Hotels4Climate

«Assessment and evaluation of the energy performance and GHG emissions of Cyprus and Greek Hotels»

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EU Sustainable Energy Week – Local Event

« Energy transition in the Hotel sector »

30 September 2021 10:00 – 12:30

On behalf of:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

European Climate Initiative EUKI

Hotel industry in Greece and Cyprus

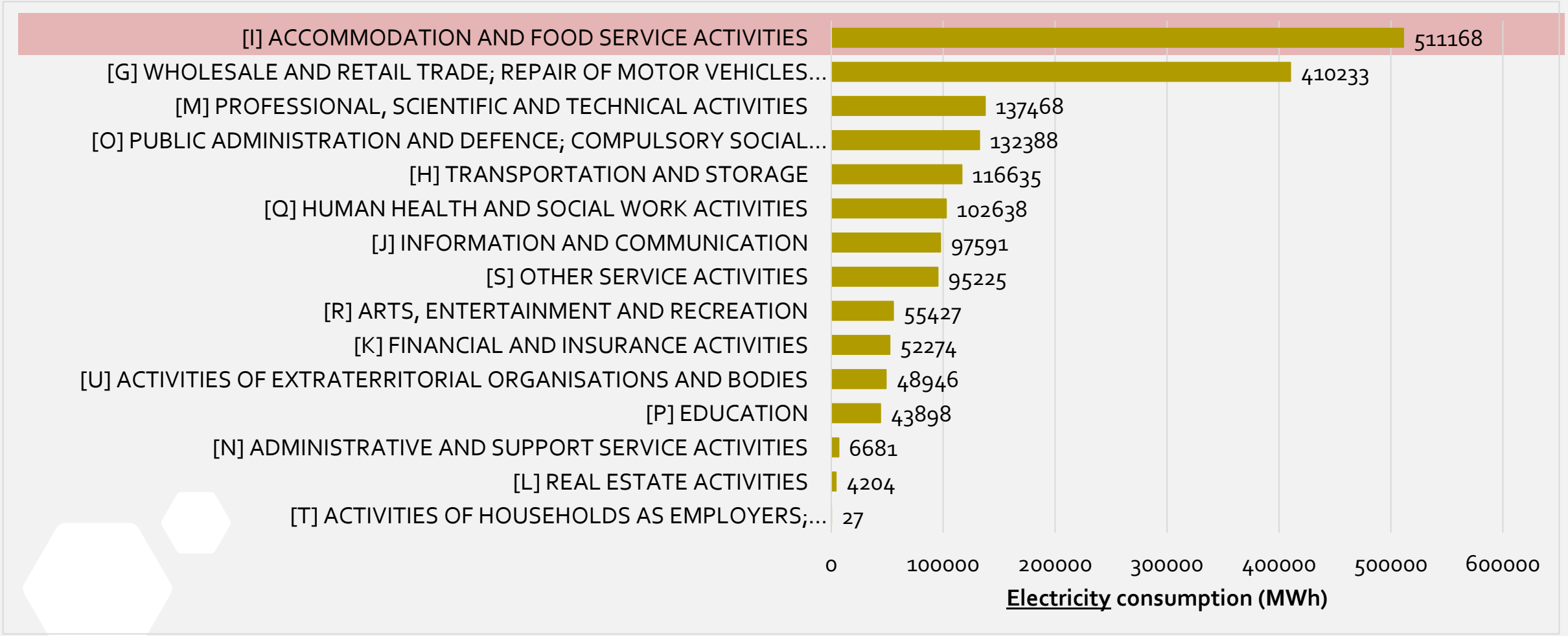
Tourism is one of the most important economic sectors for both Greece and Cyprus, with a total contribution to **GDP** corresponding to 21.2% and 22.7%, respectively in 2019 (before COVID-19 pandemic).

Greece welcomed about 31,3 million tourists in 2019, contributing about 17,8 billion euros to the economy

Cyprus welcomed about 4 million visitors with total revenues estimated at 2,7 billion euros

This development leads to higher energy demand and, consequently, to the increase in greenhouse gas emissions produced by the hotel industry.

Final electricity consumption (MWh) per economic activity in the Tertiary sector for 2018 (before COVID-19)



Source: Statistical Service of Cyprus

The most energy-intensive activities of the Tertiary for 2018 (before COVID-19)

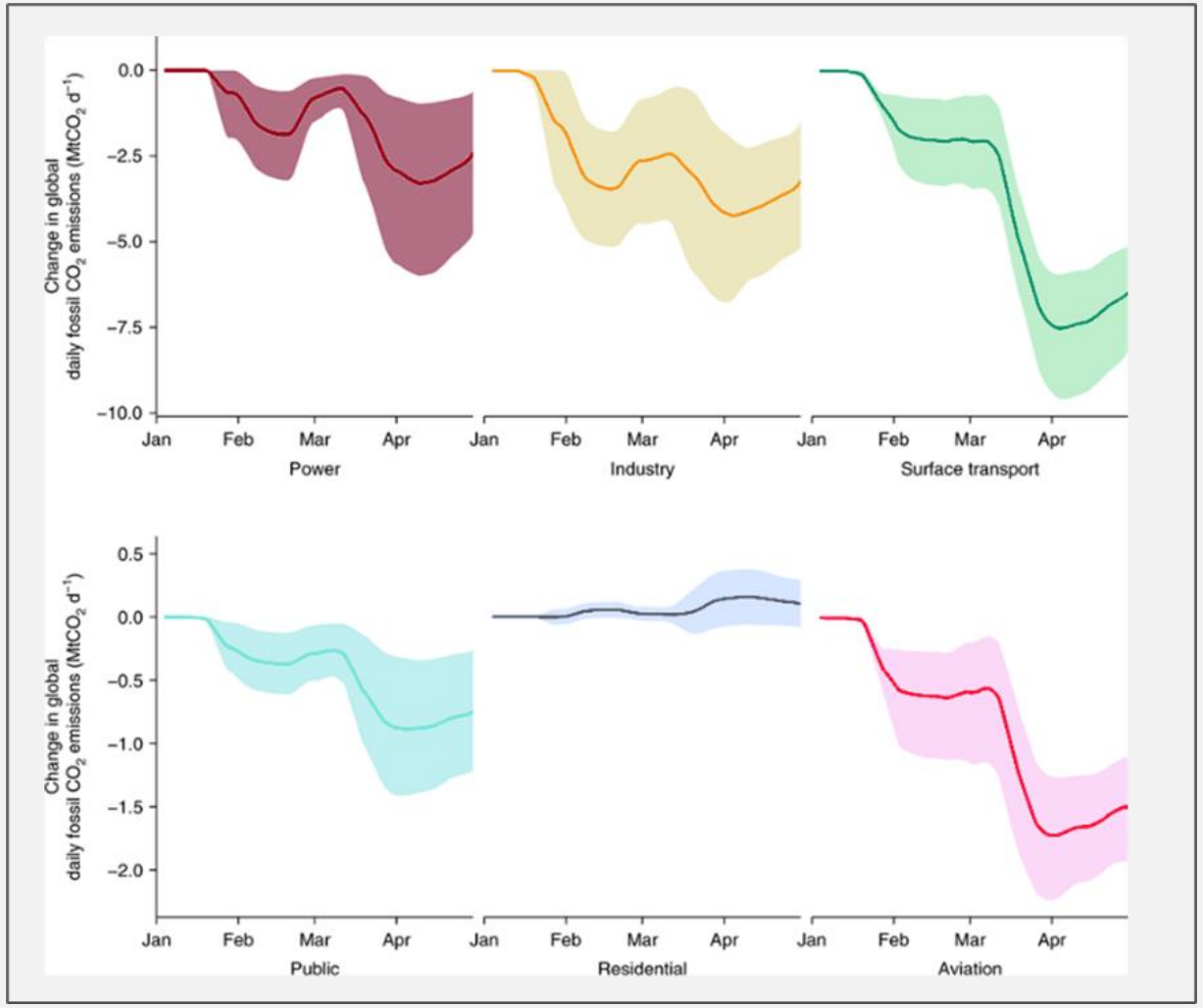
	Number of enterprises	kWh	Electricity consumption kWh/Enterprise
[U] ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES	106*	48.946.000	461.755
[O] PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	297	132.388.000	445.751
[I] ACCOMMODATION AND FOOD SERVICE ACTIVITIES	5.869	511.168.000	87.096
[J] INFORMATION AND COMMUNICATION	1.948	97.591.000	50.098
[H] TRANSPORTATION AND STORAGE	3.167	116.635.000	36.828
[R] ARTS, ENTERTAINMENT AND RECREATION	2.223	55.427.000	24.933
[Q] HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	4.224	102.638.000	24.299
[G] WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	17.022	410.233.000	24.100
[S] OTHER SERVICE ACTIVITIES	5.545	95.225.000	17.173
[K] FINANCIAL AND INSURANCE ACTIVITIES	3.259	52.274.000	16.040
[M] PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	8.844	137.468.000	15.544
[P] EDUCATION	2.917	43.898.000	15.049
[L] REAL ESTATE ACTIVITIES	1.116	4.204.000	3.767
[N] ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	3.321	6.681.000	2.012
[T] ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	23.932	27.000	1

