

## Course: Livable Future Cities

### Answer sheet - week 5 *Optional Exercise 2*

#### Urban climate and livability

#### How do you measure the canopy-layer heat island of your city?

**1. Where would you measure the maximum UHI intensity?**

Two locations have been chosen for measurements: city centre and rural area.

**2. When (at what time of the day) is the UHI intensity at its maximum?**

The data of official Meteorological Institute (KNMI) has been used.

The chosen time for measurements is 05:00 AM.

**3. How should you set-up your sensor?**

Set-up of sensor: height 1,5m above surface

#### What do the measurements mean?

**4. How big is the temperature difference between where you measured the urban**

temperature location A: 6,6 °C

temperature location B: 4,3 °C

Difference = location A – location B 2,3 °C

**5. Can you explain the magnitude of the difference?**

1. *What are possible influences of the immediate surroundings where measurements were taken?*

\*The majority of The building materials have a higher heat capacity than rural materials such as sand and grass. City centres are more effective at storing heat than their rural surroundings. **True**

\*Areas covered by buildings become large thermal masses that cannot release their heat rapidly. This causes, especially at night, warmer air temperature above urban centres than the air temperature above rural surroundings would be. **True**

2. *What influence does the weather have on the measurement? (e.g. season, wind, clouds etc.)*

\* Strong winds lower The urban-rural temperature difference due to the increased atmospheric mixing which breaks down temperature gradients. **True**

6. *Can you elaborate a number of interventions against the UIH in your city, which are carried out by different actors?*

*The next options will be possible to use in big cities against UIH.*

*\*Tall trees:*

Trees provide shade, which results in cooling down the surroundings.

*\*Green roofs and walls (roofs covered with vegetation)*

Vegetation absorb the pollutant carbon dioxide and help to reduce the heat.

*\*Buildings and roads with light colours*

Light colours reflect the sunlight, which results in the reduce of the amount of heat absorbed into buildings and roads.

## MEASUREMENT DATA FORM

### Location

1. Name of city

1.1 Location A: Rotterdam

1.2 Location B: Gilze Rijen

2. Country

the Netherlands

3. GPS coordinates or street name/number of city location (A) and reference location (B)

3.1 Location A: 51,962N 4,447E -4,3mALT

3.2 Location B: 51,556N 4,936E 14,9mALT

4. Describe immediate surroundings (within 200 m of site) in terms of building type/morphology and vegetation (e.g. type of land cover, building heights, street width, type and amount of green space/trees and their height)

4.1 Location A : Buildings with height approximately 100,0m

4.2 Location B : Low buildings and trees with height approximately 5,0m

### Sensor

5. What sensor did you use? Internet, official Meteorological Institute KNMI

6. What is the accuracy of the sensor? if available)

### Measurements

7. Time of measurements? (dd/mm/yyyy and 00:00 PM/AM)

7.1. Season : autumn

7.2. Date : 28-11-2017

7.3. Time\* : A: 5:00 B: 5:00

*\*Measurements are ideally taken simultaneously; if not possible then an effort should be made to minimize the time lag between (up to ~2 hours is acceptable)*

8. Set-up of sensor (e.g. height above surface, distances from buildings etc.)

1,5m above surface

9. Duration of measurements? (one measurement or an average value of measurements taken during a certain period, e.g. 10 minutes)

Duration of measurements: constantly

10. Weather during measurements

8.1 Wind speed : A: 5,0 m/s B: 3,0m/s

8.2 Amount of clouds: unknown