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Introduction

- Urban expansion in China has been booming at a rapid rate, and the annual expansion rate from 2007 to 2012 was reported to be 5.2%.
- Land Use and Land Cover (LULC) has been observed in Dongguan city (Fig.1) where urban and industrial land has rapidly and continually been expanding.
- The Artificial Neural Network-Cellular Automata (ANN-CA) model can simulate and forecast the complex and non-linear spatial-temporal process of urban growth in a reasonably short computational time.

Objective

The main objective of the study was to conduct urban growth simulation and prediction based on the artificial neural network in Dongguan Metropolitan Area. The main outputs were:

- LULC maps of the area in 2004, 2009 and 2014;
- The simulation results in 2014 and new urban growth area in 2024.

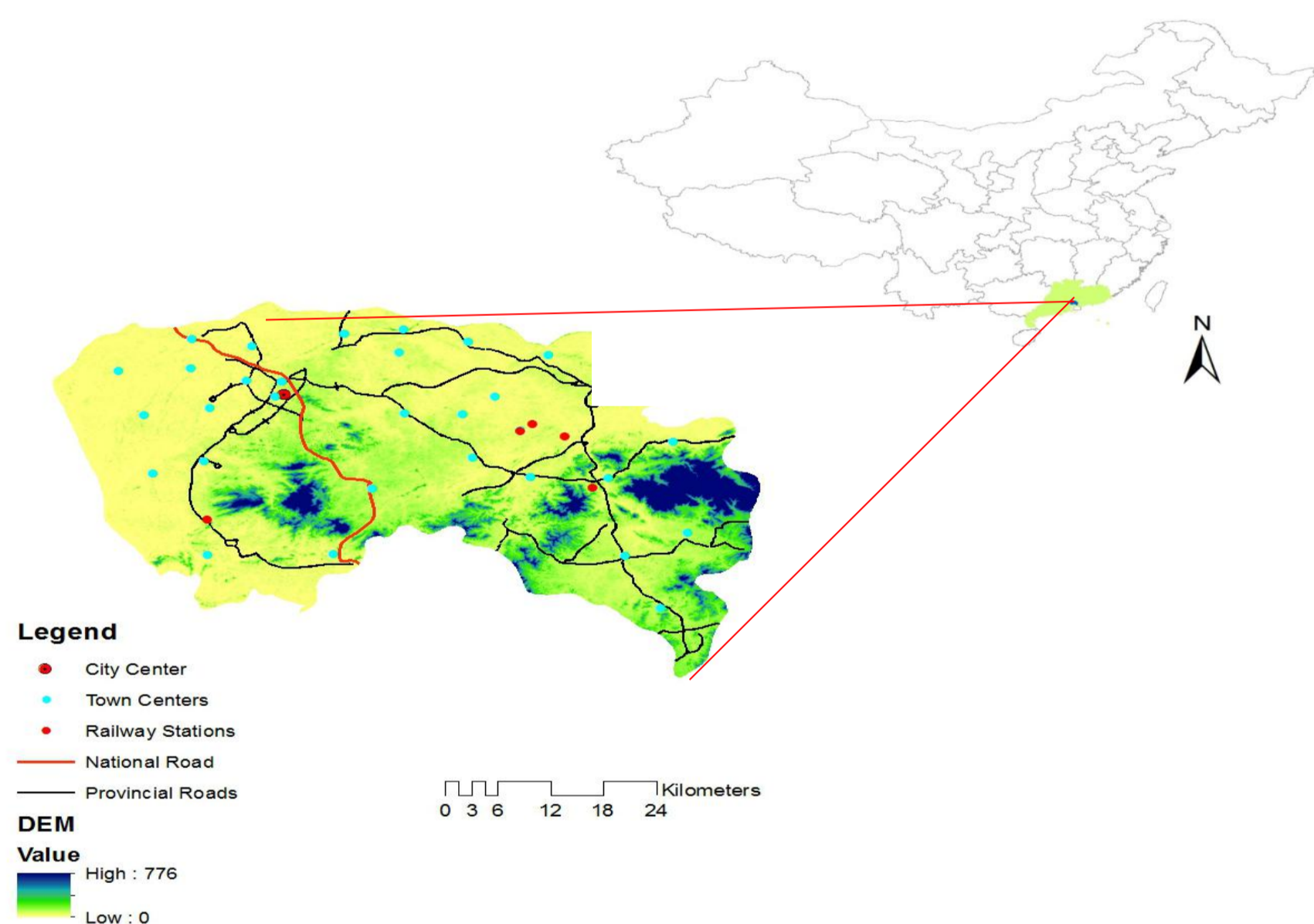


Fig. 1. Study area: Dongguan city, China

Methodology

The main methods and procedures of the study were:

- Using a supervised classification method (the maximum likelihood classification of ArcGIS) to classify LULC changes in 2004, 2009 and 2014.
- Using ANN-CA to simulate urban growth process in Dongguan city in 2014.
- Using map comparison techniques to calculate kappa indices for analyzing the components of agreement and disagreement and the value of Figure of Merit (FoM).
- The prediction of urban growth was explored and discussed in Dongguan city in 2024.

