Module 3. Green reception basics of low-emission tourism activity

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MODULE 3. GREEN RECEPTION BASICS OF LOW-EMISSION TOURISM ACTIVITY

"The declaration by the UN of 2017 as the International Year of Sustainable Tourism for Development is a unique opportunity to advance the contribution of the tourism sector to the three pillars of sustainability – economic, social and environmental, while raising awareness of the true dimensions of a sector which is often undervalued"
— UNWTO Secretary-General, Taleb Rifai, December, 2015

The Sustainable Development Goals (SDGs) is an ambitious inter-governmental set of 17 Sustainable Development Goals, with 169 associated targets and 231 indicators which are "people-centred, transformative, universal and integrated", building on the Millennium Development Goals (MDGs).

The purpose of SDGs is to end poverty and hunger, improve health and education, make cities more sustainable, combat climate change, protect the world and oceans from environmental degradation and foster prosperous, peaceful, just and inclusive societies.

Tourism, specifically mentioned in three SDGs (#8, #12, #14), has a huge, impacting potential to contribute, directly or indirectly, to all of the goals, in more ways than all other businesses. It's one of the top GDP earners for countries, especially the Least Developed Countries of the world, it can reach into all corners of a country (not just in focused areas like extractive industries) and can offer great benefits to a country's people at many levels.

However, over the past years, tourism industry has seen an increase in the consumption of natural resources and energy as well as significant increases in carbon emissions and the disposal of other types of waste.

Hence, assessing tourism sustainability is essential to provide a clear path for the reduction of carbon emissions against the backdrop of global climate change.

3.1. Energy conservation

"Despite recent improvements to energy giving nearly 9 out of 10 people access, 840 million people remain without electricity. 37% of the global population, or 3 billion people,

still use fuel and stove combinations that pollute household air, such as kerosene, wood, coal, charcoal or even dung for cooking and heating, resulting in 4 million premature deaths annually". (UN, 2021)

Reliable and affordable electricity saves and improves lives. Among its many benefits, electricity powers computers, schools, charges phones, keeps food cold and businesses and essential infrastructure functioning. But, energy is also the main contributor to climate change, producing more than 70% of greenhouse gases, requiring investment and development in renewable sources.

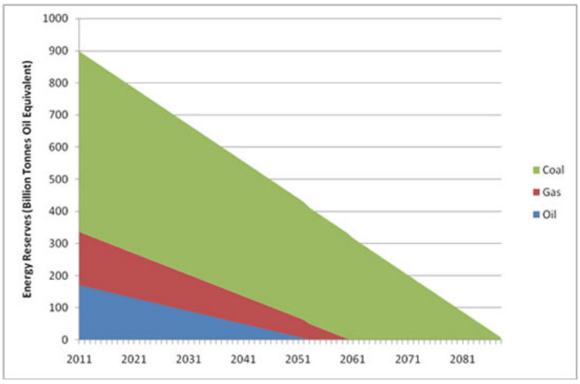
For this reason, Goal 7 of the UN 17 Global Goals of the 2030 Agenda for Sustainable Development, fundamental to human prosperity, is:

SDG #7 "Ensure access to affordable, reliable, sustainable and modern energy for all

Energy supply is about 60% of global greenhouse gas emissions. While some 17% of energy consumption is now met with renewables, the Intergovernmental Panel on Climate Change warns this needs to hit around 85% by 2050 to avoid the worst impacts of climate change.

Finite Fossil Fuels

The fossil fuels we have historically been using, such as coal, oil and natural gas, currently the world's primary energy sources, are finite in supply. It's not a matter of if they run out, but when: we are using them much faster than they can reproduce, as they were formed over millions of years compressing organic material, including carbon which gives off emissions when combusted. We have already passed 'peak oil', at current usage it may be gone by 2052. Switching to gas could then extend just 8 further years to 2060; filling its gap with coal could maybe last until 2090. During that time, we may find more reserves of fossil fuels, but they're likely smaller than the rate at which our world's developing population is consuming them. (Stanford)



Climate Change

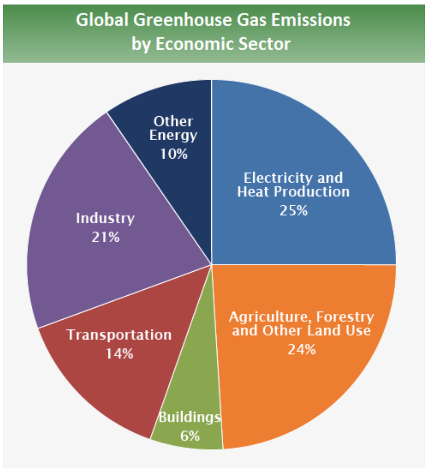
Energy is the main contributor, producing around 70% of global greenhouse gas emissions (UN, 2021): burning fossil fuel emits carbon dioxide into the atmosphere, creating a man-made greenhouse effect for the world, whose insulation creates global warming. By 2030 global demand for energy is expected to rise by 20–35% (Better Growth, Better Climate, 2014). Stabilizing global temperature will require de-carbonising energy consumption, a shift to renewable or nuclear power from fossil fuels, significant energy efficiency and large-scale deployment of carbon capture and storage (CCS) for remaining fossil fuel use.

Health and Well-being

Switching from fossil fuels to renewable and nuclear power would not only reduce the risk of climate change, but also reduce pollution, reducing mortality, disease, and ecosystem and biodiversity damage, for a healthier world.

What's that got to do with Tourism?

