UNIVERSITAT POLITÈCNICA DE VALÈNCIA

FACULTAD DE ADMINISTRACIÓN Y DIRECCIÓN DE EMPRESAS. UPV

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Faculty of Business Administration and Management

Development of a Circular Economy evaluation model for Hotels

End of Degree Project

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Development of a Circular Economy Evaluation Model for Hotels

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Co-Supervised by: Marival Segarra Oña

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[1] Creación de una Plataforma de Innovación para el Impulso e Implementación de una Estrategia de Economía Circular en el Sector Turístico de la Comunidad Valenciana, (convocatoria de 2021 de Acciones complementarias de impulso y fortalecimiento de la innovación de la Agència Valenciana de la Innovació, AVI, 2021. *https://innoecotur.webs.upv.es*

Table of Contents

Table of Figures

Table of Equations

"The closed earth of the future requires economic principles which are somewhat different from those of the open earth of the past. For the sake of picturesqueness, I am tempted to call the open economy the "cowboy economy," the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behavior, which is characteristic of open societies. Tile closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy. (Boulding, 1966)[2]"

[2] In the *Economics of the Coming Spaceship Earth* (1966), Kenneth Ewart Boulding is one of the first academics to define the idea of circular economy.

1. BT INTRODUCTION

1.1 Extended Abstract

The circular economy is an alternative to typical linear economies in which materials are extracted, manufactured, used, and discarded. This manner of life depletes scarce basic supplies and generates massive amounts of waste. For this reason, a transition towards a more "circular" economic made must be made, as our current linear model has limitations towards a world that is depleted from resources.

To establish if this transition is proceeding as intended, a monitoring system is necessary, and a suggestion for one is given in this Bachelor Thesis (BT). The monitoring system distinguishes between the intended consequences and the transition process that must occur to get these effects. The most significant intended outcome of the transition to a circular economy is a reduction in natural resource usage. This will have less environmental consequences, reduce our reliance on natural resource imports, and hence boost resource supply security. Reduced natural resource use necessitates circularity methods, such as prolonging the lifetime of products and product components or encouraging the sharing of specific products. This will necessitate measures to guarantee that such circularity methods are implemented, which is complicated and, at first, slow procedure. Furthermore, the results will not be seen for some time. Monitoring both the change process and its consequences is thus necessary. In this BT, a model of indicators to track the degree of circularity in a hotel is proposed, aiming to monitor this transition from linear to circular.

1.2 Description of the Bachelor Thesis Structure

The structure that this BT will follow is very straightforward, starting by an introduction to important concepts of circular economics, explaining the legal framework around it in the European Union, and then analyzing the most relevant areas in hotel companies, with the aim of proposing indicators later on that will be sum up in the final model.

1.3 Objectives

The three main objectives that will be cover in this BT will be the following:

• To provide a general, basic knowledge about circular economy and its most relevant aspects.

• Describing the most important criteria and characteristics and indicator needs to have in order for it to be relevant.

• Explaining and proposing a model of what indicators can be the most useful, significant, and viable regarding the hotel sector.

Moreover, it should also be noted that, due to the topic of this BT, it has a clear, direct relationship with the SDG's. For a more detail explanation of it, refer to "Sustainable Development Goals".

1.4 Methodology

Briefly, there will be three main aspects to talk about in the methodology section, which are how the indicators are going to be define following certain criteria, secondly what characteristics those indicators must follow, and third how these indicators are going to be classified.

2. AN INTRODUCTION TO CIRCULAR ECONOMY

The circular economy is a production and consumption model that promotes the reuse, repair, refurbishment, and recycling of existing resources and goods for as long as feasible. The life cycle of commodities is therefore prolonged. In reality, this means keeping waste to a minimum. When a product approaches the end of its useful life, its materials are recycled wherever possible. These may be utilized profitably again and again, generating more value. This is a different approach from the traditional linear economic model, which is based on the take-make-consume-throw-away cycle. This approach is based on a significant amount of economical, easily accessible resources and energy (European Commission, 2022).

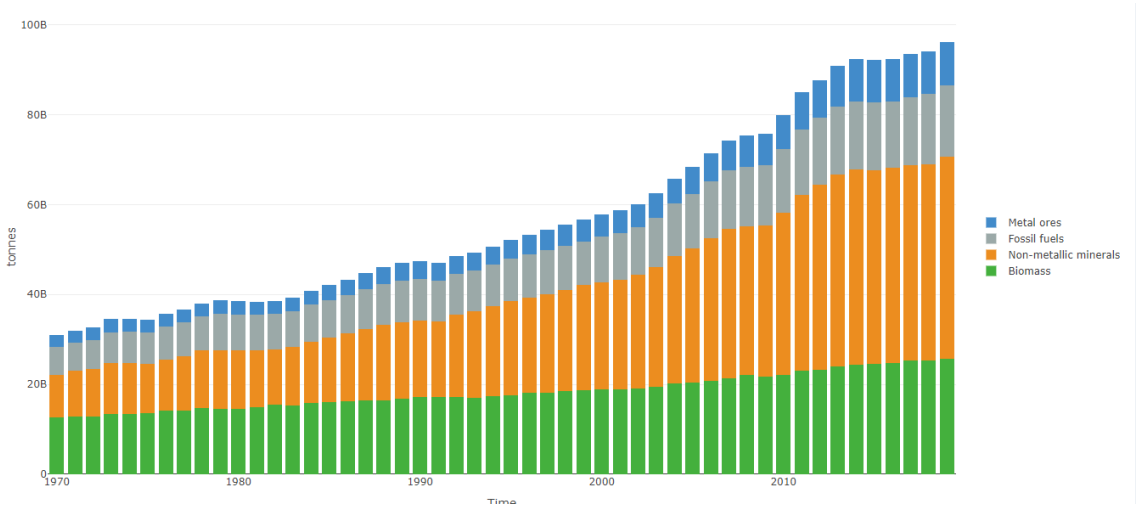
2.1 The Limits of Linear Consumption

Our industrial economy has scarcely moved past one important element introduced in the early days of industrialization: a linear resource usage model based on the 'take-make-dispose' pattern. Companies harvest and extract materials, then utilize them to make a product, which is subsequently sold to a customer, who discards it when it no longer serves its function. While substantial progress has been achieved in improving resource efficiency, any system centered on consumption rather than the restorative use of materials results in severe losses along the value chain. More efficiency is still desired, but to handle the enormity of the impending resource crisis, minimizing inputs must be accompanied with reinventing how we work with the outcome. Making the transition from consuming and discarding items to utilizing and reusing them to the greatest degree feasible, in closer accordance with the rhythms of living systems, is critical to ensuring that further expansion results in increased wealth.

Declining real resource prices have fueled economic expansion in industrialized economies for the majority of the last century (Ellen MacArthur Foundation, 2013). The existing inefficient system of resource utilization is partly the result of low resource prices relative to labor expenses. Given the ease of getting new input materials and disposing of garbage, reusing materials has not been a big economic concern. In reality, the greatest

advances in economic efficiency have come from employing more resources, particularly energy, to minimize labor costs (Figure 1). The system has struggled to fix itself as long as the fiscal regimes and accounting rules that control it allowed for a wide range of indirect expenses to be unaccounted for. Further market inertia originates from lock-in effects, such as the lengthy and costly approval procedures experienced by some items, such as medications and fertilizers (Ellen MacArthur Foundation, 2013).

Figure 1 Material flows by material group, 1970-2019.



Source: WU Vienna, 2022: Visualisation based upon the UN IRP Global Material Flows Database. Vienna University of Economics and Business.

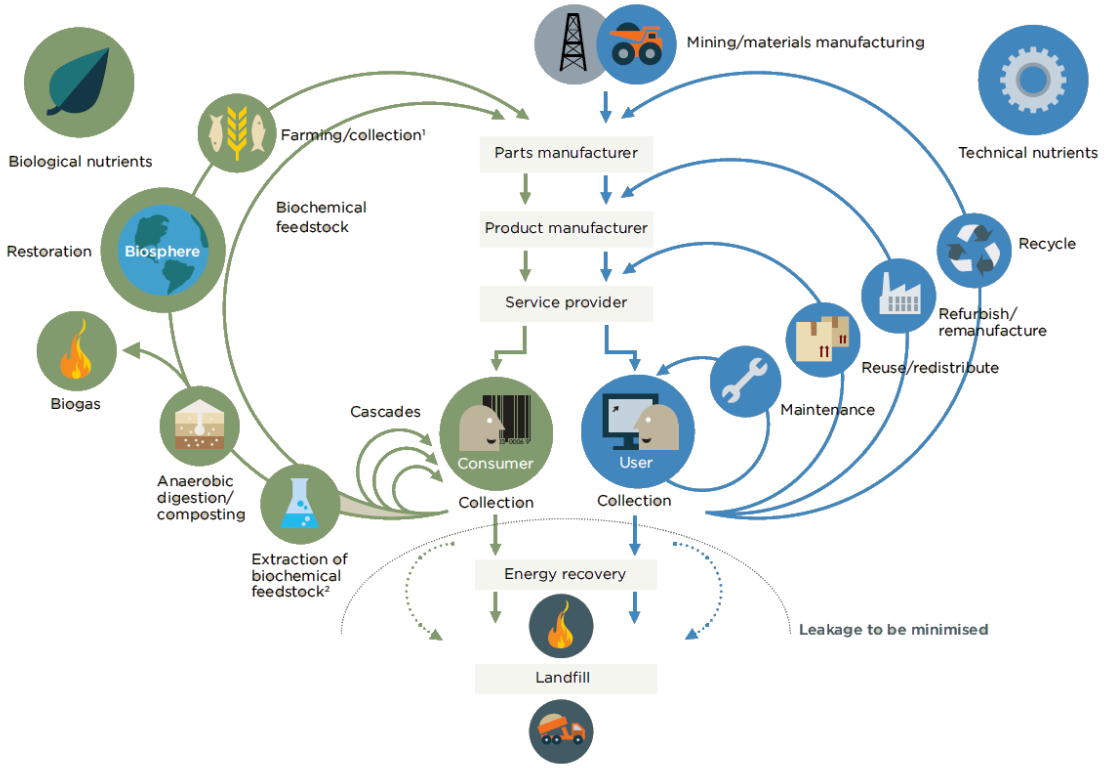
The resultant system is referred to as a 'take-make-dispose' or 'linear' model. This model's concept is straightforward: firms collect resources, apply energy to them to create a product, and then sell the product to an end user, who discards it when it no longer functions or fulfills the user's purpose. The linear production model wastes resources in a variety of ways, starting by waste in the manufacturing process, as significant amounts of materials are frequently wasted in the manufacturing process between mining and final manufacture, ending by the waste produced by non-recyclable goods at the end of its useful life.

