



University of the Aegean  
Department of Environment



*Measuring pressure  
on touristic island  
destinations and its  
impact on carrying  
capacity.  
The case of Mykonos.*

Veriou Sofia, Spilanis Ioannis, Perivolari Natalia, Eva Psalti

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# Carrying Capacity

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**Ecology:** the average population density or population size of a species below which its numbers tend to increase and above which its numbers tend to decrease because of shortages of resources.

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**Destination:** The amount of environmental, social and economic pressure a touristic destination can support without being degraded and unsustainable

# Sustainable Tourism

A positive approach intended to reduce the tensions and friction created by the complex interactions between the tourism industry, visitors, the environment and the communities which are host to holidaymakers (Bramwell & Lane 1993).

# Aim of the Study

**Operationalizing the concepts by creating a methodology/framework for a holistic sustainability assessment of islands, namely under tourism pression**

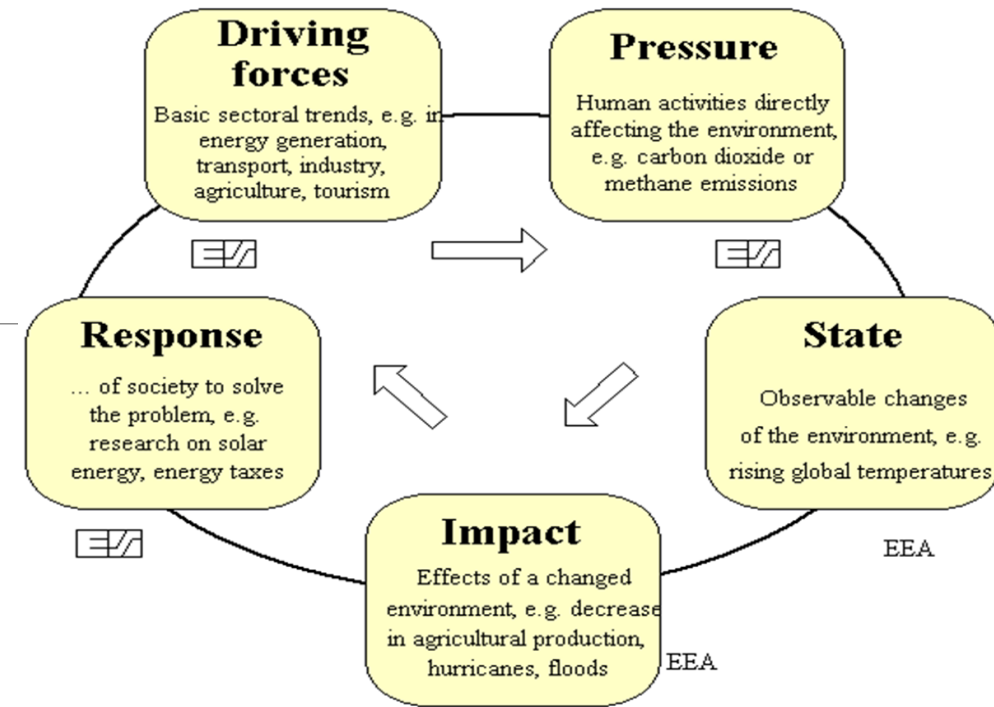
## **Specific Aims:**

1. To gather and calculate data on:
  - Tourism Activity
  - Island Destination
2. To assess the sustainability of tourism and the destination's carrying capacity
3. To examine three alternative development scenarios and their results for the future of the island.

# Methodology

## 1. Creation of DPS(I)R indicators

- ❑ Setting Benchmarks and unsustainable limits based on existing data and/or existing Bibliography. The role of local societies
- ❑ Normalization for comparison and in view of creation of complex indexes for sustainability



# Methodology

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## 2. Data Collection & Analysis

- ❑ Investigating Problems
- ❑ Present State Mapping & Description (DPSIR)
- ❑ Calculation of Indicators

## 3. Scenario Building & Assessment

- ❑ 3 Scenarios:
  - ❑ Business-as-Usual
  - ❑ Weak Sustainability
  - ❑ Following the SDGs “limits” – Strong Sustainability

Tourism Sustainability						
Parameter	Indicators	Scoring Ranges				
Social Pressure	Total Beds/Resident	0	1,5	3	4,5	6
	Equivalent Pop/Resident Pop	0%	25%	50%	75%	100%
	Daily Cruise arrivals / Total Pop	0%	2%	4%	6%	8%
Economic Efficiency	Daily Expenditure	200	150	100	50	0
	Hotel Occupancy Rate	100%	75%	50%	25%	0%
Seasonality	Arrivals: Highest Trimester/ Total Year	25%	40%	55%	70%	85%
	Hotel Turnover: Highest Trimester/ Total Year	25%	40%	55%	70%	85%
Employment	Employment Hotels/Professional Beds	0,2	0,15	0,1	0,05	0
	Employment in Tourism/Total Tourism Beds	0,7	0,55	0,4	0,25	0,1
Environmental Pressure	Water Consumption/Night	100	300	500	700	900
	Energy Consumption/Night	10	20	30	40	50
	Waste Production/Night	0,5	1	1,5	2	2,5
	Built Hotel Area/Hotel Bed					

**Tourism sustainability depends on both tourist behaviour and tourism development model (production and consumption patern)**