Tourism, as one of the largest economic global sectors, is one of the largest energy-consuming sectors. Tourists also use energy (and water) with a greater intensity than local people, often to local detriment where scarcity exists.



With over a billion tourists a year set to continue increasing, tourism's energy consumption looks only set to grow. So how hospitality gets its fuel needs provided, and how that affects and is affected by the processes of the world's climate and ecosystem, is vital.

Tourism is both a victim of, and contributor to climate change: rising sea levels, melting glaciers, floods, avalanches, water scarcity, deforestation, biodiversity loss, desertification, wildfires, drought and diseases hurt the tourism economy.

But these impacts are in part created by Tourism operations, which contribute around 8% of global greenhouse gas emissions: from aviation, accommodations, restaurants, activities and other transportation. The consequences of tourism not utilising renewables can seriously impact a business, industry and world.

As such, tourism can be incentivised to help accelerate the shift toward renewable energy, increase its share in the global energy mix, help reduce greenhouse gas emissions, contribute to innovative energy solutions in urban, regional and remote areas and provide reliable energy for guests.

Customers and investors are increasingly expecting tourism businesses to be responsible and held accountable for their carbon emissions and reports. Responsible organisations voluntarily follow codes of conduct and certification schemes, such as we highlight in our Places information.

Alternative energies for sustainable tourism and the future

Tourism and energy need not be opposed to each other: with renewables, sustainable energy and tourism can complement each other.

Sustainable energy is the one collected from renewable sources, meaning those which are naturally replenished, such as solar from sunlight, wind, water from rain, tides, waves, and geothermal heat: natural resources to which many tourism establishments have access.

With its large consumption of energy, tourism has a great cost incentive to utilise renewable energy for greater efficiencies and longer term cost savings – the purely economic 'business case' for sustainable tourism makes sense, as well as for the planet. Initial outlay may be required to change but over time works out much cheaper than previously-used energy sources. By measuring and monitoring consumption, organisations (and guests where they are aware!) can become more aware of managing consumption, efficiencies and thus longer term impacts.

Tourism is thus at the forefront of many innovative sustainable energy solutions. Whether it's airlines making aircraft lighter, using biofuels or fuel-efficient taxiing, hotels saving energy with key-cards or towel reuse, or hospitality supporting local communities with energy services and related economic opportunities, the tourism industry knows it has to reduce its carbon emissions for a sustainable future. But with more than a billion tourists per year, more must be done.

How Can Tourism Help?

Energy efficiency

Using less energy to perform the same task (eliminating energy waste), is often the most immediate, and cheap, way to reduce the use of fossil fuels. If we applied all the energy efficiency technologies available today, we could cut energy consumption straight away by a third (World Bank, 2015).

There are great opportunities for using less energy in tourism and transport, eg:

- *choosing LED light bulbs and energy efficient appliances like fridges and washing machines,*
- *refurbishing to upgrade heating, insulation, windows and cooling systems,*
- *using energy efficient vehicles, especially electric,*
- *changing standard operating procedures to decrease energy use,*
- *offering incentives to guests to use less than average energy.*

Energy Innovation

Continual growth in air travel due to lower costs has shown reducing emissions by reducing consumption is not likely, despite efficiency innovations to airframes, engines, aerodynamics and flight operations: air travel is set to increase, despite a plan to offset carbon emissions, but only voluntarily on increased from international flights after a base year of 2020.

The reliance on offsetting (eg. tree planting to reduce equivalent CO2 in the atmosphere) leads to effectiveness for climate change mitigation being questioned. But where land transport has alternatives (rail, fuel cells and electric cars), to reduce carbon, aviation does not.

Energy Generation

Despite rapid growth in recent years, renewable energy still makes up a relatively minor share of total energy consumption. The challenge is to increase the share of energy generated through renewable sources in the transport and heat sectors, which together account for 80% of global energy consumption. (UN, 2019)

It's also important to balance demand and supply, in total quantity and source, eg. using more or less from wind when there's a spike in demand or little wind, balanced by alternative energy sources.

Solar

'Photovoltaics' (PV) is the conversion of light into electricity using semiconducting materials. A typical photovoltaic system employs solar panels, each comprising a number of solar cells, which generate the electrical power. PV installations may be ground-mounted, rooftop mounted or wall mounted, and may be fixed, or use a solar tracker to follow the sun across the sky. Solar PV generates no pollution and no greenhouse gas emissions once installed, with simple scalability. Cells don't need direct sunlight to work – just daylight - they can still generate electricity on a cloudy day.

Wind

Wind has been used for centuries for power, such as windmills to convert the energy of wind into rotational energy by means of vanes (sails) to mill grain in agriculture and pump water. Likewise, modern windmills tend to take the form of wind turbines used to generate electricity, or wind-pumps used to pump water, either for land drainage or to extract groundwater.

Hydropower

Water-powered hydroelectricity has been created since ancient times, using the power derived from the energy of falling water or fast running water, for useful purposes, such as watermills for irrigation. Whilst hydropower may not add large amounts of carbon to the atmosphere or emit pollution, dams can also have significant negative social and environmental impacts, for example altering a river's flow, creating floods or deepening riverbeds, transforming upstream and downstream ecosystems, thus species, blocking fish migrations, affecting deltas, barrier islands, fertile floodplains, coastal wetlands and their populations. Submerged plant life can decay anaerobically (in the absence of oxygen) generating greenhouse gases like methane.

Electricity generated by hydro-electric power plants is the cheapest electricity, so it is no surprise that in 2015 hydropower generated 16.6% of the world's total electricity and 70% of all renewable electricity, and was expected to increase about 3.1% each year for the next 25 years.