2.2 Made to Last: A Change of Course

A circular economy is an industrial system that is intended to be restorative or regenerative (Figure 2). It replaces the idea of 'end-of-life' with restoration, moves toward the use of sustainable energy, prevents the use of harmful chemicals that hinder reuse,

and strives for waste elimination through improved design of materials, products, processes, and, within this, business models (Ellen MacArthur Foundation, 2013).

Figure 2: The circular economy—an industrial system that is restorative by design



Source: Ellen MacArthur Foundation, 2013

A basic set of ideas underpins such an economy. First and foremost, a circular economy seeks to 'design out' waste. Products are built and optimized for a cycle of disassembly and reuse, so there is no waste. These tight component and product cycles characterize the circular economy and distinguish it from disposal and even recycling, which waste significant quantities of embedded energy and labor. Second, circularity establishes a clear distinction between a product's consumable and durable components. Unlike today, commodities in the circular economy are generally composed of biological materials or 'nutrients' that are at the very least non-toxic, if not helpful, and can be safely returned to the biosphere—either directly or through a series of subsequent uses. Durable goods, on the other hand, are composed of technical nutrients that are harmful to the environment, such as metals and most polymers. These are intended to be reused from the start. Third, the energy needed to power this cycle should be renewable by nature, reducing resource dependency and increasing system resilience.

The circular economy essentially substitutes the idea of a consumer with that of a user when it comes to technical nutrients. This necessitates the establishment of a new contract between firms and their consumers based on product performance. Durable goods are leased, rented, or shared wherever feasible, in contrast to today's "buy-and-consume" economy. If they are sold, there are incentives or contracts in place to guarantee that the product or its components and materials are returned and reused at the end of its primary use period (Ellen MacArthur Foundation, 2013).

2.3 Advantages of a Circular Model for Businesses

Companies stand to benefit in two ways. On the one hand, the circular economy will open up new profit streams by allowing for the expansion of circular activity. On the other hand, the benefits of the circular economy will solve a number of today's enterprises' most important strategic concerns. As a result, now a directory of potential, profitable business models that can be created in an indirect or direct way thanks to an implementation of a circular business models (Ellen MacArthur Foundation, 2013).

Along the reverse value cycles, there is the opportunity for a new profit pool. Businesses that supply solutions and services along the reverse cycle will almost certainly benefit from significant growth prospects. As I mentioned before, collection and reverse logistics are critical components of any system aimed at increasing material productivity by guaranteeing that end-of-life items may be reintroduced into the business system. Reverse logistics is becoming more appealing to logistics service providers as a stand-alone company rather than just a way to fill backhaul loads. This will lead to creating business structures that allow for the closure of reverse cycles. Closing the reverse cycle may need the formation of even more new firms. For example, giving sufficient incentives to customers and suppliers may be challenging due to increasing transaction costs and the difficulty to agree on precise pricing, which is something that can be counterpart by thanks to the recent technological advances in regards with digitalization. Moreover, a company's material expense can be greatly reduced via resale and component recovery. Furthermore, 'built to last' helps save warranty expenses. A utility provider that may reuse materials installed in permanent infrastructure (for example, overland electric power lines) might lessen the company's vulnerability to price increases and supply problems.

Because of the specialized expertise required, parts and component remanufacturing and product refurbishment may be regarded the most difficult loop to complete on the route to a more circular economy. Collection, disassembly, product refurbishing, integration into the remanufacturing process, and product distribution all need specialized skills and process knowledge. Circular ideas might solve issues such as growing cost-price pressure, shorter product life cycles, regional and political supplier concerns, greater product commoditization, and diminished consumer loyalty.

Individual businesses and groupings of businesses will require not just assistance with changing ownership patterns, but also money for R&D and new technologies. The financial industry, like in the linear economy, plays an essential role in the circular economy, both in transition and in steady state. Banks are often significantly more knowledgeable and hence better at creating long-term return models than companies alone due to the volume of cases they handle.

2.4 Advantages of a Circular Model for Consumers

The overall benefits of a tighter loop are likely to be shared by businesses and consumers, starting by a decreased in obsolescence with long-lasting or reusable items improves both finances and quality of life. Overcoming premature obsolescence would greatly reduce total ownership costs and provide more ease for the consumer by minimizing the headaches associated with repairs and replacements. Moreover, producers can adjust length, kind of usage, and product components to the unique client, replacing today's typical purchase with a larger set of contractual alternatives, increasing choice.

On a daily basis, users will profit from this package based on their own interests and circumstances. Repair and replacement duties now caused by 'weakest link' parts will be decreased, reducing money and trouble, and increased possibilities for customized home and work items will enable new forms of self-expression and problem-solving. Furthermore, well-crafted items and 'two-in-one' products with many purposes may provide both aesthetic and functional benefits. While the shift to a circular economy may cause disruptions, the more productive use of resources and materials should have a

stabilizing influence on the economy, allowing the globe to deal with the stresses of increasing and aging civilizations.

2.5 The 9 R's Model

The 9 R's model (United Nations Environment Programme, 2022) explains principles that, directly or indirectly, contribute to boosting resource efficiency and lowering environmental effects throughout value chains (Figure 3):

• R1 Refuse: by saying no, a user might choose to buy or use less. It entails adopting more sustainable lifestyles, such as avoiding needless packaging, shopping bags, or other items or services. Refusing to utilize hazardous substances in the creation of a product is another example of refusing to use refuse. Users send a powerful signal to the market by refusing to buy or consume a given product or service, assisting economies in transitioning to more circular models.

• R2 Rethink: as an overarching idea used early in the design process, results in the creation of products and services that utilize less materials per unit of production and/or during usage. Thus influences all stages of a product's or service's lifecycle: less raw material is extracted, production is designed to use less materials, consumption patterns, and end-of-life of such products and services are influenced by the design in order to result in less impact and waste, as well as to increase product usage (for example, through product-as-a-service, reuse and sharing models, or the introduction of multi-functional commodities).

• R3 Reduce: it suggests that companies consider how they may best achieve their purpose having the least amount of influence on the environment. Reduce may be performed at little cost and has a high potential for increasing the value of a product or service over time.

• R4 Re-Use: it is the use of a non-waste product, item, or substance for the same function for which it was designed, without the need for repair or refurbishment. Re-use and re-sell indicate a user's decision to pass on to another user, most often without the use of an intermediary and with no alteration to the goods or service. It pertains to the usage of secondhand items or things that have been cleaned and reused. It may be accomplished

at little cost and have a high potential for keeping the value of a product or service for a longer length of time. As the capacity to re-use a product, object, or substance becomes a selection criterion when purchasing a product, object, or substance, customers drive manufacturers to produce more resilient items and materials with a longer lifetime by promoting more sustainable consumption and production patterns.

• R5 Repair: it is the process of correcting a specific flaw in an object, whether it is a waste or a product, and/or replacing defective components, in order to transform the trash or product into a fully functional product that can be utilized for its intended purpose. It increases the life of a product by, for example, replacing damaged pieces or correcting faults. A user submits his or her goods for repair to a commercial middleman, a merchant, or straight to a repair shop. The product is returned in functioning order to its original user or to a new one. As a result, repair might be viewed as a user service.

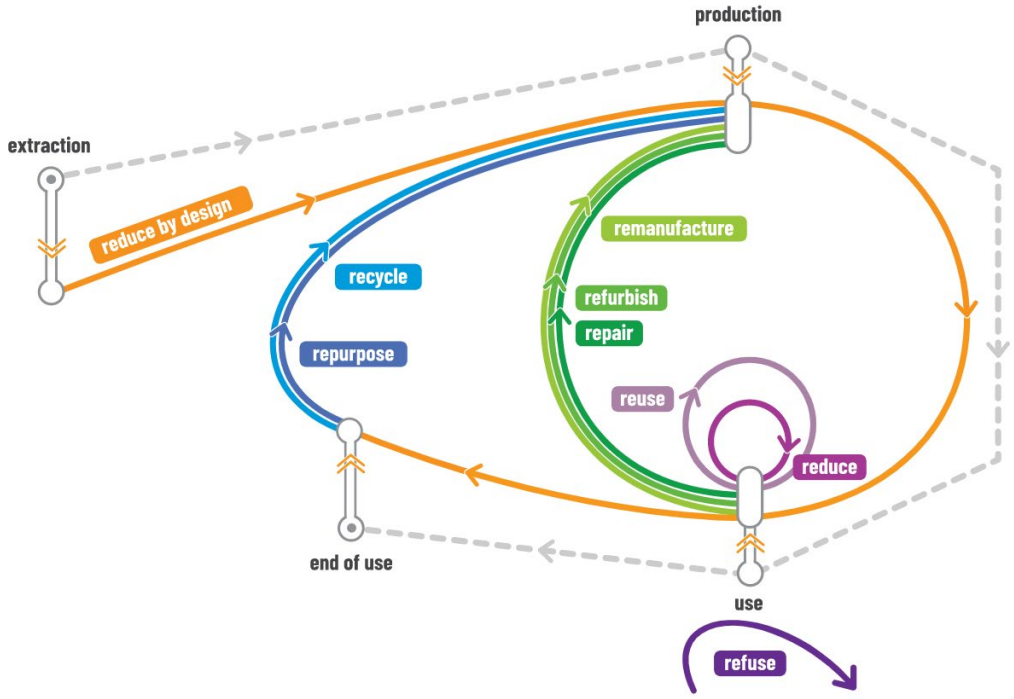
• R6 Refurbish: it is the process of improving or restoring the performance and/or functionality of a waste or product to meet applicable new specifications or regulatory requirements, resulting in a fully functional product that can be used for at least the purpose for which it was designed. The restoration of functioning, but not value, allows the product to have a new service life. Refurbishment that occurs as part of routine maintenance or intermediate maintenance. Comprehensive refurbishment varies from regular refurbishment in that it comprises a more rigorous procedure inside industrial or manufacturing settings, with a high standard and level of restoration. The addition of value during complete refurbishment allows the product to have nearly a full new service life. It brings the product up to "state of the art," using newer, more modern components. Comprehensive refurbishment permits the production of 'high-quality' products with a much lower environmental effect and potentially cheaper cost to the manufacturer and client.

• R7 Remanufacture: it is a defined industrial process that takes place in industrial or manufacturing settings to restore cores (products or modules that have been sold, worn, or are no longer functioning) to as new or superior condition and performance. The remanufacturing process adheres to strict technical criteria, including engineering, quality, and testing requirements, and often results in fully guaranteed items. Producers of remanufactured items are companies that provide remanufacturing services to return worn goods to their original operating state.

