

Application of Remote Sensing and GIS in evaluating the relationship between Urban Green Space and Thermal Environment for Eastern urban areas in HCMC

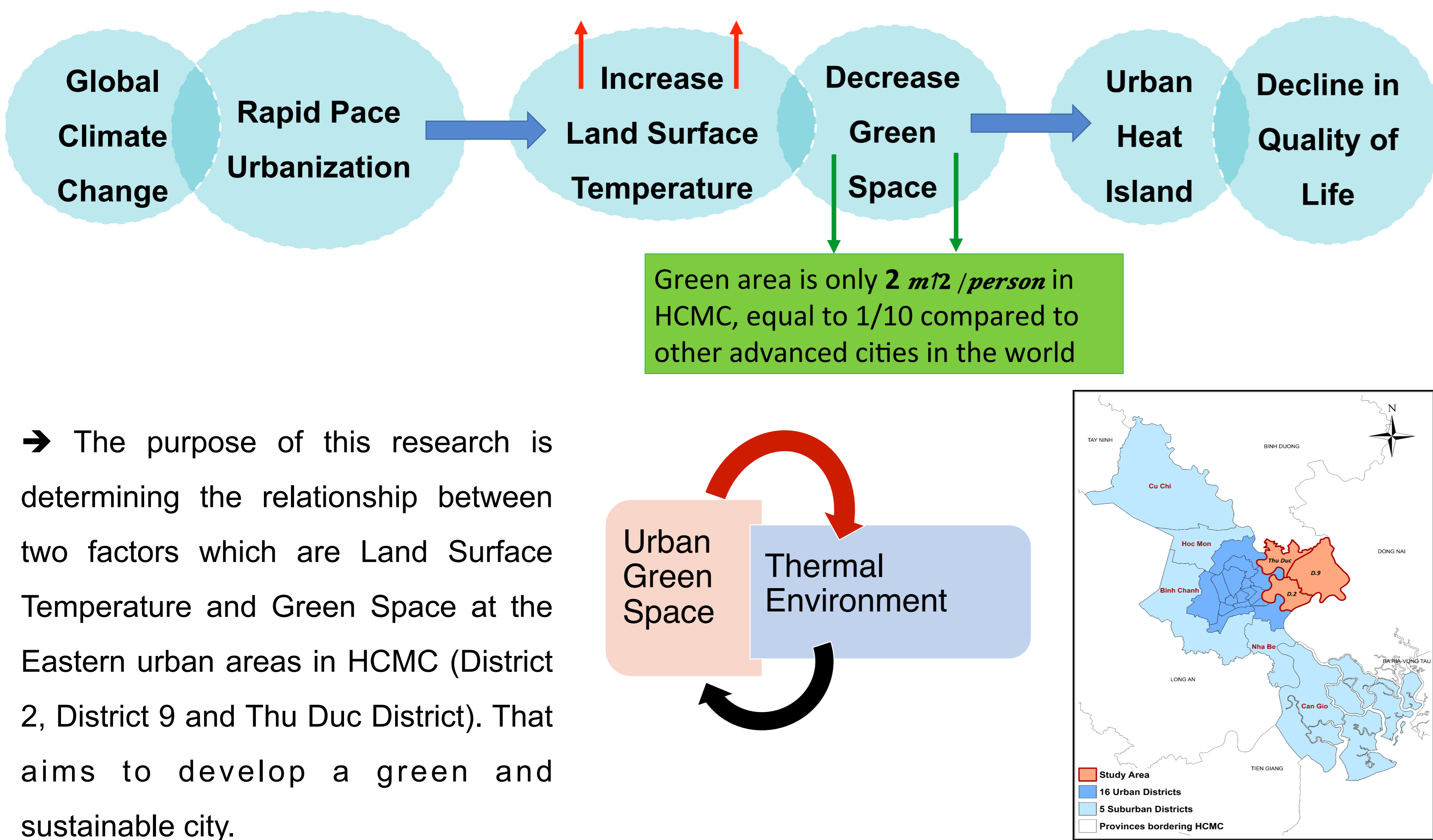