**Equivalent Population/Resident Population:**

- Scoring Range Criteria: Greek Average

**Waste Production/Night:**

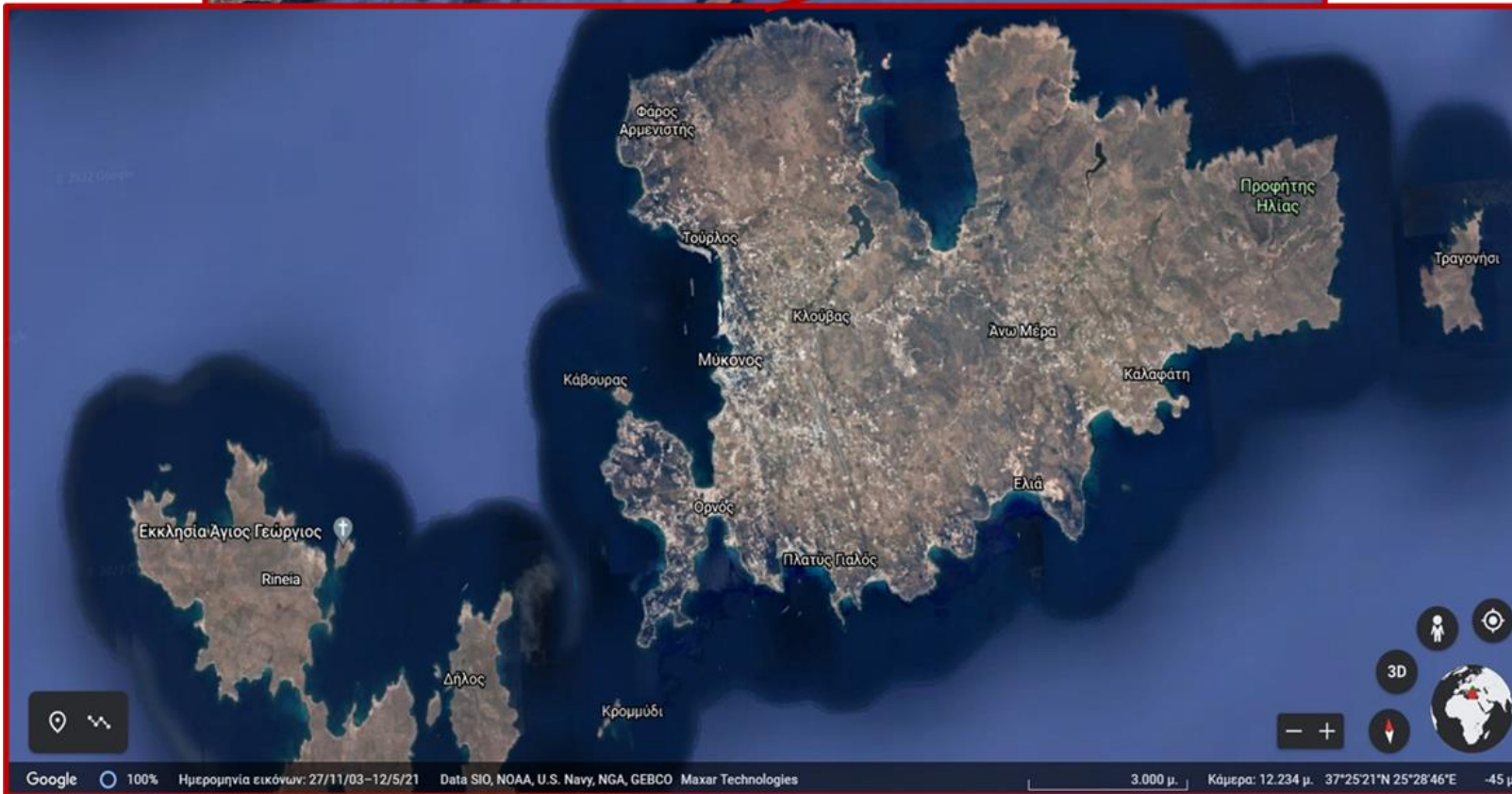
- Scoring Range Criteria: Environmental Benchmarking (WWF, 2005)



Destination Sustainability							Scenarios Result Estimation			
Parameter	Indicators	Scoring Ranges					Data	Scenario 1	Scenario 2	Scenario 3
Economic	Turnover: Tourism/Total	0%	20%	40%	60%	80%				
	Employment: Tourism/Total	0%	20%	40%	60%	80%				
Employment Seasonality	Employment: Census/Turnover Data	110%	90%	70%	50%	30%				
	Employment in Tourism: Census/Turnover Data	110%	90%	70%	50%	30%				
Social Sustainability	Natural Movement (Pop)	6	3	0	-3	-6				
	Population Growth	60%	80%	100%	120%	140%				
	Population Aging Indicator	50%	75%	100%	125%	150%				
	Active Pop/Total Pop	50%	55%	60%	65%	70%				
Environmental Sustainability	Total Pressure/km <sup>2</sup>	0	200	400	600	800				
	Built Shoreline %	0%	10%	20%	30%	40%				
	RES/Total Energy	80%	60%	40%	20%	0%				
	Noise Pollution	0	2,5	5	7,5	10				
	Built Area %	0%	10%	20%	30%	40%				
	Fragmentation Indicator	0	0,2	0,4	0,6	0,8				
	Desertification Vulnerability	0%	15%	30%	45%	60%				
	Water Consumption/Natural Water Supply	20%	40%	60%	80%	100%				
	Sea Water Quality	100%	95%	90%	85%	80%				
	Air Quality	0	50	100	150	200				

**Destination's Sustainability depends on:**

- its natural CC through a scientific assessment and socio-economic CC based mainly on stakeholders perceptions
- Efficiency of policy making



# Mykonos Island

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# Mykonos Island

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Southern Aegean:

Cyclades

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Surface Area:

86 km<sup>2</sup>

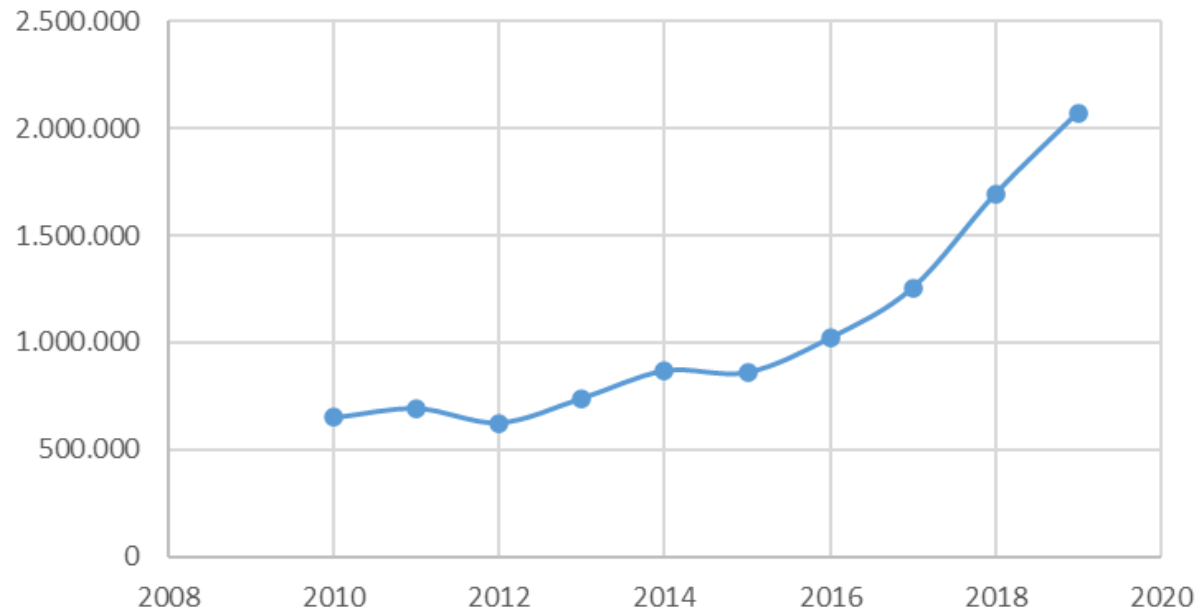
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Population:

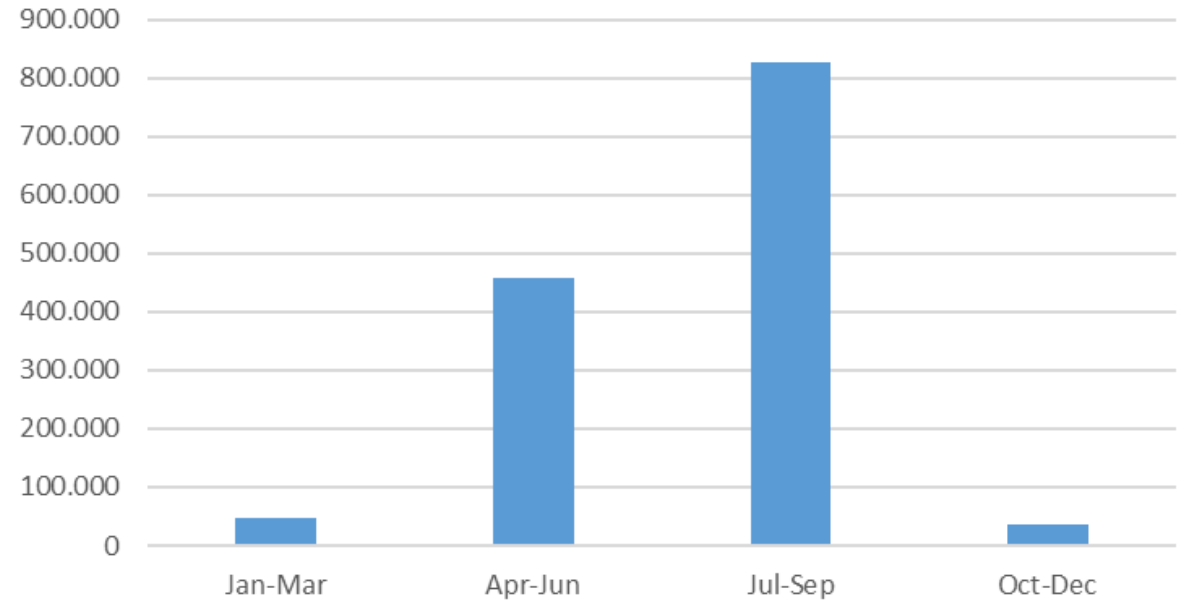
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# Basic Tourism Data (Drivers)