• R8 Repurpose: the material is given a separate new life cycle by recycling abandoned commodities or components modified for another application (for example, plastics used in handbags). Converting unwanted or wasted materials into something usable allows them to be reintroduced into the market while preserving some, if not all, of their worth. Repurposing allows users to add uniqueness via design or a new function as they gain 'one-of-a-kind' goods by acquiring unique elements. From a manufacturing standpoint, repurpose allows for financial benefits by lowering production costs by using recovered materials, or by reducing waste creation and related treatment needs.

• R9 Recycle: Recover resources from waste to be reprocessed into new goods, materials, or substances for original or alternative uses. It comprises organic material reprocessing but excludes energy recovery and reprocessing into materials for use as fuels or backfilling activities.

Figure 3: Contributing Circular Principles to Circularity (9 R's)



Source: UNEP Circularity Platform, 2022

2.6 The Environmental Issues of Tourism

Players in the tourism business must address the numerous environmental implications connected with their activity and take steps to "regenerate" rather than "deplete" natural capital. To sum up, travel and tourism-related activities have a wide range of effects on natural capital, from CO2 emissions and resource usage to local ecology / habitat damage and titanium oxide compounds from sunscreen damaging corals. Moreover, the tourist business consumes and/or uses a significant amount of materials, energy, and other resources, including land (destinations), buildings (construction materials), furniture, automobiles, fossil fuel, food, textiles, a variety of consumables, and many more. In this setting, operators in all major tourist sectors are under growing demand to record, account for, and decrease their ecological and social ecosystem impacts. Airlines, cruise lines, hotels, inbound/outbound land operators, ground transportation operators, and ground activities operators will face increased demand for accountability and transparency on the real costs of travel services, while regulators will impose stricter GHG emissions and resource use regulations sooner rather than later (Table 1).

Table 1 Some characteristics of both sustainable and unsustainable tourism

Sustainable	Non-sustainable
General concepts	
– Slow development – Controlled development – Appropriate scale – Long term – Local control	– Rapid development – Uncontrolled development – Inappropriate scale – Short term – Remote control
Development strategies	
– Plan, then develop – Concept-led schemes – All five landscapes concerned – Pressures and benefits diffused – Local developers – Locals employed – Vernacular architecture	– Develop without planning – Project-led scheme – Concentrating on 'honey pots' – Increase capacity – Outside developers – Imported labour – Non-vernacular architecture
Tourist behaviour	
– Low value – Some mental preparation – Learning of local traditions and language Sensitive to destinations and hosts – Repeat visits	– Little or no mental preparation – No learning of local traditions and language – Intensive and insensitive – Unlikely to return

Source: Styles, Schönberger, & Martos, 2013

External vendors supply goods and services to all tourist organizations. The environmental implications of producing and delivering these items and services can be significant when compared to the environmental impacts of activities happening within or directly administered by tourist organizations. Meanwhile, depending on the design of the device, the environmental effect of use and disposal might vary significantly. Thus, via the selection of buildings, equipment, consumables, and services associated with superior environmental performance, all tourist organizations have the ability to dramatically lower the entire – direct and indirect – environmental effect deriving from their activities. As a result, the most important activities of the sector will be detail in this BT, with the aim of proposing indicators that will help companies to further reduce their negative impact of operating by detecting in which activities they can increase their degree towards a more circular business model.

3. METHODOLOGY

Different criteria can be used to categorize indicators connected to the circular economy. The environmental performance of tourist organizations in terms of supply chain management may be measured using the following criteria:

• By the % of a certain set of ecologically significant items or services that have been certified in accordance with applicable environmental criteria, mainly ISO Type I (*Figure 5*).

• By the % of a certain category of ecologically significant items or services that meet a predetermined standard of environmental performance

• By the proportion of a certain category of ecologically significant products or services originating from suppliers who are developing their environmental sustainability.

Percentages are frequently represented most simply and accurately in relation to value. In certain circumstances, however, indications are based on alternate metrics, such as active components in detergents and other chemical products. The latter scenario provides more accurate comparison among items where functional units might range greatly from value.

To provide a visual picture of some of the most essential qualities of the indicators evaluated in this BT, they are divided into four main characteristics that reflect distinct criteria to determine their practicality:

• **Measurable**: The indication can be tallied, observed, examined, tested, and contested. Progress cannot be assessed if an indicator cannot be measured. How will one know if the goal has been met? Once an indication is clear and precise, it may be measured in a variety of ways; practically any sign is measurable in some manner.

• **Relevant**: An indicator has to be a genuine measure of the outcome or result and be related through study and professional experience. The best method to consider relevance is to ensure that there is a connection between what the indicator measures and the ideas that contribute to the results, meaning, not all activities or resources will be measured, but those who are mostly relevant with the sector and towards circularity.

• **Comparable**: A number or figure may be interesting, but it is only helpful when contrasted to what is ideal, acceptable, or unsuitable. A comparison or benchmark is required for each indicator. Using an industry benchmark provides the comparator with objective quality, with the idea of being able to compare the performance in several areas between other companies inside and outside the sector to properly measure the progress towards circularity.

• **Feasible**: The information for the indicator must not be too difficult to acquire. For incorporation in the decision-making process, the indicator should be fair in terms of data collecting cost, frequency, and timeliness, in order to ensure its viability and ease of use.

Aside from the criteria used to choose appropriate indicators for the final model, the indicators will be separated into three categories:

• **Main Business Assets** are costly objects purchased by the company and used for a lengthy period of time, such as materials from buildings, furniture, computers, electrical systems…

• **Regular Business Assets** are all of a company's assets that are expected to be readily sold, consumed, utilized, or expended via normal business activities, such as water, energy, textiles, food and drinks, personal care products, chemical products...

• **Waste Disposal Management** can be described as the method through which a company disposes of its assets on a regular basis, mainly referring, to the regular business assets.

4. MODEL EXPLANATION PROPOSAL

4.1 Analysis of the Legal Framework

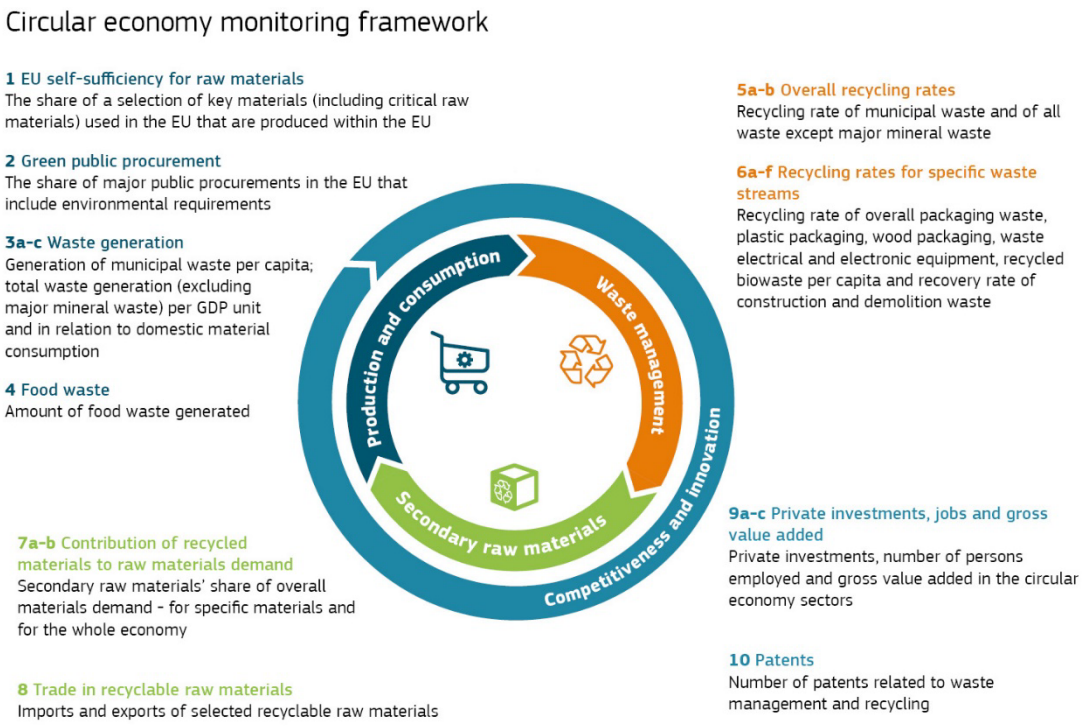
The importance of the criteria used in the development of the model proposed in this BT, will be directly correlated with the establishment of a more circular economic level at a European level, as detail in this chapter.

It was defined for first time (from a legal point of view) the meaning of circular economy, which in accordance with the current stablished European framework, can be define as "an economic system whereby the value of products, materials and other resources in the economy is maintained for as long as possible, enhancing their efficient use in production and consumption, thereby reducing the environmental impact of their use, minimizing waste and the release of hazardous substances at all stages of their life cycle, including through the application of the waste hierarchy" (European Commission, 2020). In the Article 13 of this regulation, it is explained, in the context of this BT in regards with the hotel sector, that an economic activity qualifies as considerably contributing to the transition to a circular economy, including waste prevention, re-use, and recycling.

Because this concept is still very new, at least in legal terms, it is also explained how the criteria for assessing indicators to whether determine if an economic activity is ecologically sustainable should be standardized at Union level in order to remove barriers to the internal market's functioning in terms of obtaining finance for sustainability initiatives and to avoid future barriers from arising. With such harmonization, economic operators would find it simpler to secure money for environmentally friendly activities across borders, because their economic operations could be examined against universal criteria to be selected as underlying assets for environmentally sustainable projects. As a result, harmonization would make cross-border sustainable investment in the Union easier.

The European Commission established a monitoring framework for the circular economy, which includes ten indicators, some of which are further broken down into sub-indicators, as can be seen graphically in Figure 4.

