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Committee on Environmental and Health crisis: Governance and solidarity challenges
Comité Crise environnementale et sanitaire : Enjeux de gouvernance et solidarité

Extreme summer temperatures in Greece

Heatwaves and traditional Bioclimatic architecture

Social Cooperative of Cyclades

ALTERA VITA

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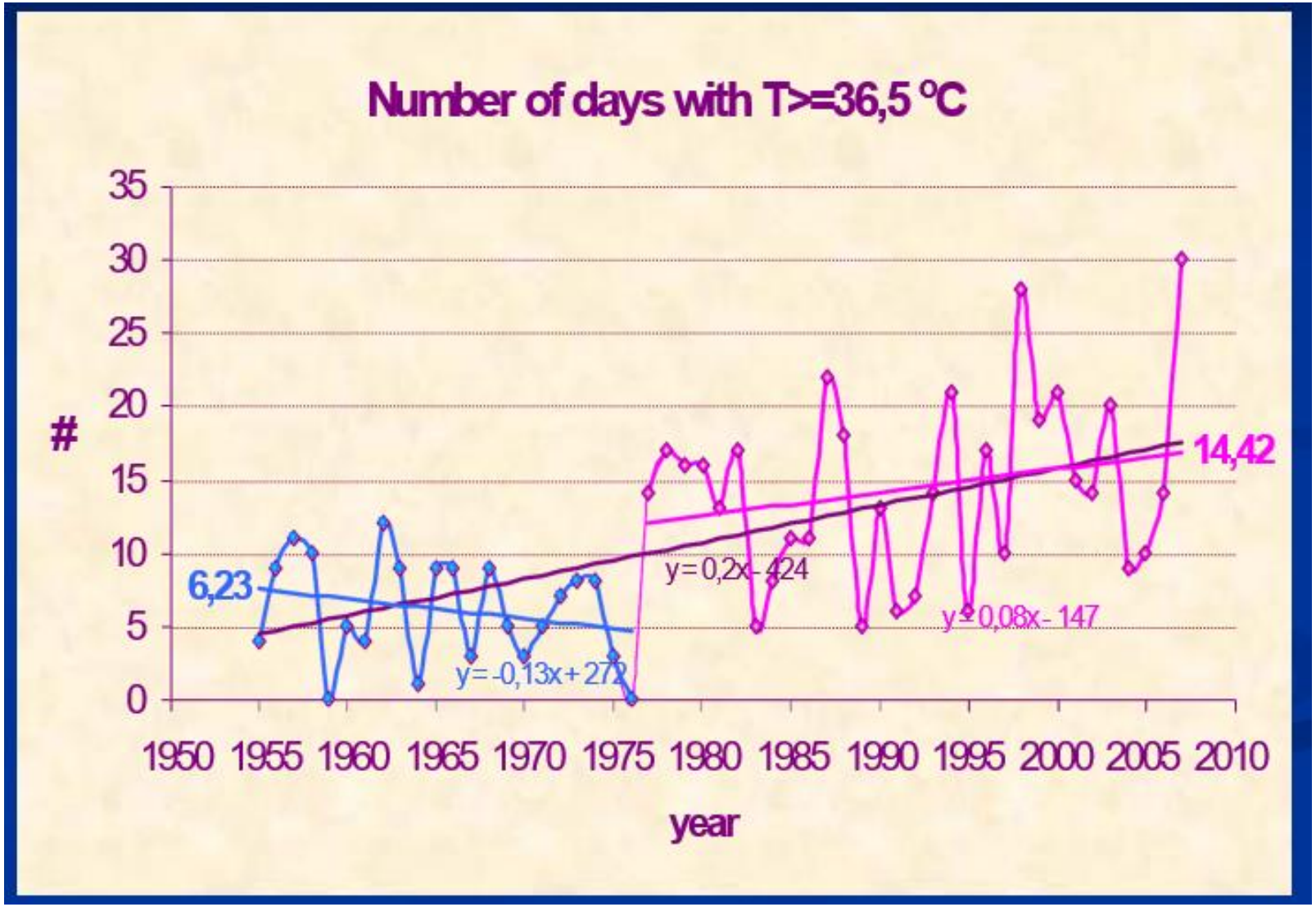
Definitions