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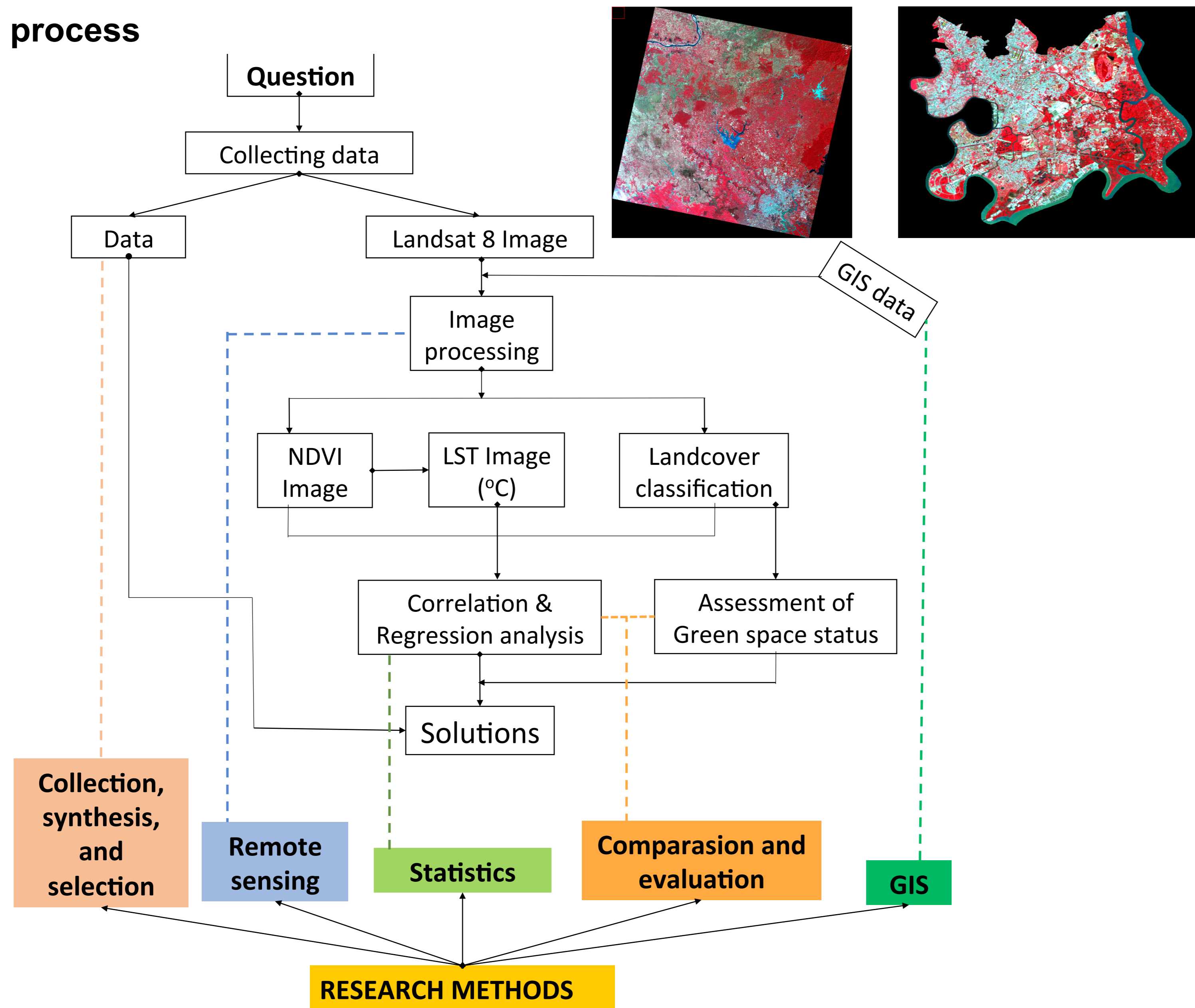
Vietnam School of Earth Observation | ICISE, Quy Nhon, Vietnam | August 27-31, 2018

