

GREENING THE ISLANDS OBSERVATORY

“GREENING THE ISLANDS OBSERVATORY – GLOBAL INDEX”

DATA COLLECTION SHEET

Name of the island: **Crete**

0. GENERAL INFORMATION ABOUT THE ISLAND

0.1. Population residing on the island 623.065 (2011)

0.2. Average population in the peak tourist month: more than 1million (2011)

0.3. Surface area: 8,303 km²

0.4. Presence of energy and/or environmental planning tools on the island (e.g. energy plans, waste management plans, water management plans, sustainable mobility plans)

1. “Regional Waste Management Plan of Crete”, 2016 <https://www.crete.gov.gr/prefecture>

2. “Water Management Plan of Crete”, 2017 <https://www.apdkritis.gov.gr/el/dataset/>

3. “Energy Planning Region of Crete”, 2016

0.5. If existing, specify the names of such plans and approval details

0.6. Links to dedicated web sites

0.7. Attach any suitable documentation

0.8. Presence of any protected natural areas (parks, reserves, marine protected areas, etc.) Yes

0.9. If existing, specify the year when they were created, the entity in charge, the type of protected area and restrictions; briefly describe protection legislation, local regulations, restrictions, percentage of protected area, surface area and any other suitable information

NATURA 2000 sites:

There are 54 sites in Crete included in the European Ecological Network NATURA 2000. They integrate both terrestrial and marine areas and are designated either as Special Protected Areas or Sites of Community Importance. The total surface of the 53 sites corresponds to about 30% of Crete’s total area. There are two Management Bodies for the sites, one for Western Crete (23 sites) and one for Central and Eastern Crete (31 sites).

0.10. Links to dedicated web sites

0.11. Attach any suitable documentation

0.12. Any environmental quality certifications and/or quality labels recognized by the local government

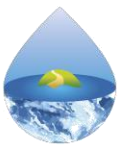
Green key <https://www.greenkey.gr>

0.13. If such certifications/labels were granted, specify the type, year, entity and briefly describe the certification

0.14. Links to dedicated web sites

0.15. Attach any suitable documentation





0.16. Presence of companies operating in the tourism sector which were granted officially recognized environmental quality certifications and/or labels

<https://www.greenkey.gr>

0.17. If existing, specify the number and briefly describe the type of certification, type of company and meaning of the certification

0.18. Attach any suitable documentation

0.19. Significant projects in the “Sustainable tourism” sector

- INTERREG EUROPE “BRANDTour”- Building Regional Actions for New Developments in Tourism
- INTERREG MED “PANORAMED” - Mediterranean Governance Platform
- INTERREG MED «BLUEISLANDS» Seasonal variation of waste as an effect of tourism
- INTERREG MED “MISTRAL” Mediterranean Innovation STRAtegy for transnational activity of clusters and networks of the Blue Growth
- INTERREG ADRION “TOUREST” Tourism Water Management For Sustainable Adrion Coastal Areas

0.20. If existing, briefly describe the most relevant projects carried out on the island, including by private entities, to promote sustainable and responsible tourism

0.21. Links to dedicated web sites

0.22. Attach any suitable documentation



1. ENERGY SECTOR

Reference year of data: **2017**

1.1. ELECTRICITY

1.1.1. Number, type and capacity of centralized energy generation plants on the island (thermal power stations, co-generation plants, solar plants, district heating):

- **3 Thermal Power Plants with 824,8MW total installed capacity**
- **34 Wind Farms with total installed capacity of 200,3 MW**
- **Photovoltaic Plants in fields with 78,29 MW total installed capacity**
- **Photovoltaic Panels on building roofs with 17,39 MW total installed capacity**
- **1 Hydroelectric Plant with 0,3 MW total installed capacity**

1.1.1.1. Total annual generation of electricity:

3.019.581 MWh (1.7% increased compared to 2016)

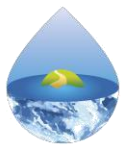
1.1.1.2. Total annual consumption of electricity:

3.019.581 MWh (1.7% increased compared to 2016)

1.1.5. Monthly generation of electricity: (specify the MWh of electricity generated each month of the reference year)

Ref. Year 2017	Electricity generation MWh/month
January	260.090,60
February	209.874,40
March	212.687,40
April	201.131,40
May	233.885,50
June	272.339,90
July	340.748,40
August	336.075,00
September	284.169,00
October	236.359,80
November	202.684,40
December	229.535,70
Sum	3.019.581,50