Biomass

Biomass means getting energy by burning wood and other organic matter. Biomass most often refers to plants or plant-based materials that are not used for food or feed, specifically called lignocellulosic biomass.

As an energy source, biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel, in solid, liquid or gas form.

Burning biomass releases carbon emissions, around a quarter higher than burning coal, but has been classed as a "renewable" energy source in the EU and UN, because plants can be regrown.

Geothermal

Geothermal energy is the energy stored in the form of heat beneath the earth's surface. From hot springs, geothermal energy has been used for bathing since Paleolithic times and for space heating since ancient Roman times, but it is now better known for electricity generation.

With 99.9% of the planet at a temperature greater than 100°C, geothermal energy is a significant carbon-free, sustainable resource that can provide a reliable, uninterrupted supply of heat that can be used to heat homes and office buildings and to generate electricity.

Environmentally friendly, whilst geothermal wells release greenhouse gases trapped deep within the earth, the emissions are much lower per energy unit than those of fossil fuels.

Summary

The tourism sector consumes significant levels of energy based on both transport-related activities, such as travel to, from and at the destination, and destination-related aspects, such as accommodation, food and tourist activities. While the expansion of tourism resulted in an increase in fossil energy consumption and important greenhouse gas emissions, investments in energy efficiency and renewable energy in tourism are found to generate significant returns within a short period of time.

Existing indicators focus on consumption, the use of alternative sources and the introduction of energy efficiency and saving programs. In addition, measuring the overall carbon footprint of tourism has become increasingly important within in the climate change discussions. However, measuring energy consumption in the tourism sector remains difficult and complex due to a variety of reasons, such as difficulties in capturing tourism´s indirect energy use from the construction of hotels, airports, cars and roads, as well as energy use in associated sectors, such as tour operators and their offices or travel to work by those employed in tourism.

Questions for reflection

- How can Tourism support the achievement of 2030 Agenda for Sustainable Development?
- Is energy conservation a challenge or an opportunity for Tourism Business?

3.2. Sustainable Tourism

According to the United Nations World Tourism Organization (UNWTO, 2008), "*tourism comprises the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes*".

Tourism output is not a simple product but, rather, a wide range of goods and services interacting to fulfil a tourist experience that comprises both tangible parts (e.g. hotel, restaurant, airline) and intangible aspects (e.g. sunset, scenery, mood). The actual purchase and consumption/production of tourist services (e.g. airline ticket, meal, admission ticket) may often be incidental to "non-market" activities, such as independent sightseeing, hiking, or sunbathing.

Travels have already become an inseparable part of human lives. However, tourism as any other economic field not does only bring economic benefits to states, but it also creates some serious problems as excessive energy consumption and increasing negative environmental effects including climatic change. Also due to tourism and travel expansions the nature is being wasted, tourist destinations suffer from high tourist flows and the life quality of the local people is also negatively affected. In order to decrease negative tourism effects, the United Nations World Tourism Organization (UNWTO) announced the year 2017 – the year of sustainable tourism and invited all world population to travel, following the principles of sustainable tourism and to turn to local communities (UNWTO, 2017).

Sustainable tourism contents

Despite plenty of research in this area, sustainable development of tourism is a dynamic process that is constantly experiencing new challenges as there are changing the applied technologies and consumption aspects of tourism.

Tourism is one of the most significant economic sectors in major countries of the worlds. According to World Travel and Tourism Council (2020) in 2018, the Travel & Tourism sector experienced 3.9% growth, outpacing that of the global economy (3.2%) for the eighth consecutive year. Over the past 5 years, one in five jobs were created by the sector, making Travel & Tourism the best partner for governments to generate employment. Therefore, tourism as one of the world's largest economic sectors, supporting one in 10 jobs (319 million) worldwide, and generating 10.4% of global GDP. Although tourism market is dependent on the health and natural environment; however, simultaneously it often affects them negatively.

As a result, several future guidelines for developed for sustainable tourism providing main environmental indicators for tourism sector including climate change mitigation, pollution reduction, use of renewables, waste disposal etc. (UNEP, 2004; UNWTO, 2013, 2014, 2017). As was already mentioned before, innovations, research and technological development can provide significant solutions for dealing with environmental challenges of tourism development. In the presence of such a situation, the pace of technological development has been slowed and as a result there is a harm not only for economy, but also for nature as further steps towards utilisation of renewables are lacking. The use of renewables has direct impact on climate change mitigation. The outcomes of the previous economic crisis are still being felt around the world, and as the growth of other countries' economies slowed; the European economy has just few chances to turn into a powerful economic force. Investment into technological development is being observed as well as focus on social issues of sustainability. It is also significant to mention that in case of improving life quality – tourism is playing important role. The quality of life is one of the most important targets of sustainable development also relevant to tourism sector in terms of providing services for tourist as well as taking into account quality of life of residents in tourist destinations.

Though sustainable tourism issues are mainly linked with promotion of green and social tourism there are important issues of competitiveness necessary to address as competitiveness is perceived as one of the main economic dimensions of sustainability also relevant to tourism sector. The main problem identified based on systematic sustainable tourism research review is about finding possibilities to achieve all three sustainability dimensions (economic, social and environmental) together, that is, to develop competitive tourism business by addressing environmental and social challenges of tourism development in holistic way. The systematic review of literature of competitiveness issues of tourism might provide relevant answers how to trade – off between social, economic and environmental dimension of sustainable tourism development.