I. Introduction



II. Methodology

Implementation process

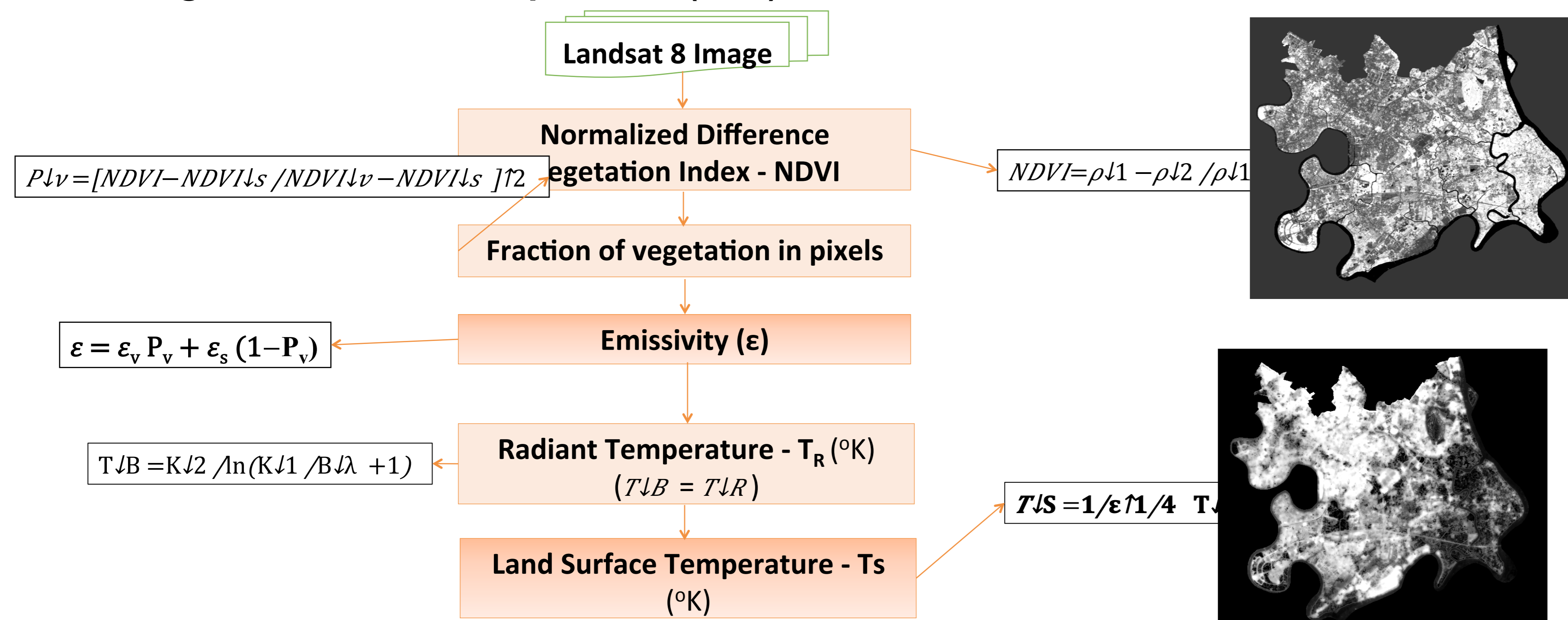


• **Data:** The Landsat 8 satellite image was acquired on February 14th, 2017.

• **Classification methodology:** Supervised classification method with MLC – Maximum Likelihood Classifier has been used. This method considers each class in each spectrum channel to have a standard distribution, and pixels will be classified into the class that has the highest probability. The classification system for this research includes 4 primary object classes: Vegetation, Impervious surface, Bare land, and Water.

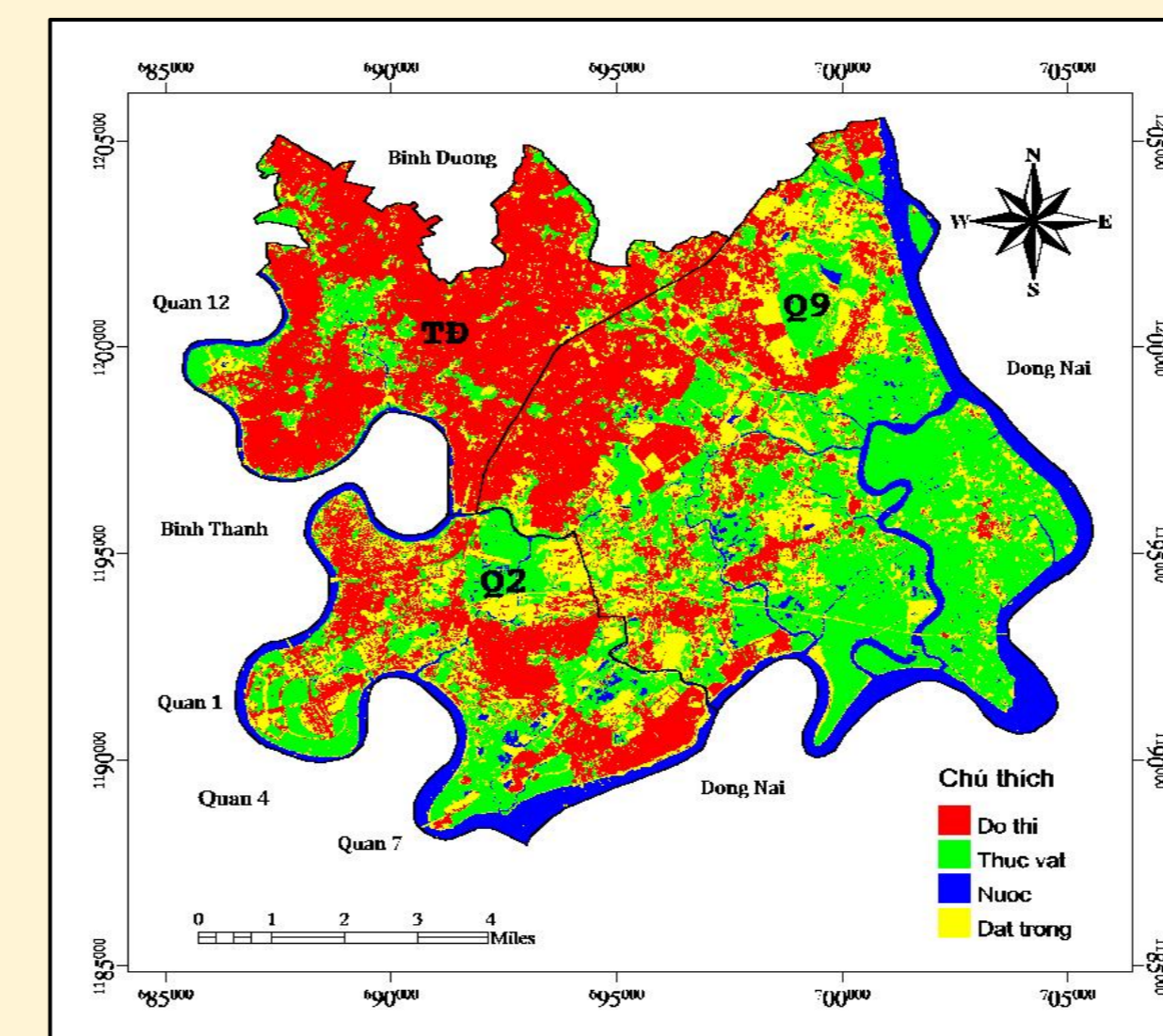
Accuracy of supervised classification is evaluated based on an error matrix and norms such as Overall accuracy (>85%) and Kappa coefficient (κ) (>0.8).