1.1.6. Type of electricity generation: (specify the various sources of energy generation and the relating percentage of the total generation)

Net System Production	3.019.581,40	%
Net steam-electric production	1.030.589,00	34,13%
Net Diesel Production	719.602,20	23,83%
Net Turbine Production	616.231,20	20,41%
Net Hydroelectric Production	295,40	0,01%
Net Wind Farm Production	512.832,10	16,98%
Net PV Production	140.032,60	4,64%

1.1.7. Percentage of electricity produced by renewable sources: %

The net electricity production from renewable energy sources for the reference year (2017) was 21.63% of the total generation of the system, while for 2016 the percentage was 25%.

1.1.8. Total installed capacity of electricity generation plants from renewable sources: MW (specify the capacity by type of renewable source)

- **34 Wind Farms with total installed capacity of 200,3 MW**
- **Photovoltaic Plants in fields with 78,29 MW total installed capacity**
- **Photovoltaic Panels on building roofs with 17,39 MW total installed capacity**
- **1 Hydroelectric Plant with 0,3 MW total installed capacity**

1.1.9. Attach any suitable documentation

Details regarding energy data of Crete: <https://www.deddie.gr/>

1.2. THERMAL POWER

1.2.1. Number, type and capacity of thermal power plants on the island (thermal power stations, co-generation plants, solar plants, district heating...)

There are 3 Thermal Power Plants on the island with 824,8MW total installed capacity:

- **Linoperamata thermal power plant in the Regional Unit of Heraklion (279,1MW)**
- **Atherinolakkos thermal power plant in the Regional Unit of Lasithi (211,2MW)**
- **Xylokamara thermal power plant in the Regional Unit of Chania (334,5MW)**



Details about the type and capacity of each thermal power plant:

Type of Plant	No of units	Installed Capacity (MW)
Linoperamata Thermal Power Plant		
Steam-electric	6	111,30
Diesel	4	49,20
Turbines	5	118,60
Atherinolakkos Thermal Power Plant		
Steam-electric	2	93,00
Diesel	3	118,20
Xylokamara Thermal Power Plant		
Turbines	5	202,20
Combined Cycle	3	132,30

1.2.2. Total annual generation of thermal power: thermal MWh (if available, please specify consumption of diesel fuel, LPG, methane or other sources used to generate heat, net of the volumes used in the electric power stations)

	Installed Capacity (MW)	Annual Production (MWh)	Fuel Oil 3500 Consumption (tn)	Diesel 3500 Consumption (tn)
Linoperamata Thermal Power Plant				
Steam-electric	111,30	499.073,50	168.971,10	0,00
Diesel	49,20	196.484,40	40.919,10	223,30
Turbines	118,60	59.112,90	0,00	19.649,20
Atherinolakkos Thermal Power Plant				
Steam-electric	93,00	531.514,50	137.474,90	0,00
Diesel	118,20	523.117,70	106.864,40	14,90
Xylokamara Thermal Power Plant				
Turbines	202,20	141.245,00	0,00	51.835,60
Combined Cycle	132,30	415.873,50	0,00	239.394,40
SUM	824,80	2.366.421,50	454.229,50	311.117,40

1.2.3. Type of thermal power generation: (specify the various sources of energy generation and the relating percentage of the total generation)

	MWh	%
Total Annual Generation	2.366.421,00	100
Steam-electric	1.030.588,00	43,6



Diesel	719.602,20	30,4
Turbines	616.231,20	26,0

1.2.4. Percentage of thermal power produced by renewable sources: % **None**

1.2.5. Total installed capacity of thermal power generation plants from renewable sources: MW
(specify the capacity by type of renewable source) **None**

1.2.6. Attach any suitable documentation

Details regarding energy data of Crete: <https://www.deddie.gr/>

1.3. ADDITIONAL INFORMATION

1.3.1. Presence of LED public lighting : **Yes**

1.3.2. If existing, specify the percentage of total lights -

1.3.3. Projects/Activities/Actions in the smart Grid and/or Storage sectors

There are 14 projects that have received a Production License from the Greek Regulatory Energy Authority that have to do with energy storage technologies. The projects include two technologies for energy storage, pump-storage and batteries. The total guarantee capacity of the 14 projects is 291MW.