Main initiatives

Travelife

A sustainability management system for tour operators which includes an ecolabelling scheme to qualify tour operator's suppliers: accommodation structures, restaurants, other tourist companies (e.g. providers of tourist activities, such as excursions, leisure, sightseeing, etc.).

Final stakeholder: those tourists who use to book tourist services and whole holiday packages through tour operators and travel agencies.

EU eco-label

Type I Environmental label (ISO 14024:1999) eco-label for accommodation structures and camp sites.

Final stakeholder: those tourists who use to book tourist accommodation autonomously; Travel agencies and tour operators.

Blue Flag

It's a voluntary award for tourist destinations such as beaches and marinas. The Foundation for Environmental Education in Europe (FEEE) presented in 1987 the concept of the Blue Flag to the European Commission, and it was agreed to launch the Blue Flag Programme as one of several "European Year of the Environment" activities in the Community.

Final stakeholder: tourists.

Other tourist environmental labels

Environmental labels and declarations of tourist services. Most labels are "Type I Environmental labels" (ISO 14024:1999) and are characterised by a regional scale dissemination (e.g. Viabono, Legambiente Turismo, The Green Key, Milieubarometer, Ibex label, and many others). Final stakeholder: Those tourists who use to book their own holidays autonomously; Travel agencies and tour operators.

V.I.S.I.T.

The Voluntary Initiative for Sustainability in Tourism (Visit) is a technical standard setting up the framework according to which credible tourism eco-labels should operate in Europe. The purpose of this initiative was, therefore, to put together tourist labeling under a unique umbrella, also to increase the label recognisability by tourists. VISIT is also the name of the association which manages such a standard.
Final stakeholder: those tourists who use to book their own holidays autonomously; Travel agencies and tour operators.

TourBench

It's a free European monitoring and benchmarking online tool to reduce the environmental burden and costs of tourist accommodation organisations.

Final stakeholder: hotels and campsites.

EcoPassenger

It's a user-friendly internet tool to cross-compare energy consumption, CO2 and other airborne emissions of alternative transport modes (e.g. planes, cars and trains) for travelling all around Europe.

Final stakeholder: travellers.

Summary

Given the predictions of an increased role of tourism industries in the world economy, the environmental aspects of, and impacts generated by tourist activities should be accurately considered.

In the framework of sustainable development policies, the "Sustainable Consumption and Production and Sustainable Industrial Policy (SCP) Action Plan" (European Commission, 2008) is a building block in the EU. In line with this policy, a wide range of environmental instruments have been developed for assessment and labelling/certification purposes of travel and tourist services.

Questions for reflection

- What environmental instruments and initiatives are currently supporting the application of the European Sustainable Consumption and Production (SCP) Action Plan in the travel and tourism industry?
- What are their key characteristics and the instruments be combined into a general framework capable to render this industry low carbon and more sustainable from an environmental point of view?

3.3. Green Tourism

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Renewables are already the cheapest source of new power generation in most markets across the world. Cost declines due to technology evolutions and rapid policy advancements have triggered new investments, leading to further capacity additions and price drops. In the case of solar PV, investors and governments have come to expect continuously lower capex. In recent years however, as the technologies have matured, the capex of solar and wind has declined at a slower pace and become subject to temporary supply chain hurdles, such as the past year's escalating shipment costs, rising module prices and escalating steel costs.

As the penetration of renewables increases, it is not so much about the cost, as it is about the value provided to the system. In a moment of high volatility, the predictability in operating renewables is valued. Financiers and investors also value investments in renewables as a step to meet climate commitments and de-risk portfolios. The consolidated banking experience with renewables, alongside a strong push for green financing, has also brought down the cost of capital for renewable power projects. Recent spikes in electricity prices have also improved the captured prices for renewables. These perceived values counterbalance the industry's higher-than-expected capex and underpin the continued build-out of new renewables capacity.

Supply chain risks and increasing costs remain a major concern for the renewables industry, and companies throughout the value chain will need to mitigate and hedge these risks to remain successful. Despite these concerns, the value of renewables remains high enough to sustain a healthy growth rate of renewables additions.

Air conditioning

Heating ventilation and air conditioning (HVAC) systems account for up to 50% of a commercial building's energy use and dominate peak electricity demand. Capital and maintenance costs for these systems also comprise a high portion of overall building costs.

Improving HVAC efficiency can therefore have a big impact on your bottom line by reducing energy use, maintenance costs and peak demand charges. It also brings reputational benefits through higher energy efficiency ratings.

A holistic HVAC strategy relies on an integrated approach to:

- *reduce demand,*
- *optimise existing systems,*
- *upgrade to more efficient systems.*

Reduce demand

Methods to reduce demand for HVAC services include:

- *improved building insulation,*
- *high performance window glazing,*
- *natural ventilation,*
- *external window shading,*
- *colour and reflectivity of external materials,*
- *green roofs,*
- *cool roofs.*

Painting roofs white or with special reflective coatings to create 'cool roofs' can significantly reduce air-conditioning loads. This is especially so in hotter inland climates and for large, flat buildings like factories and warehouses.

Optimise

While significant energy and capital savings can be made through investing in new, high-efficiency HVAC systems, existing systems can also be optimised.

Many factors that influence the comfort of building occupants can be measured and optimised. Such factors include humidity, air movement and surface temperatures of nearby objects, like windows.

Some recommended practices are:

- *altering control algorithms and schedule,*
- *adjusting thermostat set points,*
- *good maintenance,*
- *minor mechanical repairs.*

Optimisation can also involve a 'night purge' that reduces mechanical cooling by automatically flushing a building with cool night air using natural ventilation. This reduces HVAC operating hours and plant load.

