

## **BLUEISLANDS**

Tackling seasonal variation of waste

as an effect of tourism on Mediterranean islands

HIGHLIGHTS FROM THE STUDYING AND THE TESTING PHASE



Project co-financed by the European Regional Development Fund

#### MONITORING PLASTIC POLLUTION ON THE BEACHES OF MEDITERRANEAN ISLANDS

BLUEISLANDS assessed the seasonal dynamics of **marine litter** in highly touristic coastal areas: the beaches. A total of eight islands from the Mediterranean Sea (Mallorca, Sicily, Rab, Malta, Crete, Mykonos, Rhodes and Cyprus) were involved. For each of these islands, three selected beaches were periodically monitored during both the low and high touristic season, from February to November 2017. Three kind of beaches were selected: **touristic beaches, beaches mainly used by locals** and **remote beaches**.

# Results

 Considering the accumulation rate of the marine litter (number of items/m²/day), an average increase of +238% was observed during the high season compared to the low one.

- The five most abundant items left on the beaches by the beachgoers were found to be cigarette butts, cutlery (including straws), plastic caps/lids, crisp/sweet packets (including lolly sticks) and metal bottle caps.
- The items most likely left on the beaches by beachgoers represented "only" 25.4% of the total amount of marine litter collected during the surveys of 2017. However, during the high season, this type of items represented **58.5%** and **17.0%** of the items accumulating on the touristic beaches and the beaches mainly used by locals respectively.
- The accumulation rates of mesoplastics (0.5 - 2.5cm) and "visible" microplastics (0.1 - 0.5cm) showed a seasonal variation as well.



Average number of items



# Average accumulation rates items/1000m²/day



# The five items with the highest accumulation rates Values in items/1000m²/day



#### MONITORING THE PRESENCE OF ANTHROPOGENIC NUTRIENTS IN COASTAL SEAWATER

BLUEISLANDS carried out three sampling campaigns in different periods (June, August and October), aiming to assess the **impact of tourism on marine coastal areas** through short-term experiments with macroalgae in Cyprus, Sicily and Rhodes.

**Macroalgae** collected from a pristine site were deployed into the sea for three days within small nylon net bags. On each island, macroalgae were deployed in a popular tourist site characterised by large tourist infrastructures, popular beaches, with a sharp increase in population density during the tourist peak, and in two coastal sites with less developed tourist infrastructures and a negligible variation in population density throughout the year. After deployment, samples of macroalgae were analysed in laboratory in order to assess the presence of **anthropogenic nutrients** taken up by macroalgae.

Results

- 72 georeferenced points of macroalgae deployment in each island and period (30 at the tourist beach, 21 in each local beach).
- The presence of **anthropogenic nutrients** was recorded **in the tourist site on every island** during the peak tourist season, although the amounts were not of great concern.
- Short-term macroalgae deployment worked as an effective monitoring system to detect the presence of anthropogenic nutrients in coastal waters.
- This suggests a limited influence of anthropogenic activities in coastal seawater. Although no dramatic extent of anthropogenic nutrients was detected in the investigated sites, suggesting that the management of wastewater seems to be overall efficient, including during the peak tourist season, specific strategies can be proposed and adopted in order to further limit input of anthropogenic nutrients in marine coastal areas.

The approach adopted by BLUEISLANDS can be used as an **effective technique for the detection of anthropogenic nutrients in marine coastal areas. It represents a smart early-warning system** that could help competent authorities make decisions about the eventual need to improve standards to prevent the deterioration of water quality due to the impact of tourism.

low	moderate	high	June	August	October	
Cyprus						}
Sicily				<b>.</b> ,		}
Rhodes			and the second s	-		}

#### Levels of anthropogenic niutrients in the seas

### THE WASTE CHARACTERISATION STUDY

During the study phase of the project, one of the main goals was to assess the seasonal dynamics of **municipal solid waste** (MSW) in highly touristic coastal areas.

