



# International Conference

## Climate Change in the Mediterranean and the Middle East: Challenges & Solutions

**Nicosia, Cyprus | 18 & 19 May, 2018**

**Pre-Conference Workshops | 16 & 17 May, 2018**

# Mediterranean & Middle East Air pollution in a Changing Climate”

## Context & Objectives

Prof. Jean Sciare

Director of the Energy Environment Water Research Centre (EEWRC)

# OUTLINE

## I. Why a scientific workshop & international conference ...

... on Air Pollution & Climate change ?

... with a focus on the Mediterranean & the Middle East ?

... in Cyprus ?

... organized by the Cyprus Institute ?

... with all of us ?

## II. Objectives of the (pre-conference) workshop

**Why a  
scientific workshop & international  
conference  
on ...**

**Air Pollution & Climate change?**



**Why a  
scientific workshop & international  
conference  
on  
Air Pollution & Climate change  
with a focus on ...**

**the Mediterranean & the Middle East ?**

# Air pollution :

## First environmental concern of EU citizens & Cypriots

### Air pollution

Water pollution (seas, rivers, ...)

Health impact of chemicals

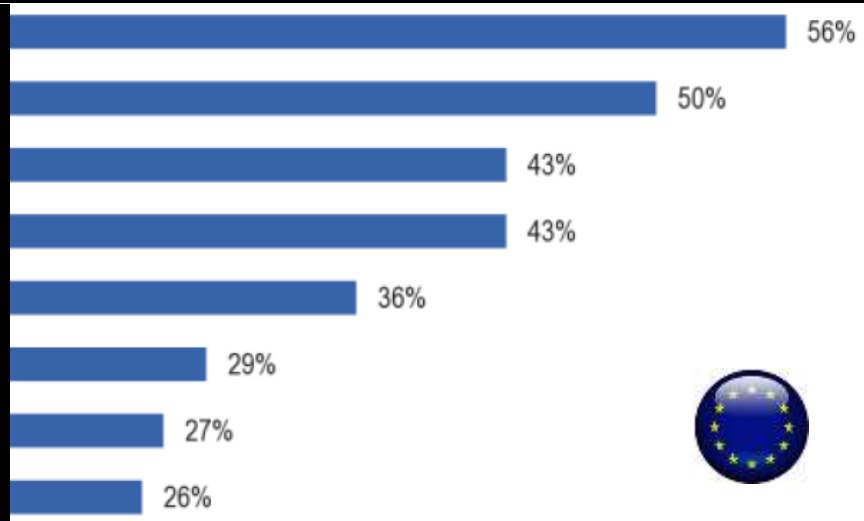
Amount of waste

Natural Resources (depletion)

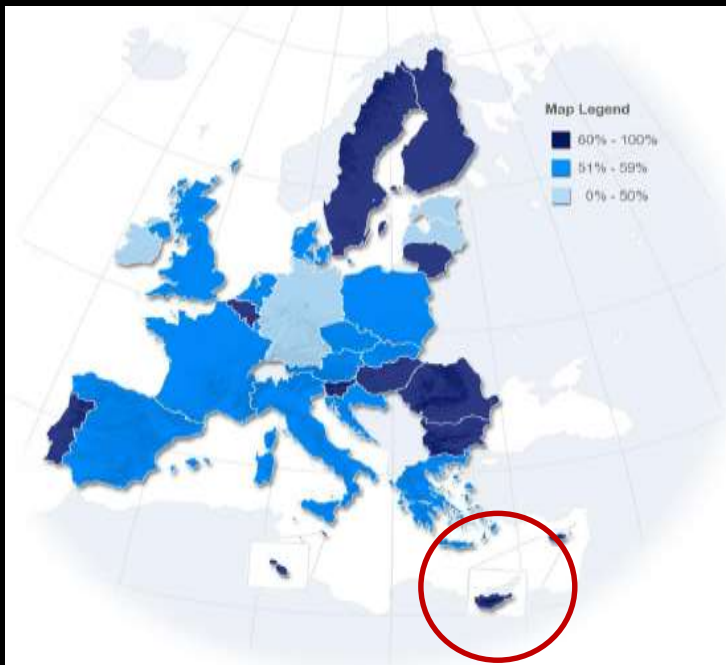
Agricultural pollution

Shortage in drinking water

Ecosystems (loss)



Source : Adapted from « Special Eurobarometer 416 (2014), Attitudes of European citizens towards the environment »



**Two third of the Cypriot population ranks « Air pollution » as the first Environmental issue** before water pollution, health impact of chemicals, and shortage in drinking water

# Health impact of AIR POLLUTION

**8,000 Years of life lost attributable to fine particulate pollution exposure in 2012 in Cyprus**

Country	PM <sub>2.5</sub>			O <sub>3</sub>			NO <sub>2</sub>		
	Annual mean	YLL	YLL/10 <sup>5</sup> inhabitants	SOM035	YLL	YLL/10 <sup>5</sup> inhabitants	Annual mean	YLL	YLL/10 <sup>5</sup> inhabitants
Cyprus	25.0	8 000	729	8 369	500	47	9.42	0	0