- "Although the heat wave phenomenon is widely perceived **as a prolonged period of excessive heat**", there is no commonly accepted definition in the international literature regarding what constitutes a "prolonged period" and especially what constitutes "excessive heat".
- The **minimum duration of three days** seems to have prevailed in the literature and to have been **adopted by most meteorological services.**
- A common approach is to use upper percentiles (90th or 95th) of the maximum daily temperature distribution, which represent the local climate of an area, often using a combination of maximum and minimum (nighttime) temperature thresholds.

The definition criterion for a Heat Wave in Greece is:

- at least 3 consecutive days with max air temperature >= **36.5 Cº**

Number of days with T>36.5 increase



Summer 2021: The Greek heat wave of records

- From the comparison with all heat waves from 1890 to the present, based on data from the EAA historical station in Thisio - Athens, this year's heat wave presented:
- The **longest heat wave ever** recorded at the historic EAA station (**10 days**), with heat waves 8-16/8/1945, 19-27/7/2007 and 8-16/7/2012 following, with nine days duration each.
- **The second highest daily maximum temperature** value ever recorded at the historic EAA station**, equal to 43.9 Cº** (03/08/2021), with the absolute record still standing at **44.8 Cº** recorded during the heat wave of **June 2007** (6/26/2007)
- In **other areas of mainland** Greece, much higher temperatures (**up to 47 Cº**) were recorded, also breaking historical records, according to the network of meteorological stations of the meteo service of the EAA and the National Meteorological Service.
- In conclusion, the main characteristics of this year's heat wave were its **long duration, high temperatures also during the night**, as well as the overall cumulative heat (a combination of intensity and duration). Πηγή: Protagon.gr


Greek stations during HW2021
Thessaloniki (40.5 °C)
Ioannina (40.4 °C)
Larisa (44.0 °C)
Mytilini (39.8 °C)
Makrakomi (46.3 °C)
Stylis (45.9 °C)
Agioi Theodoroi (45.1 °C)
NOA (43.9 °C)
Zakinthos (41.4 °C)
Samos (41.4 °C)
Kranidi (45.8 °C)
Arfara (46.1 °C)
Paros (39.2 °C)
Argos (45.6 °C)
Sparti (45.7 °C)
Souda (40.2 °C)
Moires (45.2 °C)
Sivas (45.3 °C)
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
N
400 km

