



LIFE URBANPROOF
CLIMATE PROOFING
URBAN MUNICIPALITIES

Historical climate and future climate change projections for Urbanproof municipalities

Konstantinos V. Varotsos
National Observatory of Athens

Project title: **Climate Proofing Urban Municipalities**

Acronym: **LIFE UrbanProof**

PROJECT LOCATION:

Cyprus, Greece, Italy

BUDGET INFO:

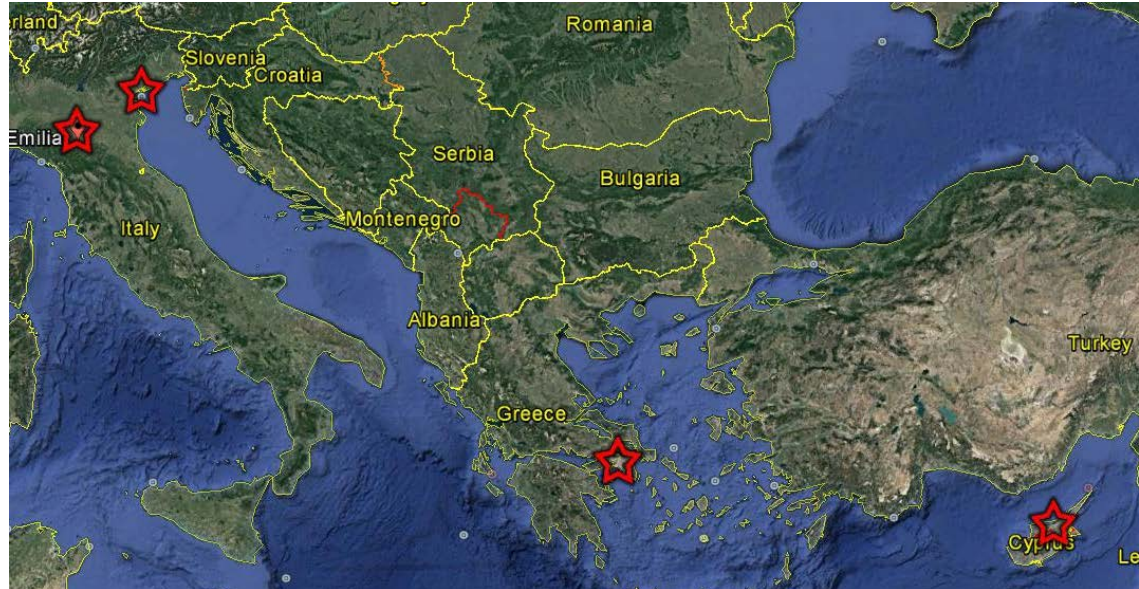
Total amount: 1,854,000 €

EC Co-funding: 60%

DURATION: 44 months

Start: 01/10/16

End: 30/04/21



*The **overall aim** of the UrbanProof project is to increase the resilience of municipalities to climate change equipping them with a powerful tool for supporting better informed decision making on climate change adaptation planning.*

Analyzing the historical climate conditions

Methodology

- ✓ The analysis is based on available observations obtained from stations located at/near the partner municipalities. More specifically, for Strovolos-Lakatamia and Peristeri data from the stations of Nicosia and NOA have been analyzed respectively whereas for Reggio Emilia the partner have provided data from the urban station of Ex Tribunale.
- ✓ The variables analyzed are : daily mean temperature, daily maximum temperature, daily minimum temperature, precipitation
- ✓ Years analyzed 1985-2014

Current Situation: Monthly variability

Temperature (°C): Daily mean air temperature (TG), Daily minimum air temperature (TN), Daily maximum air temperature (TX)

Figure. Monthly variability of TX, TG and TN over the partner municipalities

- The pattern of the monthly variability for the three variables is typical for Mediterranean climate with July and August being the warmest months of the year and January and February the coldest ones.
- Higher TX in Strovolos-Lakatamia, lower TN in Reggio Emilia

Current Situation: Seasonal Trends - WINTER

Warming Rates:

- Strovolos-Lakatamia

TX=0.46 °C/decade (1.35 °C over the 30 yr period)

