

TREASURE 

Thermal Risk Reduction Actions and Tools for Secure cities

# LAYMAN'S REPORT

TREASURE, co-funded under Grant Agreement No. 695561 from the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG-ECHO) of the European Commission





National Technical University of Athens (El)  
**Coordinating Beneficiary**



National Observatory of Athens (El)  
**Associated Beneficiary**



National & Kapodistrian University of Athens (El)  
**Associated Beneficiary**



AnySolution S.L. (Es)  
**Associated Beneficiary**



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# What is it all about?

TREASURE (ECHO/SUB/2014/695561) is a project co-funded by the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG-ECHO) of the European Commission. TREASURE integrates -for the first time- the expertise of epidemiologists, climatologists, Earth Observation scientists and IT developers into intelligent heatwave risk assessments for Authorities and personalized tools for citizens.

## Why?

Heatwaves are extreme temperature events that affect human health. For this reason the European Environmental Agency recognizes them as one of the most prominent hazards in Europe. The 2003 European heatwave which caused 25,000-70,000 excess deaths across Western Europe, mainly in urban areas, is a stark reminder of the dangers that extreme temperatures pose to humans. TREASURE addresses the growing need of protecting the safety and wellbeing of the urban population by developing a series of tools that appraise and quantify the spatially distributed heatwave risk now and in the future.

## Where?

### Athens (El) & Palma de Mallorca (Es)

Athens and Palma were selected as pilot cities. Both cities belong to the Mediterranean basin which has been assigned as a 'hot spot' in the context of climate change. Yet, the cities are very different in size, enabling the evaluation of the applicability of the services both to metropolises and smaller cities.



## Why is TREASURE Innovative?

At the moment heat wave risk estimations rely on data from single, centrally-located weather stations in cities and these are broadly applied to entire urban areas. Alternatively short-term weather forecasts are used which lack explicit spatial dimension.

However, heatwave hazard varies within a metropolitan area due to specific characteristics such as topography, land cover/ land use, meteorological conditions; all together contributing to the formation of the Urban Heat Island phenomenon. On the other hand, population vulnerability to heat waves varies with age -primarily the elderly and also infants being more vulnerable to high temperatures- and it is higher in urban areas due to larger population numbers and density. Health condition, poverty and isolation are also influential factors.

## TREASURE's Goals



To assess the past, present and future heat wave hazard by means of satellite measurements, long time series of meteorological station data as well as the best available climatologic models.



To quantify urban heatwave health risk via epidemiological studies.



To provide services to Authorities to reinforce urban resilience to heat waves.



To provide personalised heat wave risk estimations to citizens.

**IN THE FUTURE**, heatwaves are projected to become more frequent, more intense and longer lasting due to global climate change. **Europe** in particular emerges as an especially responsive area to temperature rise where the warming will continue at a higher rate than the global mean. This fact brings forth the necessity to maintain an acceptable quality of life in the foreseeable future. Cities have to be properly managed and major actions regarding the understanding, monitoring and mitigating of the Urban Heat Island phenomenon and heatwaves have to be adopted.

# What did the Analysis of Past Station Data Reveal?

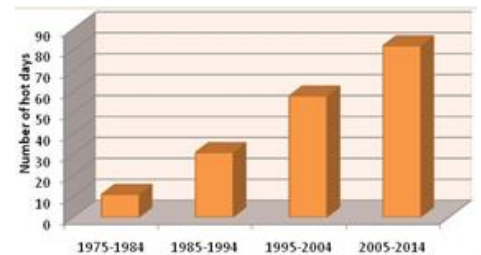
In Athens the summer mean temperature has increased by approximately  $3^{\circ}\text{C}$  during 1975-2014.

In Palma the summer mean temperature has increased by approximately  $2.3^{\circ}\text{C}$  during 1975-2014.

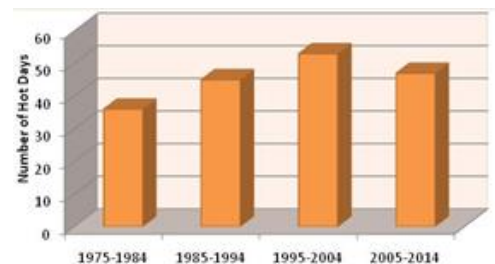
In Athens the summer minimum temperature has increased by approximately  $3.5^{\circ}\text{C}$  during 1975-2014.