Fires

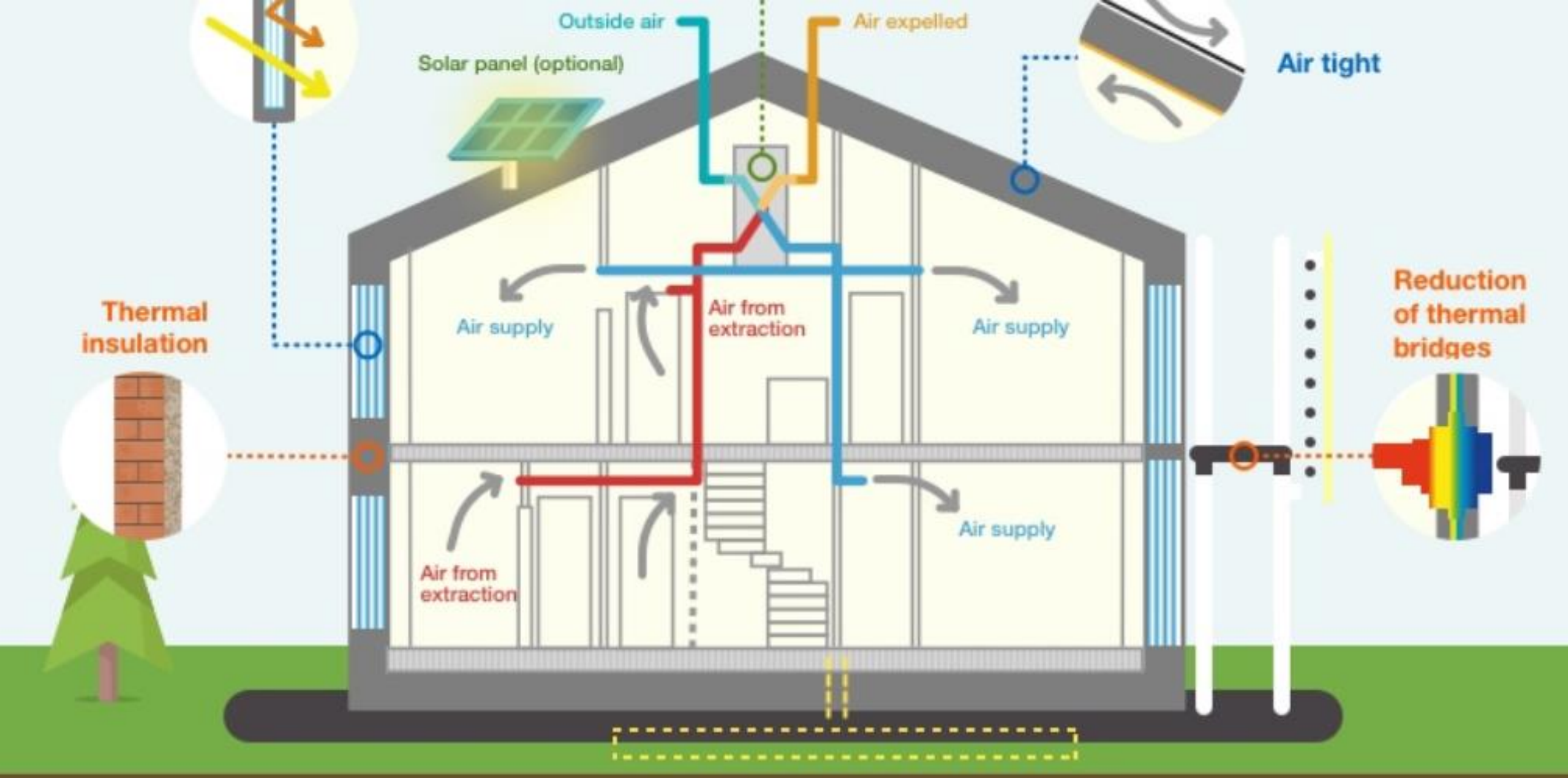
BIO-CLIMATIC ARCHITECTURE . . . POPULAR KNOWLEDGE

- In recent decades, the requirement to minimize negative impacts on the environment and the need to reduce energy consumption have significantly reformed the perceptions of building design.
- The construction of buildings that will function as "**living organisms**" in direct connection with their natural environment is presented as a capable solution to the energy and social crisis of our times.
- The **integration of environmental parameters into the design of the building** is an integral part of our traditional architecture.
- The principles of **Bioclimatic Architecture** as they are formulated today, expressed by the transfer of practices of the past, and how are these practices adapted to keep up with modern building requirements.

Modern bioclimatic architecture

- **emphasis on**:
- limiting energy consumption from non-renewable sources
- saving water
- avoiding overheating of buildings (in view of climate change)
- the choice of building materials and methods with ecological criteria


Sustainable Energy Consumption
Utilize Low Flow Fixtures
Reduce Storm Water Runoff
Solar Panel Installation
on select projects
Vehicle Charging Stations



Source: Passivhaus Institut.

Traditional/folk architecture in Greece

- Popular knowledge and experience in Greece were incorporated into the buildings in simple ways.
- In the search for the bioclimatic building, the traditional house can provide important information in modern design.
- The principles of bioclimatic building that are distinguished in the constructions of the past, have the possibility to adapt to modern needs.
- Characteristic of traditional/folk architecture was **freedom, improvisation, and independence from any style or theory**.
- The traditional builders, **guided by the weather conditions**, the economy and **the available material of each region**, adapted their techniques to the conditions of their place in a natural and effortless way.