Source: EEA Air pollution 2015 Report

# Economic impact of AIR POLLUTION

**857 millions US\$ of Economic cost of deaths from air pollution (outdoor and indoor) in Cyprus**

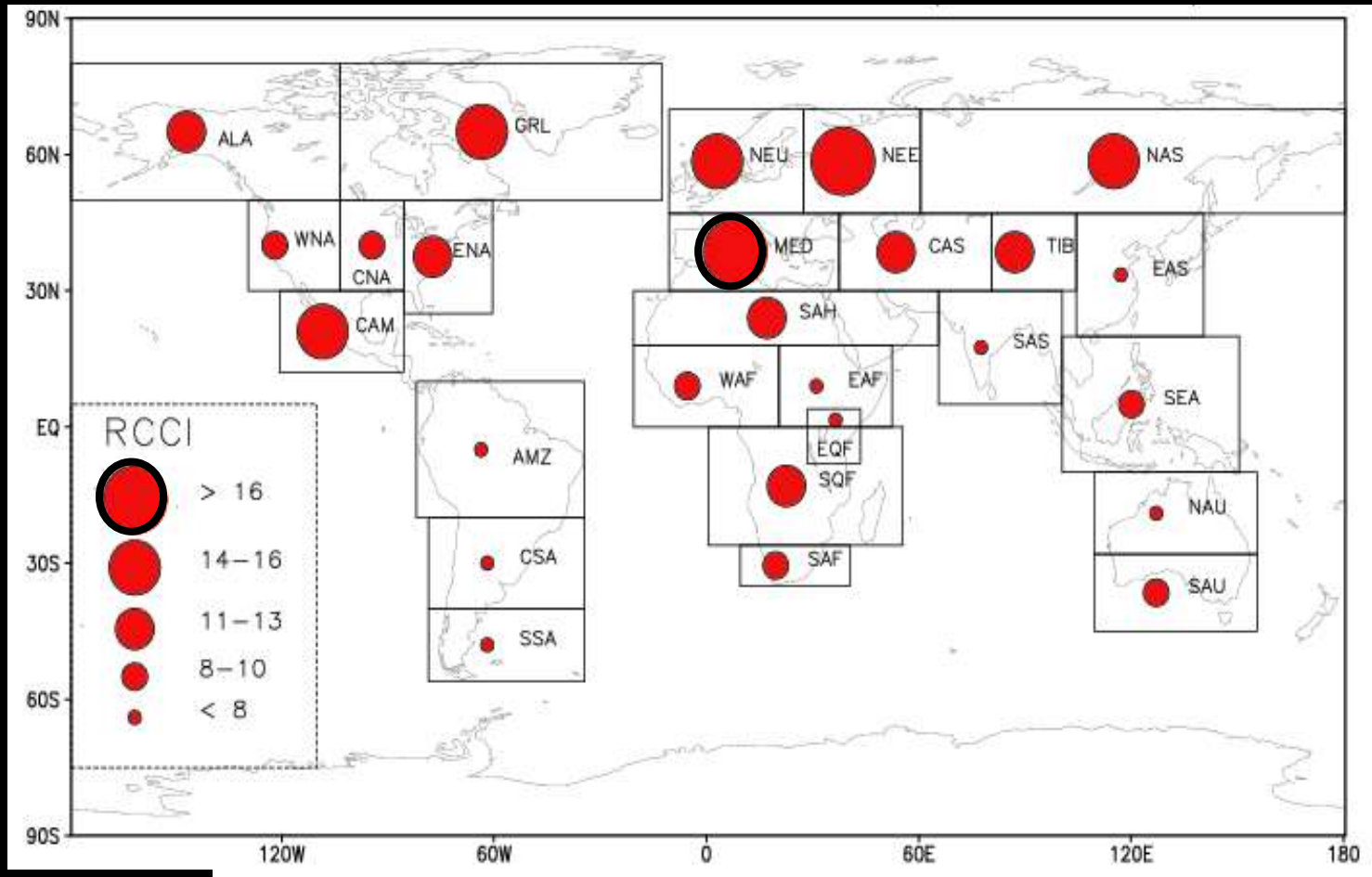
Country <sup>a</sup>	Economic cost of deaths from air pollution	
	US\$ millions	Percentage of GDP (at purchasing power parity)
Cyprus	857	3.3



Source: WHO European Region (2010)

# The Mediterranean & The Middle East: *A major climate change Hot Spot*

Regional Climate Change Index, 20 models, 3 scenarios



Source: Giorgi (2006)