* Number of utility meters from EAC for 2017

Source: Statistical Service of Cyprus

Effects of COVID-19 on progress in reducing greenhouse gases

Change in global daily CO2 emissions by sector ($MtCO_2$ d – 1) (Le Quéré et al. 2020)



- The year 2020 was the so-called "black swan" to reduce greenhouse gas emissions
- The reductions are not real due to the pandemic
- Increased use of heating / cooling, fossil fuels, with higher greenhouse gas emissions and operating costs

It is necessary to find permanent solutions for the short-term effects of COVID-19 on the reduction of greenhouse gases

Study/Survey of the current situation

- The main objective was to identify and evaluate the energy performance and greenhouse gas emissions of the hotel industry of Cyprus and Greece.
- Structured methodology that included questionnaire design, on-site hotel visits, data collection, data analysis and reporting.
- Data collection: from January 2020 - December 2020.
- The reference year was 2018 and in some cases 2019.
- 4 * and 5 * Hotels

Study/Survey of the current situation

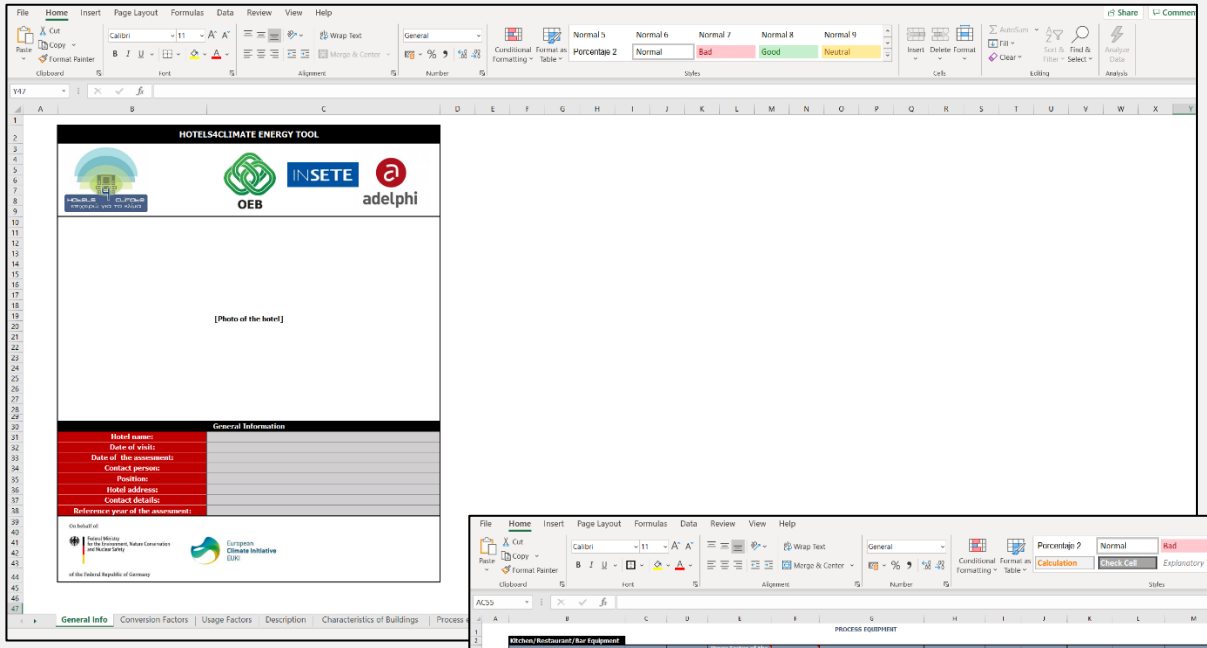
Collection of energy and environmental data during site visits:

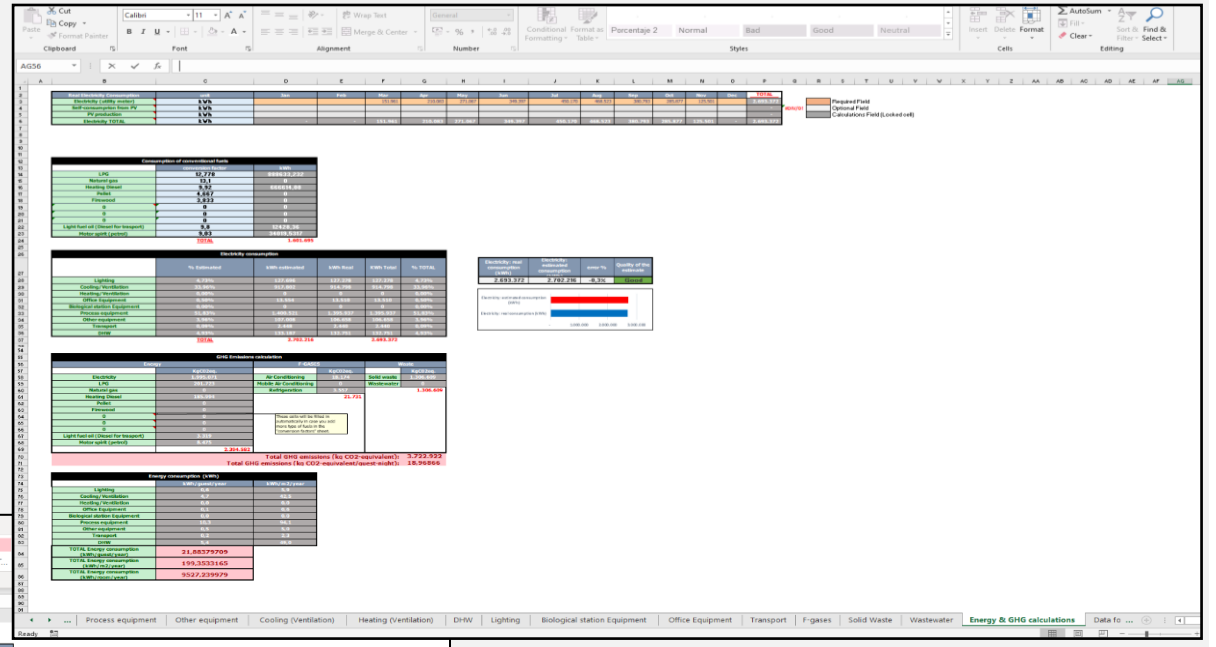
- General and structural characteristics
- Energy and Environment Management Systems
- Technical characteristics of HVAC and lighting systems
- Use of RES
- Solid wastes

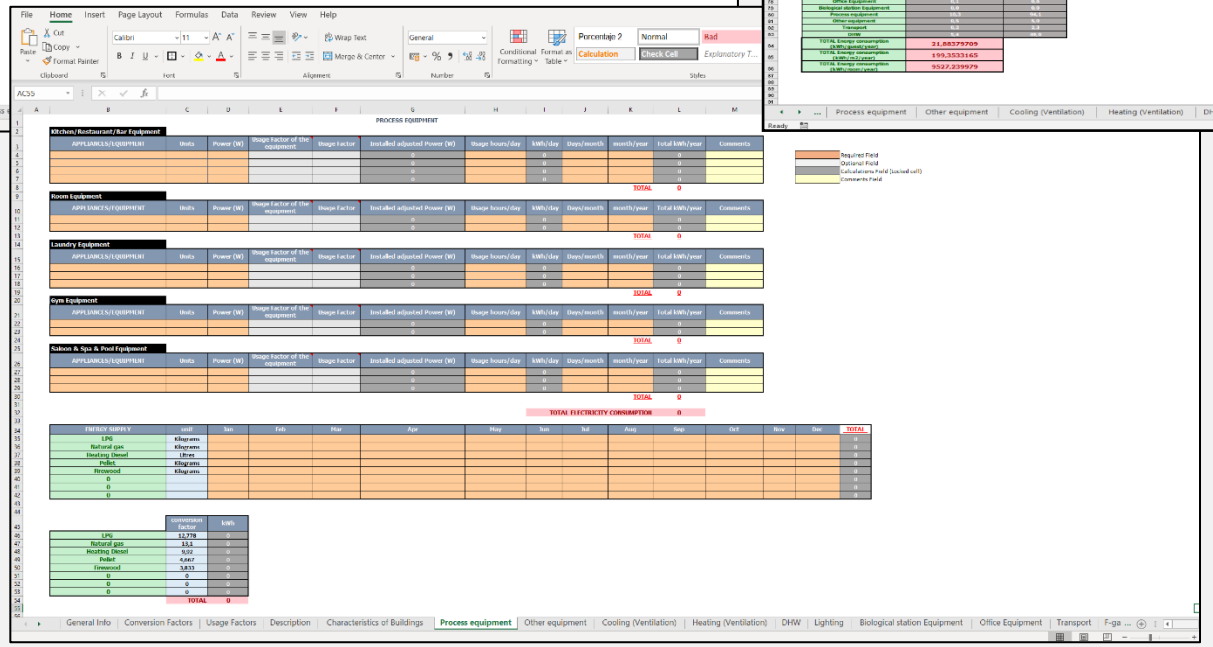
In order to make the results comparable between the participating hotels, key energy performance indicators (KPIs) were set:

- Total annual energy consumption per unit area (kWh / m2 / year)
- Total annual energy consumption per guest-night (kWh / guest-night / year)
- Total annual energy consumption per guestroom (kWh / guestroom / year)
- Total annual greenhouse gas emissions per guest-night (kg CO_2-equivalent / guest-night / year)
- Total annual solid waste per guest-night (kg / guest-night / year)