Chelidonia

A. The main components of modern bioclimatic architecture

- **A1. Limitation of energy consumption from non-renewable sources**
- **A2. Saving water**
- **A3. Avoiding overheating of buildings**
- **minimization of direct heating from the sun**
- **natural cooling**
- **ground cooling**
- **prompt for semi-outdoor living**
- **A.4 Bioclimatic design of the building environment**
- **configuration of uncovered areas**
- **utilization of wind flow**
- **appropriate tree planting**
- **A5. Selection of building materials and methods with ecological criteria**

B. The main components of Greek traditional bioclimatic architecture

- **B1. Limitation of energy consumption from non-renewable sources**
- **Limiting energy consumption in transportation of building materials**
- With a short-sighted view of ecology, **we often choose materials that are environmentally friendly, but come from distant locations (eg wood from Indonesia)**.
- The energy used to transport materials is one of the main factors contributing to the destruction of the natural environment.

Limitation of energy consumption for heating of buildings

- Saving energy for heating is achieved by appropriate design to minimize the thermal losses of buildings.
  The thick stone or brick exterior walls of the buildings had a high heat capacity.

- **Use of watermills and windmills**
- **Strabo gave the earliest written evidence of the existence of a watermill.** Describing the palaces of the Pontian king Mithridates VI (120 - 63 BC) he speaks of a "hydralet".
- **Watermills and windmills** are among the most interesting creations of our traditional architecture. Buildings designed with special know-how for the use of renewable energy sources are also morphological landmarks of our traditional settlements.
- **Watermills** can be considered the **ancestors of modern hydroelectric works.**
- **Windmills**

With windmills, which were popular from the 12th to the 19th century, wind energy was used to grind cereals. They were built mainly on the islands, were also built in mainland Greece.

Windmills can be considered **the ancestors of modern wind turbines**

Save water

Cisterns

- The saving of water in traditional buildings located in areas without rivers and natural springs is carried out by collecting rainwater in cisterns.
- The **cisterns are located in the basement of the building** or in an outdoor area next to the building.
- The outdoor cisterns are covered.
- Rainwater is mainly collected on flat roofs. From the roof, the water is led by clay tubular gutters (kiugia) to the cistern.

Cisterns of Santorin

Avoiding overheating of buildings

- In the Greek area and especially south of the 39th parallel, avoiding overheating of buildings was one of the main goals of traditional architecture.

Bioclimatic design of buildings

In the design of traditional Greek buildings, almost all the components of modern bioclimatic architecture, which we mentioned above, were implemented.

- **minimization of direct heating from the sun**
- **avoiding extensive glazing**

Radiation of heat to the sky

- In the Cyclades the shells of the buildings are **white.**
- With successive whitewashes carried out at regular intervals, absolute whiteness is continuously maintained.
- **Most of the long-wavelength solar radiation is reflected and does not heat the building.**
- Modern research carried out in the world's largest research centers ends up urging us to paint white, at least the roofs of buildings, or apply white coatings.
- They refer to the example of the **Cycladic settlements and other settlements in the Mediterranean.**

