IMPACTS OF CLIMATE CHANGE IN CASCAIS, PORTUGAL

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The Project

Municipality of Cascais Climate Change Strategic Plan

Cascais
Câmara Municipal

SCENARIOS
- Climate
- Socio-economic

IMPACTS
- Water Resources
- Human Health
- Biodiversity & Agriculture
- Coastal Zones
- Tourism
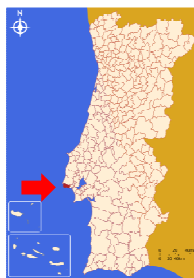
STRATEGIC ACTIONS
- Mitigation
- Adaption

Health Impact Study: Objectives

OBJECTIVES

☐ Assess potential adverse health impacts of climate change in Cascais

- ■ Heatstress
- ■ Air pollution impacts
- ■ Vector-borne diseases

Study Area: Cascais Municipality

About Cascais

General Facts

- Coastal municipality
- Good infra-structures
- Population density
  - 1919 Hab/km^2
- Population ≈ 190 000
  - 17% < 14 years
  - 17% > 65 years
- Tourism key economy
- Mild climate
- Private airport & marina

Health Indicators

- Life expectancy at birth
  - 79 years
- Main mortality causes
  - Cardiovascular (44%)
  - Cancer (24%)
  - Respiratory (9%)
- Birth rate = 13.1 ‰
- Death rate = 9.5 ‰
- Private health care ≈ 50%

Study Methods

1- Identification of climate-sensitive health outcomes

| A - International & national expert judgment | B - Current population health status in region | C - Suitable data accessibility |

2 - Assessment of climate change impact for each health outcome

| A - Current/historical health burden | B - Climate-health relationship | C - Climate changes anticipate – Resulting impacts |

3 - Suggestion of adaptation measures &
**4 - Identification of knowledge gaps**

HEATSTRESS

Heatwaves frequently recorded

- Funeral homes in region gave the 1st alert of the usual number of extra deaths in the 1981 national heatwave

- Following 2003 heatwave, municipality set-up a local heathwave response action plan

Heatwave	Portugal		Lisbon District	
	O/E	Excess deaths (Nº)	O/E	Excess deaths (Nº)
1981	1.9	1906	2.1	460
1991	1.4	1001	1.6	311
2003	1.43	1953	1.41	396

HEATSTRESS: Local mortality-climate dose-response
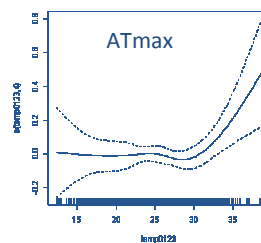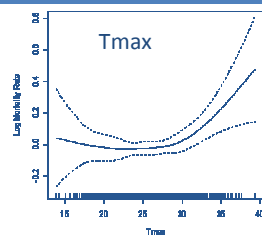
Apparent temperature ˚C (AT) = -2.653 + (0.994 x temperature ˚C) + 0.0153 x (dew point temperature ˚C)^2

Index of an individual's perceived air temperature given the humidity.

	Threshold	IC 95%	% Increase per 1ºC	IC 95%
T max	30.04	28.6, 31.5	4.74	2.28, 7.25
AT max	30.2	28.7, 31.6	5.35	1.98, 8.84

GEE (Generalized Estimating Equations) Models
Abril - September 2002-2007

Compared to other European cities

Cascais

AT max = 30.3ºC

	Threshold (°C) (95% CrI/CI)[a]	
Region		
North-continental	23.3	(22.5 to 24.0)
Mediterranean	29.4[b]	(25.7 to 32.4)
City		
Athens	32.7	(32.1 to 33.3)
Barcelona	22.4[c]	(20.7 to 24.2)
Budapest	22.8	(21.9 to 23.7)
Dublin	23.9	(20.7 to 27.1)
Helsinki	23.6	(21.7 to 25.5)
Ljubljana	21.5	(15.0 to 28.0)
London	23.9	(22.6 to 25.1)
Milan	31.8	(30.8 to 32.8)
Paris	24.1	(23.4 to 24.8)
Praha	22.0	(20.4 to 23.6)
Rome	30.3	(29.8 to 30.8)
Stockholm	21.7	(18.2 to 25.3)
Turin	27.0	(25.2 to 28.9)
Valencia	28.2	(23.7 to 32.7)
Zurich	21.8	(16.5 to 27.0)