Use of a specialized energy analysis tool



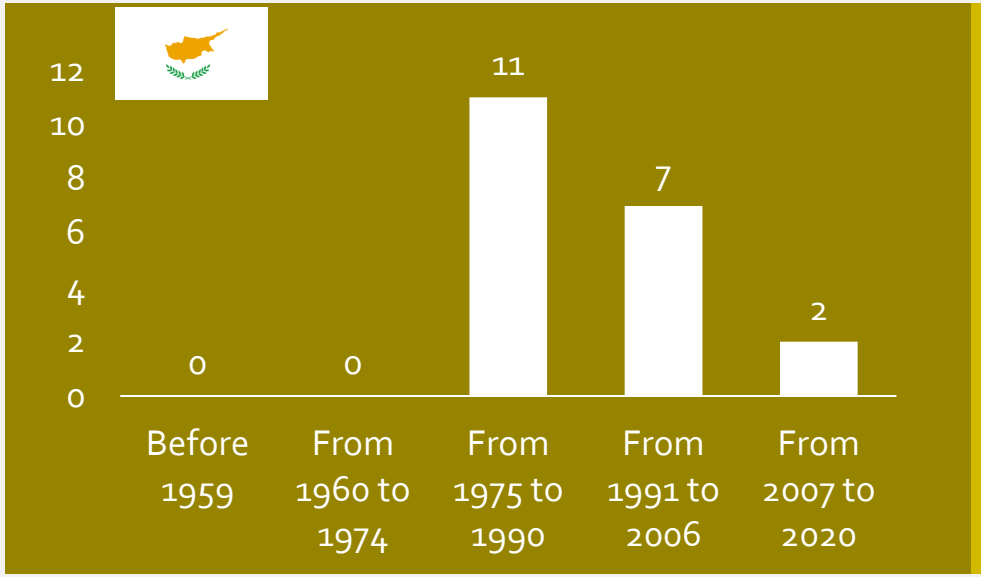




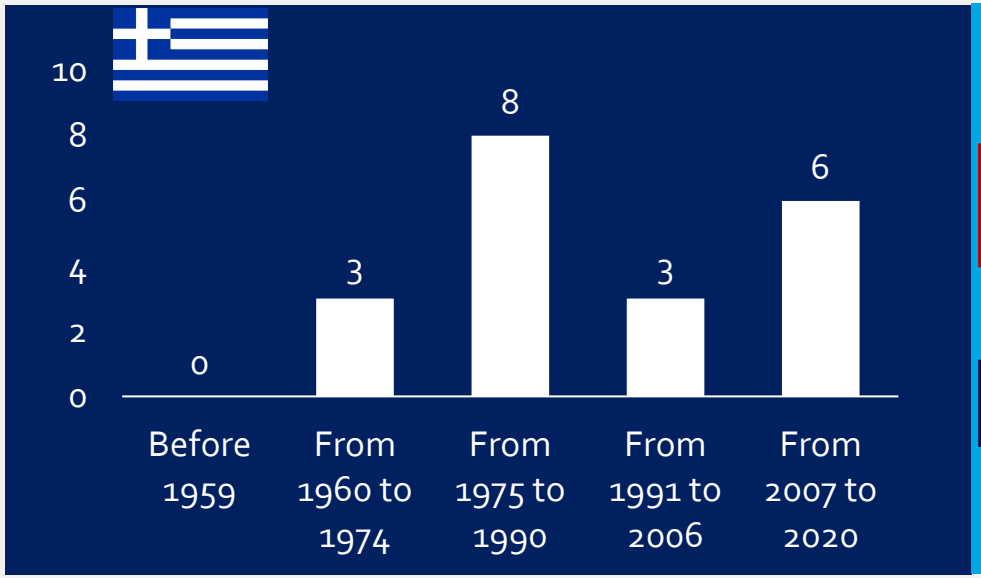
General information of the hotels that participated in the survey

		Number of hotels		Average Useful Area (m²)	Number of guestrooms		Occupancy rate (%)	Daily average of guest-nights
		Seasonal	Non-Seasonal		Range	Average		
	4*	10	1	7.280	16 – 446	173	70% – 92%	317
	5*	6	3	14.025	157 – 561	280	70% – 97%	515
	4*	7	7	14.950	144 – 330	231	60% – 87%	391
	5*	0	6	18.680	155 – 424	268	70% – 88%	477

Structural characteristics of the hotel sector, CY & EL



External walls	**25%** of the participating hotels have thermal insulation on the external walls
Roof	**40%** of the participating hotels have thermal insulation on the roof
Thermopanes	**70%** have double glazed windows and frame without thermal break
	20% have double glazed windows and frame with thermal break
	10% have single glazed windows and frame without thermal break

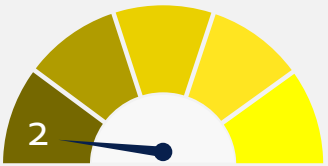


External walls	**45%** of the participating hotels have thermal insulation on the external walls
Roof	**40%** of the participating hotels have thermal insulation on the roof
Thermopanes	**50%** have double glazed windows and frame without thermal break
	35% have double glazed windows and frame with thermal break
	15% have single glazed windows and frame without thermal break

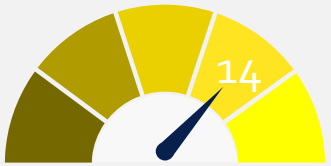
Implementation of energy and environmental standards

Cyprus

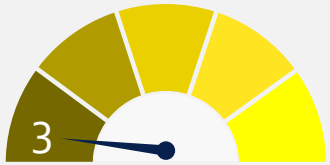
Eco-Management and Audit Scheme (EMAS)



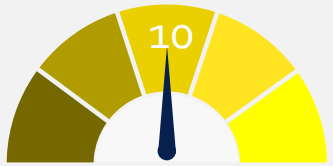
ISO14001 Environmental Management System



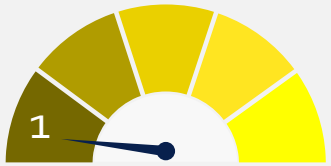
ISO50001 Energy management System



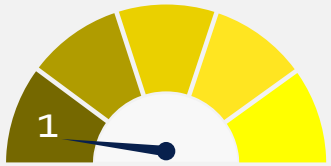
Travelife



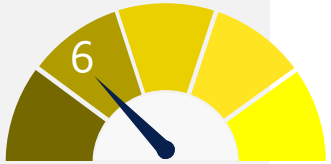
Green Key



EPC

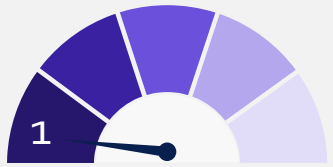


Energy Audit

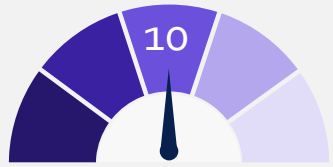


Greece

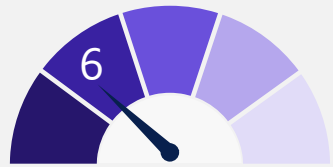
Eco-Management and Audit Scheme (EMAS)



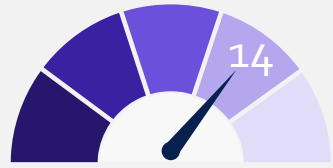
ISO14001 Environmental Management System



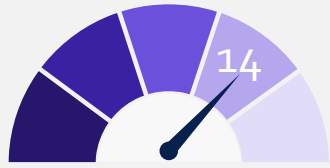
ISO50001 Energy management System



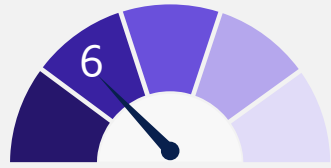
Travelife



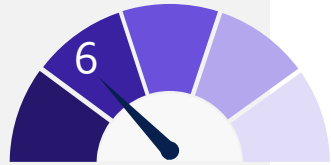
Green Key



EPC



Energy Audit



Main systems of heating, cooling, DHW and lighting

Main Heating Systems

Cyprus

- 30% have oil-fired boiler.
- 10% have pellet boiler.
- 35% have central heating system such as heat pump chiller and VRF units.
- 25% of hotels do not need space heating due to their seasonality.

Greece

- 5% have oil-fired boiler.
- 5% have pellet boiler.
- 40% have central heating system such as heat pump chiller and VRF units.
- 25% have AC split units.
- 25% of hotels do not need space heating due to their seasonality.

Main systems of heating, cooling, DHW and lighting

Main Cooling Systems

Cyprus

- 25% have heat pump chiller
- 65% have central cooling system with chiller
- 10% have only VRF units

Greece

- 40% have heat pump chiller
- 10% have central cooling system with chiller
- 15% have only VRF units
- 35% have AC split units

Main systems of heating, cooling, DHW and lighting

Lighting Systems

Cyprus

All hotels have replaced a large percentage **(> 75%)** of their conventional lighting (halogen, incandescent) with CFL and LED.

On average, hotel lighting consists of **85%** LED, **12%** CFL and fluorescent tubes and **3%** conventional lighting.

Greece

All hotels have replaced a large percentage **(> 70%)** of their conventional lighting (halogen, incandescent) with CFL and LED.