Calculating Land Surface Temperature (LST):



III. Results and Discussion

1. Status quo of Green space

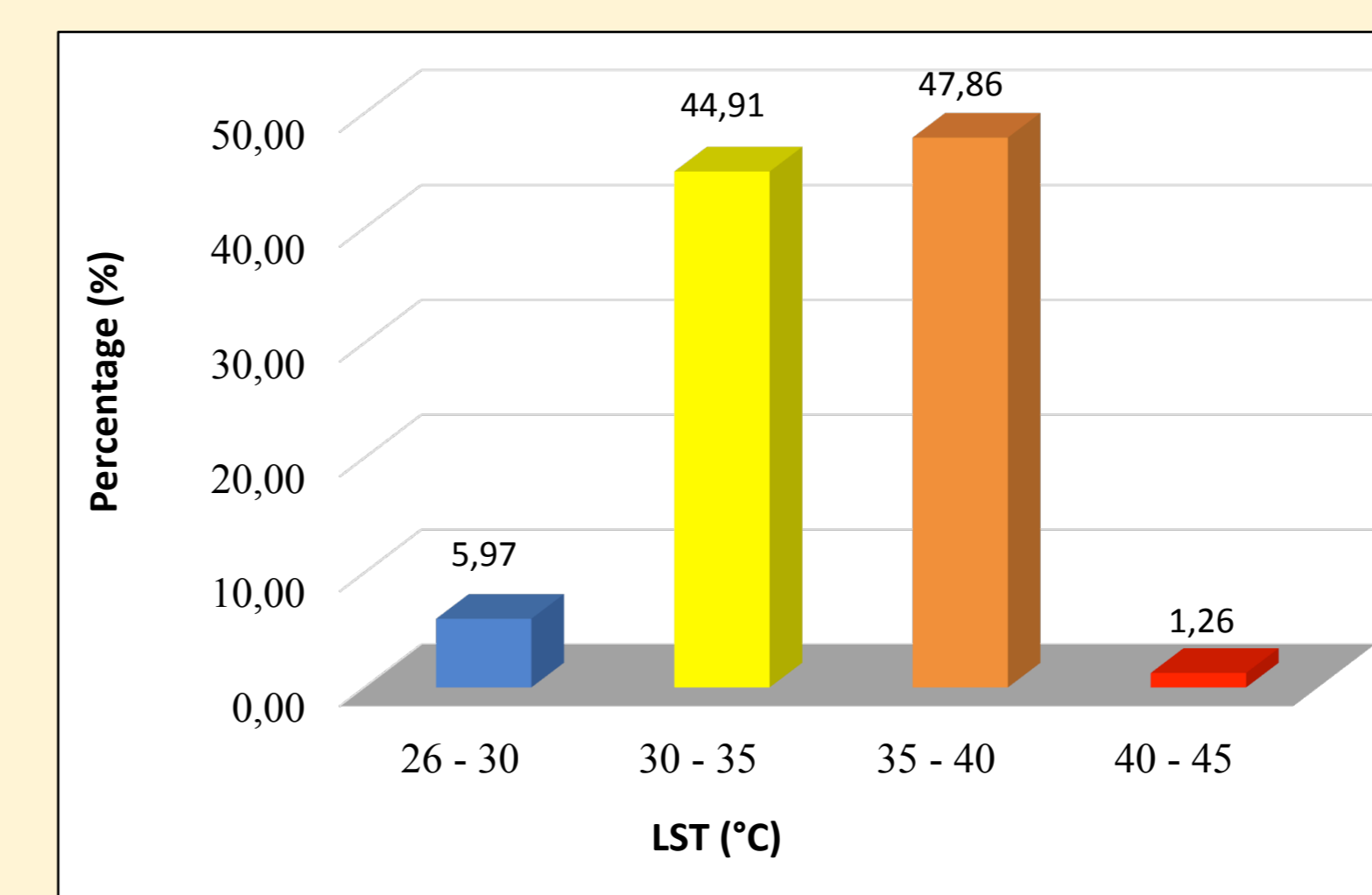


Overall accuracy: 85.57%
Kappa coefficient: 0.8

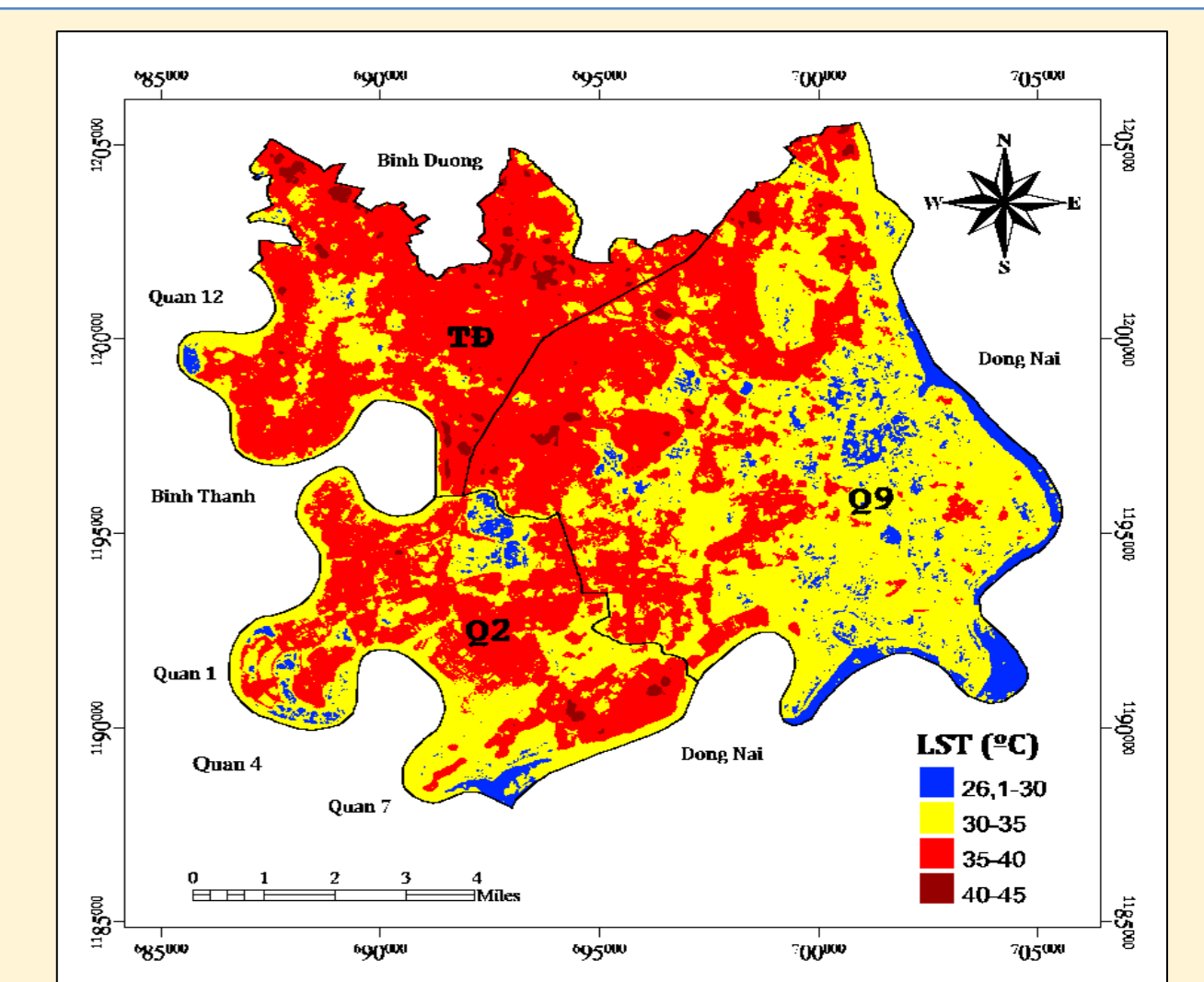
	D.2	D.9	Thu Duc
Green area of trees (m ²)	14,390,500	48,712,100	6,252,500
Population in 2016 (person)	153,832	296,198	537,050
Green area/capita	93.6	164.5	11.6

According to National Standard TCVN 9257:2012 (Greenery planning for public utilities in urban areas - Design standards): 12-15 m²/person for special urban areas.