Upgrade

Upgrading to a more efficient HVAC system can deliver significant energy savings over its 20-25 year lifespan. Due to technological advances, there are many more efficient options available.

At the point of upgrade, assess opportunities to improve performance across the entire HVAC system. This includes the plant equipment, delivery and emission system. Overall performance is determined by the features of all 3 sub-systems and their integration.

A range of more efficient HVAC systems, some of which use passive heat transfer or low airflow rates, can halve mechanical HVAC energy use. An upgrade can also yield substantial water and trade-waste savings. HVAC systems are responsible for up to 30% of water use in commercial buildings. In more extreme climates, accurate sizing of the heating and cooling units can greatly improve efficiency. The best available reverse cycle air conditioners are 30-40% more efficient than 'minimum standard' models.

Some business models can address upfront cost barriers to investing in HVAC upgrades. These include energy performance contracts delivered by energy service companies (ESCOs) and 'HVAC as a service' business models. To read more, see the factsheet on overcoming split incentives.

Innovations

Advances in electrically powered HVAC systems, such as heat pumps, can result in significant energy savings and emission reductions. For some buildings, 100% electrification may not be viable. However, a majority of the heating load being met with electricity, paired with a small amount of fuel backup, can still result in big savings. The savings generated from HVAC electrification can be even greater when combined with onsite renewable energy generation.

In addition to potential energy savings, there is growing recognition of the health and productivity benefits of indoor air quality management. This includes mitigating the spread of airborne contaminants and disease through ventilation systems. The market for indoor air purification devices is expanding and, by reducing outside fresh air requirements, could contribute to lower overall HVAC energy use.

Rooftop-packaged air conditioners are becoming more common, although many operate at part load where they are less efficient than at full load. Rooftop-packaged air conditioners can incorporate advanced features that improve part load efficiency, reliability, and reduce energy consumption by about 17%. These features include:

- *variable speed fans with greater control,*
- *inverter controls to vary output,*
- *economisers such as ventilation lockout during start-up,*
- *demand controlled ventilation,*
- *evaporative pre-cooling of the condenser unit,*
- *superior monitoring and diagnostics using advanced sensors.*

Active solar thermal systems capture solar radiation by heating and storing fluid in a collector. In space heating and cooling applications, the heat is transferred indirectly via a heat exchanger. In other applications, the hot fluid may be used directly. Active solar thermal systems do not require energy infrastructure and generate low or no carbon emissions. Since periods of incident solar radiation and cooling loads coincide, solar cooling reduces peak demand.

Computer technologies continue to enhance HVAC system efficiency, reliability and intelligence. They also assist integration with other building services. Accurate and reliable measurements enable efficient HVAC tuning and operation. Intelligent controls allow post-failure assessment and can provide predictive diagnostics and maintenance advice.

UV treatment of return air can deliver a high standard of air quality while reducing the dependence on outdoor supply. It also reduces fouling of fans and heat exchangers.

Chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) refrigerants have a high global warming potential (GWP) and have largely been phased out in Australia. A regulated phase down of hydrofluorocarbons (HFCs) is underway worldwide as these refrigerants have high GWP. Many new refrigerants will be based on ammonia or CO2. Ask your service provider about the best products for efficiency and environmental performance.

Building management systems

A building management system (BMS) provides automated control of energy efficiency and occupant comfort from a single digital interface. BMS monitors and controls electrical and mechanical services, such as HVAC and lighting. It can also incorporate services such as security, access control, elevator and safety systems.

Depending on specific application and configuration, a BMS may be known as a:

- *building automation systems (BAS),*
- *building management and control system (BMCS),*
- *building energy management system (BEMS).*

A BMS can be procured as a complete package or as an add-on to existing systems. BMS applications are based on open communications protocols and are web-enabled, for the integration of systems from multiple vendors.

Compared with separate control systems, a BMS offers centralised control, flexibility, interactivity and feedback. A new BMS should be an essential consideration of any major building fit-out or plant upgrade. A BMS older than 10 years is likely to benefit from an upgrade or replacement.

Main reasons to consider upgrading:

- *reliability issues,*
- *poor condition of components,*
- *lack of web compatibility,*
- *difficulty with incorporating new equipment and sensor,*
- *ability to perform monitoring and reporting.*

A new BMS should be closely monitored and fine-tuned for at least 12 months. A system may initially perform badly due to poor commissioning. Control loop tuning will ensure equipment operates in a stable, predictable and repeatable manner.

Specifications should include:

- *a requirement for the BMS contractor to regularly run diagnostics,*
- *assessment of energy-use trends,*
- *reporting against targeted NABERS ratings.,*

Further energy-saving strategies can include:

- *accurate control of comfort conditions,*
- *precise start-up and run times,*
- *economy cycle including CO2 occupancy control,*
- *removing overlap between systems, such as HVAC,*
- *adjusting for seasonal conditions, including variable plant sequence selection,*
- *air pressure and coolant temperature control.*

To get the most out of a BMS, correct location and calibration of sensors is crucial. This ensures the BMS is responding to accurate readings at all times.

A BMS enables early identification of equipment failure. Buildings can become less efficient as operational patterns change and equipment performance declines. A BMS can implement diagnostics for most HVAC components, and detect when a component is starting to fail. Operators can be alerted to commence preventative maintenance.

BMS equipment suppliers offer an ever-increasing range of communication protocol options, including open source and IP-enabled systems. BMS components can be interfaced to a variety of devices and systems, including Industry 4.0 platforms.