On average, hotel lighting consists of **80%** LED, **10%** CFL and fluorescent tubes and **10%** conventional lighting.

Main systems of heating, cooling, DHW and lighting

Systems for production of hot water

Cyprus

Main system

- 90% (18) use boiler (15 with oil-fired boiler and 3 with pellet boiler) as the main system for the production of hot water.
- 5% (1) uses a heat pump.
- 5% (1) uses a VRV system.

Auxiliary systems

- 45% of hotels have solar panels that contribute to the production of hot water.
- 85% of hotels use heat recovery technique from the cooling mode.

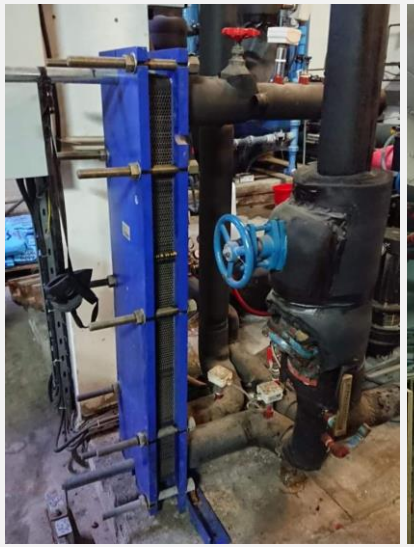
Greece

Main system

- 75% (15) use boiler (9 with oil-fired boiler, 3 with LPG boiler, 2 with natural gas boiler and 1 with wood boiler) as the main system for the production of hot water.
- 20% (4) uses a heat pump.
- 5% (1) uses an electric water heater.

Auxiliary systems

- 40% of hotels have solar panels that contribute to the production of hot water.
- 10% of hotels use heat recovery technique from the cooling mode.



Use of RES

Solar thermal systems

	Number of hotels	Number of solar panels	Average number of solar panels	Solar panels area per guestroom (m^2/room)
	9	45-361	105	0,8
	8	12-216	63	1,09

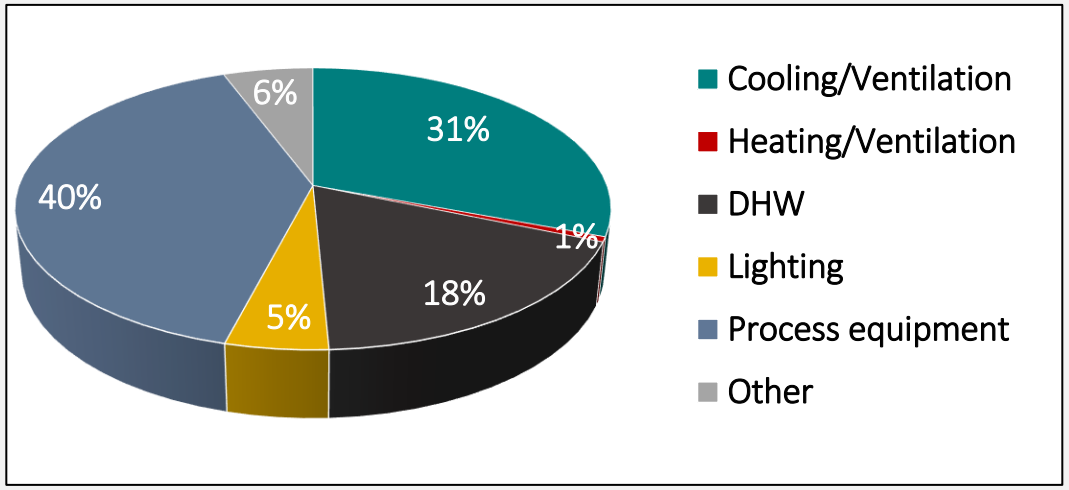
Use of RES

PV systems

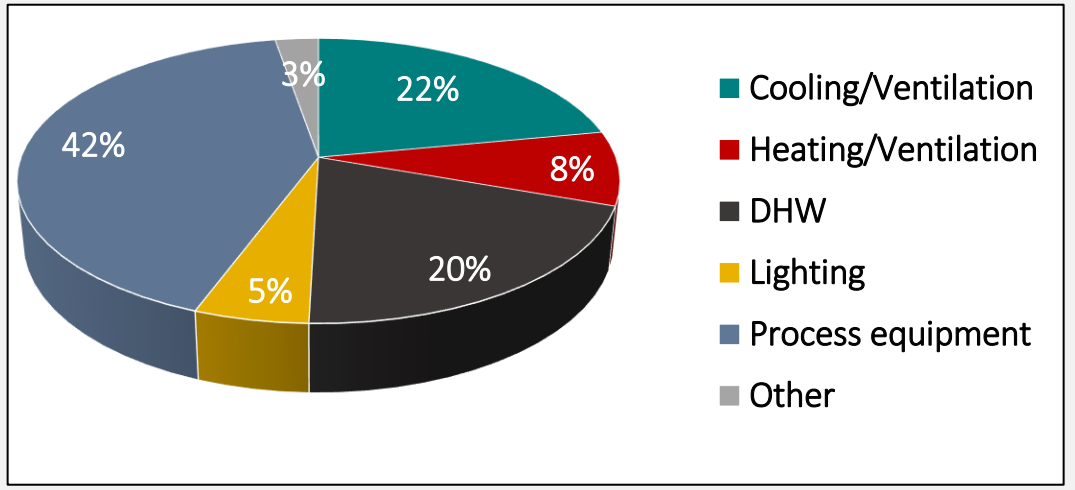
	Number of hotels	Installed capacity (kW)	Share in the total electricity consumption (%)
Autonomous systems	7	1,25 - 17 kW	<1 %
Net-Metering scheme	1	20 kW	1,2 %
Net-Billing scheme	2	40 – 100 kW	5,2–6 %