Figure 4: Circular economy monitoring framework



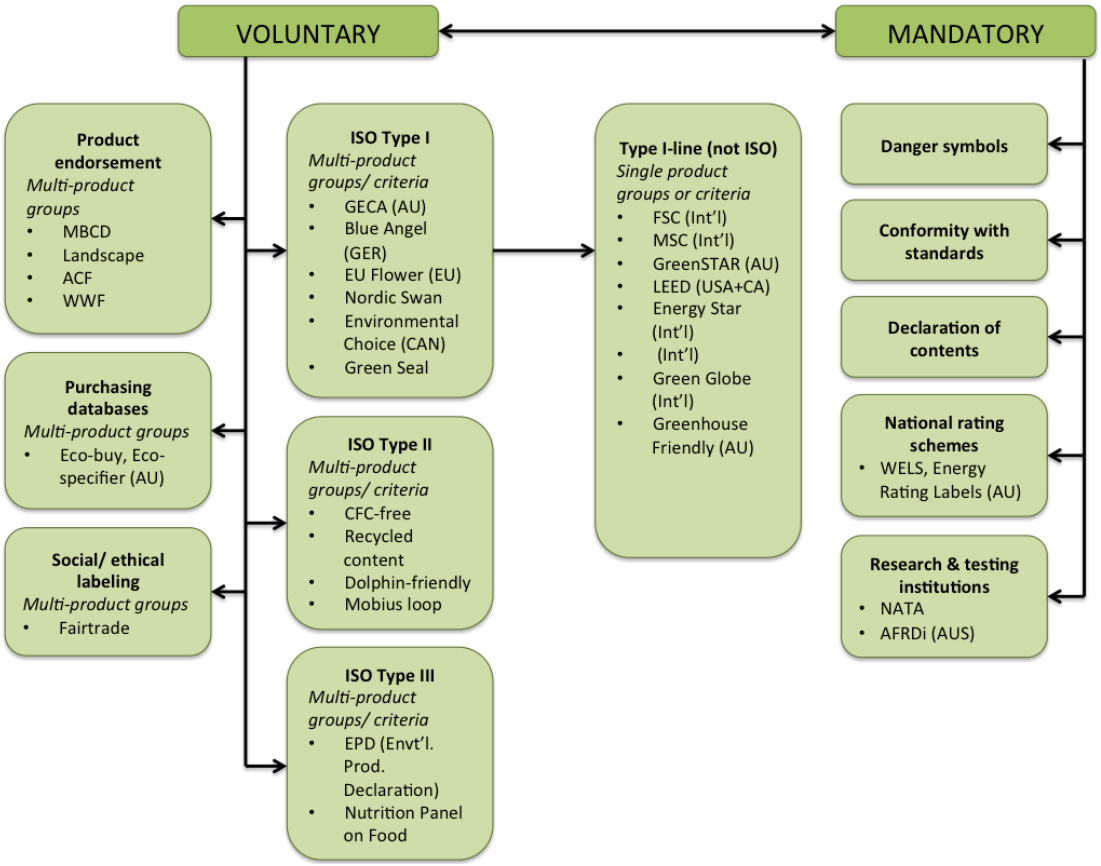
Source: Eurostat, 2022

These indicators were chosen to represent the most important aspects of a circular economy. The list is designed to be concise and focused. It makes use of existing data while also highlighting areas where new indicators are being produced, such as green public procurement and food waste. Eurostat provides around half of the indicators in this framework (Eurostat, 2022), the Joint Research Centre and the Directorate-General for Internal Market, Industry, Entrepreneurship, and SMEs provide the rest. Another important point in regard to measure circularity from a more legal perspective are Ecolabels and Green Stickers, which are food and consumer goods labeling systems.

Ecolabels are optional, whereas green stickers are required by law. They are a type of sustainability measurement aimed for customers, designed to make it simple to consider environmental concerns when buying (*Figure 5*). Some labels measure pollution or energy usage through index values or units of measurement, whilst others claim conformity with a set of practices or minimal standards for environmental sustainability or damage reduction. Many ecolabels are concerned with reducing the negative ecological consequences of primary production or resource extraction in a specific sector or commodity by implementing a set of best practices codified in a sustainability standard. Two major developments in ecolabels have emerged in recent years. The number of

distinct ecolabelling schemes throughout the world and across business sectors is increasing, as is the spread of umbrella labeling systems. Within the ISO 14000 framework, the International Organization for Standardization (ISO) has developed guidelines for labeling procedures. The ISO 14020–14025 series is concerned with environmental labels and declarations. According to the areas addressed and the rigor necessary to issue the seal, ISO suggested three kinds of environmental labels: type I in ISO 14024, type II in ISO 14021, and type III in ISO 14025 (International Organization for Standardization, 2022).

Figure 5: Types of Ecolabels according to different classification criteria



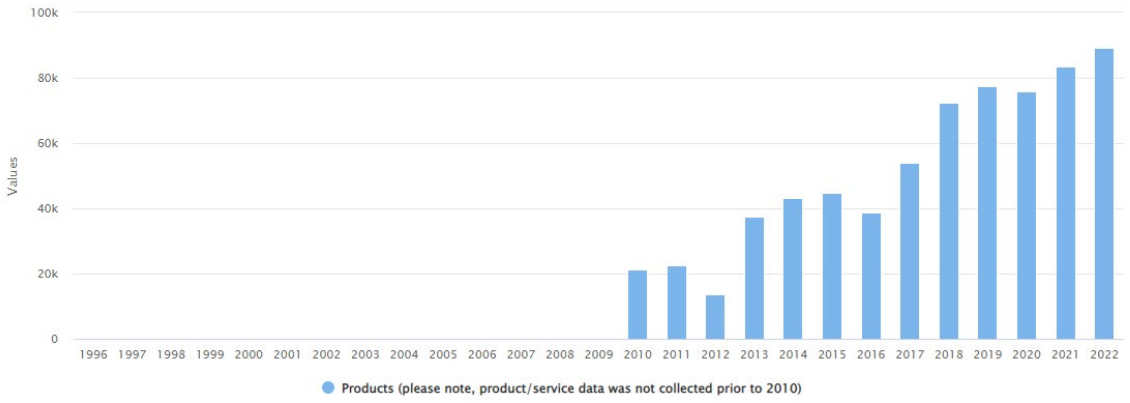
Source: Innovation Essence, 2017

For example, in accordance with the (European Commission, 2017), the EU Ecolabel was established as an optional ecolabel certification program designed to encourage products with lower environmental effect across their whole life cycle and to offer consumers with relevant, non-deceptive, scientific information on their environmental impact. Because it is a voluntary program, manufacturers, importers, and merchants may apply for the label for their goods and services. The EU Ecolabel, which is synonymous with environmental excellence, is granted to products and services that fulfill the most stringent environmental requirements throughout their entire cycle. Even throughout the epidemic,

the number of EU Ecolabel goods increased, reaching an all-time high of 89 357 items up to 2022 (Figure 6). The current number of items with the EU Ecolabel is the largest ever recorded. This demonstrates an increasing interest in green products among organizations, consumers, and merchants (European Commission, 2022).

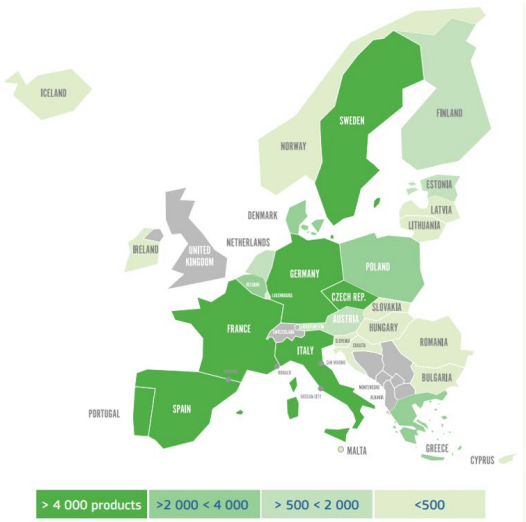
In the great majority of EU Ecolabel product groupings, both the number of licenses and the number of items has increased. Tourist accommodation has received ten additional licenses, making it the leading product group in terms of licenses given, with a total of 461. Absorbent hygiene goods, furniture, and indoor cleaning services had the greatest increases, with absorbent hygiene items more than tripling in number (European Commission, 2022).

Figure 6: Evolution of the number of EU Ecolabel products



Source: European Commission, 2022

Figure 7: Number of products awarded per country



Spain	18 174	Denmark	3 163	Hungary	94
Italy	13 947	Netherlands	1 822	Cyprus	84
Germany	10 284	Finland	1 758	Latvia	79
France	8 638	Estonia	1073	Romania	79
Sweden	6 482	Austria	852	Croatia	39
Portugal	6 002	Lithuania	474	Malta	5
Czech Republic	5 197	Norway	185	Slovak Republic	5
Belgium	3 740	Ireland	171	Luxembourg	4
Greece	3 559	Slovenia	125		
Poland	3 227	Bulgaria	95		

TOTAL 89 357

Source: European Commission, 2022

By March 2022, Germany (18%), Italy (16%), and France will have received the majority of licenses (15%). Similarly, the bulk of products are recognized in Spain (20%), Italy (16%), Germany (12%), and France (10%), as can be seen in Figure 7.

Another Ecolabel that is very common in Europe is the Nordic Swan Ecolabel, which considers the big picture, including the entire environmental effect of goods production and consumption. When developing the specifications for an eco-labeled product, the full life cycle of the product is considered (*Figure 7*), from raw material to manufacture, usage, disposal, and recycling. This is critical to reducing the total impact on the environment and climate. In addition to environmental regulations, the criteria include quality requirements for product attributes to ensure efficient and long-lasting products. Nordic Swan Ecolabel criteria are assessed and strengthened on a regular basis based on the most recent environmental information and market changes. When the rules change, all eco-labeled items are reviewed and must prove that they meet the new requirements.

Figure 7: Nordic Swan Ecolabel Criteria Selection Process

Source: The Nordic Swan Ecolabel, 2022

4.2 Analysis of Relevant Resources & Activities

The first step in proposing indicators for the sector is to provide a list of the most significant resources and activities that occur throughout the development of the sector's economic activity[3]:

Main Business Assets → Building Materials

The EU Ecolabel for hard covering items comprises eco-friendly and sustainable alternatives to traditional hard covering materials (European Commission, 2021) such as tiles, slabs, panels, vanity tops, and kitchen worktops that have been approved assures that these hard covering products meet rigorous standards for decreased environmental impacts caused by raw material quarrying, minimal pollutant emissions, and restricted usage of hazardous compounds. Manufacturers are also urged to utilize renewable energy and reuse/recycle manufacturing waste.

Main Business Assets → Technical Electrical Facilities & Electrical Consumption

Putting in place an energy management plan is critical to ensuring that no energy losses or efficiency declines occur in the system. Monitoring and reporting on energy use is also a requirement for environmental standards such as the EU Ecolabel (European Commission, 2017) for tourist lodgings and the Nordic Swan (The Nordic Swan Ecolabel, 2022) for hotels and hostels. An energy audit, at its most basic level for small businesses, is compiling an inventory of energy-consuming equipment, together with predicted consumption patterns, to determine the primary sources of energy demand. An energy audit should ideally be performed by a skilled energy specialist, either internal or external. Typically, preliminary audit information is adequate to tell lodging management on preliminary efforts to minimize energy use. These range from requiring that all unneeded lighting be turned off, to replacing outdated equipment with newer, more energy-efficient versions, to HVAC system adjustments and building envelope retrofitting (Styles, Schönberger, & Martos, 2013). Maintenance, employee training, and visitor information are all critical parts of energy management on hotel grounds. The EU Ecolabel for lodging

[3] Based partially on (Fundación Impulsa Balears, 2021) classification

mandates accommodation management to provide suitable staff training and to give visitors with energy-saving advice, such as light-off reminders. It also demands at least yearly maintenance and service of boilers and air conditioning systems by adequately certified specialists (more frequently if needed or required by law).

