



## **UHI - USER REQUIREMENTS AND SERVICE SPECIFICATIONS**

### **Status report Nr. 5 - Quarter 1/2015**

<http://www.naclim.eu>

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## TABLE OF CONTENTS

<b>1</b>	<b>Aim of the document .....</b>	<b>2</b>
<b>2</b>	<b>User requirements.....</b>	<b>2</b>
<b>3</b>	<b>UHI - service specifications .....</b>	<b>2</b>
	3.1 Scenarios .....	2
	3.2 Exposure mapping.....	2
<b>4</b>	<b>Timing and status work .....</b>	<b>2</b>
	4.1 Work done in current reporting period.....	2
	4.2 Work planned for next reporting period .....	3
	4.3 Summary overview status .....	3
	4.3.1 Scenarios .....	3
	4.3.2 Exposure mapping .....	4

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## 1 AIM OF THE DOCUMENT

The aim of this document is to update the NACLIM WP4.2 end-users on a regular (quarterly) basis on the progress of the work and the planned activities for the next period.

## 2 USER REQUIREMENTS

An overview of the main user requirements for mapping the impact of climate change on urban societies is given below. In particular, the Urban Heat Island (UHI) effect is analysed over three different cities (Berlin, Antwerp and Almada) with varying landscape and climate characteristics.

The user requirements have been consolidated in close collaboration with the end-users by means of dedicated **user workshops** and the common **main requirements** have been identified (cf. *NACLIM: UHI - User Requirements and Service Specifications: Status Report 1 - Q1 2014*). After the 4<sup>th</sup> end-users meeting dd. October 16<sup>th</sup> 2014 in Berlin, the user needs and expectations have been further fine-tuned.

## 3 UHI - SERVICE SPECIFICATIONS

Different scenarios are taken in consideration in the framework of NACLIM. This work includes both the preparation of the UrbClim input data layers by GIM and performing the climate model simulations by VITO over the requested time periods and spatial scales. Moreover, using the outputs of the UrbClim simulations the result will be combined with socio-economic datasets to generate heat stress exposure maps.

### 3.1 SCENARIOS

A brief description of the various proposed scenarios that have been approved by the end-users can be found in status report Q4 2014. This report is available on the NACLIM website.

[http://naclim.zmaw.de/fileadmin/user\\_upload/naclim/Archive/EUM-DOCS/Status\\_Report\\_2014\\_Q4.pdf](http://naclim.zmaw.de/fileadmin/user_upload/naclim/Archive/EUM-DOCS/Status_Report_2014_Q4.pdf)

### 3.2 EXPOSURE MAPPING

The set of relevant exposure risk maps has been further fine-tuned based on the feedback received during the 4<sup>th</sup> NACLIM end-users meeting.

Two **socio-economic themes** are taking into consideration: "population" and "vulnerable institutions". The maps that will be produced per city are depending on the availability of the required socio-economic data from the end-users.

The data for each socio-economic dataset will be mapped against **heat stress related variables** such as the UHI effect or the estimated average number of heat wave days per year. Moreover, other heat wave statistics such as the average duration and intensity could be extracted if of interest to the end-users.

For a brief description of the various exposure maps that will be considered is referred to status report Q4 2014 (see the abovementioned link).

## 4 TIMING AND STATUS WORK

This chapter gives an overview of the activities performed over the current reporting period and the work planned for the next period. In addition, summary tables are provided showing the progress of the NACLIM work according to the scenarios and exposure mapping analyses that have been identified together with the end-users.

### 4.1 WORK DONE IN CURRENT REPORTING PERIOD

The activities performed in the current reporting period (Q1 2015) include:

- **VITO:**
  - Run the simulations for Almada based on the new UrbClim input layers for the base scenario over the 3 different time scales (past/present, near future and far future);
  - Process urban planning scenarios for Antwerp and Berlin (all time periods);

- Deliver UrbClim results to GIM.
- **GIM:**
  - Finalize the review of socio-economic data, urban planning projects and population predictions for the near future provided by the end-users;
  - Finalise the UrbClim input layers production for the following scenarios: (1) Antwerp – urban densification project – near future; (2) Almada – realisation urban plans – near future.
  - Setup of a methodology for the urban planning scenarios and the extraction of **UrbClim input layers** for Antwerp and Almada for 2030. The results have been delivered by GIM to VITO.
  - Setup of an exposure mapping template in agreement with the end-users;
  - Create all exposure maps of base scenarios 1986-2005 for the city of Antwerp, and partially the ones for Berlin and Almada. First maps have been delivered to the end-users.

## 4.2 WORK PLANNED FOR NEXT REPORTING PERIOD

The work planned for the next reporting period (Q2 2015) includes:

- **VITO:**
  - Run Almada urban planning scenarios with the updated UrbClim input data delivered by GIM;
  - Discussing and starting mitigation measures simulations for all three cities;
  - Analysis of downscaling strategies at street level to better assess local climate impacts;
  - Upload UrbClim results to the NACLIM CT4.2 data portal (see website).
- **GIM:**
  - Calculation of the **heat stress related variables and statistics** for all remaining scenarios and time scales for all three cities;
  - Continue and finalize the production of exposure mapping results for all cities and for the present and near future situation and validation in collaboration with the end-users;
  - Production of heat stress mapping results (UHI effect, average number of heat wave days per year) for all cities and for the present, near future and far situation and validation in collaboration with the end-users;
  - Upload exposure mapping results to the NACLIM CT4.2 data portal (see website).