Distribution of energy consumption by sector

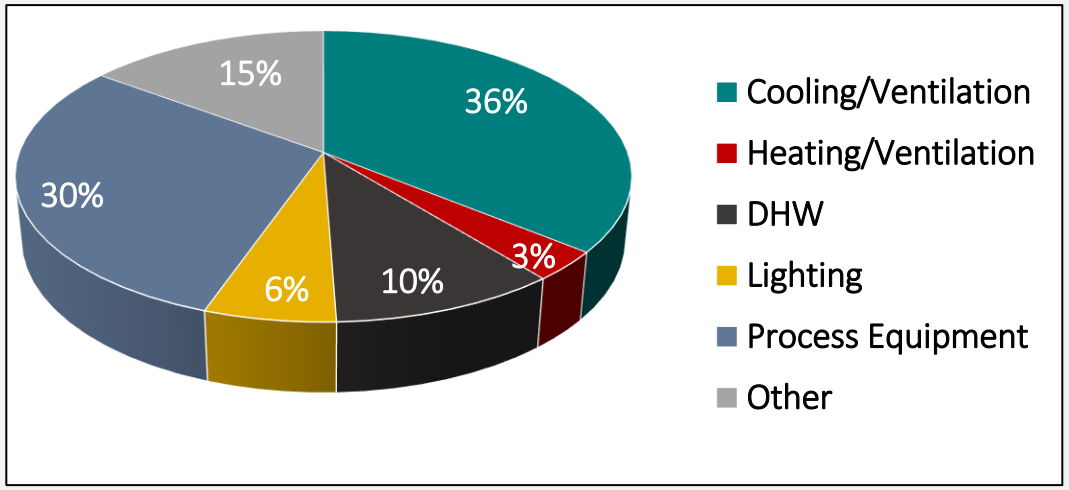
Seasonal 4* hotels



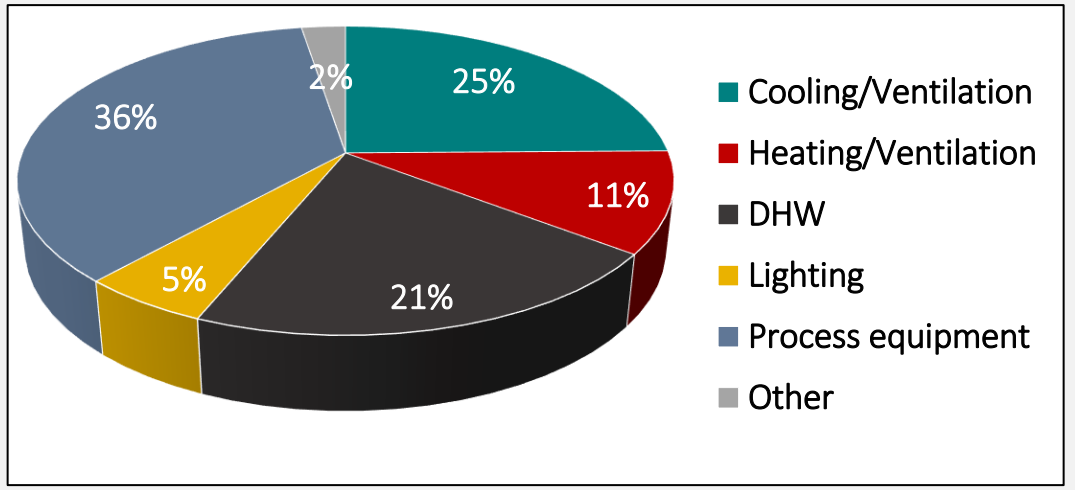
Non-Seasonal 4* hotels



Seasonal 5* hotels



Non-Seasonal 5* hotels



Distribution of energy consumption per m²

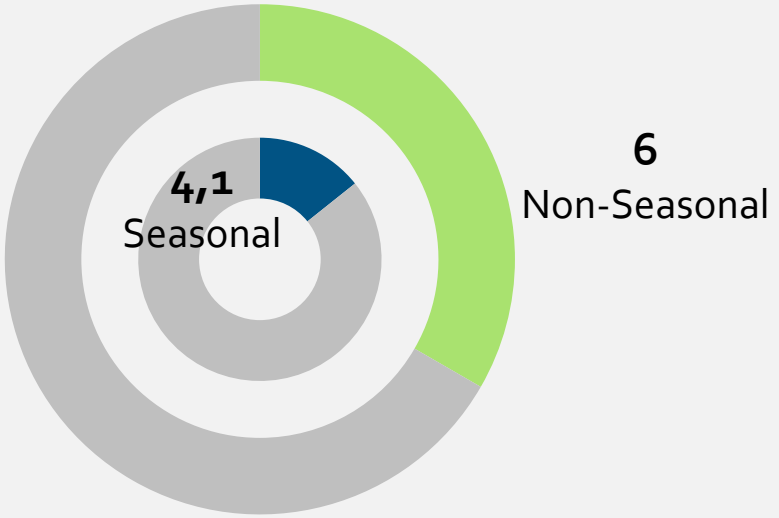
	Final energy consumption per unit area (kWh/m²/year)			
	4* Hotels		5* Hotels	
	Seasonal	Non-Seasonal	Seasonal	Non-Seasonal
Cooling	33,8 – 57,7	42,4 – 74,7	-	58,9 – 142,9
Heating	0,1 – 2,7	15,1 – 28	-	31,1 – 39,0
Lighting	3,6 – 8,5	7,9 – 13,8	-	8,4 – 17,7
Process Equipment	39,5 – 94,1	52,3 – 152,4	-	88,5 – 190,5

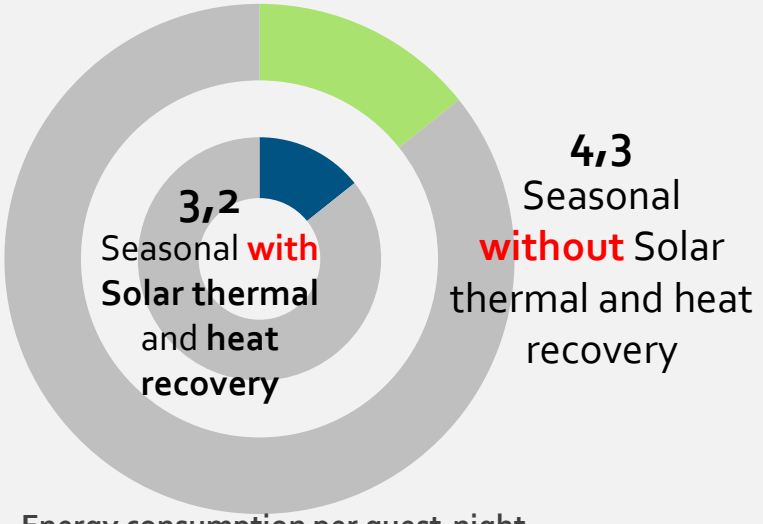
5 * hotels compared to 4 * hotels have higher energy consumption per m2 for the following reasons:

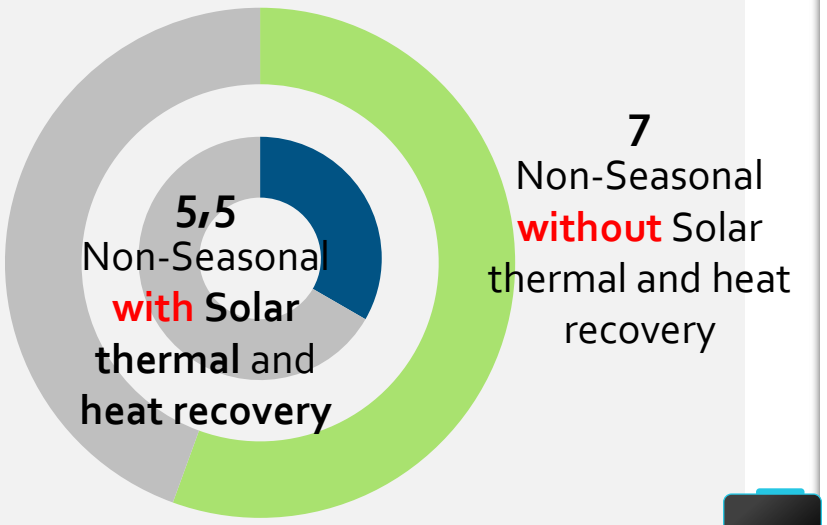
- The 5 * hotels offer **24-hour services** that require the continuous operation of HVAC systems, lighting and various processing equipment (e.g. kitchen).
- The requirement for **cooling and heating in all areas** of 5 * hotels leads to higher energy consumption.
- The **number and operating hours of kitchen/restaurant/bar equipment** is higher in 5 * hotels, resulting in significantly higher energy consumption per m².
- The 5 * hotels offer more **luxury services and a greater variety of meals**.
- 5 * hotels show higher energy consumption per m2 in lighting, mainly due to the installation of higher number of **decorative lighting** (e.g. hidden lighting)