The European standard for energy management systems (EN 16001), which also gives recommendations, has detailed information on best practices in energy monitoring (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2010). A management system should guarantee that all key corporate objectives are implemented in a systematic way and can be evaluated at each stage. Management systems that are implemented correctly assist to the improvement of a company's operational and organizational structure in line with the needs of the market, consumers, investors, society, and the country. This system is built on organizational measures such as establishing responsibilities, authorities, operational procedures, and monitoring systems. By establishing accountability in action plans and objectively assessing the system by internal employees or, if necessary, external auditors, it is possible to monitor whether the objectives are being met on time or, if documented, who or what is to blame for any deviation. The implementation of an energy management system necessitates the implementation of energy-saving strategies. Long-term, this leads in quantifiable energy savings and cost-related improvements, as well as process efficiency. At the macro-level, it significantly helps to the improvement of the environmental condition.

Main Business Assets → Water Network & Water Consumption

Leaking water pipes and appliances can significantly increase water use and, as a result, incur considerable expenditures. Even minor isolated leaks with scarcely discernible flow rates can result in substantial water loss over a year, whereas moderate leaks in accommodation premises that are still undetectable can result in enormous wastage of hundreds of m3 per year. A lot of tiny leaks throughout the lodging premises can add significantly to overall water use and easily result in annual waste of thousands of m3 in bigger establishments. The first step in improving water use efficiency is to monitor and evaluate water consumption. Water consumption may be monitored at various degrees of detail depending on the resources available and the size of the premises. Annual water usage for small premises may be monitored and compared with the number of guest nights

to benchmark performance against comparable lodging premises and uncover performance improvement opportunities. An audit of all water-using equipment in all regions can be used to discover potential water-saving strategies. Effective system monitoring and the execution of suggested water-saving solutions can greatly reduce energy consumption for water heating. Furthermore, monitoring may be utilized to precisely manage water heating so that hot water output, in terms of amount, time, and temperature, meets demand. As a result, avoiding leaks through monitoring, inspection, and maintenance may significantly cut water use.

Main Business Assets → Furniture (Interior & Exterior)

The standards for the EU Ecolabel represent the finest environmentally performing goods on the furniture market. While the use of chemicals and the release of pollutants is a necessary part of the manufacturing process, the use of hazardous substances is avoided whenever possible or limited to the bare minimum required to provide an adequate function while adhering to strict standards of safety for furniture products. Derogation criteria for certain compounds/groups of substances are given in rare situations to avoid shifting the burden on the environment to other life cycle stages or consequences, and only when no viable alternatives are available on the market. Along with a bill of materials that lists the product's total weight and how it is divided between the following different materials, technical drawings are provided that show how the component parts and subcomponent parts that make up the final furniture product are assembled, as well as the product's dimensions. Wood-based panels, cork, bamboo, rattan, plastics, metals, leather, and coated textiles are all acceptable materials (European Commission, 2016).

Main Business Assets → Electronic Equipment and Components

This EU Ecolabel product category recognizes environmentally efficient electronic equipment such as televisions, computer monitors, and signs displays, as it ensures that electronic displays are energy efficient, repairable, and contain a low level of harmful compounds (European Commission, 2020). Furthermore, in terms of environmental performance, the EU Ecolabel requirements target the best electronic displays on the market. The criteria emphasize the key environmental implications connected with these

items' life cycles and support components of the circular economy. The requirements specifically aim to encourage items that are energy efficient, repairable, easy to disassemble (to assist resource recovery through recycling at the end of their useful life), have a minimum recycled content, and may only contain a restricted quantity of dangerous compounds.

Regular Business Assets → Water

The water consumption of a tourist is greater than that of a resident. A European tourist uses around 450-800 liters per day (European Commission, 2022), but a European resident consumes 100 - 200 liters per day, with an average of 150 liters (Eurostat, 2018). There are several causes for greater tourist water usage in lodging establishments, including grounds upkeep (irrigation), daily room cleaning, daily laundry, pool maintenance, intense kitchen operations, and a "pleasure approach" to showers and baths. Water varies greatly between types of lodging (Table 2).

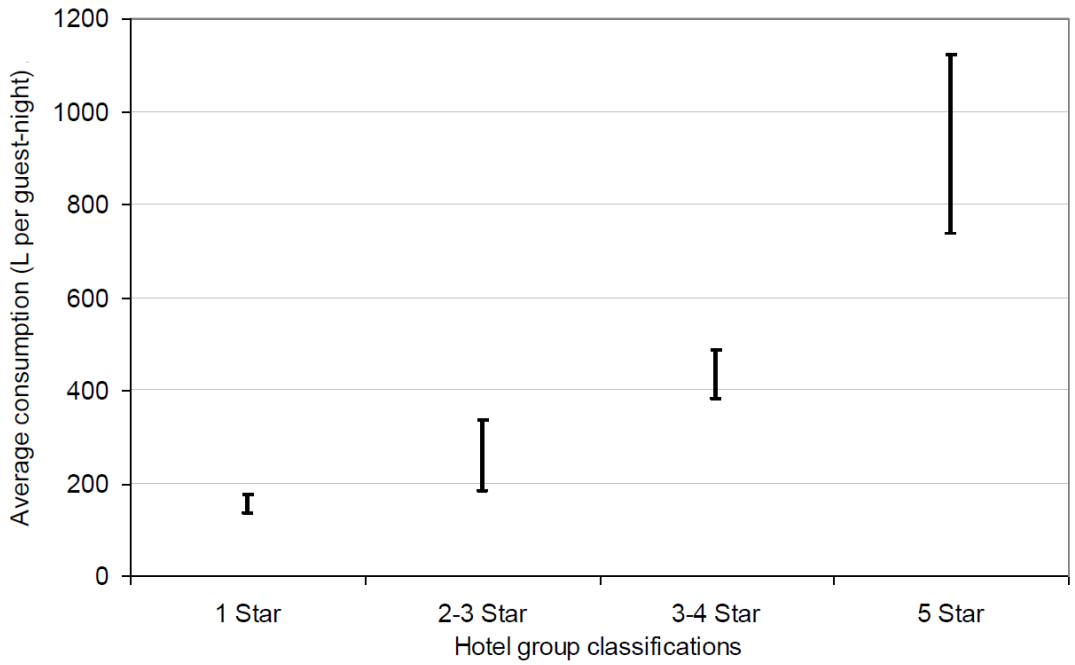
Table 2: Water consumption in various types of lodging

Accommodation type	**Specific water consumption**
	(L/guest-night)
Hotel	312
Holiday house	273
Bed & breakfast	226
Campsite	148
Group accommodation	115

Source: Styles, Schönberger, & Martos, 2013

Specific water consumption per guest-night, as well as the distribution of such consumption among water-using processes, varies according to a variety of characteristics across lodging types (Maunsell, 2006). One element is the number of services and the perceived level of luxury (Figure 8).

Figure 8: Water usage averages for hotel brands within a large European hotel network based on star grade



Source: Styles, Schönberger, & Martos, 2013

Within lodging establishments, guest spaces include guest rooms, public restrooms, and gym/spa changing areas. The installation of efficient water fittings extends to public spaces in other tourism enterprises such as pubs and restaurants. Meanwhile, showering facilities in pool, spa, and gym areas have been linked to high water use. Taps in public places may be left partially or completely open. Water usage in public places varies greatly depending on the services provided by the hotel and the number of day guests, but it may make a significant contribution to overall water consumption. Because of the great saving potential of more efficient fitting types and the relatively frequent frequency of replacement, the installation of efficient water fittings selected through green procurement is the most effective strategy (European Commission, 2017). Guests may be informed of the benefits of low flow fittings if they are fitted. Water use is heavily influenced by guest behavior. A "pleasure effect," in which visitors enjoy to relax under a hot shower or in a bath during their stay, is one cause for greater water usage in hotels and other lodging places, and this increases most of the times due to the category of the hotel, as more "intensive water pleasure activities" are available for customers (Figure 8). Although it may be difficult to separate energy consumption for heating hot water used in guest areas from other hot water needs, such as kitchen, laundry, and space heating,

energy consumption for heating hot water is an excellent environmental indicator (depending on system design).

Regular Business Assets → Energy Efficiency

Between 15 and 45 percent of the power used in hotels is used for lighting, which is the single largest consumer of electricity in lodgings (Styles, Schönberger, & Martos, 2013). The installation of contemporary lighting technology, appropriate building design, and the use of intelligent lighting control often enable hotels to realize significant power and cost savings. Inefficient lighting produces a lot of heat, which increases the need for cooling in buildings during the summer. Therefore, the EU energy label for light sources will be an effective indicator of energy efficiency (European Commission, 2019), and the labels range from A (most efficient) to G. (least efficient).

Regular Business Assets → Renewable Energy

Following the deployment of steps to reduce energy demand, actions to enhance the supply of renewable energy can produce additional reductions in primary energy consumption and related environmental advantages. The majority of renewable power is generated by wind and water, with solar being the fastest-growing energy source (Eurostat, 2020). Fast development of renewable energy and energy efficiency, as well as technical diversity of energy sources, would result in considerable economic and energy security advantages.

Regular Business Assets → Textiles

The EU Ecolabel on clothes and textile items provides a reliable method of recognizing high performing ecologically friendly textile products on the European market (European Commission, 2014). The Ecolabel standards reflect the best environmentally performing textile items on the market. While the use of chemical products and the discharge of pollutants are inherent in the manufacturing process, a product with the EU Ecolabel assures the customer that the use of such substances has been reduced to the degree technically possible without jeopardizing the product's fitness for use. Product testing for

prohibited hazardous compounds is required in order to provide customers with a high degree of assurance. Strict constraints are also enforced on textile production operations to minimize contamination of water and air, as well as to limit worker exposure. The verification of conformity with the criteria is written in such a manner that it provides customers with a high degree of certainty, represents the realistic capacity for applicants to get information from the supply chain, and eliminates the possibility of 'free riding' by applicants.

Regular Business Assets → Food & Drinks

The upstream environmental implications of producing food and beverages eaten on hotel and restaurant facilities may be significantly bigger than the direct environmental impacts of on-site operations (Styles, Schönberger, & Martos, 2013). Green procurement, which is focused on the selection of reduced environmental effect items, is thus a key technique for hotel and restaurant owners to leverage environmental progress. Although the environmental advantages of green procurement are not always represented in environmental reporting, they may be communicated to clients as a significant signal of social responsibility and additional value of the service offered; therefore, a trustworthy source for fostering circularity should be the production of food and beverages using organic principles.