In Palma the summer minimum temperature has increased by approximately  $3^{\circ}\text{C}$  during 1975-2014.

1. Number of hot days ( $T_{\text{max}} > 95^{\text{th}}$  percentile) per decade in Athens

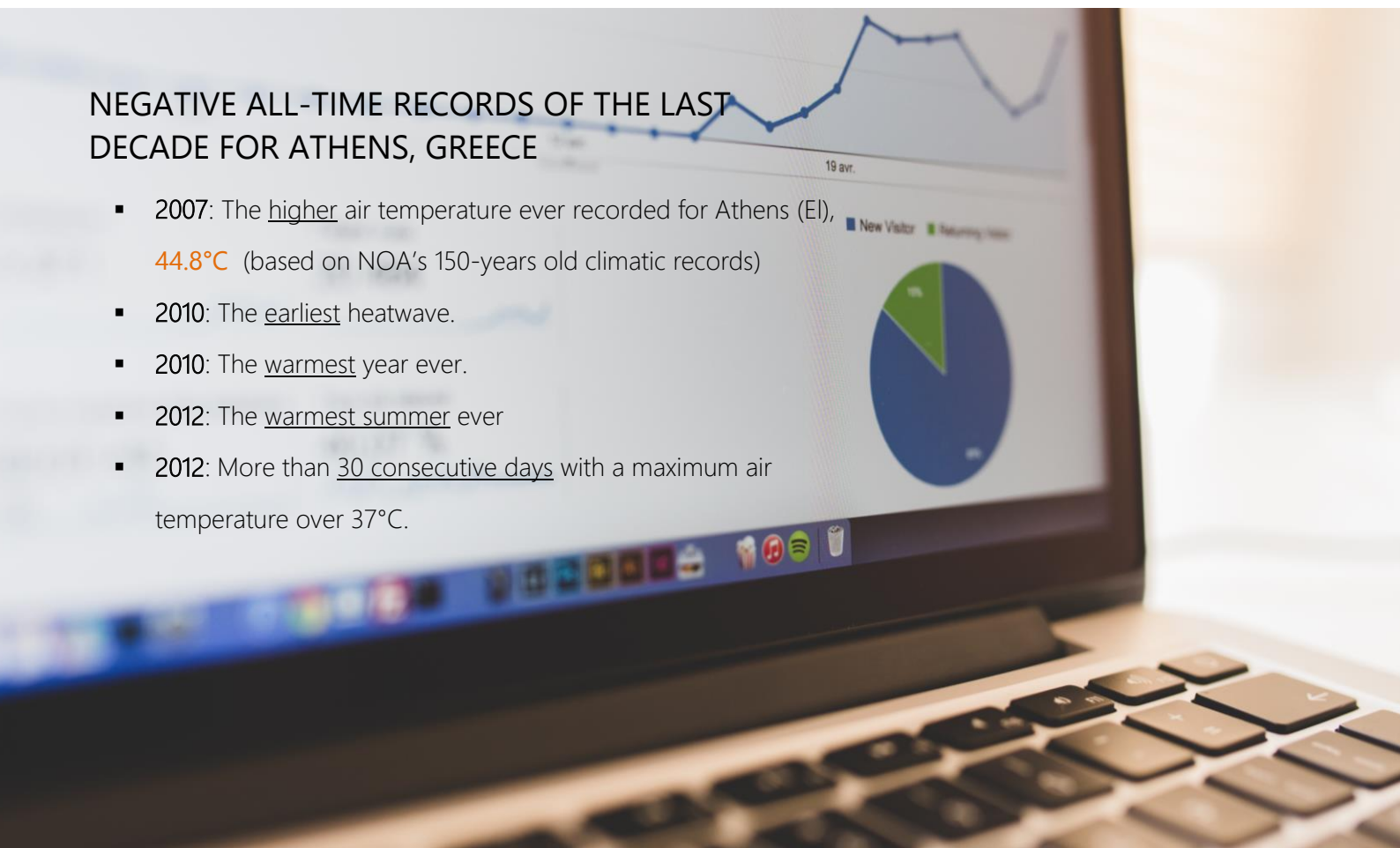


2. Number of hot days ( $T_{\text{max}} > 95^{\text{th}}$  percentile) per decade in Palma de Mallorca



## NEGATIVE ALL-TIME RECORDS OF THE LAST DECADE FOR ATHENS, GREECE

- 2007: The higher air temperature ever recorded for Athens (EI),  $44.8^{\circ}\text{C}$  (based on NOAA's 150-years old climatic records)
- 2010: The earliest heatwave.
- 2010: The warmest year ever.
- 2012: The warmest summer ever
- 2012: More than 30 consecutive days with a maximum air temperature over  $37^{\circ}\text{C}$ .