Baccini et al. 2008

HEATSTRESS: Future Impact
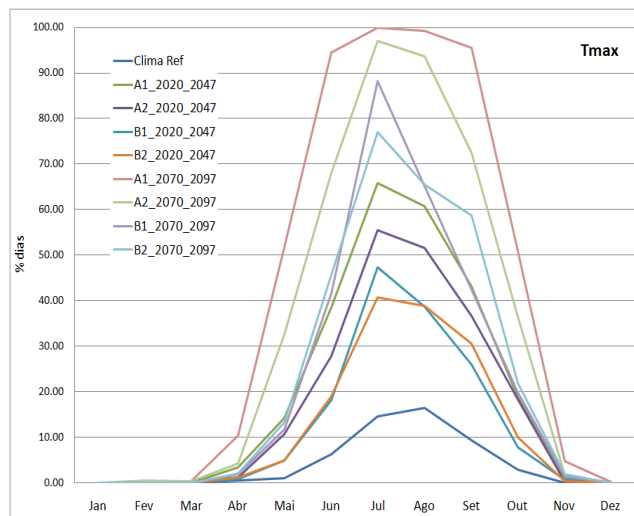
VECTOR-BORNE DISEASES

Vector-borne diseases significant public health problem in the region in the past

• Many vector & pest control programs

- Often co-funded between health & tourism sectors
- 1st vector control program in 1938/9 to control flies & mosquitoes

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VECTOR-BORNE DISEASES: Concerns

	Reason for concern
Mosquitos	
Malaria	• Endemic in past • Imported cases reported every year • Vector (*Anopheles atroparvus*) abundant in region (not infected)
West Nile fever	• Various vectors abundant in region (not infected) • Region is a stop-over for some migratory birds (risk of introduction of new vectors & virus)
Dengue/ Yellow Fever/ Chikungunya	• Yellow fever endemic in past – currently no cases. • No information as to imported cases • No information on vectors • Region has an airport & a marina (risk of introduction)
Sandflies	
Leishmaniasis	• Currently endemic in region
Ticks	
Lyme Disease	• Currently have reports of local sporadic cases
Med. Tick-borne fever	• Currently endemic in region •Most important VBD in summer !!!

VECTOR-BORNE DISEASES: Screening method

- Data very limited – modeling not possible for all diseases of concern.

- Used screen method developed to assess the national impacts of VBDs in Portugal (Casimiro et al., Env. Health Perspectives 2006)

- Qualitative assessment based on:
  - Vector abundance
  - Pathogen prevalence
  - + how temperature can affect vector & pathogen survival

- Allows all VBD included in assessment to be evaluated equally

| Vector	Pathogen			
	None present	Imported human cases only	Low prevalence in vectors/hosts	High prevalence in vector/hosts
None present	Negligible risk	Negligible risk	Negligible risk	Negligible risk
Focal distribution	Negligible risk	Very low risk	Low risk	Low risk
Regional distribution	Negligible risk	Very low risk	Low risk	Medium risk
Widespread distribution	Negligible risk	Very low risk	Medium risk	High risk

VECTOR-BORNE DISEASES: Screening method - Scenarios

- Problem - many knowledge gaps regarding current vector & pathogen presence, distribution & abundance

- Various scenarios used to compensate this knowledge gap

Climate Scenario	Assuming current knowledge of vector & pathogen prevalence in Cascais	Assuming the introduction of focal population of pathogen-infected vectors into Cascais
Current climate	Scenario 1	Scenario 2
Climate change	Scenario 3	Scenario 4

- Combine
  - All previous steps
  - Use risk criteria
  - Use all four scenarios
  - Get result = VBD transmission risk level

VECTOR-BORNE DISEASES: Risk Levels
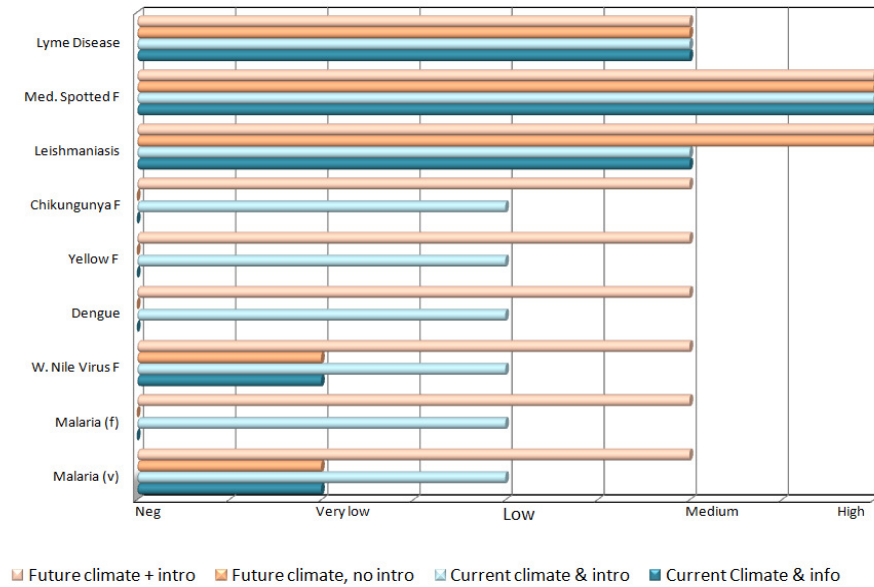
ADDITIONAL INFORMATION

Study technical report (in Portuguese)
http://www.siam.fc.ul.pt/PECAC/pdf/saude-humana.pdf

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THANK YOU