For each beach, an impact zone was defined, including the portion of beach that was monitored for the marine litter and the area right behind the beach where the waste generated by all the establishments related to tourism (hotels, restaurants, bars, etc.) as well as the waste collected by public litter bins was quantified and characterised. The monitoring took place every month for a full week from June to November 2018.

• The average amount of municipal solid waste per impact zone and per survey increased from June to August before decreasing until November. In August, the average amount of MSW is the highest with 760.75 kg collected per impact zone and per survey.

• Organic waste is the highest contributor to the municipal solid waste, followed by glass, plastics, paper, other solid waste, metal and wood.

By combining the results of the waste characterisation study to other data available from the monitored areas, it was possible to calculate that **during the high season, the MSW generated by a tourist is on average 1.85 times higher than the one generated by a resident.** This value can increase up to 2.07 in August.

Average weight of municipal solid waste (MSW) collected in the impact zones where the surveys were conducted (left) and the average relative contribution per category of waste (right).





Comparison between the tourist and resident average waste generation indices.



#### PREPARATION AND IMPLEMENTATION OF PILOT ACTIONS

Based on the results recorded during the studying phase of the project conducted in 2017, BLUEISLANDS partners set specific objectives for their own island aimed at improving environmental conditions through a series of proposed actions. These activities were carried out throughout summer 2019 and included:









### **ASSESSMENT OF PILOT ACTIONS**

After the implementation of the pilot actions in summer 2019, the accumulation of waste generated by tourism and the quality of seawater in coastal areas were measured and compared with the measurements done in 2017 during the studying phase.

#### 1. THE ACCUMULATION OF WASTE GENERATED BY TOURISM

Assessed in Mallorca, Sicily, Malta, Crete, Rhodes and Cyprus

Indicator: Accumulation Index (AI), which indicates the accumulation of marine litter of a given item per unit of surface and per unit of time

- At most beaches, the **AI decreased** after the implementation of the pilot activities.
- Although the levels of accumulation remain moderate to very high in many islands,
- the results are encouraging, since they clearly show that **the pilot actions had a positive**
- effect on the decrease in the accumulation of marine litter related to tourism.



#### 2. ANTHROPOGENIC NUTRIENTS IN COASTAL SEAWATERS

Assessed in Cyprus, Rhodes and Sicily

Indicator: the variation in anthropogenic nutrients measured in macroalgae tissues after the deployment into the coastal seawaters

- All the islands showed improved conditions at distances from the coast of 100m, 200m
- Resul and 300m. The only exception was the 200m distance from the coast in Cyprus.
  - The results show that the pilot actions had overall a positive effect on the water quality
  - of all the islands.







# **FRHODES**

**ENVIRONMENTAL EDUCATION CENTRE** In summer 2019, an environmental education centre went on a three-week-long tour around the island, stopping in the main beaches and involving hotel managers, members of the educational and school community, active citizens, associations and tourists of various nationalities.

The education center was a double-decker bus containing aluminum, plastic, glass and paper recycling machines, as well as a video room where informative videos were displayed for the public. The electricity required for the operations was provided by a special photovoltaic panel.

More than 2,500 locals and tourists had the opportunity to become familiar with concepts like environmental protection, marine litter prevention and waste management, the reduction in single-use plastic items use, recycling and the possibility to donate for a social cause the rewards incentive obtained for every recovered packaging.



#### LET'S KEEP OUR BEACHES CLEAN!



The Mediterranean Sea is the world's leading tourist region. According to the World Tourism Organisation, in 2017 about one third of the world 1.326 billion arrivals was generated in the countries surrounding this semi-enclosed sea. The annual massive tourist wave towards the Mediterranean, largely concentrated within a short period, places a great burden on local infrastructure, especially for waste management. This is particularly true for seas-locked areas, such as islands.

The BLUEISLANDS project carried out activities to identify, address and mitigate the effect of the seasonal variation of waste generated on Mediterranean islands as an effect of tourism.

This booklet contains summaries of the key results that the project produced during the first two phases of the project, namely the studying and the testing phase.

For a complete overview of the work carried out during the project, please visit the website:

blueislands.interreg-med.eu











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