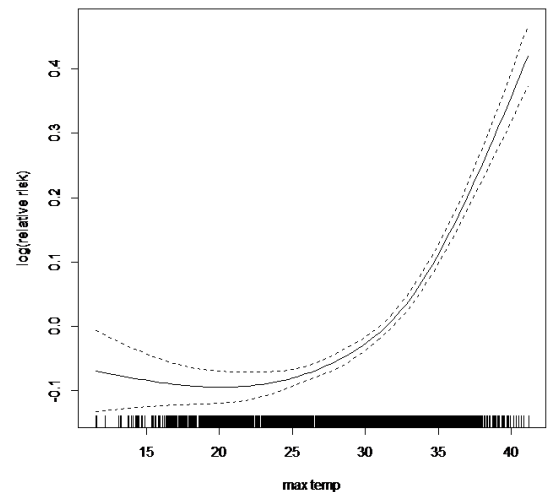


# What did the Epidemiological Analysis Reveal?

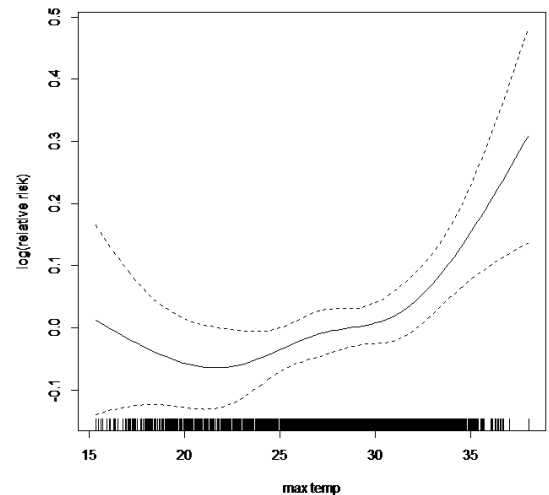
- The temperature-mortality association during the warm season in both cities is **J-shaped**.
- In Palma, an increase in maximum temperature of 1 °C above 31.3 °C is associated with 4.28% (95% CI: 2.01, 6.60) increase in daily total number of deaths.
- In Athens, an increase in maximum temperature of 1 °C above 31.5 °C is associated with 4.16% (95% CI: 3.73, 4.60) increase in daily total number of deaths.
- During heatwaves, an increase of 9.89% (95% CI: 6.85, 13.01) in total mortality for all ages was found in Athens.

Association of max temperature (x-axis) and total daily mortality (y axis)

## 1. Athens (El)



## 2. Palma de Mallorca (Es)



***“The number of deaths attributable to high ambient temperature is not negligible. The attributable fraction is about 10% of the deaths during warm season. There is evidence that these figures are increasing and therefore mitigation strategies should be implemented and applied.”***