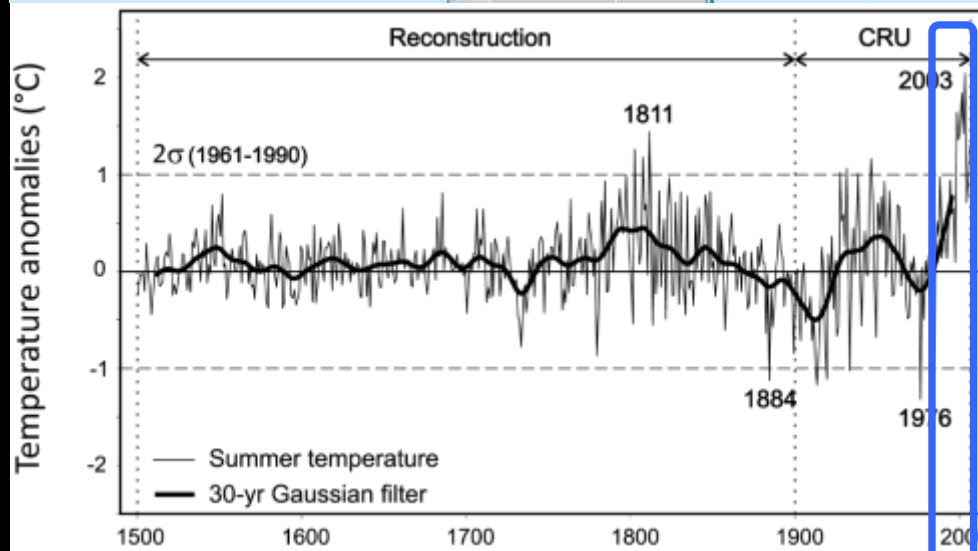


# The Mediterranean & The Middle East

## *climate change Hot Spot*

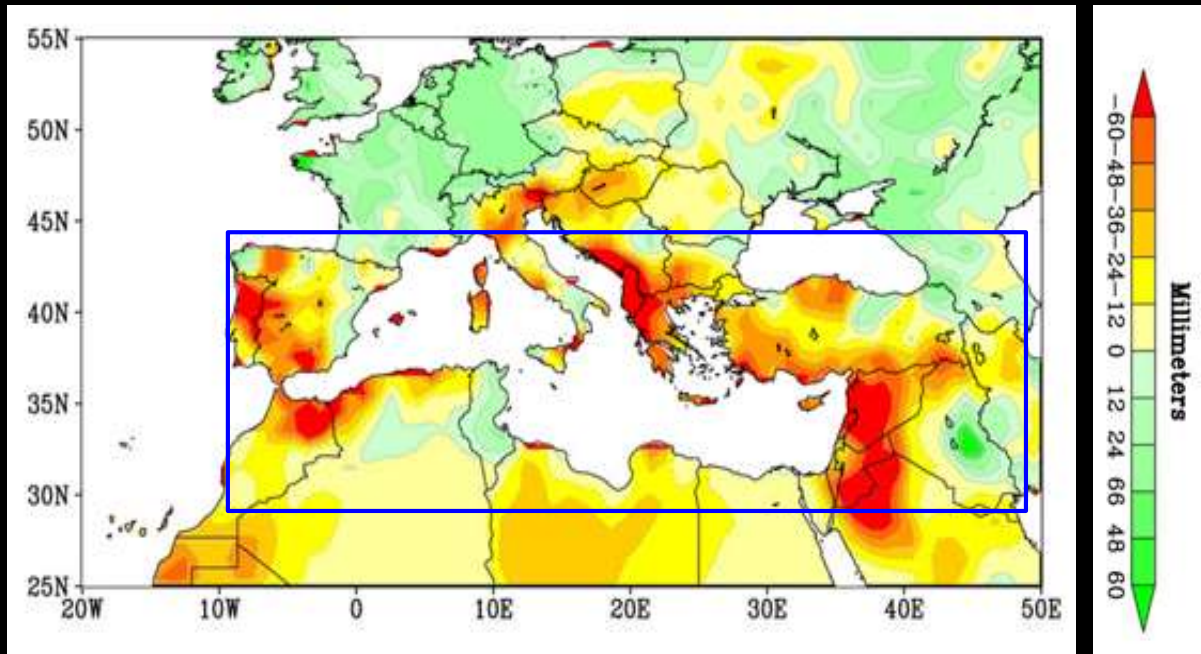
**MENA:** region between Morocco and Iran, including all Middle Eastern and Maghreb countries (“Greater Middle East”)

Summer (JJA) mean temperature anomalies over land in the region from 1500 to 2006 (relative to 1961-1990). The data for the period 1500-1900 are from multi-proxy reconstructions, for 1901-2006 from CRU TS3.0. The thick black line is the 30-year Gaussian low pass filtered time series



Strong temperature anomalies recorded since the beginning of the 1970s

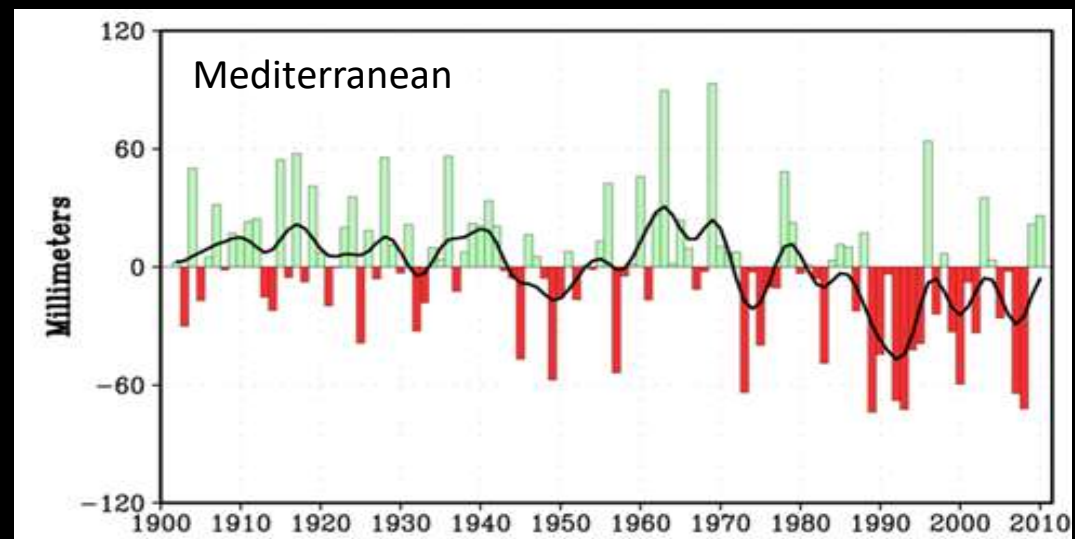
# The Mediterranean & The Middle East: *climate change Hot Spot*