Conclusion

- Urban land increased within the period 2004 to 2014, and Dongguan city has undergone rapid urbanization.
- Provincial roads have high contributions to urban growth and constructing urban pattern based on the network pattern of provincial roads. It reflects a strong relationship between the provincial roads and urban pattern.
- The new growth area is concentrated in the southwest areas of Dongguan city because of convenient traffic and flat terrain. Emphasizing on the development of the surrounding towns and provincial roads will achieve a high urbanization.

Results

Following figures show the obtained LULC maps, actual and simulated map in 2014 and prediction in 2024 (Fig. 2)

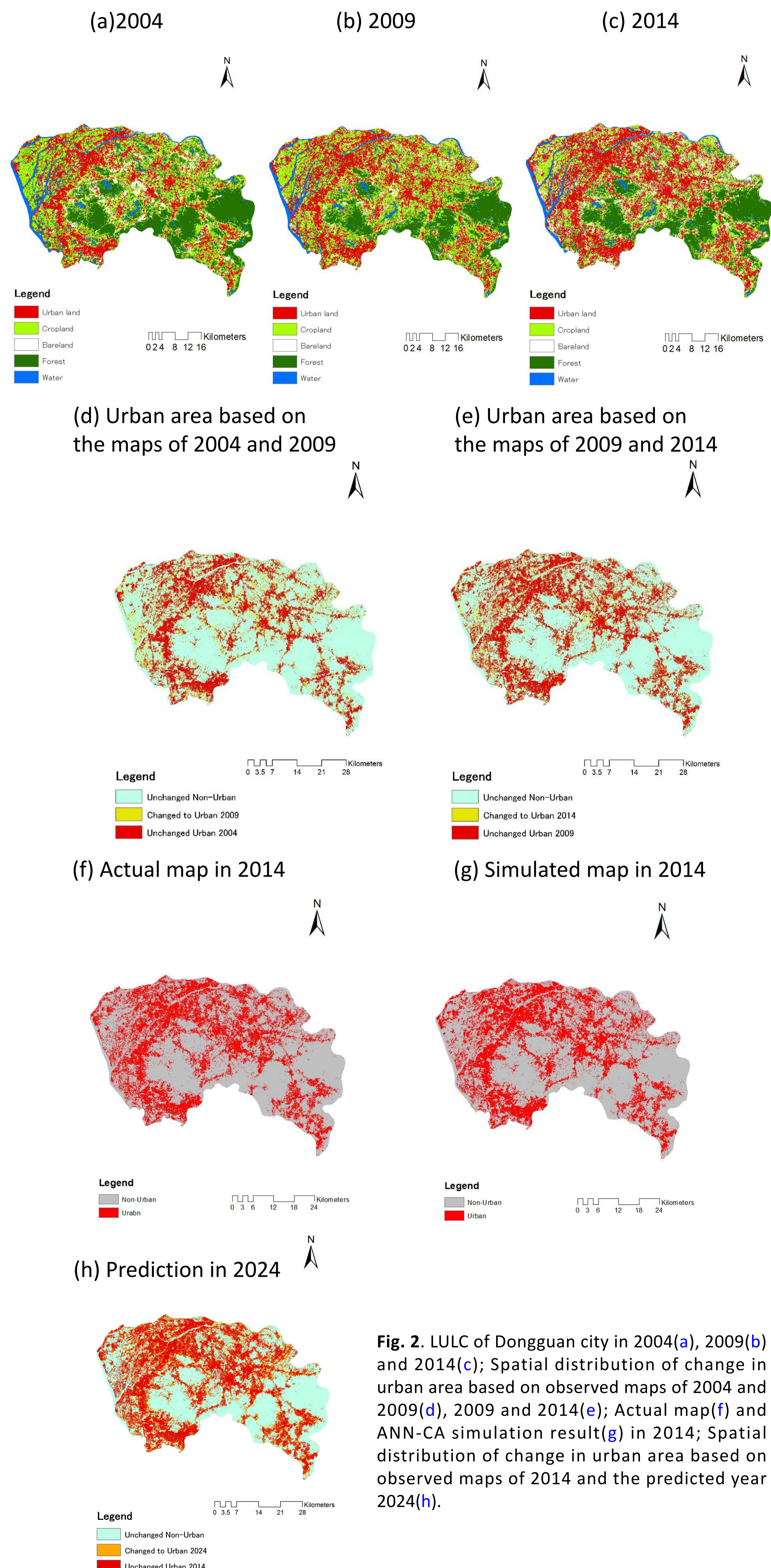


Fig. 2. LULC of Dongguan city in 2004(a), 2009(b) and 2014(c); Spatial distribution of change in urban area based on observed maps of 2004 and 2009(d), 2009 and 2014(e); Actual map(f) and ANN-CA simulation result(g) in 2014; Spatial distribution of change in urban area based on observed maps of 2014 and the predicted year 2024(h).