Arrivals Through The Years

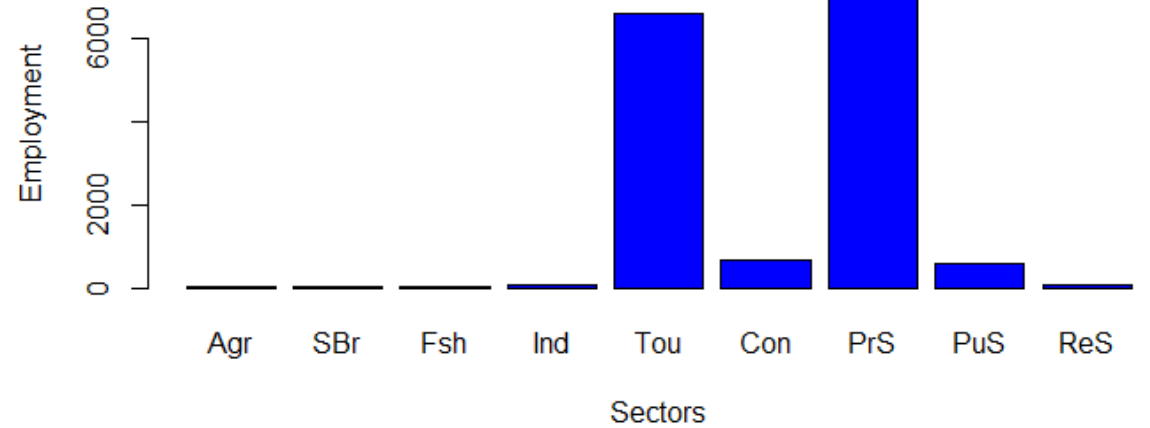
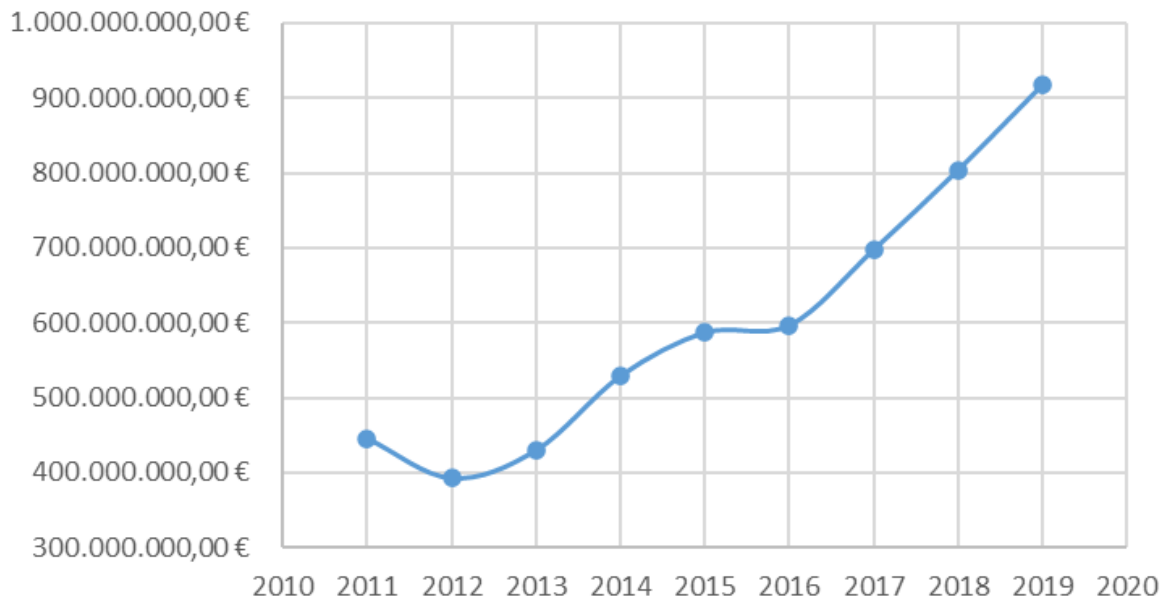


Total Tourist Arrivals Per Trimester (2019)



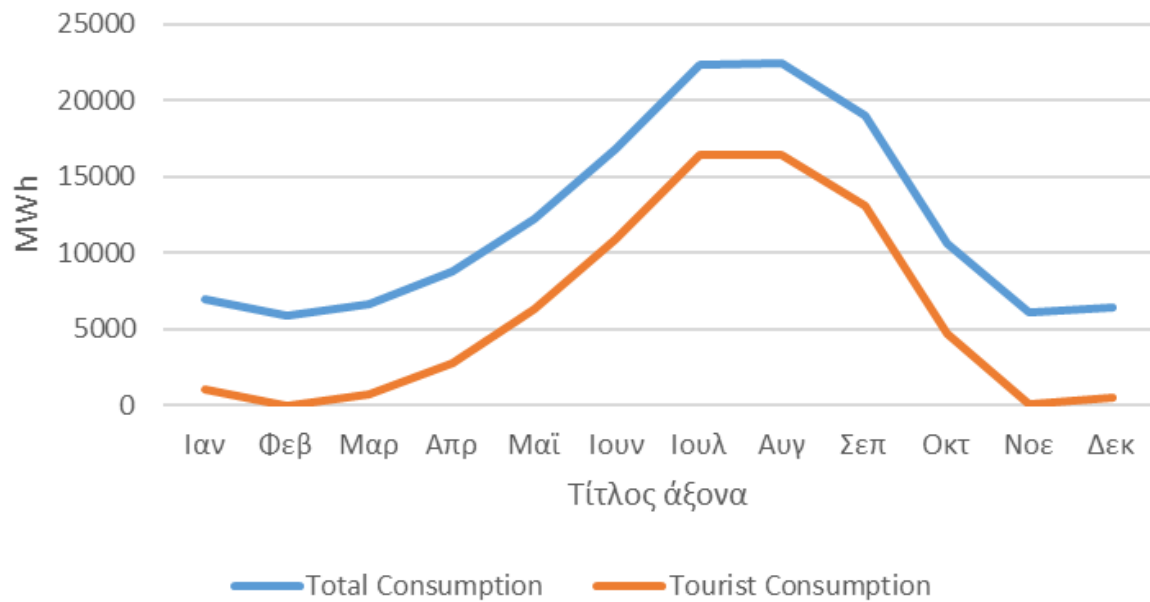
# Basic Tourism Data (Pressures)