TG=0.49 °C/decade (~1.5 °C over the 30 yr period)

TN=0.52 °C/decade (~1.6 °C over the 30 yr period)

- Peristeri

TX=0.16 °C/decade (~0.5 °C over the 30 yr period)

TG=0.42 °C/decade (~1.3 °C over the 30 yr period)

TN=0.53 °C/decade (~1.6 °C over the 30 yr period)

- Reggio Emilia

TX=0.34 °C/decade (~1 °C over the 30 yr period)

TG=0.73 °C/decade (~2.2 °C over the 30 yr period)

TN=1.1 °C/decade (~3.3 °C over the 30 yr period)

Current Situation: Seasonal Trends-SPRING

Warming Rates:

- Strovolos-Lakatamia

TX=0.3 °C/decade (~0.9 °C over the 30 yr period)

TG=0.5 °C/decade (~1.5 °C over the 30 yr period)

TN=0.7 °C/decade (~2.1 °C over the 30 yr period)

- Peristeri

TX=0.37 °C/decade (~1.1 °C over the 30 yr period)

TG=0.56 °C/decade (1.7 °C over the 30 yr period)

TN=0.74 °C/decade (~2.2 °C over the 30 yr period)

- Reggio Emilia

TX=0.37 °C/decade (~1.1 °C over the 30 yr period)

TG=0.9 °C/decade (~2.7 °C over the 30 yr period)

TN=1.4 °C/decade (~4.2 °C over the 30 yr period)

Current Situation: Seasonal Trends-SUMMER

Warming Rates:

- Strovolos-Lakatamia

TX=0.26 °C/decade (~0.8 °C over the 30 yr period)

TG=0.51 °C/decade (~1.6 °C over the 30 yr period)

TN=0.75 °C/decade (~2.2 °C over the 30 yr period)

- Peristeri

TX=0.53 °C/decade (~1.6 °C over the 30 yr period)

TG=0.74 °C/decade (~2.2 °C over the 30 yr period)

TN=1 °C/decade (~3 °C over the 30 yr period)

- Reggio Emilia

TX=0.22 °C/decade (~0.7 °C over the 30 yr period)

TG=0.74 °C/decade (~2.2 °C over the 30 yr period)

TN=1.3 °C/decade (~3.9 °C over the 30 yr period)

Current Situation: Seasonal Trends-AUTUMN

Warming Rates:

- Strovolos-Lakatmia

TX=0.28 °C/decade (~1.1 °C over the 40 yr period)

TG=0.43 °C/decade (~1.7 °C over the 40 yr period)

TN=0.58 °C/decade (~2.3 °C over the 40 yr period)

- Peristeri

TX=0.31 °C/decade (~1.3 °C over the 40 yr period)

TG=0.49 °C/decade (~2 °C over the 40 yr period)

TN=0.73 °C/decade (~2.9 °C over the 40 yr period)

- Reggio Emilia

TX=0.16 °C/decade (~0.6 °C over the 40 yr period)

TG=0.62 °C/decade (~2.85 °C over the 40 yr period)

TN=1.1 °C/decade (~4.4 °C over the 40 yr period)

Current Situation:

Number of Days $T_{max} >$ Temperature Threshold

	Strovolos-Lakatamia	Peristeri	Reggio Emilia
Number of days/yr >30 °C	127-162	72-118	30-95
Number of days/yr >35 °C	53-95	6-54	0-56
Number of days/yr >40 °C	0-15	0-8	0-6

Current Situation: Precipitation

	Strovolos-Lakatamia	Peristeri	Reggio Emilia
Precipitation [mm]/month	1.5-57	3-39	34-77
Number Wet days/month	0-27	0-17	18-30

Climate Projections

Methodology

Methodology

Model used: **RCA4** driven by **MPI-ESM-LR(EURO-CORDEX database)**

- ✓ Horizontal Resolution : **~12km**
- ✓ Scenarios:
 - **RCP4.5**: intermediate mitigation scenario
 - **RCP8.5**: high emission scenario
- ✓ Bias adjustment was applied to the model data
 - Local intensity scaling (LOCI) method (Schmidli et al., 2006) for precipitation data
 - Variance scaling method (Chen et al., 2011) for temperature data