Opportunities to implement a BMS have been enhanced through internet connectivity. Communication between devices or complete systems over a data network is replacing hard-wired connections. Recent developments in wireless energy harvesting is enabling a new generation of sensors that gain energy from ambient sources.

A BMS can reduce maximum demand charges, which make up a sizeable portion of many business' energy bills. A BMS can anticipate high building loads and allow appropriate adjustments to avoid maximum demand threshold levels. A web-enabled BMS can anticipate favourable or extreme weather conditions and adjust HVAC sequences for the most efficient outcome. For example, if the BMS anticipates a hotter than normal day, it can automatically pre-cool the building to take advantage of off-peak energy.

The flexibility and cross-compatibility of BMS components allows multiple aspects of a business to be coordinated more effectively. For example, a BMS can feed into accounting and resource planning, or interface with entire facility management systems.

Building information modelling (BIM) is a 3D imaging process used by architects, engineers, and construction professionals to collaboratively plan, design, construct, and manage buildings. Integrating a BMS with a BIM allows a proposed design to be simulated and refined prior to construction.

Lighting

Lighting can consume up to 40% of energy in commercial premises, depending on the nature of the business and type of lighting used. The biggest impacts on electric lighting requirements and design come from the architectural orientation, massing, ceiling height, and section profiles that determine daylight availability in a building.

Lighting designers should be involved early in the design process of new buildings or retrofits. A good energy-efficient lighting strategy relies on an integrated approach.

Many lighting efficiency opportunities can be easily implemented with little or no capital investment or any need to redesign a lighting system. These include turning lights off manually or automatically when not needed, or removing excess lamps from over-lit areas.

There are excellent opportunities for energy saving whenever upgrades or refurbishments are planned. Options for upgrading energy-efficient lighting can be applied to all types of commercial, industrial and service facilities, and may include replacing light fittings and lamps, optimising lighting layout, and adding more circuits and switches for greater control and automation.

LEDs. Old-style incandescent (including halogen) bulbs are highly inefficient, burning most of the energy they use as wasted heat. This also makes them a fire risk. Light emitting diodes (LEDs) use up to 75% less energy and emit 90% less CO_2 than the old halogens. They also last up to 25 times as long which greatly reduces the need for changing or maintenance. This is especially useful where fittings are difficult to access. LEDs generate less heat than halogens meaning the load on air conditioning is reduced. They also emit 50% less CO_2 than compact fluorescent lights (CFLs) and, unlike CFLs, don't contain toxic mercury.

Daylighting. Good lighting design includes consideration of daylighting, the admission of natural light. Window design must strike a balance between the admission of daylight and not allowing harsh, direct sunlight into the eyes of workers or reflected glare from surfaces. Heat levels from direct sun also need to be controlled. Curtains and shades should always be used in conjunction with daylighting strategies. A daylight-optimised building footprint is essential for new building designs. For many buildings, there are several effective measures to maximise natural lighting indoors:

Occupancy/motion sensors. An occupancy sensor (a type of motion sensor) detects when a room or area is occupied and when it becomes vacant. Lighting is adjusted accordingly. This offers hands-free convenience and substantial energy savings. Occupancy sensors are ideal for meeting rooms, storage and print rooms, and bathroom facilities. Outdoor motion activated lights illuminate an area when people approach or enter it, such as a carpark or building entrances. Along with the energy benefits, motion-activated lights provide convenience, safety and added security.

Timer controls. Timer controls do not respond to changes in occupancy but are instead pre-set based on the expected use of rooms. This is useful when room occupancy times are consistent and predictable. Lighting timers can be manually operated or automated. Manual timers are plug-in units that are adjusted to set lighting times. Automated timers are generally in-wall programmable digital units that can be integrated with a building management system (BMS).

Electrodeless induction lamp and LEDs. The induction lamp's main advantages are long life, ease of replacement and low maintenance. These lamps have mostly been applied where high lamp replacement is difficult and expensive. The efficiency of induction lamps range from about 56lm/W to 80lm/W. This is less impressive than some LEDs (90lm/W or more) which are also claiming equivalent lamp life and lower long-term capital costs. As LEDs further improve in power output and live up to the predictions of lamp life, they can be expected to compete increasingly successfully with induction lamps.

Smart pole street lighting. LED smart poles are already in use in many cities around the world. The poles are operated via a centralised online hub to remotely control and monitor street lighting and other services. Automated sensors detect ambient local conditions, such as visibility, traffic and weather. The poles integrate with the Internet of Things (IoT) cyberscape.

Daylight response. Daylight response or 'harvesting' technology uses photosensors to instantly adjust output in response to available ambient light. This technology is available as an integrated feature in common LED fittings, including for factory high bay lamp types. Daylight response ensures productive levels are maintained perfectly and energy costs are minimised.

Summary

Energy technology is the key driver in improving the eco-efficiency of the tourism sectors. Specifically, the structure effect and energy technology effect have a significantly positive effect on the eco-efficiency of tourism hotels. The structure effect and energy technology effect influence the eco-efficiency of travel agencies too. The structure effect, scale effect and energy technology effect influence the eco-efficiency of scenic spots with respect to both direct and total carbon emissions.

Nowadays, energy-consumption reduction strategies are still more used than alternative energy sources; therefore, conceiving a building in a modern, more sustainable way is still the best choice for Tourism Business.