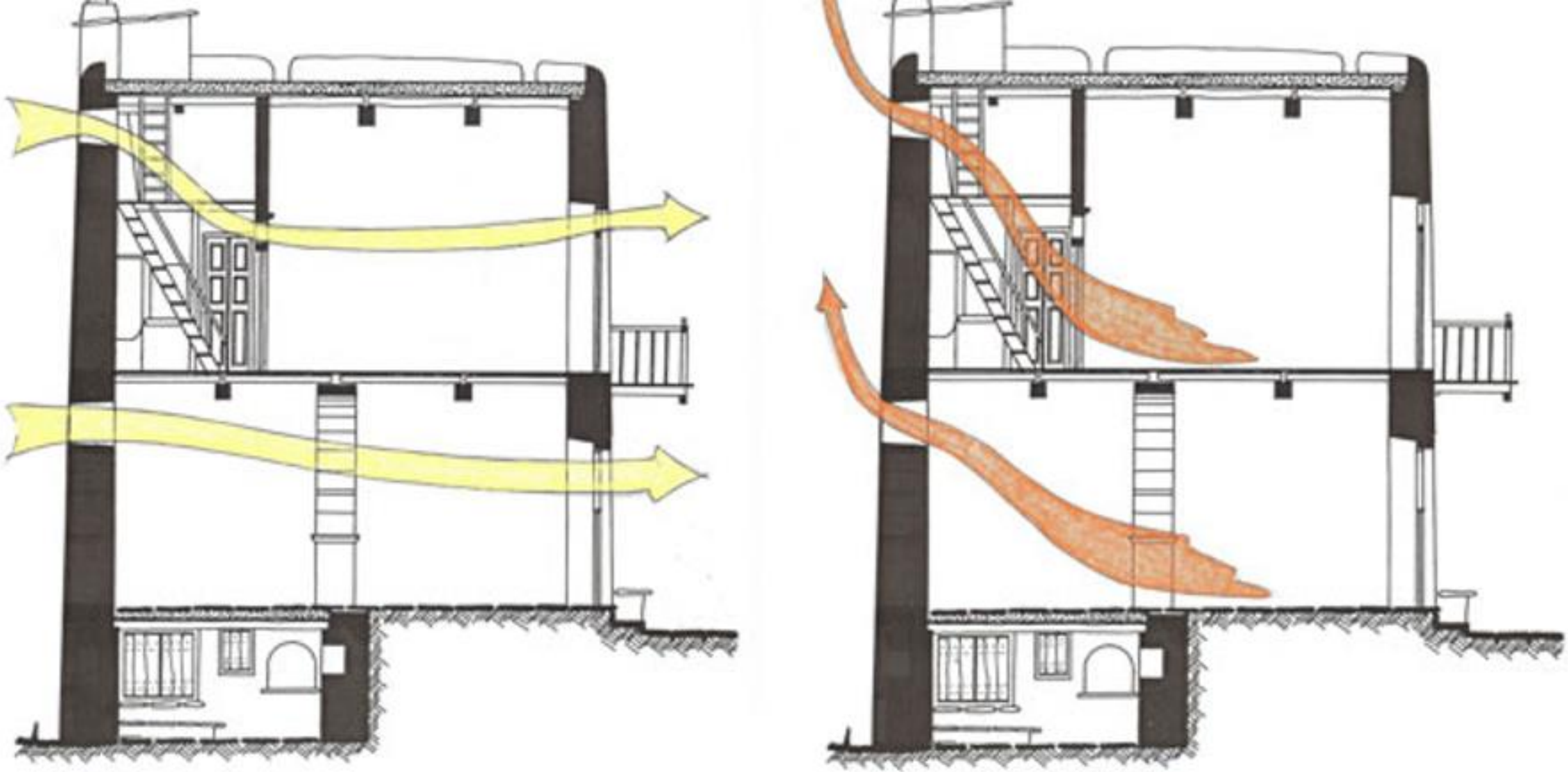
Cyclades -Naousa Paros

external shading

- External shading is achieved with a canopy, with arbors, as well as by planting suitable plants in suitable positions.

Natural cooling techniques

- The **main openings** were placed, whenever possible, **on the south** or east side of the building, **small openings** were created in the highest part of the external walls, **mainly opposite the main openings** and preferably **on the north side**.
- In the summer months, by leaving the windows open, a very satisfactory cooling was achieved, from the current of air entering through the small windows of the northern walls and passing through the building



(Left) Φ08. Through Ventilation - north wind entry from north face,
(Right) Φ09. Cooling - exhausting hot air from inside the building.