Financial Turnover Through The Years

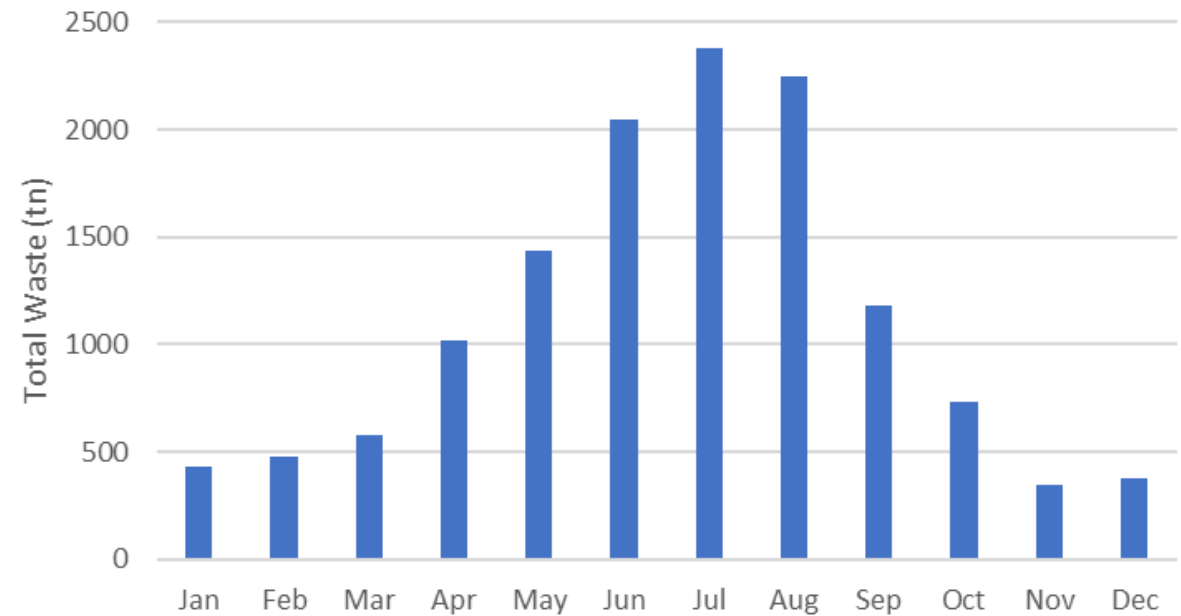


# Basic Tourism Data (Pressures)

## Monthly Energy Consumption (2017)



## Monthly Municipal Solid Waste



# Tourism Indicators

Equivalent population: **17.621**  
**173,9%** of the resident population

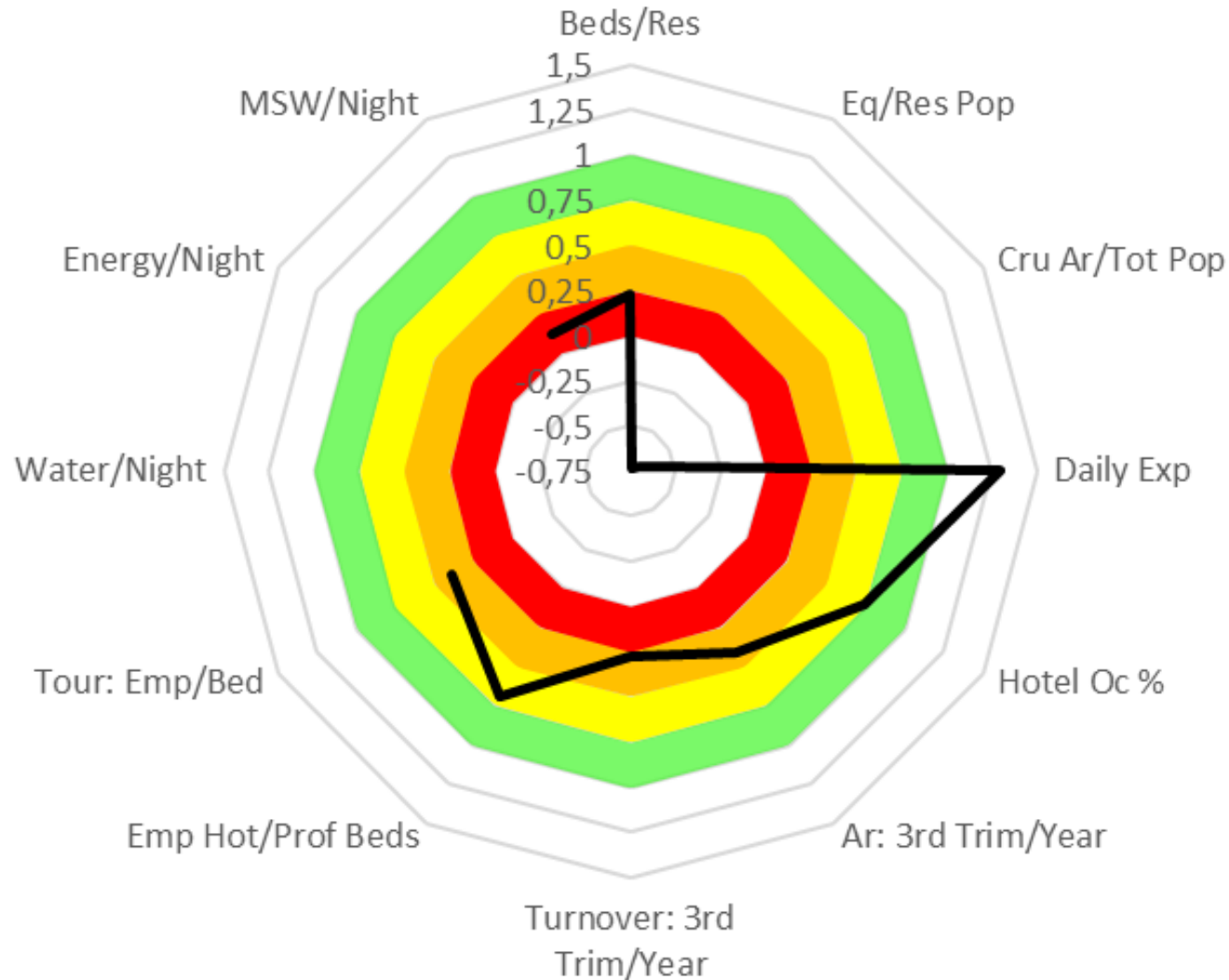
2,25 Kg Waste Per Night

**Seasonality: 3<sup>rd</sup>** trimester of the year accounts for  
**63%** of the total arrivals and **68%** of tourism turnover

**74%** Occupancy Rate

Average Daily Expenditure:  
**259,20 €**

## Tourism Sustainability



## Social Pressure

- Total Beds/Resident
- Equivalent Pop/Resident Pop
- Daily Cruise arrivals / Total Pop