Energy consumption for the production of hot water

- Hotels that use **only boiler for the production of hot water** higher energy consumption per guest-night.
- Hotels that combine the main system with **solar thermal system and the heat recovery technique** through cooling function, had significantly lower energy consumption per guest-night.
- A typical hotel (based on the available roof space) can install about 80 solar panels (160m²) and **the energy savings that can be achieved is between 30-40%.**
- Through the proper design and implementation of the available technological solutions and systems, **almost zero energy consumption for DHW production** can be achieved.







Greenhouse Gas Emissions & Solid Waste

Main conclusions

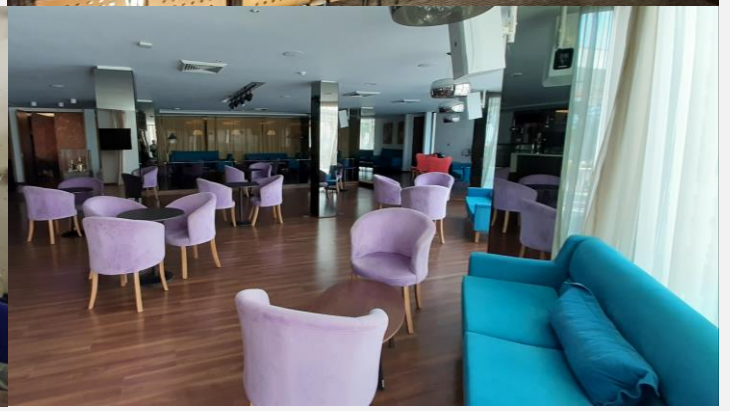
- **75%** of the total annual greenhouse gas emissions came from the energy consumption, **24%** from the production of solid waste and **1%** from F-GASES.
- The increased amount of solid waste in 5 * hotels is mainly due to the **additional services they offer, the higher number of bars and restaurants, as well as the increased variety of food they offer.**
- The average solid waste produced in Cyprus and Greece is between **2.2 and 3.2 kg per guest-night per year.**
- **Hotels recycle between 20% - 35% of their solid waste**, including paper, PMD, glass, batteries, light bulbs, electrical and electronic equipment.

Energy consumption

General conclusions

There are several factors that affect the energy consumption of hotels, such as:

- Luxury services (existence of jacuzzi for public or private use, fountains, whirlpool, etc.)
- Variety of facilities (conference room, theatre, etc.) and leisure services.
- Number of kitchens, bars, restaurants, shops.
- In-house laundry.
- Occupancy rate
- Hotel policy for the operation of sauna and steam bath (on demand or non-stop).
- Energy performance of the building envelope.
- Seasonality of hotel.
- Climate zone of the hotel.



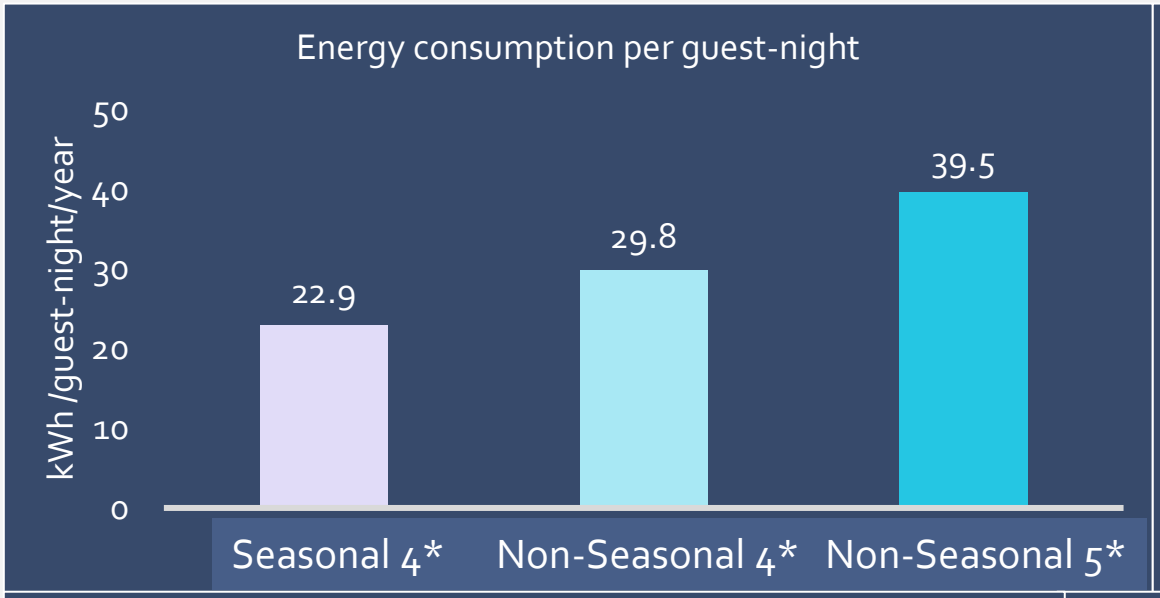
Practices to avoid

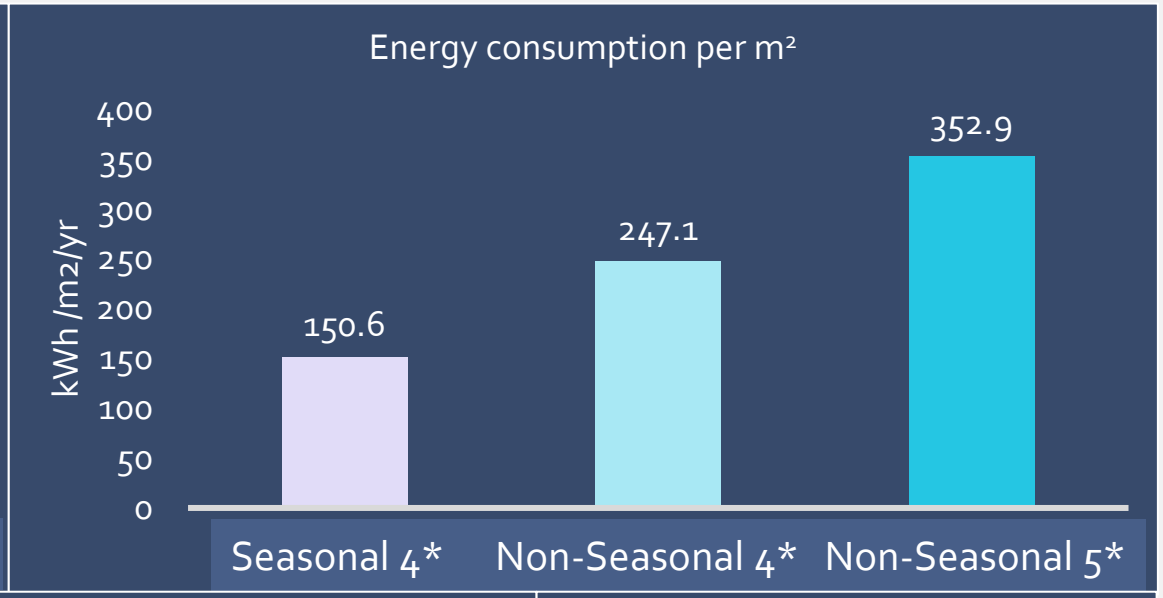
- Some hotels keep high-energy consuming equipment running continuously. Continuous operation of equipment does not only lead to waste of energy and money, but it greatly reduces the lifespan of the equipment.
- Implement the practice of **"on-demand operation"**, where possible (e.g. for sauna, whirlpools etc).