BIAS CORRECTION: Maximum temperature

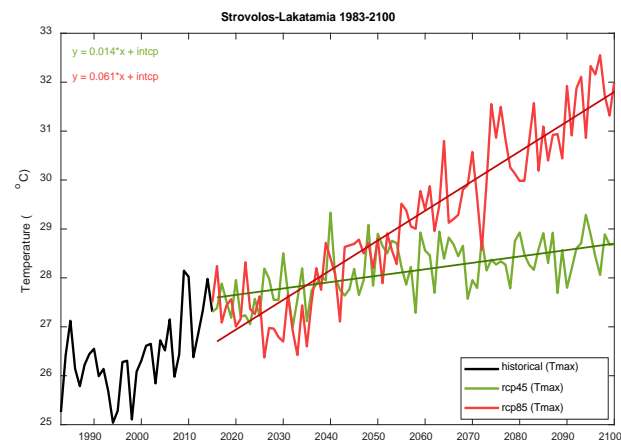
1971-2005 for Peristeri and Reggio Emilia
1983-2005 for Strovolos-Lakatamia

Bias adjustment scales
the RCM annual cycle
to the observed one

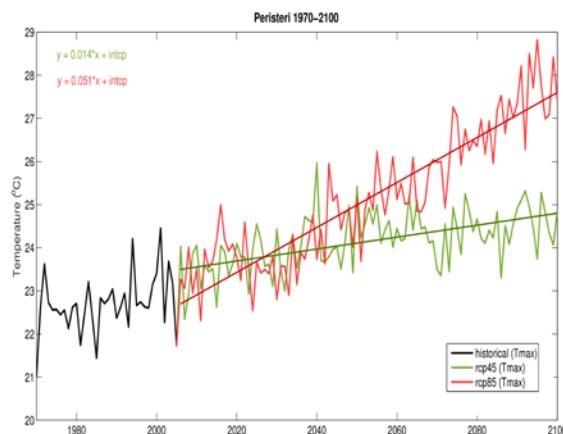
BIAS CORRECTION: Minimum temperature

1971-2005 for Peristeri and Reggio Emilia
1983-2005 for Strovolos-Lakatamia

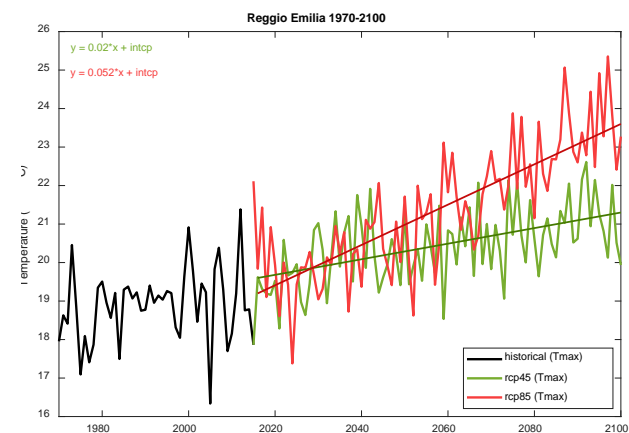
Trends: Maximum temperature



- Strovolos Latamia
TX: $0.14^{\circ}\text{C}/\text{decade}$ under RCP4.5
 $0.6^{\circ}\text{C}/\text{decade}$ under RCP8.5



- Peristeri
TX: $0.14^{\circ}\text{C}/\text{decade}$ under RCP4.5
 $0.5^{\circ}\text{C}/\text{decade}$ under RCP8.5



- Reggio Emilia
TX: $0.2^{\circ}\text{C}/\text{decade}$ under RCP4.5
 $0.5^{\circ}\text{C}/\text{decade}$ under RCP8.5

