

## ALMADA HEAT STRESS MAPS METADATA

### Versions

Reason for change	issue.rev	Reviewed by	Date
Initial document	00.01	CS	2015-08-06
Final document	01.00	CS	2015-08-25

### Signatures

Author	Catherine Stevens	2015-08-06
Reviewed by	Bart Thomas	2015-08-21
Approved by	Catherine Stevens	2015-08-25
Issuing authority	GIM	

The research leading to these results has received funding from the European Union 7th Framework Programme (FP7 2007-2013), under grant agreement n.308299  
NACLIM [www.naclim.eu](http://www.naclim.eu)



## Table of Contents

<b>1</b>	<b>Overview maps and datasets .....</b>	<b>3</b>
1.1	Maps availability .....	3
1.2	Credits .....	4
<b>2</b>	<b>Description of the maps and datasets .....</b>	<b>4</b>
2.1	General Metadata .....	4
2.1.1	Map coordinate projection .....	4
2.1.2	Heat stress parameters .....	4
2.1.3	Maps style .....	4
<b>2.2</b>	<b>Base scenario 1986-2005 .....</b>	<b>5</b>
2.2.1	Average number of heat wave days per year per grid cell .....	5
2.2.2	Average number of heat wave days per year per statistical unit.....	6
2.2.3	Urban Heat Island effect at 11pm per grid cell.....	7
2.2.4	Urban Heat Island effect at 11pm per statistical unit .....	8
<b>2.3</b>	<b>Base scenario 2026-2045 .....</b>	<b>9</b>
2.3.1	Average number of heat wave days per year per grid cell .....	9
2.3.2	Average number of heat wave days per year per statistical unit.....	10
<b>2.4</b>	<b>Base scenario 2081-2100 .....</b>	<b>11</b>
2.4.1	Average number of heat wave days per year per grid cell .....	11
2.4.2	Average number of heat wave days per year per statistical unit.....	12
<b>2.5</b>	<b>Urban planning scenario 1986-2005 .....</b>	<b>13</b>
2.5.1	Average number of heat wave days per year per grid cell .....	13
2.5.2	Average number of heat wave days per year per statistical unit.....	14
<b>2.6</b>	<b>Urban planning scenario 2026-2045 .....</b>	<b>15</b>
2.6.1	Average number of heat wave days per year per grid cell .....	15
2.6.2	Average number of heat wave days per year per statistical unit.....	16

# 1 OVERVIEW MAPS AND DATASETS

## 1.1 Maps availability

This document contains a description of the content of Almada Heat Stress maps and delivered datasets for following scenarios and time frames: base scenarios (1986-2005, 2026-2045 and 2081-2100) and urban planning scenarios (1986-2005 and 2026-2045).

The following table is a list of all provided maps. The maps described in this document are highlighted in yellow.

CITY	TYPE	THEME	EXPOSURE MAP VARIABLE	MODELLED HEAT STRESS VARIABLE	BASE SCENARIOS				URBAN PLANNING SCENARIOS		
					PAST - PRESENT (1986-2005)	NEAR FUTURE (2026-2045)	FAR FUTURE (2081-2100)	PAST - PRESENT (1986-2005)	NEAR FUTURE (2026-2045)		
Almada	Exposure maps	Population	Total population 2011	Average number of heatwave days per year	X					X	
			Population density inhabitants per hectare 2011		X					X	
			Number of inhabitants aged 0 to 19 years 2011		X						
			Number of inhabitants aged 20 to 65 years 2011		X						
		Vulnerable institutions	Average number of heatwave days per year	Number of inhabitants aged +65 years 2011	X						
				Number of childcare centres 2014	X						
				Number of hospitals 2014	X						
				Number of schools 2014	X						
				Number of schools and universities 2014	X						
		Heat stress maps	Average number of heatwave days per year per grid cell	Number of universities 2014	X						
				Number of resthomes 2014	X						
				Average number of heatwave days per year per grid cell	X	X	X	X	X	X	
				UHI effects at 1.1pm per grid cell	X						
			UHI effects at 1.1pm per statistic units								

**Table 1: Almada Heat Stress maps list**

## 1.2 Credits

The heat stress data (e.g. average number of heat wave days per year and heat urban island effect at 11pm) are extracted from local urban climate simulations (UrbClim model) performed by VITO over the various considered time periods.