## 4.3 SUMMARY OVERVIEW STATUS

### 4.3.1 Scenarios

A summary overview on the status and planning of work for each considered scenario and end-user city is given in the table below. For more detail on each specific scenario, refer to the previous chapter.

THEME	ID	SCENARIO	TIME SCALE			URBAN MORPHOLOGY PARAMETERS PROCESSING STATUS	URBCLIM SIMULATIONS PROCESSING STATUS		
			PAST - PRESENT (1986-2005)	NEAR FUTURE (2026-2045)	FAR FUTURE (2081-2100)		BERLIN	ANTWERP	ALMADA
BASE & CLIMATE VARIABILITY	S01	UHI - present situation	X			DONE	DONE	DONE	DONE
	S02	UHI - present situation	X			DONE	DONE	DONE	DONE
	S03	UHI - near future incl. climate variability		X		DONE	DONE	DONE	DONE
	S04	UHI - far future incl. climate variability			X	DONE	DONE	DONE	DONE
MORPHOLOGY CHANGES	S05	Urban planning	X	X		DONE	DONE	DONE	Q2 2015
MITIGATION MEASURES	S07	Increase green roofs	X			DONE	DONE	DONE	DONE
	S08	Increase albedo buildings	X			DONE	Q2 2015	Q2 2015	Q2 2015

**Table 1 – NACLIM status and planning of work (version Q1 2015)**

### 4.3.2 Exposure mapping

A summary overview on the status and planning of work (short and long term) for the considered exposure mapping scenarios is given in the table below.

THEME	ID	EXPOSURE MAP Key variables: UHI effect, # heatwave days / year Optional: average heatwave duration / intensity	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)
Population	E01	Vulnerable population - today (total)	DONE			OPTIONAL	OPTIONAL
	E02	Vulnerable population - near future (total)		Q2 2015			Q2 2015
	E03	Vulnerable population - today (age class)	ON GOING			OPTIONAL	OPTIONAL
	E04	Vulnerable population - near future (age class)		Q2 2015			Q2 2015
Vulnerable institutions	E07	Vulnerable population - today (schools)	ON GOING			OPTIONAL	OPTIONAL
	E09	Vulnerable population - today (childcare)	ON GOING			OPTIONAL	OPTIONAL
	E11	Vulnerable population - today (hospitals)	ON GOING			OPTIONAL	OPTIONAL
	E13	Vulnerable population - today (rest homes)	ON GOING			OPTIONAL	OPTIONAL

**Table 2 – NACLIM status exposure mapping (version Q1 2015)**

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)
Antwerp	Exposure maps	Population	Total population 2014	Average number of heatwave days per year	X				
			Population density inhabitants per hectare 2014						
			Total population 2030	Average number of heatwave days per year				X	
			Population density inhabitants per hectare 2030						
			Number of inhabitants aged 0 to 4 years 2014	Average number of heatwave days per year	X				
			Number of inhabitants aged 0 to 17 years 2014						
		Number of inhabitants aged 18 to 65 years 2014							
		Number of inhabitants aged +65 years 2014							
		Vulnerable institutions	Number of schools 2014	Average number of heatwave days per year	X				
			Number of childcare centers 2014						
	Number of hospitals 2014								
	Number of rest Homes 2014								
Heat stress maps			Average number of heatwave days per year , UHI effects	X	X	X	X	X	

**Table 3– NACLIM exposure maps for Antwerp**

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)
Berlin	Exposure maps	Population	Total population 2013	Average number of heatwave days per year	X				
			Population density inhabitants per hectare 2013						
			Total population 2030	Average number of heatwave days per year		X		X	
			Population density inhabitants per hectare 2030						
			Number of inhabitants aged 0 to 17 years 2013	Average number of heatwave days per year	X				
			Number of inhabitants aged 18 to 65 years 2013						
		Number of inhabitants aged +65 years 2013							
		Number of inhabitants aged 0 to 17 years 2030							
		Vulnerable institutions	Number of inhabitants aged 18 to 65 years 2030	Average number of heatwave days per year	X		X		X
			Number of inhabitants aged +65 years 2030						
	Number of schools 2014		Average number of heatwave days per year			X			
	Number of childcare centers 2014								
Number of hospitals 2014									
Number of rest Homes 2014									
Heat stress maps			Average number of heatwave days per year , UHI effects	X	X	X	X	X	

**Table 4– NACLIM exposure maps for Berlin**

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				
			Population density inhabitants per hectare 2011						
			Number of inhabitants aged 0 to 19 years 2011	Average number of heatwave days per year	X			X	
			Number of inhabitants aged 20 to 65 years 2011						
		Number of inhabitants aged +65 years 2011							
		Vulnerable institutions	Number of schools	Average number of heatwave days per year	X				
			Number of university						
			Number of senior universities						
			Number of childcare centers						
	Number of hospitals								
Number of rest Homes									
Heat stress maps		Average number of heatwave days per year , UHI effects	X	X	X	X	X		

**Table 5– NACLIM exposure maps for Almada**