1.3.4. If existing, please provide a brief description

In the following table, details regarding energy storage projects are presented:

Place of the Project (Regional Unit)	Installed Capacity of RES (MW)	Type of RES	Guarantee Capacity (MW)	Technology
Heraklion	90,10	Wind Farm	75	Pump-storage
Heraklion	18,00	Wind Farm	12	Pump-storage
Chania	5,10	Wind Farm	5	Pump-storage
Chania	10,50	Wind Farm	5	Batteries
Lasithi	6,80	Wind Farm	5,1	Pump-storage
Lasithi-Rethymnon	81,00	Wind Farm	50	Pump-storage
Lasithi	11,90	Wind Farm	9	Pump-storage
Chania	4,73	Wind Farm	1,95	Batteries
Chania	16,15	Wind Farm	12	Pump-storage
Chania	2,55	Wind Farm	1,95	Pump-storage
Lasithi	19,55	Wind Farm	15	Pump-storage
Rethymnon	11,90	Wind Farm	9	Pump-storage
Chania-Lasithi	20,40	Wind Farm	15	Pump-storage
Chania-Heraklion	99,00	Wind Farm	75	Pump-storage

More details: www.rae.gr



1.3.5. Awareness-raising activities, incentives, benefits, laws, local regulations, etc. to support the use of renewable energy sources and energy savings in the civil sector

The Region of Crete has set as a priority energy saving, energy efficiency and reducing energy consumption. Through its Regional Operational Program it funds projects with total budget 24.000.000€, shared as follows:

- Energy saving in public buildings: 16.000.000€ budget
- Energy saving in houses: 6.000.000€ budget
- Promotion of innovative materials and technologies in energy: 2.000.000€ budget

Moreover, Environment-Energy is one of the 4 Pillars in Regional Smart Specialization Strategy of Crete (RIS3-Crete). The Regional Smart Specialization Strategy seeks to use scientific knowledge, innovation and ICT's to tackle major environmental problems and challenges for Crete. In the energy sector, the aim is to develop internationally competitive products and services in the areas of:

- Energy saving
- Promotion of renewable energy
- Reduction of the carbon footprint in economic activities (hotels, industries, hospitals and other public buildings)

The Region of Crete coordinates actions with other public bodies of the island for promoting energy efficiency and energy saving. On its own initiative, the installation of PV systems in the Municipalities and the Local Land Reclamation Organizations is being studied using Net Metering and Virtual Net Metering. The application of Net Metering and Virtual Net Metering in Greece which was set in force with the Decree ΑΠΕΗΛ/Α/Φ1/οικ.175067 (FEK B' 1547/5.5.2017).

1.3.6. If existing, please describe the type of action and attach any supporting documentation

1.3.7. Other actions/activities/projects aimed at reducing energy consumption and promoting the use of renewable sources

The Region of Crete implements four European Projects that deal with increasing energy efficiency in public buildings, energy saving and efficient use of energy in the building sector. More specifically:

Interreg Europe Project "REBUS - Renovation for Energy efficient BUildingS". Its objectives are:

- Improve the capacity of public authorities in European regions, to undertake efficient renovation works of their public building stock, thus saving energy and public resources.
- Support local authorities in designing an Energy Renovation Path (ERP) for planning, implementing and monitoring renovation works in public buildings.
- Improve skills at individual, organisational and regional level.

Interreg Europe Project "CLEAN - Technologies and open innovation for low-carbon regions". Its objectives are:

- Increase energy efficiency in housing and public infrastructure by 4% through technology, open innovation and improved low-carbon policy instruments.
- Stimulate effective engagement between public authorities and citizens who own properties, and research centers and companies who can introduce new innovative energy efficiency solutions.
- Positive change of citizen energy behavior.

Interreg MED Project "SHERPA - SHared knowledge for Energy Renovation in buildings by Public Administrations". Its objectives are:

- Development of a Regional Strategy for Energy Efficiency in Public Buildings
- Creation of a new governance structure



- 200 project proposals for Energy Renovation in Public Buildings
- Training of the civil servants involved

Interreg Greece-Cyprus Project STRATENERGY - Strategic cross-border cooperation & capitalization of a common approach for the energy saving in public buildings

STRATENERGY supports concrete and sustainable solutions, in particular:

- (a) Promotes and encourages the implementation of demonstrative mature projects in public buildings taking into account all parameters
- (b) It finalizes the common framework for strategic and operational planning by 2030 each public institution for achieving energy savings in practice.