The term "organic production" (European Parliament, 2018) refers to a comprehensive approach to farm management and food production that incorporates the best environmental and climate action procedures, a significant degree of biodiversity, the preservation of natural resources, the application of high animal welfare standards, and high production standards in line with the requirements of an increasing number of consumers for goods made with natural ingredients and processes. Thus, organic production serves a dual purpose in society: on the one hand, it creates a niche market to meet consumer demand for organic products, and on the other, it produces goods that are made available to the general public and help preserve the environment, ensure the welfare of animals, and promote rural development.

Regular Business Assets → Gels and Soaps

The EU Ecolabel cosmetic products category includes both rinse-off items like soap, shampoo, conditioner, shaving cream, and toothpaste and leave-on products such creams, oils, hairstyling products, decorative cosmetics, and deodorants/antiperspirants (European Commission, 2021), which assures that certified goods contain biodegradable and renewable components sourced from sustainable sources, have minimal and easy-to-recycle packaging, and use hazardous compounds only when necessary.

Regular Business Assets → Paints

Reduced levels of harmful chemicals and volatile organic compounds are guaranteed by the EU Ecolabel for paint products. For high performance levels for usage indoors and/or outdoors, the goods are also put through testing (European Commission, 2014). The paints and varnishes with the highest environmental performance on the market are those that meet the Ecolabel standards. To guarantee product durability and hence significantly lessen the entire life cycle impacts of paints, high quality and performance criteria of the paint are necessary. Additionally, the criteria are designed to reduce the amount of volatile and semi-volatile organic compounds used in paint composition. A product that carries the EU Ecolabel assures the consumer that the use of such substances has been restricted to the extent that is technically possible without compromising the product's suitability for use, even though the use of chemical products and the release of pollutants are part of the production process. Moreover, according to European regulations on product labeling, the finished paint or varnish product cannot be categorized as an acute toxin or an environmental danger. A number of substances that have been identified as being dangerous to human health and the environment and that may be used in the formulation of paints and varnishes are either excluded whenever possible or their concentration is limited to the bare minimum (required for providing specific functions and properties).

Regular Business Assets → Fertilizers

This EU Ecolabel category includes gardening items including growth medium, soil improvers, and mulch, which ensures that items in this category meet requirements aimed at minimizing soil and water pollution and lowering heavy metal concentrations in the

ground (European Commission, 2015). This mark also ensures that the items are recyclable and created from renewable or recycled resources.

Regular Business Assets → Paper, Envelops, Bags and Similar

In regards with paper and similar products, this is divided into three sub categories[4] in regards with the European legislation, that is, in graphic paper (European Commission, 2019); printed paper, stationary and paper carrier bags (European Commission, 2020); and tissue paper and tissue products (European Commission, 2019).

The EU Ecolabel graphic paper product group includes any unprinted paper (plain or colored) intended for writing, printing, or converting, which ensures that graphic paper goods contain a low level of dangerous compounds and that raw materials are sourced from sustainably managed forests or recycled materials. Regarding the product category that includes printed paper, envelopes, paper carrier bags, wrapping paper, and stationery, it is granted to items in this category that meet demanding standards such as using fibers produced from sustainably managed forests or recycled materials, limiting the use of hazardous compounds, and manufacturing in a sustainable manner in terms of emissions, energy usage, and waste. Finally, personal hygiene items such as tissues, toilet paper, and napkins are certified products that contain a low level of harmful compounds and are made from sustainably managed forests or recycled materials.

Regular Business Assets → Cleaning Chemicals

Clean, crease-free bedclothes are an especially significant quality control point for lodging establishments: filthy or crumpled bedclothes can give customers an instant negative impression. Laundry is a significant potential source of savings for chemical usage in lodging establishments, cleaning guest rooms and bathrooms is a substantial source of chemical usage as well in lodging companies. Chemical consumption can be reduced by: (i) dilution of cleaning products, which are normally purchased in concentrated form; (ii) effective cleaning procedure; and (iii) use of microfiber clothing. Regular chemical handling training for employees is critical for both health and safety

[4] On the same regulation, the standards for graphic paper and the criteria for tissue paper and tissue goods are consolidated (European Commission, 2019).

and the environment. Selection and green purchase of ecologically friendly cleaning chemicals, such as those with an ISO Type-I Ecolabel (*Figure 5*).

Waste Disposal Management → Water

Potable water is not necessary for all applications of water in buildings, including irrigation and toilet flushing. A significant portion of the overall water usage may be attributed to these applications. Rainwater is diverted into storage tanks using rainwater collecting systems. Roofs and other impervious surfaces are suitable for the installation of run-off systems. The water collected can be utilized for non-potable demands including irrigation, cooling towers, washing machines, toilet flushing, and general cleaning. Grey water is the word describing wastewater from tasks like bathing, showering, doing laundry, and running dishwashers; it does not include "black water" from flushing the toilet. By installing separate wastewater drainage systems for toilets and grey water sources, grey water may be collected and utilized for non-potable water activities like irrigation and toilet flushing.

Waste Disposal Management → Non-Organic Waste

Hotels must overcome a number of obstacles in order to separate and recycle their waste. They are somewhat constrained by the waste management infrastructure in their area, which is frequently owned and run by the local government, particularly if they are unable to find alternative consumers for the waste fractions that the regional system rejects. In metropolitan hotels, the amount of ground floor space that may be used for front-of-house functions including reception, lobby, restaurants, and banquet facilities may limit the storage of several bins for separated waste fractions. However, experience indicates that there are several creative ways to filter and recycle garbage in lodging, hence lowering disposal expenses.

Waste Disposal Management → Organic Waste

Kitchens create a huge amount of organic waste, such as peelings and trimmings, bones, uneaten returns from client dishes, out-of-date items, frying oil, and so on. Food waste

and loss threaten the sustainability of our food systems. When food is lost or squandered, all of the resources necessary to create it, including freshwater, land, energy, labor, and capital, are wasted. Furthermore, the disposal of food waste and loss in landfills produces greenhouse gas emissions, which contribute to climate change. Food loss and waste may also have a detrimental influence on food security and availability, as well as contribute to rising food prices. Modern food systems cannot be robust unless they are sustainable, which is why it must be prioritize the adoption of integrated ways to decrease food loss and waste like to monitor food quality and prevent food loss and waste are critical to executing this radical change.

4.3 Proposal of Potential Indicators

Main Business Assets → Building Materials

High-quality floor, roof, tile, vertical surfaces, and other covering materials for private and professional usage with a reduced environmental effect and minimal health hazards for consumers and employees are items included in the EU Ecolabel coverings group, therefore:

$$C_{MAT} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{MAT} = % of the amount of building materials purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total building materials purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total building materials purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 1 Percentage % of the amount of building materials purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2021) criteria

Main Business Assets → Technical Electrical Facilities & Electrical Consumption

The following indicator correlates to EU Ecolabel required standards for energy monitoring for lodging properties, which involve a method for gathering data on overall energy use:

$$C_{EN} = C_{EN\text{-}T} / N_{GN}$$

C_{EN} = Per-guest-night specific energy use (kWh per Guest)

$C_{EN\text{-}T}$ = Total consumption (of rooms only) in kWh for the computation period

N_{GN} = Number of guest-nights over the same period of calculation

Equation 2 Specific energy use (kWh/guest night), own elaboration based on recommendations from the (European Commission, 2017)

Energy use in guest areas is as well important to measure:

$$C_{ENG} = C_{ENG\text{-}T} \ / \ H_T$$

C_{ENG} = Total energy consumption in common areas (kWh/m^2)

$C_{ENG\text{-}T}$ = Total consumption of energy in m^2 for the computation period (based on readings in common areas)

H_T = Total m^2 of the hotel common areas (everything that is not guest rooms)

Equation 3 Energy use per m^2 in common areas, own elaboration based on recommendations from the (European Commission, 2017)

Main Business Assets → Water Network & Water Consumption

Managers in all sorts of accommodations may conduct a simple water audit utilizing equipment and compare it to water usage statistics to create a water balance. Annual water use may be calculated using water bills (actual rather than approximated readings should be utilized). Flow rates from faucets and showers may be readily monitored using the following method (Styles, Schönberger, & Martos, 2013): (i) turn on the faucet or shower to full flow; (ii) position a container of known capacity beneath the flow; (iii) time how many seconds it takes to fill the container to the designated volume mark; and (iv) calculate the flow rate using the equation:

$$F = (V/t) \times 60$$

F = flow rate (L/minute)

V = volume of water in container (L)

t = time taken to fill container (seconds)

Equation 4 Styles, Schönberger, & Martos, 2013: Flow rate of water filling

This procedure can be repeated throughout the premises for the various types of fittings and multiplied by the number of such fittings and expected use rates (average frequencies and durations of use). Water consumption in big equipment such as washing machines and dishwashers may be predicted using technical information and usage rate estimations.

Main Business Assets → Furniture (Interior & Exterior)

The EU Ecolabel product group contains safe and ecologically friendly furniture and mattresses for businesses and public areas, as well as requirements that assure a lower total impact on forests and pollutants:

$$C_{FUR} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) * 100$$

C_{FUR} = % of the amount of furniture purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total furniture purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total furniture purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 5 Percentage % of the amount of furniture purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2016) criteria

Main Business Assets → Electronic Equipment and Components

The EU Ecolabel for electronic equipment allows producers to give companies energy-efficient screens and displays produced with less harmful components:

$$C_{EEC} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) * 100$$

C_{EEC} = % of the amount of electronic equipment purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total electronic equipment purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total electronic equipment purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 6 Percentage % of the amount of electronic equipment purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2020) criteria

Regular Business Assets → Water

Water usage per guest-night is the most relevant environmental metric for water use efficiency (European Commission, 2017). The number of overnight visitors is the most important factor in determining water usage for showers, toilets and basins, laundry procedures, and kitchen processes. Calculating water use per guest night is straightforward:

$$C_{WG} = (C_T * 1000) / N_{GN}$$

C_{WG} = Per-guest-night consumption (L per Guest)

C_T = Total consumption in m3 for the computation period (based on utility bills or water meter readings)

N_{GN} = Number of guest-nights over the same period of calculation

Equation 7 Styles, Schönberger, & Martos, 2013: Water use per guest-night

Water use in guest areas may be reduced by installing efficient fittings, which can also greatly reduce energy consumption for water heating:

$$C_{WGC} = (C_{TA} * 1000) / N_{GN}$$

C_{WGC} = Per-guest consumption in common areas (L)

C_{TA} = Total consumption in m3 for the computation period (based on utility bills or water meter readings in common areas)

N_{GN} = Number of guests over the same period of calculation

Equation 8 Water use per guest in common areas, own elaboration based on recommendations from the (European Commission, 2017)

Water-saving measures in guest areas are connected with considerable cost savings due to lower water and energy use. Water-saving measures may also be easily communicated to guests in order to establish an ecologically conscientious image. It is advisable to assess water use per guest-night across a complete year to offer a strong average of water use efficiency that smooths out any seasonal variations. Water use is often represented in m3 on water meters and invoices and is multiplied by 1000 to translate to liters. In the absence

of guest-night data, occupied rooms or just the number of beds may be used as denominators (albeit the additional value of the latter denominator is minor).