## Economic Efficiency

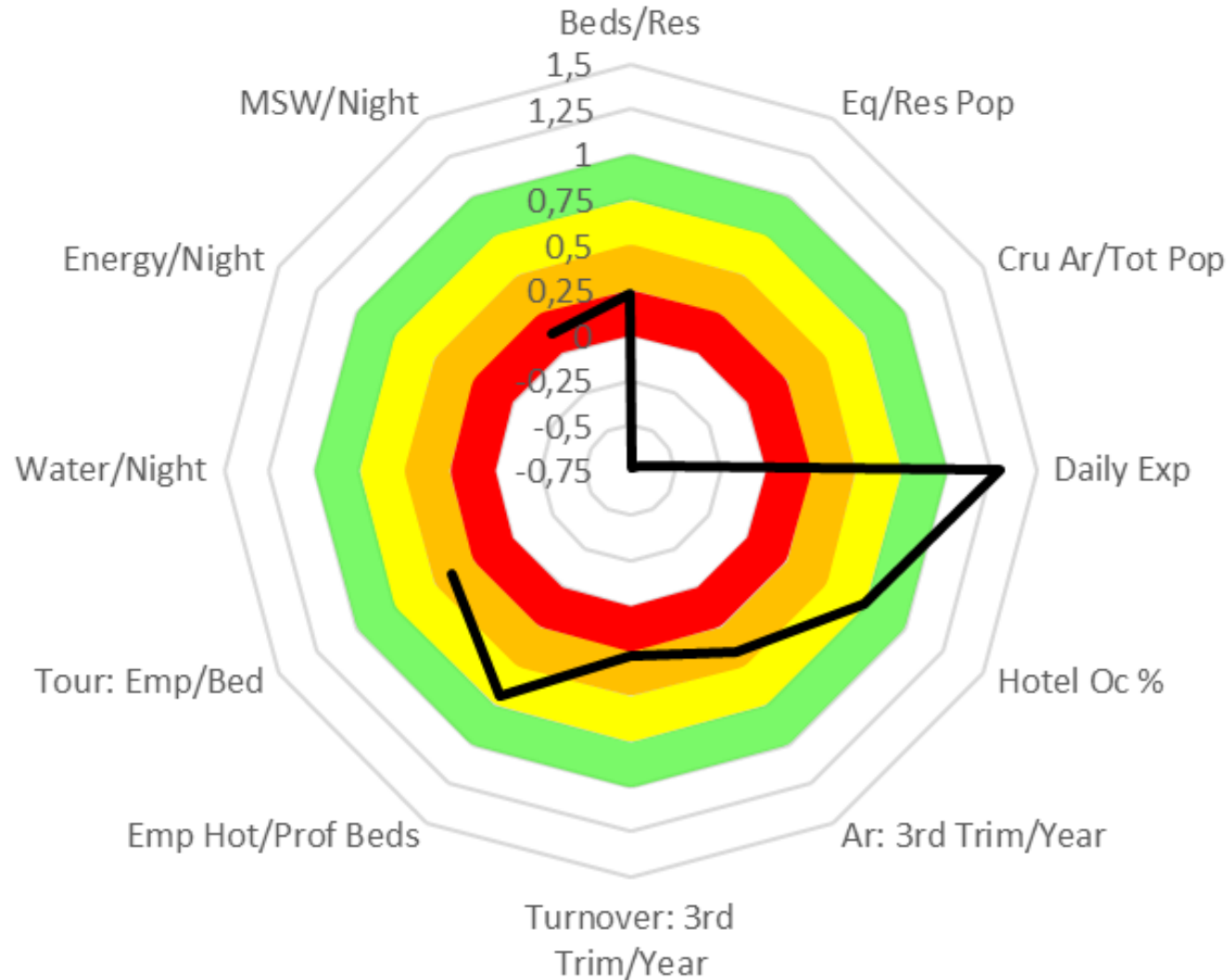
- Daily Expenditure
- Hotel Occupancy Rate

## Seasonality

- Arrivals: Highest Trimester/ Total Year
- Hotel Turnover: Highest Trimester/ Total Year



## Tourism Sustainability



## Employment

- h. Employment Hotels / Professional Beds
- i. Employment in Tourism / Total Tourism Beds

## Environmental Pressure

- j. Water Consumption/Night
- k. Energy Consumption/Night
- l. Waste Production/Night
- Built Hotel Area/Hotel Bed