The expected results are: - Much strategic EUE projects in public buildings in the area building on the knowledge of ENERGEIN project (and SYNERGEIN project). Contribution to Special Objective 2.1 (primary energy reduction of ~ 4868 MWh per year). - Increase the know-how on "energy planning" in public buildings by: (a) enriching the experience of strategic projects in the region (from 2013), (b) designing and piloting a common energy saving planning framework for each institution in its public buildings, (c) the wider use of the results through the use of IT applications. - Maximizing contribution to the 2030 targets of European, national and local energy saving policies in public buildings.

- 1.3.8. If existing, please describe the type of action and attach any supporting documentation for each action described



2. WATER CYCLE

Reference year of data: 2017

2.1 PRODUCTION PHASE

OAK SA water supply – irrigation networks of Crete. The project of former OADYK “Integrated Water Resources Management of Western Crete” has been expanded with the water networks of Eastern Crete. The networks of OAK SA include: 430 km mains and distribution irrigation networks in Western Crete (irrigation area of 135.000 ha) and water supply network 70 km in Eastern Crete (Water supply for 264.000 residents and 125.000 hotel beds). OAK SA distributes annually 45 million m³ water, through the water network, with about 28 pump stations and many water drillings.

- 2.1.1. Type of drinking water production (desalination/ local springs/import/treatment facilities/etc.)
Water Treatment Plant with Capacity 110.600 m³/day of Aposelemis Dam (Heraklio). Water Supply of the cities of Heraklio, Chersonisos , Agios Nikolaos, Malia, Elounda, Neapolis. Water supply for 264.000 residents and 125.000 hotel beds.
- 2.1.2. Total per capita water volume produced: 36 cubic metres/inhabitant*year (data for potable water from WTP of Aposelemis Dam).
- 2.1.3. Annual volume of water produced locally (specify the type of production): 46.714.356,34 cubic metres

Type of production	Water Volume (m ³ /year) 2017
Water drillings	12.438.158,00
Springs	14.387.689,50
Rivers	156.100,00
Lakes	4.843.350,00
Dams' Reservoirs	14.631.966,04
Lakes' Reservoirs	257.092,80
Total	46.714.356,34

- 2.1.4. Annual volume of water supplied by tankers (barges): 0 cubic metres
- 2.1.5. Annual volume of water supplied by submarine pipelines: 0 cubic metres
- 2.1.6. Annual volume of water produced by desalination plants: 0 cubic metres
- 2.1.7. Total annual electricity needs of desalination plants connected to the grid: MWh
- 2.1.8. Average cost of electricity supplied to desalination plants connected to the grid: €/MWh
- 2.1.9. Annual consumption of diesel fuel used by desalination plants using independent generators: litres or kilograms
- 2.1.10. Average cost of diesel fuel to feed desalination plants using independent generators:€/litre or €/kg
- 2.1.11. Percentage of electricity used for desalination generated from renewable sources:%



2.2. DISTRIBUTION PHASE

- 2.2.1. Annual volume of water supplied to the local distribution network: 37.759.016 cubic metres
- 2.2.2. Monthly volume of water supplied to the local distribution network: cubic metres
(specify cubic metres for each month of the reference year)
- 2.2.3. Percentage of water losses in the water network: 20 %

2.3. TREATMENT PHASE

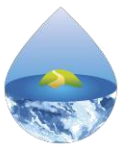
- 2.3.1. Is there a treatment facility? (Yes/No) YES See 2.1.1
- 2.3.2. Treatment capacity of facilities (in inhabitant equivalent): See 2.1.1
- 2.3.3. Percentage of wastewater treated:
- 2.3.4. Reuse of treated wastewater: (Yes/No) (If so, specify what type or reuse)
- 2.3.5. Total annual electricity consumption by treatment systems: MWh

- 2.3.4. Reuse of treated wastewater: (Yes/No) (If so, specify what type or reuse)
- 2.3.5. Total annual electricity consumption by treatment systems: MWh