Regular Business Assets → Energy Efficiency

Light sources in lighting items include LED modules and lamps as well as light bulbs (halogen, compact fluorescent, etc.). Control gears, or the tools required to link light sources to the electrical mains, are also included in lighting goods. According with the (European Commission, 2017) of sustainable tourist practices and with the most up to date energy European labeling system (European Commission, 2019), then:

$$C_{EEF} = (E_{\geq B} / E_{\geq B} + E_{<B}) * 100$$

C_{EEF} = % of all lighting in the tourist accommodation that have at least Class B

$E_{\geq B}$ = Total lighting in the tourist accommodation that have equal or more than Class B

$E_{<B}$ = Total lighting in the tourist accommodation that have less than Class B

Equation 9 Percentage of all lighting in the tourist accommodation that have at least Class B, own elaboration based on (European Commission, 2017) criteria and (European Commission, 2019) classification

Regular Business Assets → Renewable Energy

Contributing to renewable energy programs is the most direct and verifiable option to invest in off-site renewable energy. The yearly generating capacity of off-site renewable installations directly supported by the investment in the lodging might be deemed comparable to on-site renewable generation:

$$ET_{RE} = (ET_{T\text{-}REW} / ET_{T\text{-}REW} + ET_{F\text{-}REW}) * 100$$

ET_{RE} = % of all lighting sources that come from renewable sources

$ET_{F\text{-}REW}$ = Total of all lighting sources that do not come from renewable sources

$ET_{T\text{-}REW}$ = Total of all lighting sources that come from renewable sources

Equation 10 Percentage of all lighting sources that come from renewable sources, own elaboration based on (European Commission, 2017) criteria

Regular Business Assets → Textiles

A trustworthy method of locating high-performing, ecologically friendly textile items on the European market is to look for the EU Ecolabel on apparel and textile products, as a result:

$$C_{TEX} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{TEX} = % of the amount of textile products purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total textile purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total textile purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 11 Percentage of the amount of textile products purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2014) criteria

Regular Business Assets → Food & Drinks

The percentage of food products acquired that meet environmental certification requirements (European Parliament, 2018) and criteria is an important indicator measure:

$$F_{ORG} = (F_{T\text{-}ORG} / F_{T\text{-}ORG} + F_{F\text{-}ORG}) *100$$

F_{ORG} = % of the total amount of food purchased that has an organic certification based on European regulation

$F_{F\text{-}ORG}$ = Total amount of food purchased that has not an organic certification based on European regulation for the computation period (Kg)

$F_{T\text{-}ORG}$ = Total amount of food purchased that has not an organic certification based on European regulation for the computation period (Kg)

Equation 12 Percentage of the total amount of food purchased that has an organic certification based on European regulation, own elaboration based on (European Parliament, 2018) criteria

Similarly, a relevant indicator as well would be the proportion of purchased beverage goods that adhere to the same environmental certification standards and criteria:

$$D_{ORG} = (D_{T\text{-}ORG} / D_{T\text{-}ORG} + D_{F\text{-}ORG}) *100$$

D_{ORG} = % of the total amount of drinks related products purchased that has an organic certification based on European regulation

$D_{F\text{-}ORG}$ = Total amount of drinks related products purchased that has not an organic certification based on European regulation for the computation period (L)

$D_{T\text{-}ORG}$ = Total amount of drinks related products purchased that has an organic certification based on European regulation for the computation period (L)

Equation 13 Percentage of the total amount of drinks related products purchased that has an organic certification based on European regulation, own elaboration based on (European Parliament, 2018) criteria

Regular Business Assets → Gels and Soaps

Personal care items with the EU Ecolabel are not only safe and of exceptional quality, but they also have a low environmental effect:

$$C_{GEL} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{GEL} = % of the amount of personal care products purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total personal care products purchase within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total personal care products purchase within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 14 Percentage of the amount of personal care products purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2021) criteria

Regular Business Assets → Paints

The EU Ecolabel ensures that approved paints have lower levels of potentially harmful chemicals and volatile organic compounds. High performance levels for use indoors and/or outdoors are also evaluated for the goods, therefore:

$$C_{PAIN} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{PAIN} = % of the amount of painting products purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total painting purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total painting purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 15 Percentage of the number of paints products purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2014) criteria

Regular Business Assets → Fertilizers

EU Ecolabel certified gardening supplies meet obligations to decrease soil and water pollution and heavy metal concentrations:

$$C_{FER} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{FER} = % of the amount of gardening products purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total gardening products purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total gardening products purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 16 Percentage of the number of gardening products purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2015) criteria

Regular Business Assets → Paper, Envelops, Bags and Similar

EU Ecolabel certified paper products adhere to stringent requirements that promote energy-efficient production techniques in order to decrease air and water emissions while also protecting forests:

$$C_{PAPER} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{PAPER} = % of the amount of paper related products purchased that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total paper related products purchases within the hotel that are not ISO Type-1 ecolabel-led for the computation period (Kg)

$C_{T\text{-}ISO}$ = Total paper related products purchases within the hotel that are ISO Type-1 ecolabel-led for the computation period (Kg)

Equation 17 Percentage of the number of paper related products purchased that are ISO Type-1 ecolabel-led, own elaboration based on (European Commission, 2017) criteria

Regular Business Assets → Cleaning Chemicals

Best practice is to avoid using chemicals whenever feasible by using microfiber towels and mops. Cleaning goods are one of the product categories with the greatest number of ecolabels. ISO Type-1 ecolabels such as the EU Flower or Nordic Swan, consider a variety of lifetime environmental aspects, such as ecotoxicity and energy consumption, in addition to cleaning efficacy. Labeled goods are at the forefront of environmental and cleaning performance. As a result, ISO Type-1 ecolabels are the finest reference to green procurement. Some indicators that can measure the degree of circularity in regard to cleaning chemicals are:

$$C_{CHE} = (C_{T\text{-}ISO} / C_{T\text{-}ISO} + C_{F\text{-}ISO}) *100$$

C_{CHE} = % of the amount of chemical products used for regular/general cleaning that are ISO Type-1 ecolabel-led

$C_{F\text{-}ISO}$ = Total chemical use within the hotel that are not ISO Type-1 ecolabel-led for the computation period (L)

$C_{T\text{-}ISO}$ = Total chemical use within the hotel that are ISO Type-1 ecolabel-led for the computation period (L)

Equation 18 Percentage of chemical products used for routine/general cleaning that are ISO Type-1 eco labeled, own elaboration based on (European Commission, 2017) criteria

$$C_{CC} = C_{CT} / N_{GN}$$

C_{CC} = Per-guest chemical use (L per Guest)

C_{CT} = Total chemical use within the hotel for the computation period (L)

N_{GN} = Number of guest-nights over the same period of calculation

Equation 19 Total chemical consumption at the hotel given as a proportion of guest stays, own elaboration based on (European Commission, 2017) criteria

Waste Disposal Assets → Water

Grey water recycling and rainfall collecting both have decrease water usage:

$$W_T = (W_{REC} / W_{REC} + W_{POT}) *100$$

W_T = % of recovered rainwater or graywater usage replacing potable water consumption

W_{POT} = Total amount of potable water used for non-required potable water activities for the computation period (L)

W_{REC} = Total amount of rainwater or graywater used for non-required potable water activities for the computation period (L)

Equation 20 Percentage of recovered rainwater or graywater usage replacing potable water use, own elaboration based on (Styles, Schönberger, & Martos, 2013) proposal

Waste Disposal Management → Non-Organic Waste

Reduction of waste creation by green product procurement, taking into account product lifetime impacts and careful procurement volume control:

$$WNO_T = W_{TA} / N_{GN}$$

WNO_T = Total non-organic waste generation (sorted plus unsorted) (Kg per Guest)

W_{TA} = Total non-organic waste generated on the computation period (Kg)

N_{GN} = Number of guests over the same period of calculation

Equation 21 Non organic waste generation (kg per Guest/Night), own elaboration based on (Styles, Schönberger, & Martos, 2013) criteria

Insurance that there is a defined method for staff waste separation, and contract applicable recycling services at least for glass, paper and cardboard, plastics, metals, and organic waste:

$$WR_T = (WR_{REC} / WR_{REC} + WR_{NREC}) *100$$

WR_T = % of total non-organic waste that is recycled

WR_{NREC} = Total amount of non-organic waste generated on the computation period that is not recycled (Kg)

WR_{REC} = Total amount of non-organic waste generated on the computation period that is recycled (Kg)

Equation 22 Percentage of total non-organic waste that is recycled, own elaboration based on (Styles, Schönberger, & Martos, 2013) criteria

Waste Disposal Management → Organic Waste

Reduce unnecessary food waste by careful menu creation and portion size:

$$WOR_T = WO_{TA} / ND_{GN}$$

WOR_T = Total organic waste generation (sorted plus unsorted) (Kg per Dinning Guest)

WO_{TA} = Total organic waste generated on the computation period (Kg)

ND_{GN} = Number of dinning guests over the same period of calculation

Equation 23 Organic waste generation (kg per Dinning Guest/Night), own elaboration based on (Styles, Schönberger, & Martos, 2013) criteria

To guarantee that all organic waste is segregated and delivered for anaerobic digestion, or incineration with energy recovery, or local/on-site composting, when possible:

$$WRO_T = (WRO_{REC} / WRO_{REC} + WRO_{NREC}) *100$$

WRO_T = % of total organic waste that is separated and diverted from landfill and sent for anaerobic digestion or alternative energy recovery

WRO_{NREC} = Total amount of organic waste generated on the computation period that is not separated and diverted from landfill and sent for anaerobic digestion (Kg)

WRO_{REC} = Total amount of organic waste generated on the computation period that is separated and diverted from landfill and sent for anaerobic digestion (Kg)

Equation 24 Percentage of organic waste segregated and diverted from landfill, and transferred for anaerobic digestion or alternative energy recovery, if possible, own elaboration based on (Styles, Schönberger, & Martos, 2013) criteria

5. FINAL MODEL

After explaining the different areas of importance within tourist accommodations and having proposed one or two indicators following the criteria stablished in "3. METHODOLOGY", the following tables are made as a compilation of the indicators proposed in "4.3 Proposal of Potential Indicators":