**Reduction in observed winter precipitation over the Mediterranean (1971-2010 versus 1902-1970)**

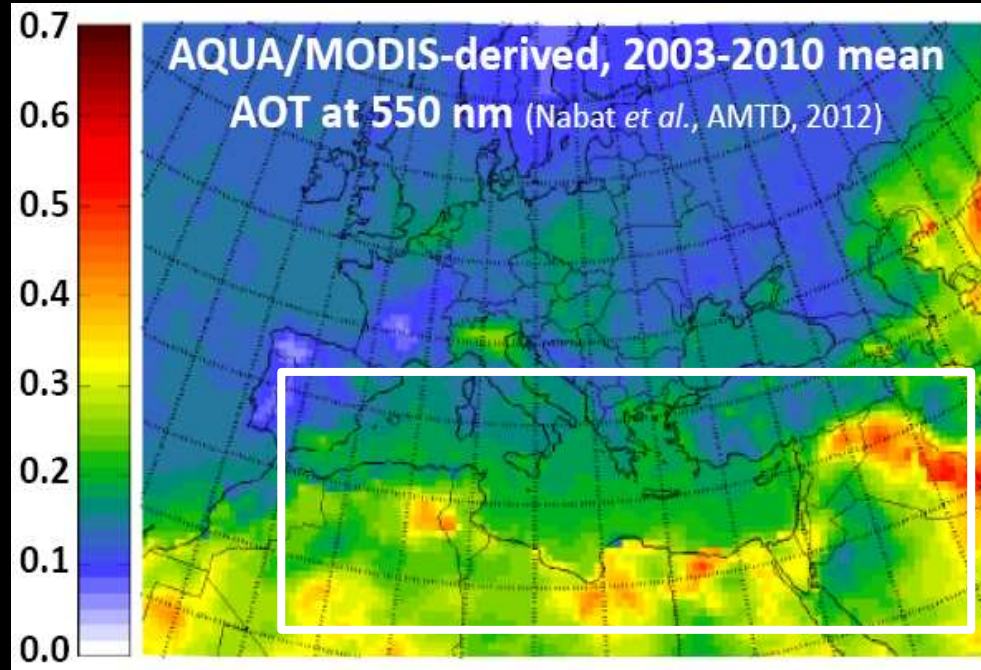
Source: Hoerling et al. 2012. Journal of Climate

Drastic reduction of winter precipitation **since the 1970s**



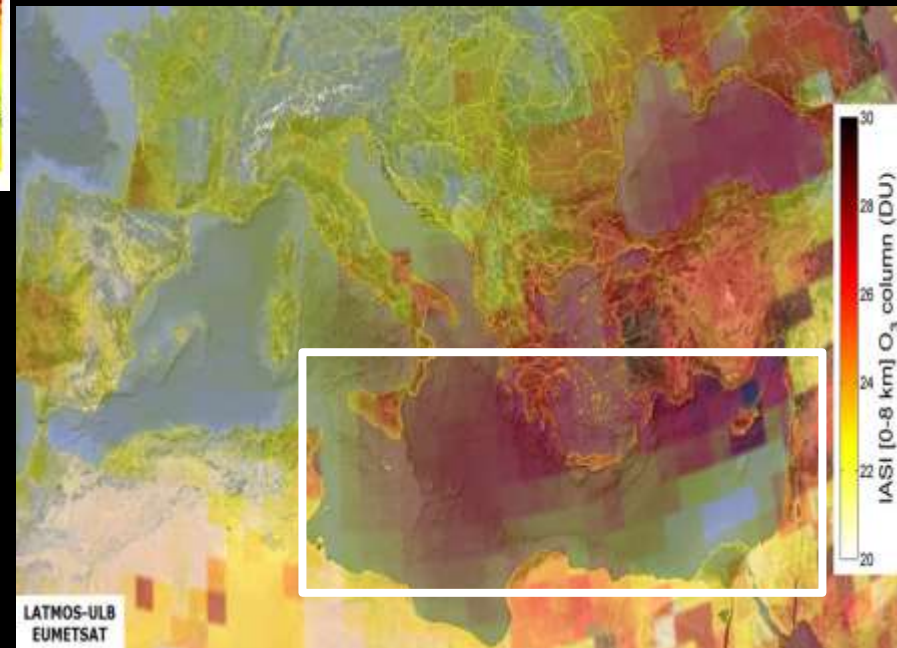
# The Mediterranean & The Middle East: *An Air pollution Hot Spot*

## AEROSOLS



A region having very high aerosol loading being responsible for **large direct radiative forcing**

## OZONE

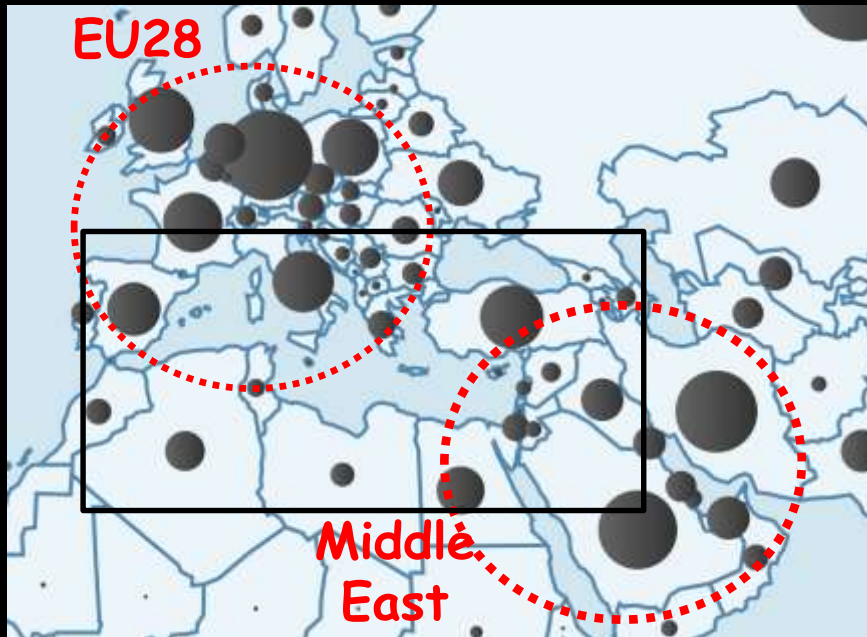


A region having very high photochemistry responsible for very high levels of **ozone and secondary pollutants**