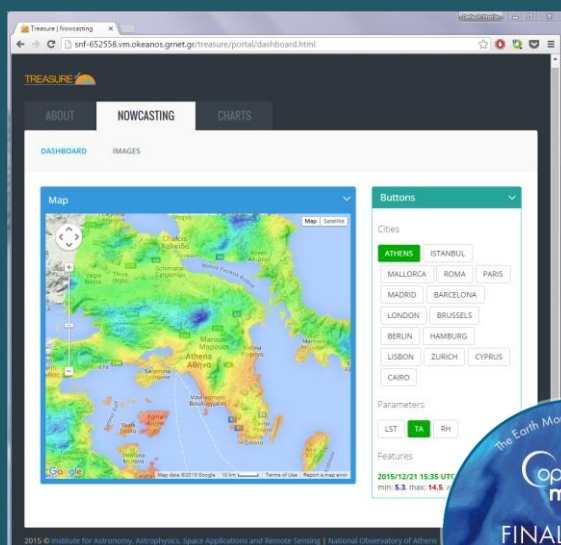


# NOWCASTING SERVICES

## Nowcasting Service & Portal

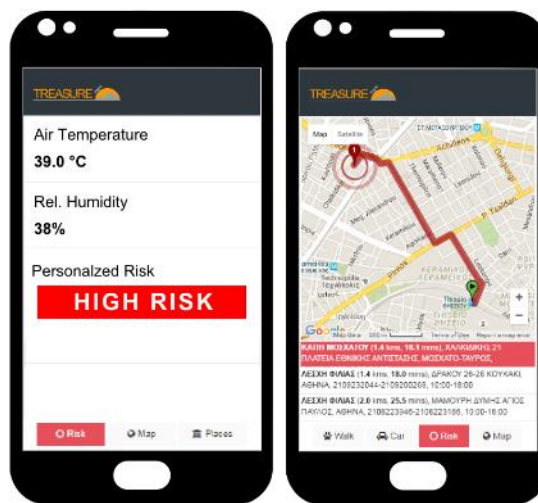
TREASURE nowcasting service is based on satellite thermal data. It provides operational nowcasts of city temperatures, heat wave hazard and thermal discomfort maps. The portal also offers the functionality to plot past data on demand.

## The Portal of the Nowcasting Service



## Mobile Application

TREASURE Mobile App is developed to provide citizens with real time information of their personalized risk due to exposure to high temperatures. It estimates the air temperature at the specific location of the user. It then assesses the personalized heat wave risk based on the user profile. The app can also assess the heat wave risk of other people (e.g. family, keen persons) at different locations.



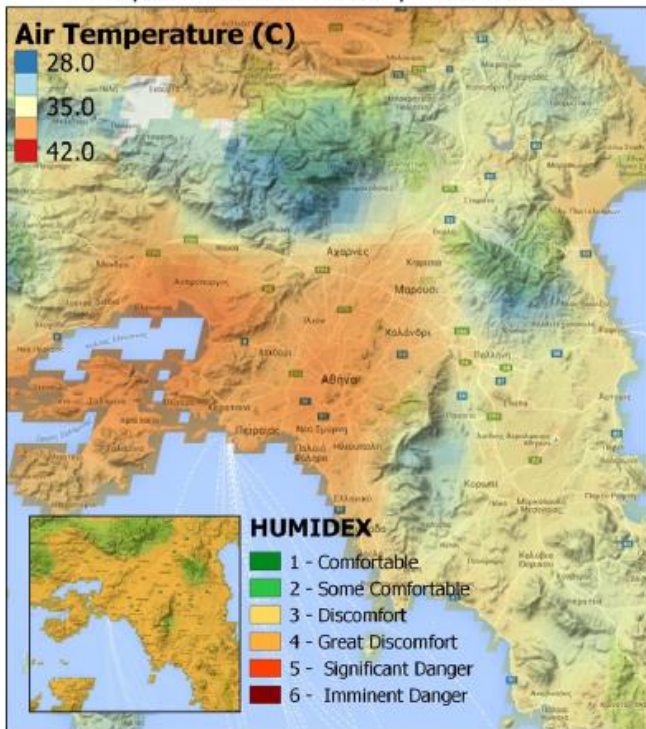
A campaign was carried out in summer 2016 so as to get feedback for the TREASURE Mobile App.

- 47 Persons Participated in Athens and 46 in Palma.
- The participants in Athens were given portable thermometers and were asked to carry them 24/7 and report on certain features.