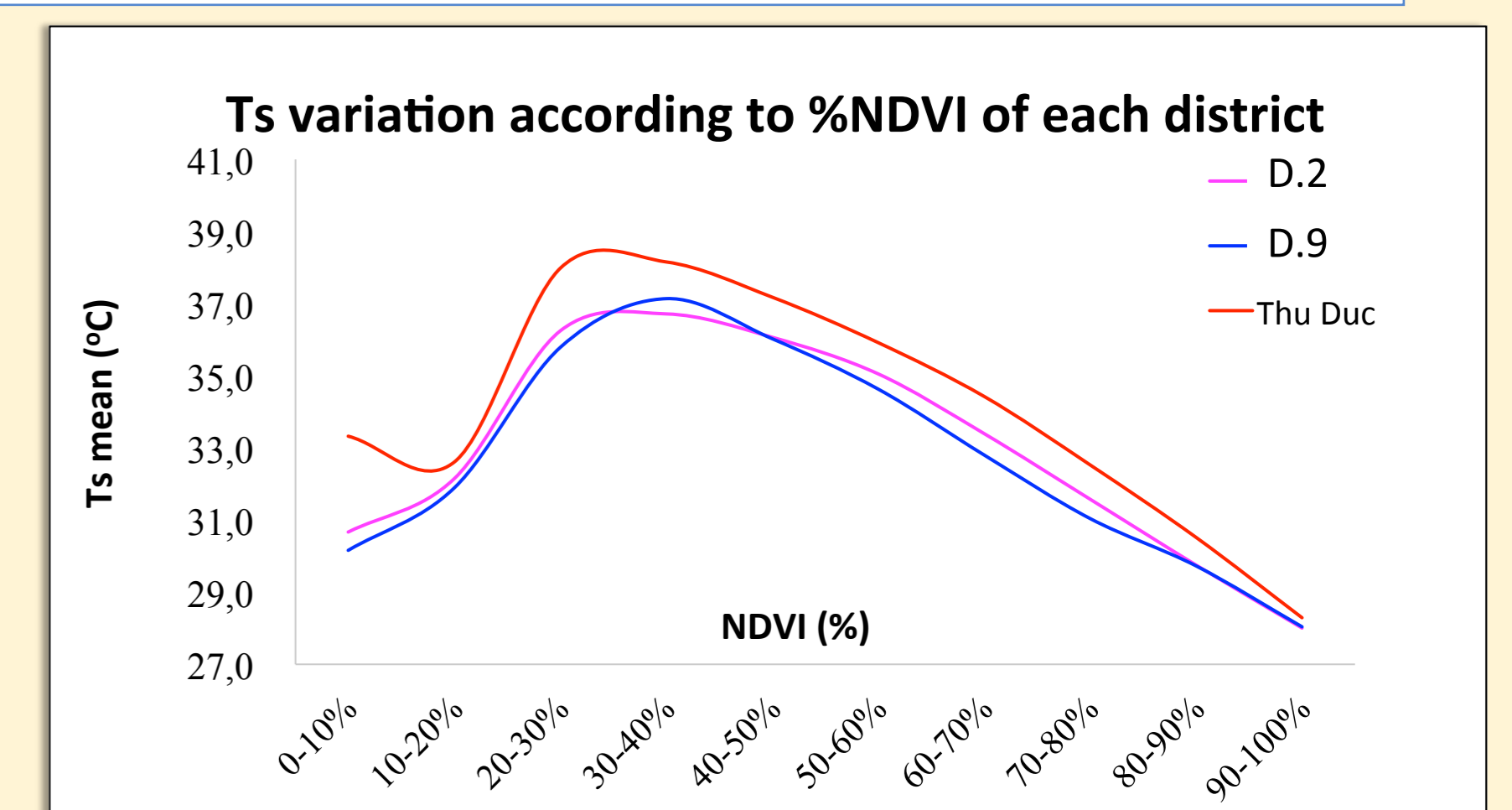
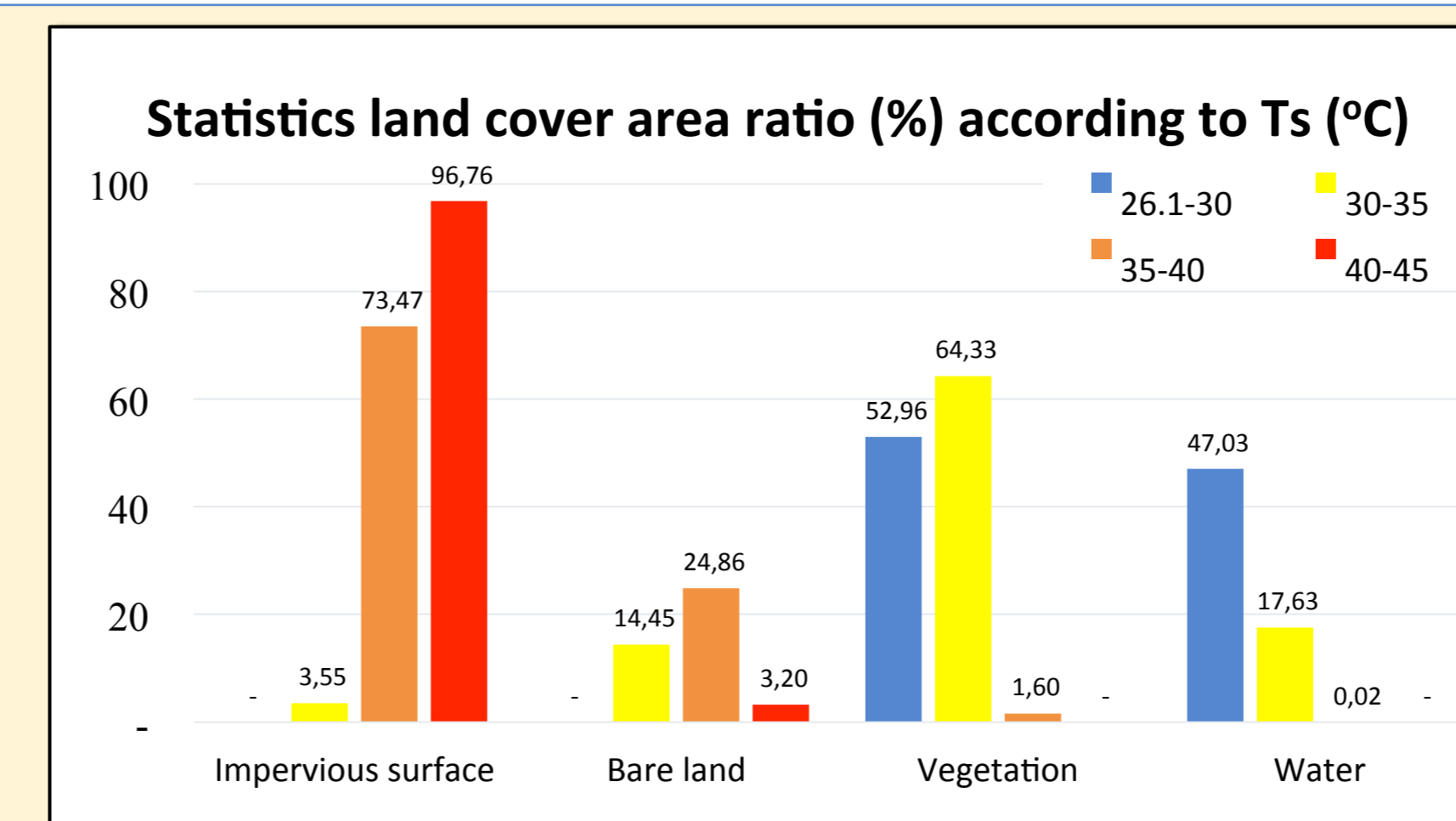
2. Calculation result of Land Surface Temperature