# Destination Indicators

38% Built Shoreline

62% Of the island's total financial turnover

21% Active Population to Total Employment

Tourism: 74% Of the total employment

Excellent Sea Water Quality

# Economical

1. Turnover: Tourism/Total
2. Employment: Tourism/Total

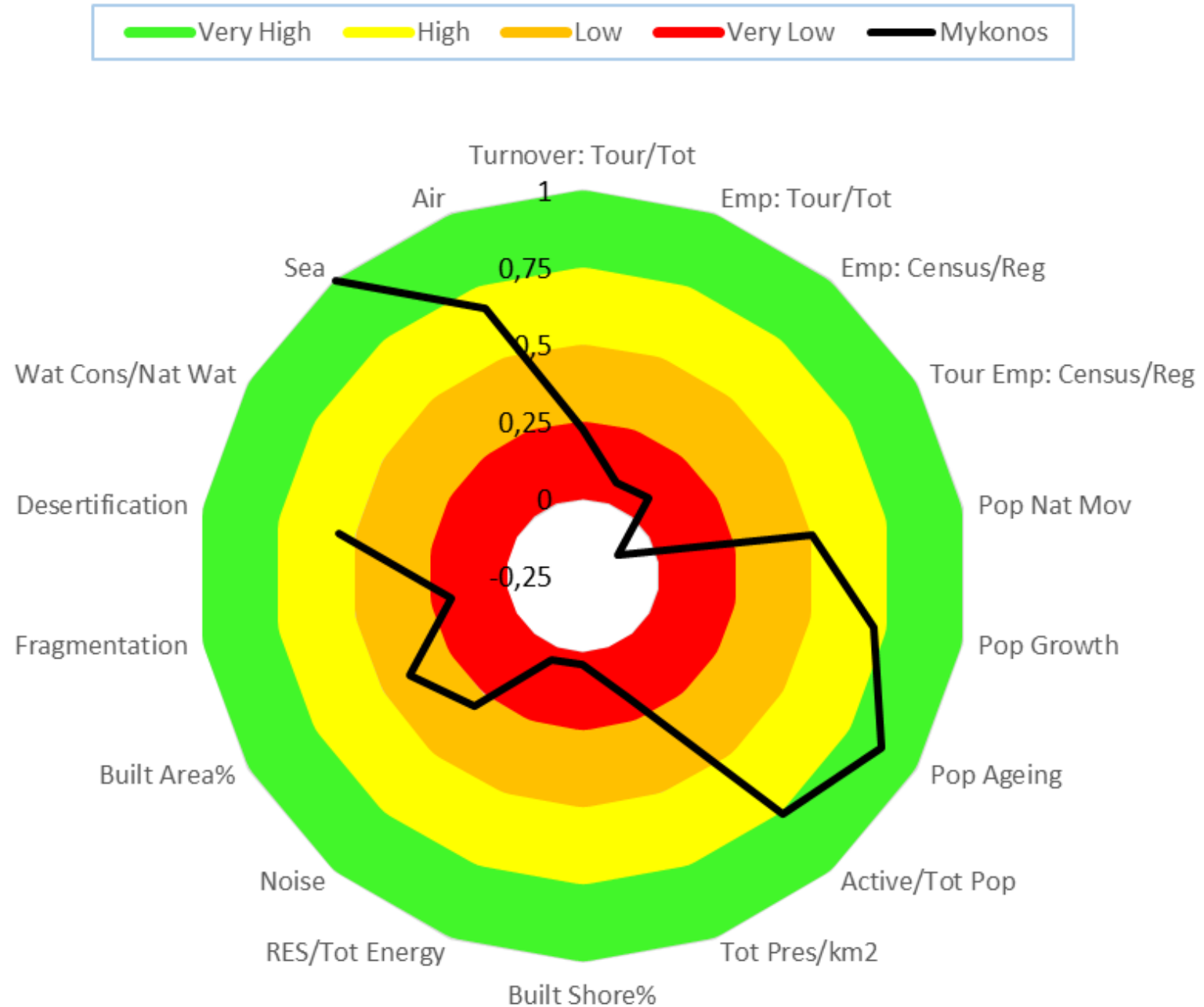
# Employment Seasonality

3. Employment: Census/Turnover Data
4. Employment in Tourism: Census/Turnover Data

# Social Pressure

5. Natural Movement (Pop)
6. Population Growth
7. Population Aging Indicator
8. Active Pop/Total Pop

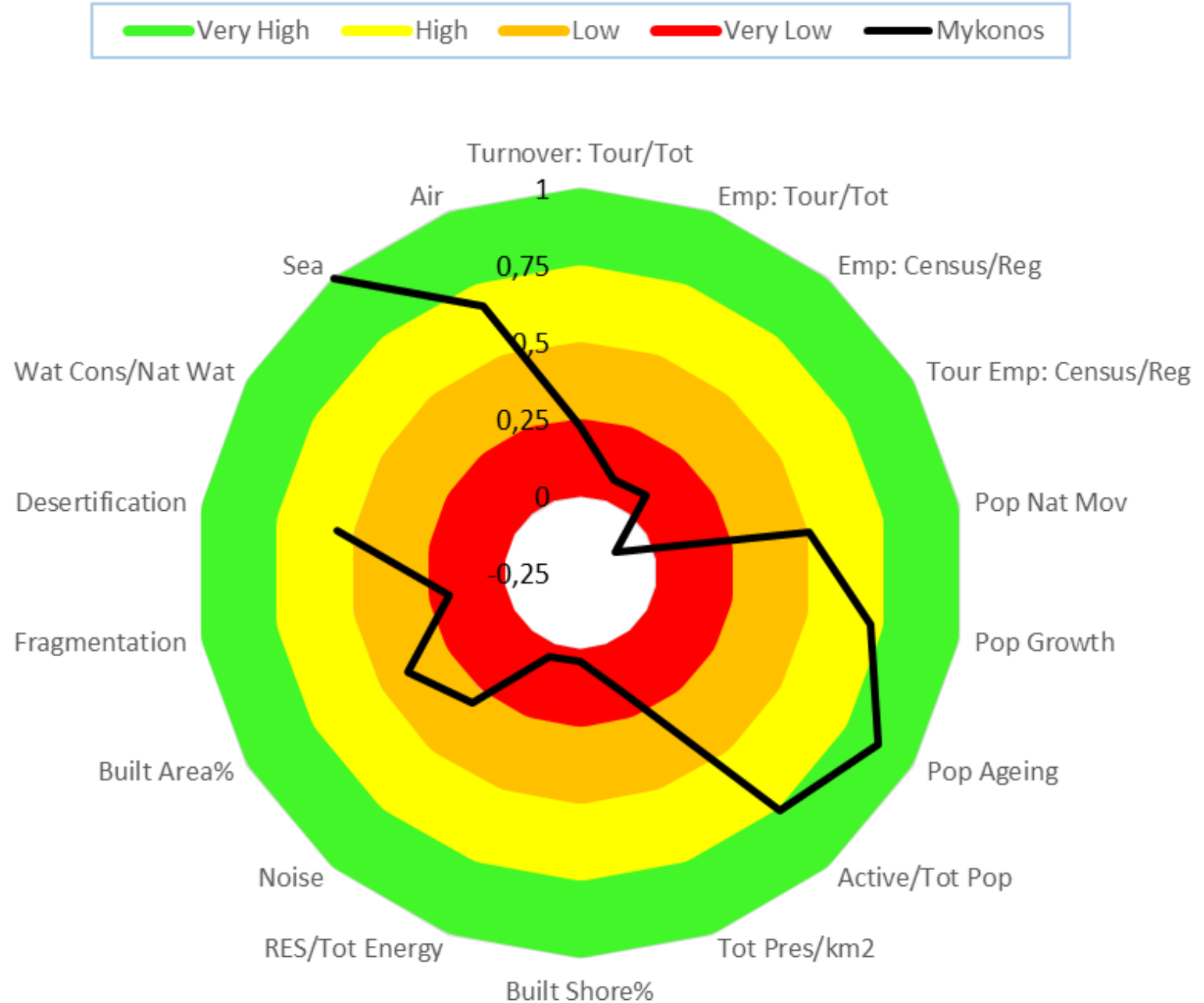
### Destination Carrying Capacity



# Environmental

9. Total Pressure/km<sup>2</sup>
10. Built Shoreline %
11. RES/Total Energy
12. Noise Pollution
13. Built Area %
14. Fragmentation Indicator
15. Desertification Vulnerability
16. Water Consumption/Natural Water Supply
17. Sea Water Quality
18. Air Quality

## Destination Carrying Capacity



# Scenario Analysis



# Scenarios

## Business-as-Usual

Economic and Tourism growth continues

No further social or environmental policies and limitations

## Weak Sustainability

Slow but steady reduction of touristic growth rate

Application of some environmental policies and limitations

## Strong Sustainability

Touristic and Economic degrowth

Detailed and strict plan for the application of environmental policies and limitations

# Indicators - Scenario Assessment

*Improvement (+) or Further Decline (-)*

Tourism Sustainability								Scenarios Result Estimation		
Parameter	Indicators	Scoring Ranges					Data	Scenario 1	Scenario 2	Scenario 3
Social Pressure	Total Beds/Resident	0	1,5	3	4,5	6	4,65	-	-	+
	Equivalent Pop/Resident Pop	0%	25%	50%	75%	100%	174%	-	-	+
	Daily Cruise arrivals / Total Pop	0%	2%	4%	6%	8%	14%	-	-	+
Economic Efficiency	Daily Expenditure	200	150	100	50	0	€ 259,20	-	-	
	Hotel Occupancy Rate	100%	75%	50%	25%	0%	73,6%			
Seasonality	Arrivals: Highest Trimester/ Total Year	25%	40%	55%	70%	85%	60,4%	+	+	-
	Hotel Turnover: Highest Trimester/ Total Year	25%	40%	55%	70%	85%	68,3%	-	-	+
Employment	Employment Hotels/Professional Beds	0,2	0,15	0,1	0,05	0	0,14	-	-	+