# The Mediterranean & The Middle East: A region at the confluence of two **CO<sub>2</sub> Hot Spots**

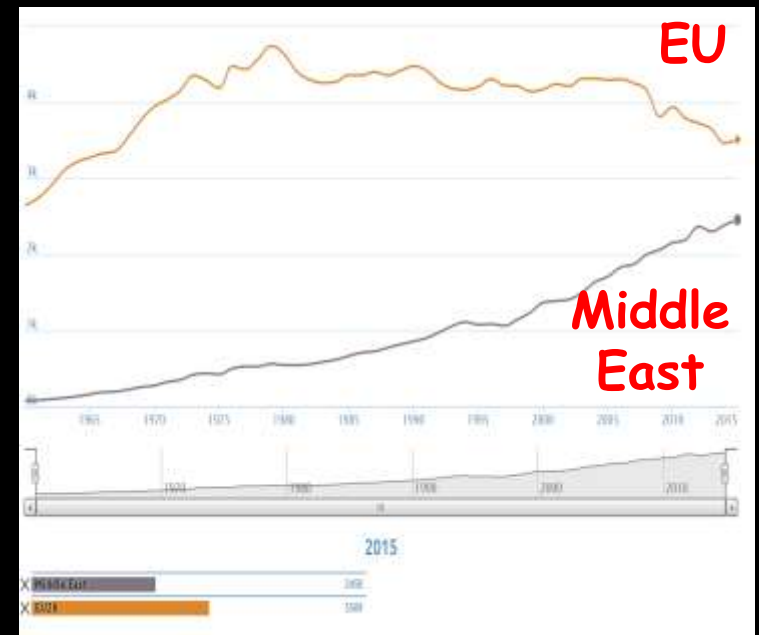
Yearly emissions of CO<sub>2</sub> (2015)



<http://www.globalcarbonatlas.org/en/CO2-emissions>

... between **two regions with high CO<sub>2</sub> emissions** (EU & Middle East countries)

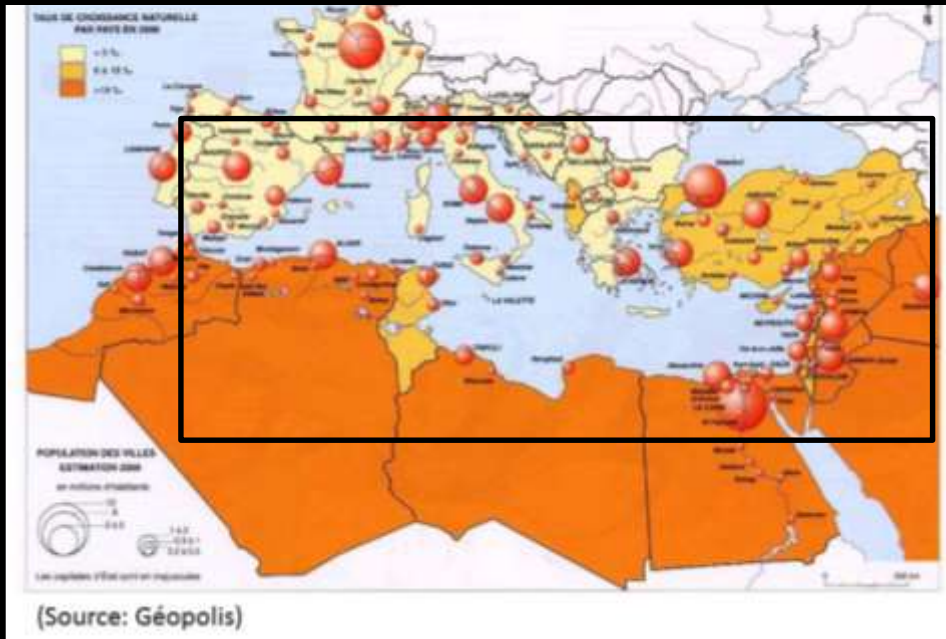
Emission trends of CO<sub>2</sub> (1960-2015)



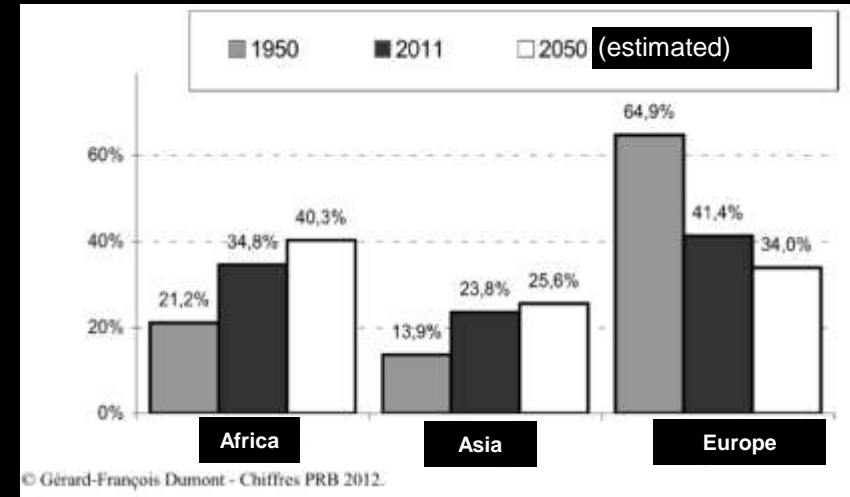
... **with opposite trends**  
(decreasing for EU ; increasing for the Middle East)