2.4. ADDITIONAL INFORMATION

- 2.4.1. Awareness-raising actions, distribution of flow restrictors, monitoring and control of the water network, etc.: (Yes/No) (If existing, describe the type of action and attach any supporting documentation)
- 2.4.2. Other actions/activities/projects aimed at loss reduction, consumption reduction and/or water resource recovery: (Yes/No) (If existing, describe the type of action and attach any supporting documentation for each action)





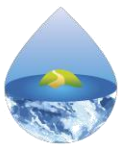
3. SUSTAINABLE MOBILITY

- 3.1. Reference year of data: 2019
- 3.2. Type of vehicles used for local public transport: Diesel
- 3.3. Motorization rate: 100%.... Number of motor vehicles per 1,000 inhabitants
- 3.4. Percentage of electric/hybrid vehicles out of the total number of vehicles: Lower than 5%
- 3.5. Automotive diesel consumption: litres
- 3.6. Automotive petrol consumption: Litres
- 3.7. Automotive LPG consumption: Litres (as a percentage of the total fuel consumption near 0%- only 2 stations, in the capital city of Crete, Heraklion, provide Lpg)
- 3.8. Automotive methane consumption: 0 cubic metres
- 3.9. Number of car rentals on the island:
- 3.10. Number of car rentals with electric cars: 0
- 3.11. % of car increase during the tourist season: 300 % in some areas, like the road section of the Northern national Road of Crete, Heraklion – Malia.
- 3.12. Presence of incentive parking lots – No
- 3.13. Presence of working electric/hybrid vehicles charging stations: No
- 3.14. Number of working electric/hybrid vehicles charging stations: 0
- 3.15. If existing, how many of them are fast charging stations:
- 3.16. Presence of charging stations for electric/hybrid boats: No
- 3.17. Number of charging stations for electric/hybrid boats:
- 3.18. Are there any low-environmental impact boats? If so, provide a brief description of the type of boat and type of technology used
Recently there was a process regarding the operation of passenger boats and their impact in the environment due to their consumption of conventional fuels. They consume oil products- Diesel, mazout. I am not sure but I don't think that they converted the boats to consume gas, a more friendly fuel for the environment. As I read the recent publication it seems like they finally used a filter on the exhaust system and they kept the same fuel for operation as before.
- 3.19. Presence of bike paths: Yes
- 3.20. If existing, how many kilometers

In cooperation with the municipalities this can be answered more precisely.

- 3.21. Percentage of bike paths out of the total road network
- 3.22. Awareness-raising actions, incentives, benefits, laws, local regulations, etc. for the use of bicycles and/or electric vehicles: No
- 3.23. Other actions/activities/projects to promote sustainable mobility: (Yes/No) (If existing, provide a description of the type of action and attach any supporting documentation relating to each action described)





4. WASTE CYCLE

- 4.1. Reference year of data: 2018
- 4.2. Total annual waste generation: ~ 375.000 tons
- 4.3. Total monthly waste generation: ~ 31.250 tons (specify the number of tons generated each month of the reference year)
- 4.4. Total annual percentage of separate collection: ~ 12 %
- 4.5. Total annual quantity of separately-collected waste: ~ 44.000 tons
- 4.6. Total monthly quantity of separately-collected waste: ~ 3.700 tons (specify the tons of separately-collected waste generated in each month of the reference year)
- 4.7. Total quantity of non-recyclable waste collected annually: - tons
- 4.8. Total quantity of organic fraction collected annually: ~ 7.500 tons (separate collection)
- 4.9. Total quantity of glass and cans collected annually: ~ 13.500 tons (separate collection)
- 4.10. Total plastic waste collected annually: ~ 15.000 tons (separate collection)
- 4.11. Total paper and cardboard collected annually: ~ 6.000 tons (separate collection)
- 4.12. Presence of waste disposal and/or recycling facilities: (Yes)

- 4.13. Total annual cost of waste collection and disposal (100 - 200 Euro / tn - Estimation)
- 4.14. Awareness-raising actions and/or distribution of household composters: (Yes - Chania)

- 4.15. Mayor's orders/laws/local regulations forbidding the sale of non-compostable products : (No)

- 4.16. Other actions/activities/projects aimed at waste reduction, recovery and recycling: (Yes)