<https://vito.be/en/land-use/sustainable-cities/urban-climate-services>

Data such as 3D buildings, land use/cover, 2030 urban plan details related to the considered maps are provided by the city of Almada.

<http://www.m-almada.pt>

The UrbClim input data (e.g. land surface parameters) and output results (e.g. daily temperature statistics) are processed by GIM.

<http://www.gim.be/en>

## 2 DESCRIPTION OF THE MAPS AND DATASETS

### 2.1 General Metadata

#### 2.1.1 Map coordinate projection

The coordinate projection of maps and data is projected Lisbon (Lisbon) / Portuguese National Grid (EPSG 20790).

#### 2.1.2 Heat stress parameters

In the case of base scenario 1986-2005, two heat stress parameters “the average number of heat wave days per year” and the “urban heat island effect at 11pm” are mapped. Each parameter is calculated per grid cell and per statistical unit.

For the other scenarios and time frames, only the “average number of heat wave days per year” stress parameter is mapped and calculated per grid cell and per statistical unit.

The reasons are that the UHI effect is typically relatively stable over future timescales (although the absolute temperatures for both urban and rural areas increase) and that the impact of the urban plans on the UHI at city scale with the present resolution is rather limited (local climate models with finer resolution are needed to assess their true impact).

#### 2.1.3 Maps style

Two versions of maps are generated per heat stress data (except for “average number of heat wave days per year” and “Urban Heat Island effect at 11pm” per grid cell).

The first one (“\_ backgr”) has World Imagery Service Layer as background of the map.

The second one (“\_ nobackgr”) doesn’t contain any background.

## 2.2 BASE SCENARIO 1986-2005

### 2.2.1 Average number of heat wave days per year per grid cell

#### 2.2.1.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_bsc\_1986-2005\_nrhwdays\_gd.pdf

#### 2.2.1.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_1986-2005_nrhwdays_gd</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per grid cell modelled over the period 1986 to 2005

## 2.2.2 Average number of heat wave days per year per statistical unit

### 2.2.2.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_bsc\_1986-2005\_nrhwdays\_ss\_nobackgr.pdf
- almada\_bsc\_1986-2005\_nrhwdays\_ss\_backgr.pdf

### 2.2.2.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_1986-2005_nrhwdays_ss</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		ADMIN	Statistical unit code
		NAME	Statistical unit name
		TYPE_PHY	Physical value type: average number of heat wave days per year
VALUE_PHY	Physical value: average number of heat wave days per year per statistical unit modelled over the period 1986 to 2005		

## 2.2.3 Urban Heat Island effect at 11pm per grid cell

### 2.2.3.1 Maps delivered

- almada\_bsc\_1986-2005\_uhi\_11pm\_gd.pdf

### 2.2.3.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_1986-2005_uhi_11pm_gd</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		TYPE_PHY	Physical value type: Urban Heat Island effect at 11pm
		VALUE_PHY	Physical value: Urban Heat Island effect at 11pm per grid cell modelled over the period 1986 to 2005

## 2.2.4 Urban Heat Island effect at 11pm per statistical unit

### 2.2.4.1 Maps delivered

- almada\_bsc\_1986-2005\_uhi\_11pm\_ss\_backgr.pdf
- almada\_bsc\_1986-2005\_uhi\_11pm\_ss\_nobackgr.pdf

### 2.2.4.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_1986-2005_uhi_11pm_ss</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		ADMIN	Statistical unit code
		NAME	Statistical unit name
		TYPE_PHY	Physical value type: Urban Heat Island effect at 11pm
		VALUE_PHY	Physical value: Urban Heat Island effect at 11pm per statistical unit modelled over the period 1986 to 2005



## 2.3 BASE SCENARIO 2026-2045

### 2.3.1 Average number of heat wave days per year per grid cell

#### 2.3.1.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_bsc\_2026-2045\_nrhwdays\_gd.pdf

#### 2.3.1.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_2026-2045_nrhwdays_gd</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per grid cell modelled over the period 2026 to 2045