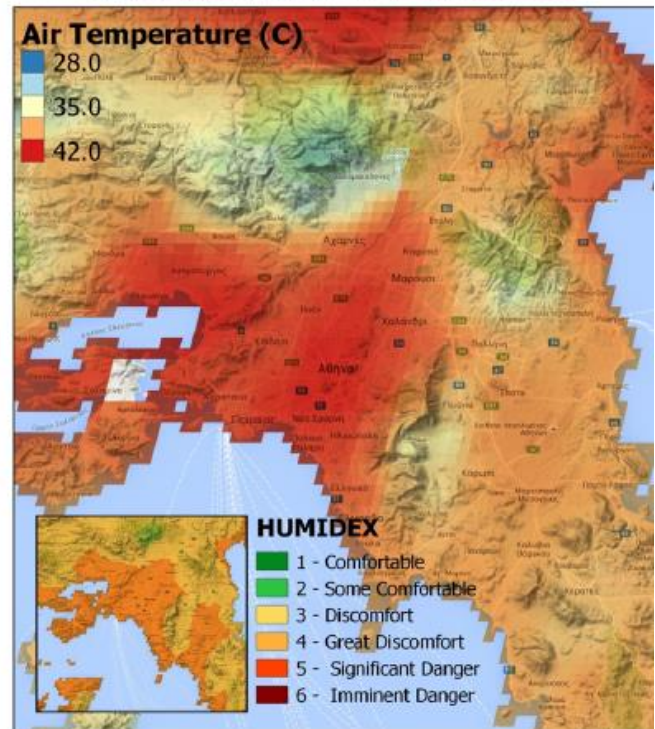


# ATHENS SEPTEMBER 2015 HEATWAVE

September 5 2015 | 12:00 UTC



September 6 2015 | 12:00 UTC



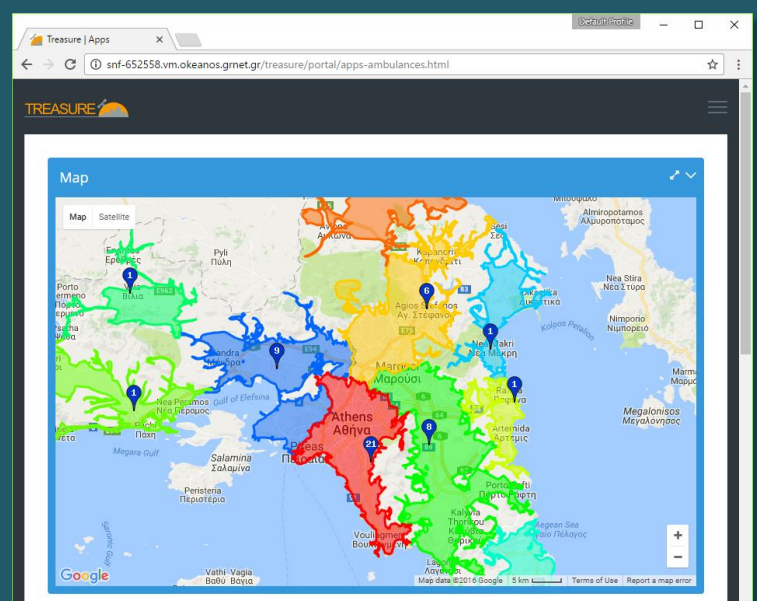
*On September 5 and 6, 2015, a heatwave event occurred in Athens (EL). The maps above, derived from TREASURE nowcasting service, present the spatial distribution of air temperature and discomfort index (HUMIDEX).*

## Ambulances

A software tool for determining the optimum location of ambulances during heatwave events was developed in the framework of TREASURE. This service aims to determine the best base locations for an ambulance fleet, by including not only population density criteria but also, the current heatwave risk distribution. In such a way the response time to the elevated demand due to the heatwave is optimized.

**URL:** [http://snf-652558.vm.oceanos.grnet.gr/treasure/portal](http://snf-652558.vm.oceanos.grnet.gr/treasure/portal/apps-ambulances.html)

## The TREASURE Ambulance Application



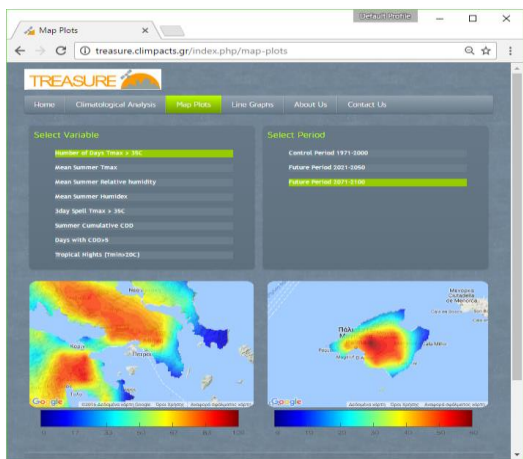


# CLIMATIC SERVICE

## Climatic Service

TREASURE climatic service is an interactive web-map based tool for the estimation of **future climate change indices** of relevance to heat, population discomfort and energy demand employing present and future regional climate model output. The **ensemble mean of four Regional Climate Models** (horizontal resolution: 25 km × 25 km) developed within the EU-ENSEMBLES project ([www.ensembles-eu.org](http://www.ensembles-eu.org)) that employ the A1B greenhouse gases emission scenario are being used.