Caves of Santorin-cooling from the ground

- **Passive cooling from the ground** is provided during the warm months of the year **in underground and semi-underground buildings**, as well as in buildings that have walls in contact with the ground.
- **Caves** are found mainly in Santorini where it is easy to excavate the volcanic soil.

Life in Greece is outdoors

- **outdoor life**

"Life in Greece is outdoors", in particular, south of the 39th parallel, the climate is so mild that people for most months of the year prefer not to live indoors, but in **sheltered spaces that have at least one side open to the outdoors**.

These spaces are called **semi-outdoors in modern architecture**, while in our traditional architecture they were called loggias.

Hayati in Arabic means life. The origin of the term is not accidental, as the loggia housed most of the **activities of daily life**.

F11. Hatzigianni Mexi mansion with semi-outdoor spaces in Spetses.

Bioclimatic design of building environment

- Limiting paving to the absolutely necessary helps to avoid overheating.
- At the same time, it contributes to the operation of the **hydrological cycle.**
- In **the settlements of the Cyclades**, the perimeters of the slabs and the joints between them (an important percentage of the total paving) of the **streets, squares and courtyards are whitewashed** (for reasons of cleanliness) and thus a reduction in solar heat absorption is achieved.

Whitewashed streets, squares and courtyards

Utilization of wind flow

- **Aristotle, Hippodamus, Xenophon, Vitruvius** and others have dealt with the appropriate arrangement of buildings in each residential complex.
- One of the **layout criteria of our traditional settlements** is, depending on the local conditions, **wind protection** or **the use of the wind to cool and clean the settlement**.
- In the hot regions of our country, **traditional settlements in Cyclades** have a layout that allows the **free flow of wind**, to cause **natural ventilation of the streets and to facilitate the natural ventilation of buildings.**

Utilization of wind flow in the Castle of Sifnos

Traditional settlement of Chora of Mykonos

- A typical example is the traditional settlement of Chora of Mykonos with the serpentine layout of the **narrow streets** (alleys) which, with a suitable layout in relation to **the winds** that prevail in summer, **create air flows that cool the settlement and the buildings**.
- They also carry away pollutants, cleaning the atmosphere on the micro-scale of the settlement.


PARALOS
COLD STORE

Appropriate tree planting

- It is obvious that they **used trees and plants** in general, **which belonged to the ecosystem of the area.**
- Trees and other plants, such as the **vines in the arbors**, were **used for shade.**
- **Deciduous trees** provided **shade in the summer**, while they did not block the **sun during the winter.**
- Where wind flow was required for cooling, it was never obstructed by planting trees.

Selection of building materials and methods with ecological criteria

- In our traditional architecture, **building materials and construction methods are used that:**
- - did not cause significant CO2 release
- - did not cause ozone depletion in the atmosphere
- - did not require significant consumption of non-renewable energy sources
- **In particular, the materials used:**
- - they were recyclable
- - they were user friendly
- - their removal from nature usually did not harm the natural environment

Epilogue

- The goal **of traditional architecture** was to **maximize functional output** while economizing on material and energy input.
- When **modern architecture** follows this goal, it minimizes its negative impact on the environment and can be labeled "bioclimatic".
- In our time the most serious natural threat is climate change.
- Modern efforts to slow down climate change should look back to the traditional ideology of simplicity and sustainability and wellbeing!!

ERASMUS + Live on the island

- **8 organizations from 8 different islands from all over the world in an ERASMUS + for the development of awareness of the environment**
- **Consortium**
- - Ottovolante Sulcis (Sant'Antioco, Italy)
- - Udruga Prizma (Croatia)
- - Teatro Metaphora (Madeira, Portugal)
- - Social Cooperative of Cyclades- Altera Vita.(Syros, Greece)
- - Community Forests Pemba (Pemba, Tanzania)
- - SYAH Cabo Verde (Cape Verde)
- - Morobe Development Foundation (Papua New Guinea)
- - CEMEA Martinique (Martinique)


https://fb.watch/fXektOisit/
20h
Tanzanie Les arbres de l'espoir
04 / 3:47

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