Trends: Maximum temperature

Strovolos-Lakatamia
1983-2100

RCP4.5

2.4 days/decade

RCP8.5

5.7 days/decade

Peristeri
1971-2100

2.6 days/decade

5.4 days/decade

Reggio Emilia
1971-2100

2.3 days/decade

4.2 days/decade

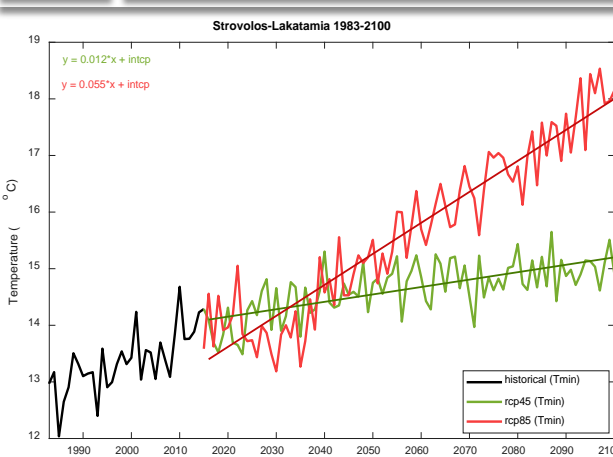
Trends: Maximum temperature

	RCP4.5	RCP8.5
Strovolos-Lakatamia	4.3 days/decade	7.9 days/decade
Peristeri	2.5 days/decade	5.4 days/decade
Reggio Emilia	2.5 days/decade	4.3 days/decade

Trends: Maximum temperature

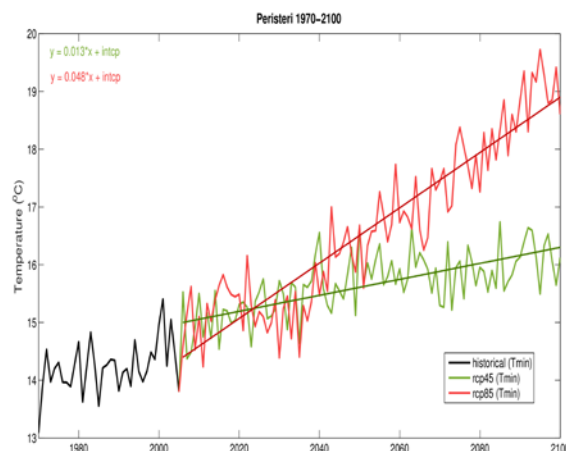
	RCP4.5	RCP8.5
Strovolos-Lakatamia	2.7 days/decade	7.7 days/decade
Peristeri	0.9 days/decade	2.5 days/decade
Reggio Emilia	0.5 days/decade	2.2 days/decade