Regular Business Assets → Water
Per-guest-night consumption (L per Guest)
Per-guest consumption in common areas (L)
Regular Business Assets → Energy Efficiency
% of all lighting in the tourist accommodation that have at least Class B
Regular Business Assets → Renewable Energy
% of all lighting sources that come from renewable sources
Regular Business Assets → Textiles
% of the amount of textile products purchased that are ISO Type-1 ecolabel-led
Regular Business Assets → Food & Drinks
% of the total amount of food purchased that has an organic certification based on European regulation
% of the total amount of drinks related products purchased that has an organic certification based on European regulation
Regular Business Assets → Gels and Soaps
% of the amount of personal care products purchased that are ISO Type-1 ecolabel-led
Regular Business Assets → Paints
% of the amount of painting products purchased that are ISO Type-1 ecolabel-led
Regular Business Assets → Fertilizers
% of the amount of gardening products purchased that are ISO Type-1 ecolabel-led
Regular Business Assets → Paper, Envelops, Bags and Similar
% of the amount of paper related products purchased that are ISO Type-1 ecolabel-led
Regular Business Assets → Cleaning Chemicals
Per-guest chemical use (L per Guest)
% of the amount of chemical products used for regular/general cleaning that are ISO Type-1 ecolabel-led

Table 3 Final model in regards of regular business assets, own elaboration based on "4.3 Proposal of Potential Indicators"

Main Business Assets → Building Materials
% of the amount of building materials purchased that are ISO Type-1 ecolabel-led
Main Business Assets → Technical Electrical Facilities & Electrical Consumption
Per-guest-night specific energy use (kWh per Guest)
Total energy consumption in common areas (kWh/m2)
Main Business Assets → Water Network & Water Consumption
F = flow rate (L/minute)
Main Business Assets → Furniture (Interior & Exterior)
% of the amount of furniture purchased that are ISO Type-1 ecolabel-led
Main Business Assets → Electronic Equipment and Components
% of the amount of electronic equipment purchased that are ISO Type-1 ecolabel-led

Table 4 Final model in regards of main business assets, own elaboration based on "4.3 Proposal of Potential Indicators"

Waste Disposal Assets → Water
% of recovered rainwater or graywater usage replacing potable water consumption
Waste Disposal Management → Non-Organic Waste
Total non-organic waste generation (sorted plus unsorted) (Kg per Guest)
% of total non-organic waste that is recycled
Waste Disposal Management → Organic Waste
Total organic waste generation (sorted plus unsorted) (Kg per Dinning Guest)
% of total organic waste that is separated and diverted from landfill and sent for anaerobic digestion or alternative energy recovery

Table 5 Final model in regards of waste disposal assets, own elaboration based on "4.3 Proposal of Potential Indicators"

The goal of this model is to assist everyone involved in the tourist industry in their efforts to enhance the environment. All organizations and sector stakeholders that are looking for trustworthy and tested information to enhance their environmental performance can utilize it. As a result, this model provides insight that enable businesses in the tourist industry to minimize environmental effect in all areas under their direct control or where they have a significant impact. Although there is nowadays more complex model which aim can be similar to the one just proposed, this model was created with the purpose of helping small and even medium companies that do not have any experience or knowledge with the concepts mentioned in this BT to be able to start measuring their degree towards circularity in a simple, easy to understand fashion.

The vast majority of the information required to create this model was already made accessible to the general public from a number of sources, including several in-depth publications, which all are available at “REFERENCES”. It should be note that this model does not intend to be a replacement for the guidelines that are necessary for the award of an EU Ecolabel for tourist accommodations (European Commission, 2017), but as a less complex model which its most important aspects (and some more) of its core characteristics, aiming at a starting point for companies. That said, companies that used the model just proposed to measure their most relevant activities as a starting point, will have the most important indicators available for the use of models that are more complex, being not only for environmental reasons, but for getting the pertinent labels as well.

6. CONCLUSIONS

Firstly, it will be addressed in this conclusion how the objectives that were define in “1.3 Objectives” have being explain throughout this BT. Along with the introduction, a basic, yet wide view and what circular economy is, why it is important and how it can help business, consumers, and society itself is stablished. This is enough information to give someone that does not have any or much idea about what circular economy entails a general concept necessary to understand the following chapters of the BT. In regards with the second objective, it is detail in “3. METHODOLOGY” what criteria and characteristics an indicator must follow in order for it to be relevant. Although this is an apparently small section of the BT, it’s of great importance, as there it is defined the common framework all of the indicators of the final model must follow, therefore describing how they have to be approached. Finally, a model of indicators is stablished in “5. FINAL MODEL”, as a compilation of all the indicators that correspond to certain areas of a tourist accommodation, defining the final stage of the BT.

It is also worth noting that data collecting is likely to be the most time-consuming aspect of the procedure. Some data items may be very simple to gather, whilst others may need coordination with other departments. Companies will most likely need to interact with value chain partners to acquire relevant data in order to compare themselves to one another. This said, however, the model presented in this BT is simple enough that most of the data is available for companies without having to look for it to hard. Another relevant point to mention is the fact that, similar to what was described in the section of water consumption (Figure 8), tourist accommodations will likely have very different results in regards with the number of starts they possess, as it is much likely that hotels with higher status will have different, more resource intensive services that will increase indicators such as waste when compare to others with less starts. As it can be deducted, this will not only be applied to the amount of starts a hotel has, but to the geographical area as well, among other factors. Therefore, when comparing among tourist accommodations using this model or another similar, another model of classification should be applied in order to divide accommodations in factors (number of starts, geographical area, etc.) that are relevant and significant enough to make this comparison both fair and realistic.

The importance of introducing less complex model in small and medium companies is, in my criteria, key to continue our growth as a society towards sustainable development, as starting with a much more complex, detailed model can be overwhelming for this type of companies. Moreover, every year that passes the minimums and criteria that are required for companies by law are greater; and companies which are already under more strict criteria, like being awarded by an ecolabel, can have its futured guarantee, as well as assuring that they have already adapted to the legislation that is to come.

Finally, I would like to add that reading and researching for this bachelor thesis has open my mind to a field of economics that I hadn't really explore that much during my degrees, as the whole implementation of a more circular economic model is quite recent due to the challenges that I explain in "2. AN INTRODUCTION TO CIRCULAR ECONOMY".

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APPENDICES

Sustainable Development Goals

Reflection of this BT's relationship with the SDGs in general, and with the ones more related to it.

Sustainability is a critical lever for prospering through a growth pattern that ensures the effective use of natural and environmental resources. The activation of this lever has a specific appeal in the sphere of tourism, because these resources are extremely important in the production and consumption processes of the services it provides. So much so that environmental sustainability is now acknowledged as one of the pillars of tourist competitiveness, to the degree that it permits forging new advantages – particularly through differentiation– and, therefore, ensures the appeal of countries and regions as destinations in the future.

In this context, the circular economy is proposed as a crucial path forward for forging a new tourist leadership that, in turn, enhances the sector's potential to improve competitiveness in the global sustainable ecosystem. The shift to the circular economy entails accepting an innovative approach, heavily backed by process optimization and product and service redesign, that permits divorcing resource and material consumption from growth and industry development aspirations.

In general, the importance of abandoning the linear 'extract-produce-use-dispose' character prevalent in production and consumption decisions, in favor of a new vision engaged to maintaining the functional value of materials for as long as possible, in order to minimize both resource pressure and waste generation, has been highlighted by the major international institutions and organizations, the majority of which explicitly recognize the role.

The United Nations considers the circular economy to be an accelerator of the 2030 Agenda and that tourism can make a significant contribution to meeting the sustainable development goals, five specifically, through targets directly related to SDG6: Clean

Water and Sanitation, SDG7: Affordable and Clean Energy, SDG8: Decent Work and Economic Growth, SDG12: Responsible Production and Consumption, and SDG14: Life Below Water. Moreover, it should be noted that circularity is generally related to other goals, such SDG11: Sustainable Cities and Communities, SDG13: Climate Action, SDG14: Life Below Water and SDG15: Life on Land (Figure 10).

Figure 9 UN 2022, Highlighted SDGs that relate to the creation of circular tourism, own elaboration from https://www.un.org/sustainabledevelopment/

Without a doubt, there are several challenges that are directly relevant to the growth of tourism in general, and the hotel business in particular. Not unexpectedly, it is critical to regularly monitor the influence on various environmental pressure indicators, which are strongly tied to the current climate problem and, in turn, condition the attractiveness of the destination. From this vantage point, the advancement of the current hotel business model toward circularity implies a progressive reduction in the inner consumption of resources positive to the control of carbon dioxide emissions, which, in the context of rising tourist demand, would contribute to compliance with the current climate-change agreements.

As a result, the contents of this report can directly help to measure the advance of companies in the tourism sector towards a more circular economy, by the use of the proposed model of indicators, which, of course, will help to accomplish these sustainable development goals (United Nations, 2022).

Appendix A

$V_{2.1}$ DOTACIÓN DE ACTIVOS

Construcciones:
- Materiales (edificación e instalaciones)

Instalaciones técnicas:
- Energía

Red de aguas:
- Agua
- Energía

$V_{2.2}$ APROVISIONAMIENTOS

Suministros:
- Agua
- Energía

Alimentación:
- Alimentos
- Bebidas

Confección:
- Textiles

Cosmética / aseo:
- Geles y jabones
- Utensilios de aseo

Productos químicos:
- Detergentes
- Pinturas
- Fertilizantes
- Químicos para piscinas

Papelería y comunicación:
- Folletos y cartas
- Letreros y señalítica
- Soportes digitales
- Papel, sobres, bolsas y similares

Mobiliario y equipamiento:
- Muebles (interior/exterior)
- Equipo y componentes electrónicos
- Electrodomésticos
- Útiles y enseres
- Menaje y cubertería
- Utensilios de mantenimiento (jardines, piscinas y similares)
- Equipamiento deportivo

Vehículos:
- Automóviles
- Minibuses
- Motocicletas
- Bicicletas y patinetes
- *Buggies*

$V_{2.3}$ PRESTACIÓN DE SERVICIOS

Alojamiento:
- Agua y energía
- Textiles
- Geles, jabones y utensilios de aseo
- Detergentes y pinturas
- Folletos, señalítica y papel
- Mobiliario, útiles y enseres
- Vehículos

Restauración:
- Agua y energía
- Alimentos y bebidas
- Textiles
- Detergentes y pinturas
- Cartas, letreros y señalítica
- Electrodomésticos, menaje y cuberteríaportivo

Ocio:
- Agua y energía
- Textiles
- Geles, jabones y utensilios de aseo
- Fertilizantes y químicos para piscinas
- Muebles y equipamiento deportivo
- Vehículos

Comercio:
- Agua y energía
- Detergentes y pinturas
- Papel, sobres, bolsas y similares
- Mobiliario y equipamiento

Table 6 Fundación Impulsa Balears 2021, Resources and Activities that can be develop towards circularity in the hotel sector