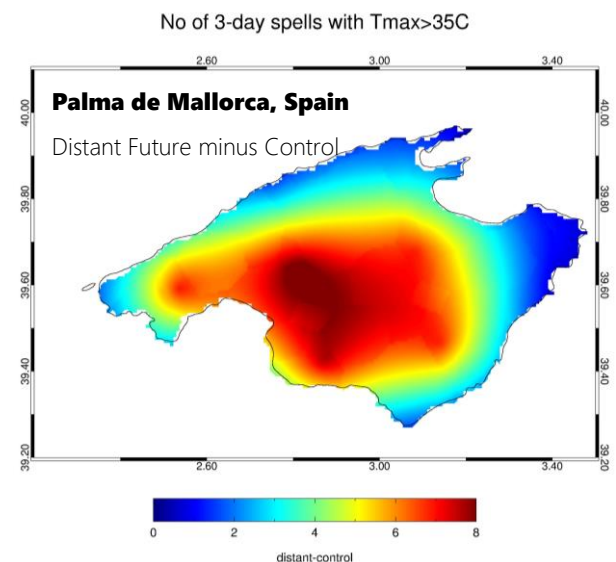
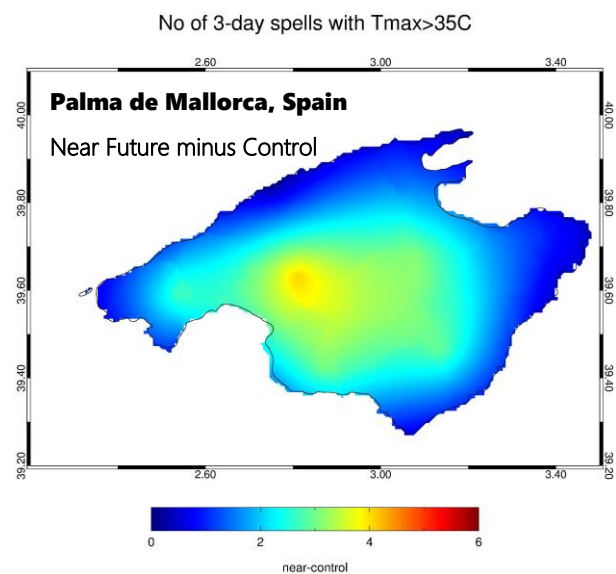
The available time frames include the **baseline period** (1971-2000), the **near-future period** (2021-2050) and the **distant-future period** (2071-2100).



The website of the Climatic Services

## Variables

- Number of Days where Tmax > 35°C
- Mean Summer Tmax
- Mean summer Relative Humidity
- Mean Summer HUMIDEX
- 3day Spell Tmax > 35°C
- Number of Tropical Nights (Tmin>20 °C)
- Summer cumulative cooling degree days
- Number of days requiring heavy cooling





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A MILESTONE for the project: City of Athens endorsed TREASURE and promoted the use of the TREASURE Mobile App during summer 2016.

A workshop entitled “The impact of heatwaves to the City of Athens. Actions and synergies for a cooler city”, was hosted at the Athens City Hall. The Mayor of Athens, Giorgos Kaminis, and the President of the National Observatory of Athens, Prof. Kanaris Tsinganos, officially inaugurated the collaboration between the Municipality and the Research Centre (NOA), which is documented in a Memorandum of Understanding. The Mayor spoke warmly about TREASURE services and the mobile app which is in the disposal of the Athenians to download and use.



# CloudOnTap 4 Smart Cities

Information from TREASURE nowcasting service is also provided at street level at 50 well-visited buildings in the City of Athens, such as health clinics, information service centers and more. This is achieved by using Cloud on Tap Information Carriers (COTICS) in the form of stickers that transfer information directly to the citizens' mobile phones.



## STAY COOL

Tap your NFC enabled smartphone to get info about the outdoor temperature, whether you are personally at risk or where to go to stay cool



- 1 Use your WiFi, 3G or 4G Android smartphone
- 2 Turn on your NFC connector
- 3 Tap your phone on the "Cool Athens" logo

Or visit <http://treasure.eu-project-sites.com>



*COTIC sticker placed at critical buildings in Athens,*

This service was implemented as a demonstration by ARATOS group, a technological partner of NOA.



# TABLE-TOP EXERCISE



A Table-Top Exercise TTX was organized in Palma de Mallorca (Es) on 22-23 September 2016.

The purpose of the TTX was to enhance the capability of the participating organizations and individuals to prepare for and mitigate risk during a heatwave, and identify gaps or weaknesses in organizational preparedness and continuity plans, policies and procedures.