Questions for reflection

- *Are energy-saving strategies easy to afford?*
- *How to access funds and financial support to implement them?*

3.4. Case studies

Case study 1. Raising awareness on energy efficiency through development of a green destination model

Raising Awareness on Energy Efficiency through Development of a Green Destination Model aims to support social, environmental and economic transformation in the field of sustainable tourism and contributing to community based socio-economic development through raising awareness on energy efficiency and the use of renewable energy sources. The Green Destination Model to be developed and piloted in selected destination, Küçükköy (Ayvalık) is intended to be further replicated and scaled up across the country.

The four main components are as follows; i) analysing the current status of the destination in terms of energy efficiency and potential for attracting visitors as a sustainable tourism destination, ii) develop "Green Destination Model" to promote sustainable tourism development and increase renewable energy usage and energy efficiency in the pilot destination iii) carrying out capacity building and awareness raising activities on the use of renewable energy resources and energy efficiency in the pilot destination to contribute sustainable local economic development and iv) communication and visibility activities.

Enerjisa Enerji, Sabancı University and the United Nations Development Programme (UNDP) have joined forces with this project to develop a "green destination model" and pilot efforts to infuse energy efficiency, the use of renewable energy and other sustainable practices into tourism businesses in Küçükköy, a promising tourism location along Turkey's Aegean coast in the Ayvalik district, which already hosts one million visitors each year

The project will raise awareness on energy efficiency and use of renewable energy resources through development of a Green Destination Model that will be replicated and scaled up across the country.

The project is also intended to offer inputs for the actions related to cross-cutting areas, buildings and services, industry and technology, energy, transportation and agriculture to be achieved by 2023 as a part of the National Energy Efficiency Action Plan and project will directly or indirectly contribute to all of the strategic goals set out in the Energy Efficiency Strategy Paper 2010-2023.

The project is also in line with the 2023 Tourism Strategy that highlights the importance of delving into environmentally friendly systems that consume minimum amount of energy and generate minimal waste, using natural resources.

Case study 2. The Use of Collaborative Practices for Climate Change Adaptation in the Tourism Sector until 2040—A Case Study in the Porto Metropolitan Area (Portugal)

Based on the growing importance assumed by outdoor recreation activities and the need to adapt urban areas to new post-pandemic challenges [5], it is mandatory that the tourism sector plays an effective role in climate resilience. To this end, an innovative research methodology was used (based on mixed approaches), where the debate on a set of defined action measures was stimulated through collaborative methods, according to the identification, inventory and diagnosis of PMA's particularities. First, six undergraduate students participated in the winter of 2020–2021 in the study with the launch of preliminary strategic guidelines for the adaptation of the urban tourism sector, in the context of a few opportunities arising from the pandemic situation. The second collaborative method used was the application of a modified Delphi questionnaire survey to 45 international researchers and technicians in the first round and 35 international researchers and technicians in the second round, focusing on the predictability of the measures to cope with climate change. The last one was a workshop held to assess what participants (while tourists) would be willing to do, namely, through a World Café, where some of the main actions to be carried out in different time horizons were outlined.

he observation of urban spaces as 'living organisms' replaces the emphasis on certain actions on specific spaces of the city, such as green spaces, squares, green roofs, vertical gardens, or green facades [34,35].

Therefore, the theory of tactical urbanism applied to tourism and related activities aims to rethink urban spaces associated with several dimensions among which the flows generated by tourism, the functions of the built space (buildings, housing, equipment, and infrastructure), the stimulation of sociability and the understanding of these interventions and their ability to readapt the city to future climate change scenarios [27,36].

The integration of qualitative–quantitative criteria (QUAL–QUANT) is fundamental for the evaluation of the effectiveness of adaptation to climate change. From this perspective, this research shares the positions defended by several authors [33,37,38] based on the importance of defining recommendations at the level of urban design guidelines. The model suggested regarding the adaptation of urban areas towards the improvement of tourism enjoyment is based on the approaches proposed in the Place Diagram, in Whyte (1980) [8], PPS (2000) [39], Jacobs (2016) [40], and, more recently, Santos Nouri and Costa (2017) [41] with the introduction of the dimension of thermal comfort.

Based on this research, urban and sectoral planning measures have been found to improve the tourism enjoyment of urban space in the face of climatic and meteorological conditions as well as in the context of climate change. In fact, although there are currently thermally pleasing conditions for tourism (particularly during the summer), in the future, they may become scarce because of the increase in extreme phenomena, such as heat waves.

Twenty-three priority measures to be implemented in the short, medium, and long term have been identified. These measures should be based on an intervention guided by the governing authorities (national and local) structured in local government, companies, tourists, and local community actions. These measures will not be very easily implemented, requiring some additional investment in some cases. Given the pandemic context, action on climate change has gained additional momentum, but it is known that some of the measures will have to be implemented over a longer period of time. To contribute to these measures, some solutions have been delineated based on the companies themselves and on public administration, but also with the support of university research units.

The present work proved to be innovative, considering that it enabled the integration of different stakeholders using multiple methods. Thus, we sought to diversify the target audiences and reduce the effects of a strictly academic vision.

Case study 3. GREENinMED projects

GREENinMED is a three-year project sponsored by the EU in collaboration with the Spanish Chamber of Commerce, Capenergies (a French sustainability cluster), Kinneret College, the Israeli Water Association, and the Arava Institute's Center for Transboundary Water Management. The project's official launch took place on November 2019 in Malaga, Spain.

The partners are developing innovative energy and water saving products and services for small and medium sized enterprises for tourism in the Mediterranean region. This integrated approach offers a wide range of eco-innovations like seawater air conditioning (SWAC), water/energy saving devices for spa, and garden/golf course irrigation, which have a high degree of replication potential in other sectors and can be adopted by other enterprises.