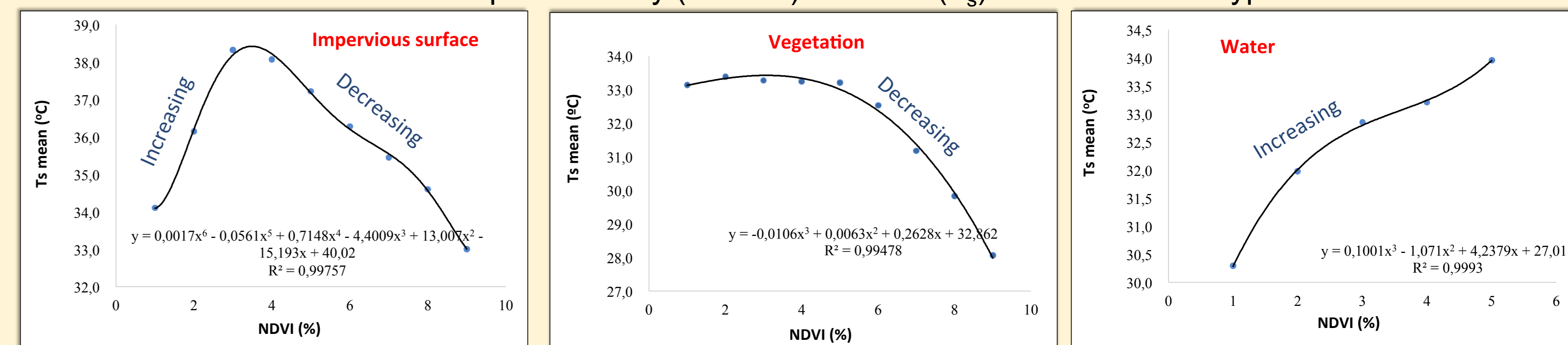
The LST value of Band 10



3. Correlation and Regression between Green Space and LST



Correlation between Green space density (%NDVI) and LST (Ts) on 3 land cover types