# The Mediterranean & The Middle East: *An increasing population exposed to air pollution*

## Population around the Mediterranean (2000)



## Fraction of population per continent in the Mediterranean



- ✓ A high anthropogenic pressure around the Mediterranean with almost **half a billion of inhabitants**
- ✓ A strong increase of the population in the Southern and Eastern Basin with **today more than half of the Mediterranean population living out of Europe** (N. Africa and Middle-East)



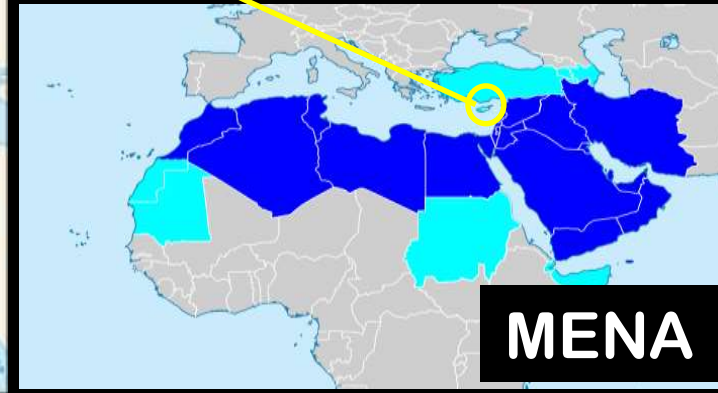
**Why a  
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on  
Air Pollution & Climate change  
in  
the Mediterranean & the Middle East ...  
in Cyprus ?**

# Cyprus : A strategic geopolitical location

A European Union member state

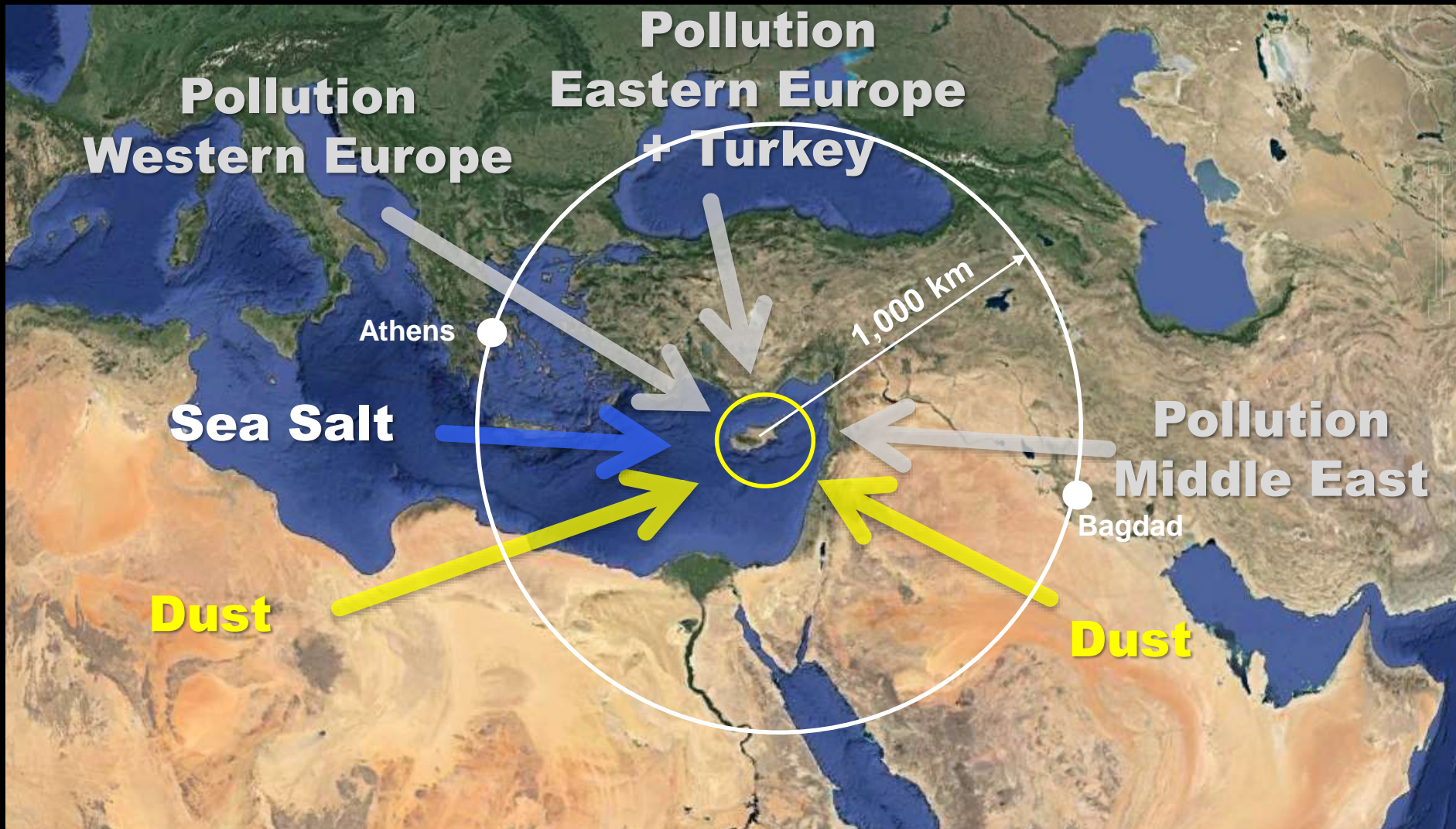
island of the Mediterranean

in the Middle East



# Cyprus : **A strategic atmospheric location**

at the crossroads of long-range transported atmospheric pollution from 3 continents