Trends: Minimum temperature



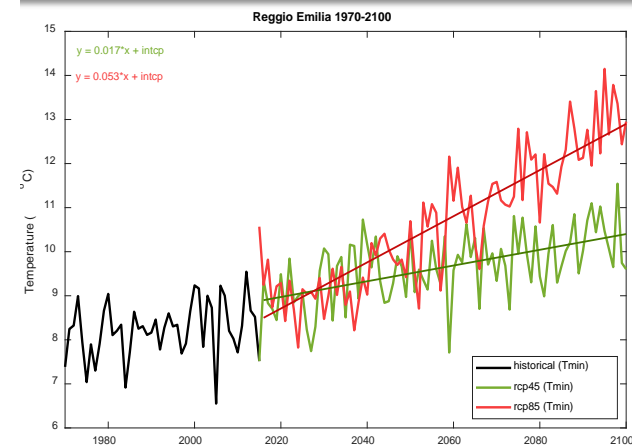
- Strovolos Latamia

TN: 0.12°C/decade under RCP4.5
0.55°C/decade under RCP8.5



- Peristeri

TN: 0.13°C/decade under RCP4.5
0.48°C/decade under RCP8.5



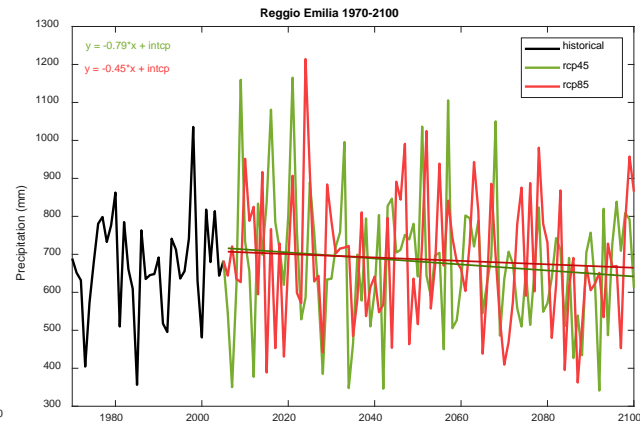
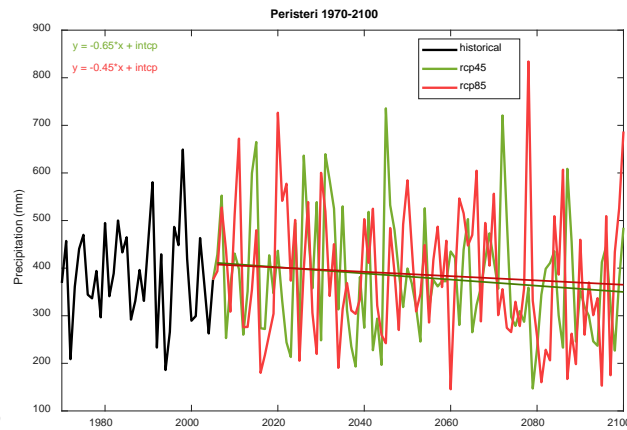
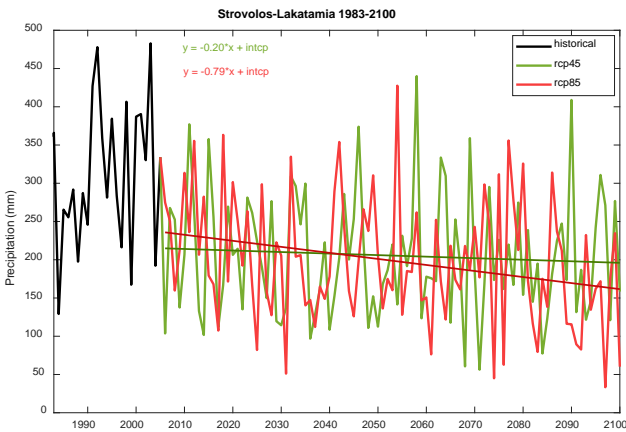
- Reggio Emilia

TN: 0.17°C/decade under RCP4.5
0.53°C/decade under RCP8.5

Trends: Minimum temperature

	RCP4.5	RCP8.5
Strovolos-Lakatamia	4.5 days/decade	8.9 days/decade
Peristeri	3 days/decade	6 days/decade
Reggio Emilia	3.2 days/decade	6 days/decade

Trends: Precipitation



- Strovolos Latamia

PR: -2 mm/decade under RCP4.5
-8 mm/decade under RCP8.5

- Peristeri

PR: -6.5 mm/decade under RCP4.5
-4.5 mm/decade under RCP8.5

- Reggio Emilia

PR: -8 mm/decade under RCP4.5
-4.5 mm/decade under RCP8.5

Trends: Precipitation

	RCP4.5	RCP8.5
Strovolos-Lakatamia	1.5 days/decade	4.6 days/decade
Peristeri	0.5 days/decade	2.2 days/decade
Reggio Emilia	0.2 days/decade	0.2 days/decade

Summary

- Regarding the historical climate the municipalities are facing a warming trend while no significant trend was identified for precipitation
- The results indicate a significant warming trend in the three municipalities under both RCP with the highest projected under RCP8.5
- For precipitation weaker trends are projected with a stronger drying trend under RCP8.5 and by the end of the century.
- The results can be visualized on the LIFE Urbanproof toolkit



Stage 1: Climate change information

Graphic representation for current climate parameters of an area as well as the projected climate change for two different emission scenarios and for different time periods.

Please fill the following fields and select "Submit" to see the results.

Select municipality: Select climatic indicator:

Select climatic scenario: RCP 4.5: Stabilization of GHG levels (with mitigation policies) RCP 8.5: Increasing GHG levels (no mitigation policies)