	Employment in Tourism/Total Tourism Beds	0,7	0,55	0,4	0,25	0,1	0,34			
Environmental Pressure	Water Consumption/Night	100	300	500	700	900				
	Energy Consumption/Night	10	20	30	40	50		-	+	++
	Waste Production/Night	0,5	1	1,5	2	2,5	2,25	-	+	++
	Built Hotel Area/Hotel Bed							-	+	++



Destination Sustainability								Scenarios Result Estimation		
Parameter	Indicators	Scoring Ranges					Data	Scenario 1	Scenario 2	Scenario 3
Economic	Turnover: Tourism/Total	0%	20%	40%	60%	80%	62%	-	-	+
	Employment: Tourism/Total	0%	20%	40%	60%	80%	74%	-		+
Employment Seasonality	Employment: Census/Turnover Data	110%	90%	70%	50%	30%	36%	-		+
	Employment in Tourism: Census/Turnover Data	110%	90%	70%	50%	30%	21%	-	-	+
Social Sustainability	Natural Movement (Pop)	6	3	0	-3	-6	7,91	-	-	+
	Population Growth	60%	80%	100%	120%	140%	83%			
	Population Aging Indicator	50%	75%	100%	125%	150%	63%			
	Active Pop/Total Pop	50%	55%	60%	65%	70%	54,8%			
Environmental Sustainability	Total Pressure/km <sup>2</sup>	0	200	400	600	800	665,2			
	Built Shoreline %	0%	10%	20%	30%	40%	38%	-	-	+
	RES/Total Energy	80%	60%	40%	20%	0%	2%	-	-	+
	Noise Pollution	0	2,5	5	7,5	10	7,00		+	+
	Built Area %	0%	10%	20%	30%	40%	24%	-	-	+
	Fragmentation Indicator	0	0,2	0,4	0,6	0,8	0,65	-	-	+
	Desertification Vulnerability	0%	15%	30%	45%	60%	27%	-	-	+
	Water Consumption/Natural Water Supply	20%	40%	60%	80%	100%		-	+	+
	Sea Water Quality	100%	95%	90%	85%	80%	100%	-	+	++
	Air Quality	0	50	100	150	200	65			

# Scenario Conclusions

<b>Business-as-Usual</b>	<b>Weak Sustainability</b>	<b>Strong Sustainability</b>
<p>Declining environmental and social state</p> <p>Economic growth</p> <p>Collapse?</p>	<p>Lessened but still declining social and environmental state</p> <p>Still surpassing carrying capacity</p>	<p>Improved social and environmental state</p> <p>Economic and tourism degrowth</p> <p>Within carrying capacity limits</p>

# Conclusions

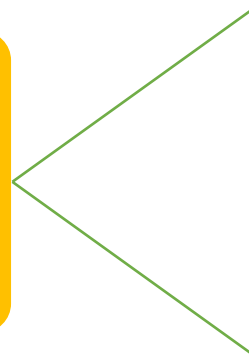
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Mykonos seems to have surpassed its Carrying Capacity

Lowered Durability  
High Vulnerability

Tourism

Destination





**Thank you for your attention!**