



Applied Remote Sensing Training (ARSET) Program

Satellite Remote Sensing for Measuring Urban Heat Islands and Constructing Heat Vulnerability Indices

Homework Questions

Question 1

Urban heat islands can form during the day or night, in small or large cities.

Answers: (bold correct)

- a. **True**
- b. False

Question 2

Which of the following statements is not true:

Answers: (bold correct)

- a. Surface Urban Heat Islands (SUHI) represent the radiative temperature difference between impervious and natural surfaces.
- b. **SUHIs measure air temperature**
- c. SUHIs tend to be most intense during the day when the sun is shining.
- d. Magnitude varies with seasons, but it is typically largest in the summer.

Question 3

Between approximately which range in micrometers (μm) does the atmosphere have relatively low absorption of infrared (IR) radiation?

Answers: (bold correct)

- a. 3 – 4 μm
- b. 6 – 7 μm
- c. 10 – 12 μm**
- d. 14 – 15 μm

Question 4

Which satellite and sensor from the training provides nighttime land surface temperature products?

Answers: (bold correct)

- a. Aqua MODIS**
- b. Landsat 8 TIRS
- c. Landsat MODIS
- d. None of the above

Question 5

Which of the following are improvements from Landsat Collection 2, Level-2 products?

Answers: (bold correct)

- a. Global land surface temperature and surface reflectance products
- b. Consistent Quality Assessment Bands
- c. Improved Geometric Accuracy
- d. Updated and Consistent Metadata Files
- e. All of the above**

Question 6

What are some limitations of using satellite remote sensing for urban heat islands?

Answers: (bold correct)

- a. Data acquisition times of sun-synchronous satellites usually do not coincide with the time of day where the SUHI is at a minimum or maximum.
- b. Most widely used satellite for SUHI detection (i.e., Landsat) only has daytime data.

- c. Optical sensors cannot penetrate clouds or vegetative cover, which can lead to data gaps or a decrease in data utility.
- d. It is difficult to obtain high spectral, spatial, and temporal resolution with the same instrument.
- e. All of the above**

Question 7

Please upload a map (screenshot, PDF, or other image file) of the LST results for your own area of interest using the script provided for either Landsat or Aqua MODIS to the link provided. Name your file (last name_LST).

Question 8

Exposure refers to the level to which an individual may be impacted by heat exposure given pre-existing physiological conditions that may help or hinder these impacts.

Answers: (bold correct)

- a. True
- b. False**

Question 9

Which of the following is a method to construct Heat Vulnerability Indices (HVI)?

Answers: (bold correct)

- a. Weighted
- b. Normalization and aggregation
- c. Principal Components Analysis
- d. Equal weight
- e. All of the above**

Question 10

HVI results may significantly vary depending on which of the following:

Answers: (bold correct)

- a. Inputs selected
- b. Construction method
- c. Scale
- d. All of the above**

Question 11

Which of the following are common vulnerability indicators?

Answers: (bold correct)

- a. Land surface temperature
- b. Impervious surfaces
- c. Older adults
- d. Income
- e. All of the above**

Question 12

For this homework, you will design a Heat Vulnerability Index with a specific heat intervention in mind (i.e. tree planting campaign or cooling centers). What heat intervention will your HVI support?

Answers: Open-ended

Question 13

For this homework, you will design a Heat Vulnerability Index with a specific heat intervention in mind. Which vulnerability indicators did you use in your HVI?

Answers: Open-ended

Question 14

For this homework, you will design a Heat Vulnerability Index with a specific heat intervention in mind. Did you weight your indicators? If so, how?

Answers: Open-ended

Question 15

For this homework, you will design a Heat Vulnerability Index with a specific heat intervention in mind. Based on your HVI results, where will you deploy your intervention?

Answers: Open-ended

Question 16

Please upload a map of your HVI (screenshot, PDF, or other image file) to the link provided on the website. Name your file (last name_HVI)

Answers: Open-ended

Question 17

Wet Bulb Globe Temperature (WBGT) accounts for ambient (2 meter) air temperatures, relative humidity, radiated heat (LST), and wind speeds (air flows).

Answers: (bold correct)

- a. **True**
- b. False

Question 18

WBGT can be estimated from meteorological data obtained from space-born Earth-observing satellites.

Answers: (bold correct)

- a. **True**
- b. False

Question 19

What is the dataset available from the NASA Socioeconomic Data and Applications Center (SEDAC) providing records for every hot-humid urban heat wave, including dates and WBGTmax estimates from 1983 – 2016?

Answers: (bold correct)

- a. **Global High Resolution Daily Extreme Urban Heat Exposure**
- b. Global Risk Index
- c. Global Urban Heat Island
- d. Global High Resolution Urban Data

Question 20

Which of the following products is produced from UC Santa Barbara Climate Hazards Center?

Answers: (bold correct)

- a. GISTEMP
- b. MYD11
- c. **CHIRTS-daily**