific energy consumption (kWh/guest night), percentage change in energy consumption, and energy consumption by source are critical for monitoring and improving energy management and for decarbonizing the sector. In addition to energy, water conservation remains a close second, with KPIs like water intensity (m^3/guest night) being highly relevant. Furthermore, effective waste management, encompassing both front-of-house (guest-related) and back-of-house operations, and sustainable procurement practices, including the prioritization of locally sourced goods and services, represent significant opportunities for enhancing the environmental performance of hotels.
- **Restaurant Value Chain:** Similar to hotels, restaurants also face significant energy consumption demands, particularly in kitchen operations. Energy-related KPIs are, therefore, of high importance. Food waste reduction is a particularly salient priority within the restaurant sector, owing to the challenges associated with managing perishable ingredients, menu variability, and customer consumption patterns. KPIs focused on food waste reduction, measured in terms of weight or volume, and waste diversion rates, indicating the proportion of waste diverted from landfills through recycling and composting, are essential metrics for assessing sustainability performance. In addition, sustainable sourcing practices, with an emphasis on the procurement of local, seasonal, and ethically produced ingredients, play a crucial role in minimizing the environmental footprint of restaurant operations and supporting regional economies.
- **Catering Service Value Chain:** Catering services share the concerns of restaurants regarding energy consumption and food waste. However, transportation and logistics add another layer of complexity. While energy efficiency within catering facilities is important, optimizing delivery routes and utilizing alternative transportation methods (reflected in transportation-related KPIs) are also key to minimizing the sector's environmental impact.

Cross-Cutting Themes and Enablers:

Across all three sectors, several cross-cutting themes emerge as critical considerations for advancing sustainability:

- Energy efficiency: This is a core priority. Implementing measures to reduce energy consumption through efficient equipment, building management systems, and operational practices is essential.
- Waste management: Minimizing waste generation and maximizing waste diversion are crucial for environmental responsibility.
- Sustainable procurement: Prioritizing environmentally and socially responsible sourcing is vital.

Furthermore, the following enablers are identified as key drivers for achieving sustainability improvements:

- Circular economy principles: Adopting strategies to minimize waste and maximize resource utilization.
- Technological solutions: Leveraging innovative technologies to improve efficiency and reduce environmental impact.
- Stakeholder engagement: Collaborating with employees, customers, suppliers, and the community to promote sustainability.

Life Cycle Cost (LCC) analysis is a vital tool for assessing the economic feasibility of sustainability initiatives; however, its effectiveness in guiding HORECA sector decisions can be significantly enhanced by a more thorough integration of financial considerations. Primarily, the LCC should provide a transparent breakdown of the initial investments required for sustainability projects, such as upgrading to energy-efficient equipment or installing renewable energy systems. Alongside this, it's essential to analyze the diverse funding avenues available to HORECA businesses. Public funding options, including grants, subsidies, and tax incentives from various governmental levels, can substantially impact the initial costs and overall LCC, thus warranting a detailed evaluation of eligibility and application processes. Furthermore, the role of third-party financing, such as loans from banks or specialized arrangements with Energy Service Companies (ESCOs), needs careful consideration within the LCC. For bank loans, interest rates and repayment schedules are critical inputs, while ESCO models require analyzing energy savings guarantees and contract terms. Beyond simply costs, the LCC should also quantify the financial risks and potential returns associated with sustainability investments. For instance, investing in renewable energy can mitigate the risk of volatile energy prices, a benefit that the LCC should capture. Conversely, the analysis should also account for the financial risks of not adopting sustainable practices, such as potential regulatory penalties. The discount rate and the time horizon employed in the LCC are also crucial financial elements. The discount rate, reflecting the time value of money and the investment's risk, must be carefully justified, and the time horizon must be sufficiently long to encompass all relevant long-term costs and benefits. Sensitivity analysis is another important technique to assess how variations in financial parameters like energy prices or interest rates could influence the LCC's outcome, providing a more robust decision-making framework.

This report provides a framework for the subsequent development of business models and benchmarking tools within the EE4HORECA project, tailored to the specific needs and priorities of each sector within the HORECA value chain.

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