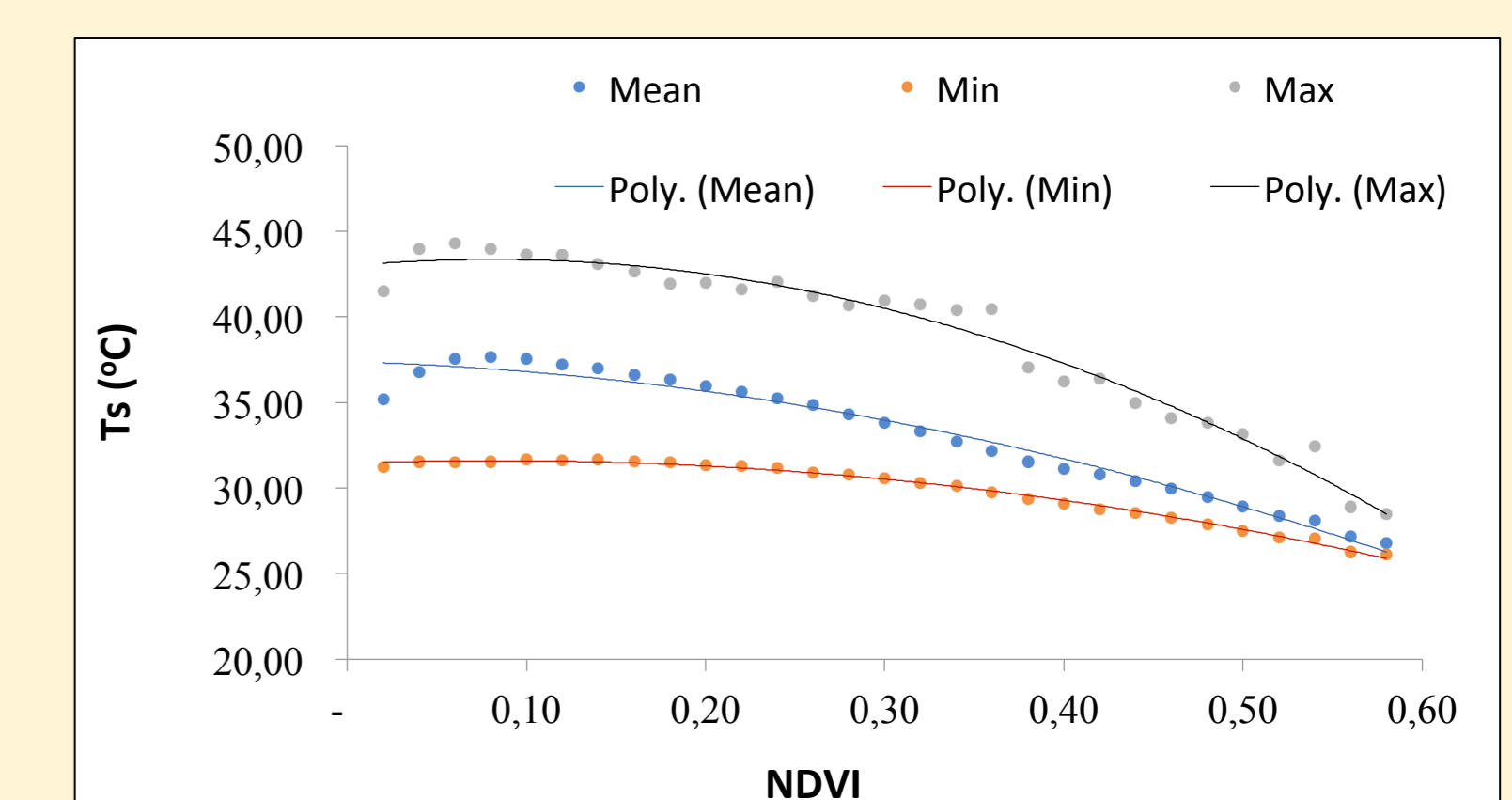


The relationship between green space density (%NDVI) and LST (Ts) is **non-linear polynomial**

Regression function between Green space and LST:

- 1) An independent variable is **NDVI**
- 2) Dependent variables are **Ts min, Ts max and Ts mean**

	Linear function	Polynomial function
Ts min	$y = -10,041x + 32,884$ $R^2 = 0,8886$	$y = -23,243x^2 + 3,9071x + 31,442$ $R^2 = 0,9948$
Ts max	$y = -26,169x + 46,676$ $R^2 = 0,8708$	$y = -59,745x^2 + 9,6841x + 42,969$ $R^2 = 0,9721$
Ts mean	$y = -19,738x + 39,108$ $R^2 = 0,9317$	$y = -27,684x^2 - 3,1244x + 37,39$ $R^2 = 0,9726$
SD	$y = -2,6921x + 2,2939$ $R^2 = 0,8922$	$y = 162,2x^4 - 224,12x^3 + 102,36x^2 - 19,629x + 3,0013$ $R^2 = 0,9756$



NDVI and Ts are inverse relationship because slopes of linear functions are negative (<0).
Polynomial function shows the relationship between NDVI and Ts is tighter, and can be used to simulate or forecast.

IV. Conclusion

1/ Temperature in urban areas is often hotter than vegetation land cover or wetlands along rivers, so Vegetation and Water are factors contributing to air cooling in urban environment.

2/ Regression analysis result shows LST goes down in places with many trees. However, the areas where the density of trees is dense are still very low.

3/ Development of urban green space as well as vertical green space should be planned from the initial design stage towards the gradual formation of "Urban forest" and conservation of current greenery.

4/ Remote sensing technology has many advantages, which can support for science researches and provide data in a wide area.