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organized by...**

**the Cyprus Institute ?**





# THE CYPRUS INSTITUTE

Research • Technology • Innovation



- A research and educational institution suited to a **knowledge economy**, taking advantage of the Cyprus «gateway» niche.
- A European institution, for the **Eastern Mediterranean and Middle East** based in Cyprus.
- A non-governmental institution devoted to the **public benefit** and for **advancing peace and prosperity in the region**, using science and technology.



# RESEARCH ACHIEVEMENTS

**Secured**

**> €27m**

**Competitive Grants**

**Scientific**

**> 770**

**Publications**

**Active**

**33**

**Research Projects**

**Staff**

**> 140**

**Researchers & Faculty**

**Research**

**16**

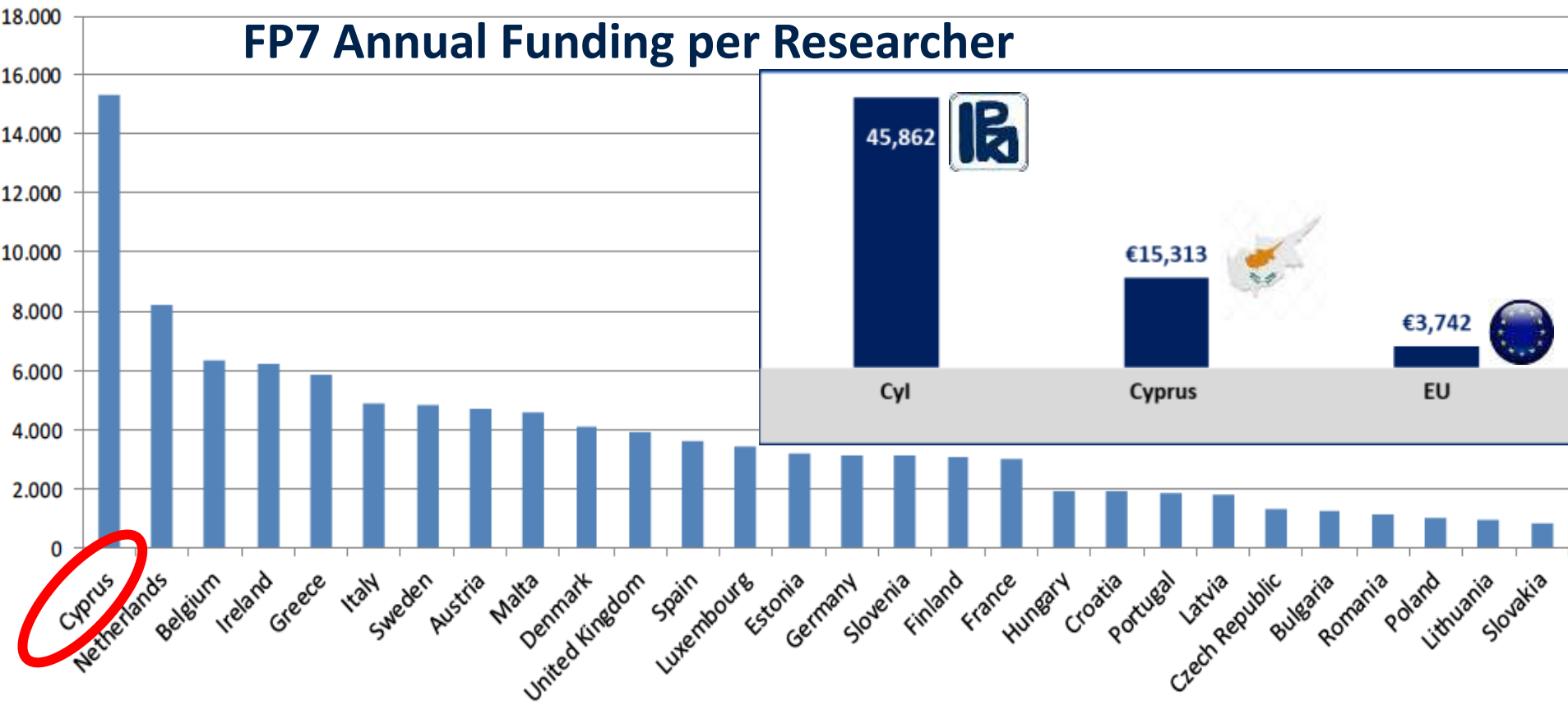
**Laboratories**



# CYPRUS (INSTITUTE) PERFORMANCE

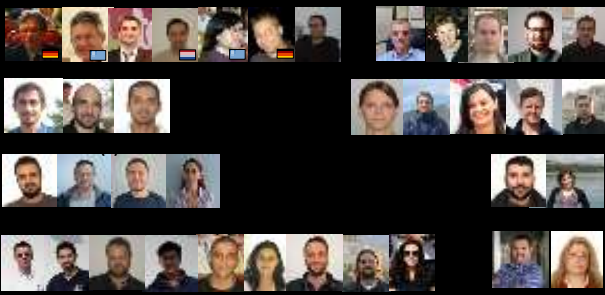
## Under the EU FP7 funding programme

### FP7 Annual Funding per Researcher



# Atmosphere & Climate Division (Est. since 2008)

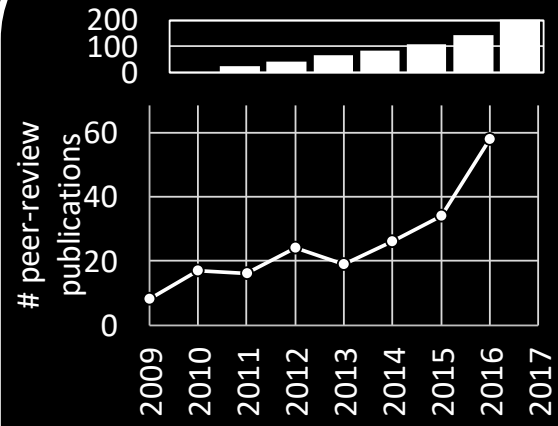
## Research staff



**Total staff = 37**  
**10 different nationalities**



## Peer-review publications



**Total >200**  
**(50% in top 10 journals)**



J. Lelieveld, et al.,  
Strongly increasing  
heat extremes in the  
Middle East and North  
Africa (MENA) in the  
21st century. Climatic  
Change, 2016



## Research projects



## Education (Ph.D, MSc) + joint/dual Ph.D



**Energy, Environment & Atmospheric Sciences**

- ❑ Language of instruction is English