The GREENinMED project aims to make the tourism industry in the Mediterranean region more sustainable by a series of actions promoting energy and water efficient development in the sector. So far sustainability consultations by experts in the field have been provided to a total of 30 small and medium-sized hospitality businesses in Spain, France, and Israel, and a number of public workshops on the topic have been held in all three countries. The project partners are now launching open calls for the generation of new innovative products or services for the tourism industry and sector. A total of 16 companies will receive grants to develop or adapt new products or services to the needs of greater efficiency in water and energy consumption and/or management by companies in the tourism sector.

GREENinMED will upgrade the eco-innovation capacities of Mediterranean SMEs in the hotel sector and create more dynamic innovation ecosystems, thanks to a cross-border learning process and dedicated financial support. By addressing the challenges of environmental sustainability in the hotel sector, GREENinMED project will reduce the negative footprint of the tourism industry and spread knowledge about efficient water and energy consumption solutions.

Expected achievements:

- *1 strategy on eco-innovation for the Mediterranean hotel industry,*
- *1 cross-border eco-Innovation support center,*
- *8 sub-grants to purchase innovative products, services, equipment,*
- *30 innovation vouchers,*
- *15 eco-innovative products and services designed specifically for the hotel industry,*
- *5 spin-offs created out of the project.*

Case study 4. King Fisher Village

King Fisher Village, a resort in Cape Verde, became an "eco-boutique" by designing an integrated solution for water and energy efficiency that cuts operating costs by 85%, using only the energy from the Sun.

King Fisher Village had to deal with poor water quality and its high costs. On the archipelago overlooking the Atlantic Ocean, it rains less than one week a year. Consequently, freshwater scarcity pushes up the prices of water. Particularly, the hotel was provided with water desalinated by a local utility through costly and polluting diesel-powered systems. Guests had to drink water from plastic bottles.

Also, energy supply from the grid is unreliable, highly-priced, and unsustainable, because it is mainly generated through diesel. Since energy costs are high, the domestic hot water supply was highly expensive, because the water was heated by grid-connected resistors.

King Fisher Village carried out a zero-emission solar project to redesign the water and energy supply of the resort. By doing so, they took up the challenge to cut operating costs while guaranteeing energy and water supply and has helped King Fisher Village become a low-impact sustainable resort.

They installed a 72-kWp photovoltaic plant to supply 100% of the energy required by the water desalination plant and help meet the electricity needs of the resort. The photovoltaic plant is grid-tied to ensure a 24/7 energy supply. Indeed, energy from the grid is used for night loads and during bad weather conditions. Thanks to the use of solar energy, the hotel significantly cut electricity bills and it also benefits from a strong reduction in water heating expenses.

A solar-powered reverse osmosis desalination unit was installed to produce 30,000 liters of clean water, of which 1,000 liters are remineralized for high-quality drinking and are channeled to the main distribution points via new piping. The consumption of drinking water in plastic bottles is thus eliminated.

Their desalination unit desalinates seawater only during the day, since it is powered by solar energy, and produces all the clean water needed for the day and the night. Indeed, our patented efficient technology exploits over 90% of the PV net power available and produces much more water for the same budget invested, compared to conventional solar desalination solutions.

The solar energy harvested is turned immediately into water storage, which is available 24/7, guaranteeing the best comfort for guests.

King Fisher Village can also serve fresh local food to its guests every day, since it can irrigate its own garden with good-quality water and grow its own fruits and vegetables.

King Fisher Village cut operating costs for water and energy by 85%, CO2 emissions by 92 tons/year, and eliminated the use of plastic bottles for drinking water.

3.5. Quiz

1. **Sustainable Development Goals (SDGs) are**
    a. A set of recommendation to expand Tourism business
    b. A set of goals to cope with poverty, health, climate change among the others
    c. A set of rules issued by the UN to tackle energy consumption
    d. None of them
2. **Tourism is mentioned in SDGs**
    a. At least in three of them
    b. In all of them
    c. SDGs are not about Tourism
    d. None of them
3. **Energy supply is**
    a. less than 50% of global greenhouse gas emissions
    b. About 60% of global greenhouse gas emissions
    c. Above 90% of global greenhouse gas emissions
    d. Not related to global greenhouse gas emissions
4. **Which of the following energy-saving strategies is correct?**
    a. Upgrade heating and cooling to high power unites
    b. Using GPL fuelled vehicles
    c. Changing standard operating procedures use more electricity
    d. Offering incentives to guests to use less than average energy
5. **Blue Flag is**
    a. An award for low air pollution
    b. An award for sustainable transports
    c. An award for tourist destinations such as beaches and marinas
    d. None of them
6. **Tourism generates**
    a. 1.0% of global GDP
    b. 5.0% of global GDP
    c. 7.5% of global GDP
    d. More than 10% of global GDP
7. **Tourism operations contribute**
    a. More than 30% of total CO_2 emissions
    b. More than 20% of total CO_2 emissions
    c. Around 8% of total CO_2 emissions
    d. Less than 5% of total CO_2 emissions
8. **Which of the following is NOT a good energy efficient strategy for HVACs?**
    a. Reduce demand
    b. Using high power systems
    c. Optimise existing systems
    d. Upgrade to more efficient systems
9. **A Building Management System (BMS)**
    a. Monitors and controls electrical and mechanical services and lighting
    b. Reduce the cost of electricity for the building
    c. Monitors the cost of electricity of the building
    d. None of them
10. **Lighting efficiency implementations require**
    a. Require huge capital investments

b. Require little capital investments
c. Low investments but high designing costs
d. Long time to be installed

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