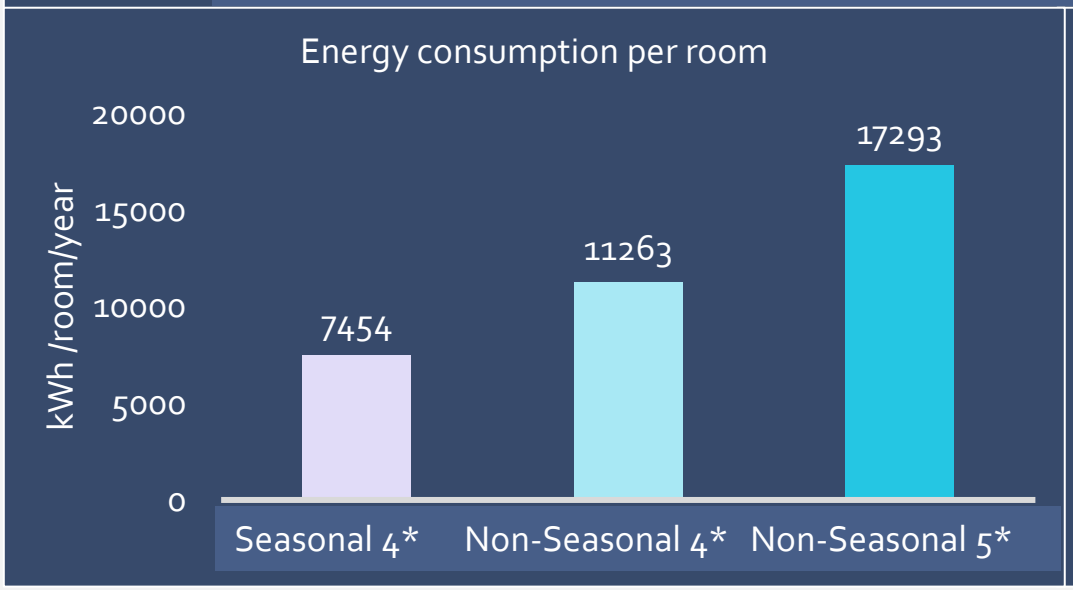
<u>Practises identified</u>

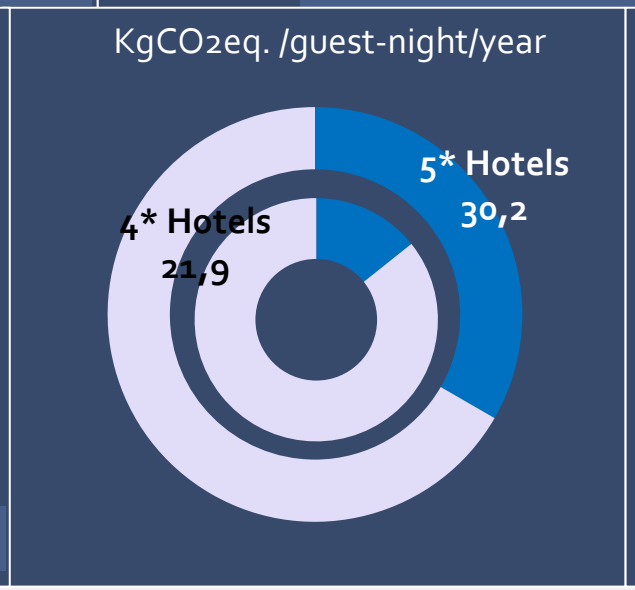
- Continuous operation of a large toaster with a total power of 5kW. This electrical equipment operated for 20 hours a day, all year round. This results to about **2.700kWh** of electricity consumption per month, which corresponds to about **€ 420 / month**.
- Continuous operation of sauna with a total power of 12kW. The sauna operated for 10 hours a day, throughout the year, resulting in approximately **3.200kWh** of energy consumption per month, which corresponds to about **€ 500 / month**.

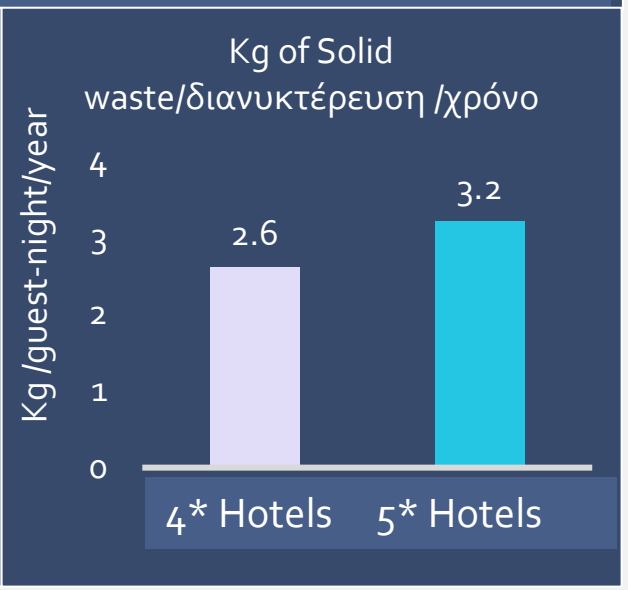
Key energy performance indicators











Assessment of Cyprus and Greece hotels - Structural characteristics, energy and GHG emissions performance indicators

Main aim of this report is the assessment and evaluation of the energy performance and GHG emissions of Cyprus and Greece hotels, with the use of an integrated methodology that includes design of questionnaires, hotels' on-site visits, data collection, data analysis and results reporting.

VIEW THE REPORT

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https://www.oeb.org.cy/wp-content/uploads/2021/04/AI.1-Report-on-characteristics-of-the-hotel-industry-in-Cyprus-and-Greece_v41-1.pdf

Thank you

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On behalf of:
Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety
of the Federal Republic of Germany
European
Climate Initiative
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