- ❑ Directly linked to Cyl research activities
- ❑ Limited number of students of high caliber
- ❑ Fully accredited

# Atmosphere & Climate Division (Est. since 2008)





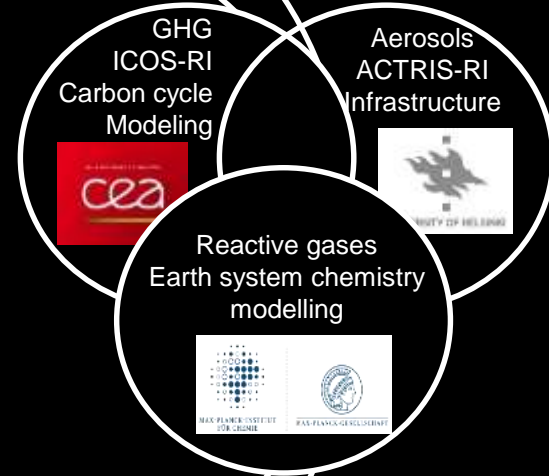
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# Atmosphere & Climate Division

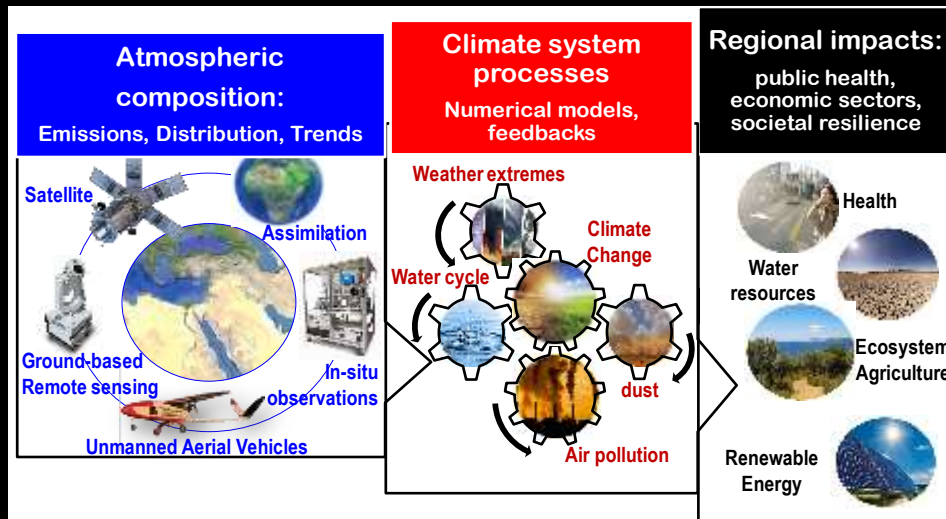
7-year project  
> 30M€



Mediterranean & Middle East  
Research Centres

**EMME-CARE**  
EASTERN MEDITERRANEAN  
MIDDLE EAST - CLIMATE &  
ATMOSPHERE RESEARCH CENTRE

## New Centre of Excellence



# Objectives of the (pre-conference) workshop

- ✓ Provide the scientific basis on Air Pollution & Climate Change in the region for the international conference
- ✓ Use this workshop in Cyprus to establish bridges between Mediterranean & Middle East research(ers) under common scientific challenges
- ✓ Engage you in the construction of our new Centre of Excellence (EMME-CARE) and its (inter)national research partnership

# Have a nice Scientific workshop !



## AND FOLLOW US !!!

EMME-CARE website: <http://emme-care.cyi.ac.cy/>

EMME-CARE Facebook : <https://www.facebook.com/EMMECARE/>

EMME-CARE on Research Gate : <https://www.researchgate.net/project/EMME-CARE-Eastern-Mediterranean-Middle-East-Climate-Atmosphere-Research-Centre>

EMME-CARE on Linked In : <https://www.linkedin.com/company/27009068/>

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