## 2.3.2 Average number of heat wave days per year per statistical unit

### 2.3.2.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_bsc\_2026-2045\_nrhwdays\_ss\_nobackgr.pdf
- almada\_bsc\_1986-2005\_nrhwdays\_ss\_backgr.pdf

### 2.3.2.2 Layer delivered

Layer name	Format	Attributes	Description
almada_bsc_2026-2045_nrhwdays_ss	shp	FID	Unique ID
		Shape	Type of shape: polygon
		ADMIN	Statistical unit code
		NAME	Statistical unit name
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per statistical unit modelled over the period 2026 to 2045

## 2.4 BASE SCENARIO 2081-2100

### 2.4.1 Average number of heat wave days per year per grid cell

#### 2.4.1.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_bsc\_2081-2100\_nrhwdays\_gd.pdf

#### 2.4.1.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_2081-2100_nrhwdays_gd</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per grid cell modelled over the period 2081 to 2100

## 2.4.2 Average number of heat wave days per year per statistical unit

### 2.4.2.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_bsc\_2081-2100\_nrhwdays\_ss\_nobackgr.pdf
- almada\_bsc\_2081-2100\_nrhwdays\_ss\_backgr.pdf

### 2.4.2.2 Layer delivered

Layer name	Format	Attributes	Description
<b>almada_bsc_2081-2100_nrhwdays_ss</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		ADMIN	Statistical unit code
		NAME	Statistical unit name
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per statistical unit modelled over the period 2081 to 2100

## 2.5 URBAN PLANNING SCENARIO 1986-2005

### 2.5.1 Average number of heat wave days per year per grid cell

#### 2.5.1.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_usc\_1986-2005\_nrhwdays\_gd.pdf

#### 2.5.1.2 Layer delivered

Layer name	Format	Attributes	Description
almada_usc_1986-2005_nrhwdays_gd	shp	FID	Unique ID
		Shape	Type of shape: polygon
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per grid cell modelled over the period 1986 to 2005

## **2.5.2 Average number of heat wave days per year per statistical unit**

### **2.5.2.1 Maps delivered**

Maps are delivered in PDF format and named accordingly:

- almada\_usc\_1986-2005\_nrhwdays\_ss\_nobackgr.pdf
- almada\_usc\_1986-2005\_nrhwdays\_ss\_backgr.pdf

### **2.5.2.2 Layer delivered**

<b>Layer name</b>	<b>Format</b>	<b>Attributes</b>	<b>Description</b>
<b>almada_usc_1986-2005_nrhwdays_ss</b>	shp	FID	Unique ID
		Shape	Type of shape: polygon
		ADMIN	Statistical unit code
		NAME	Statistical unit name
		TYPE_PHY	Physical value type: average number of heat wave days per year
VALUE_PHY	Physical value: average number of heat wave days per year per statistical unit modelled over the period 1986 to 2005		

## 2.6 URBAN PLANNING SCENARIO 2026-2045

### 2.6.1 Average number of heat wave days per year per grid cell

#### 2.6.1.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_usc\_2026-2045\_nrhwdays\_gd.pdf

#### 2.6.1.2 Layer delivered

Layer name	Format	Attributes	Description
almada_usc_2026-2045_nrhwdays_gd	shp	FID	Unique ID
		Shape	Type of shape: polygon
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per grid cell modelled over the period 2026 to 2045

## 2.6.2 Average number of heat wave days per year per statistical unit

### 2.6.2.1 Maps delivered

Maps are delivered in PDF format and named accordingly:

- almada\_usc\_2026-2045\_nrhwdays\_ss\_nobackgr.pdf
- almada\_usc\_2026-2045\_nrhwdays\_ss\_backgr.pdf

### 2.6.2.2 Layer delivered

Layer name	Format	Attributes	Description
almada_usc_2026-2045_nrhwdays_ss	shp	FID	Unique ID
		Shape	Type of shape: polygon
		ADMIN	Statistical unit code
		NAME	Statistical unit name
		TYPE_PHY	Physical value type: average number of heat wave days per year
		VALUE_PHY	Physical value: average number of heat wave days per year per statistical unit modelled over the period 2026 to 2045