

## **CHAPTER V CONCLUSION**

In this chapter, a summary of the previous chapter will be presented, beginning with a review of the interesting findings and continuing with an evaluation of the limitations of this study, along with additional work that may be conducted to enhance the current study.

### **5.1 Key Findings**

From the first study, it can be obtained that there is no doubt that there has been an appearance of urbanization from statistical calculations. From the analysis of data sourced from CBS using PCA, it can be seen that from 35 districts/cities with a total of 40 variables (dynamic and static), four principal components can be retained, covering a total of 54.2 percent. Furthermore, PC1 is the most influential, accounting for 21.80 percent of the data variance and 18 variables. PC2 (16.60 percent) had fewer variables than PC3 (9.20 percent) and PC4 (7.20 percent), which had 7 and 8 variables, respectively.

Statistical study employing cluster analysis revealed that five groups constitute the ideal number of clusters. The distinction between these five groupings is the degree of urbanization and the probability of further urbanization. Cluster 1 is the city/district with the lowest urbanization level, while cluster 5 has the highest urbanization level. The potential of urbanization increasing in the future is lowest in cluster 1 and highest in cluster 4. As the majority of the region is already urbanized, cluster 5 is projected to witness a small increase in urbanization levels.

Moving on to the LULC changes, it is noticeable that the alteration to urban areas is significant, especially the changes from agriculture and barren areas. The urban area in 2021 has become at least 60 percent larger than it was in 2000. This substantial rise in the area is a result of a 132 km<sup>2</sup> drop in agricultural land and a 12 km<sup>2</sup> decrease in vegetation. Furthermore, the possibility of changes in the future

will be quite high as shown in the transition matrix with values of 0.1033 and 0.0903 for the agricultural and vegetation, respectively.

Lastly, from the LULC projection process, it can be concluded that MLPNN and ANN-CA are capable of performing LULC prediction well in the absence of any distracting barriers. The primary difference between these two methods is the modeling architecture used, with MLPNN employing feedforward while ANN-CA uses Cellular Automata in addition to feedforward.

## **5.2 Recommendations**

The urbanization of Surabaya is expected to continue in the future. This indicates that the city's built-up area will expand. This involves the development of residential and commercial sectors as well as the expansion of existing urban districts. Moreover, if the population growth continues, infrastructure development such as the construction of additional roads, public transportation systems, and other urban amenities may occur. This growth in population density also generates a rise in the city's demand for water and electricity. Other negative effects include traffic congestion and water and air pollution in the metropolis.

In addition to the abovementioned growth in the number of physical development needs, the urbanization raises the need for services such as health and education facilities to meet the demands of the residents. The expansion of businesses and economic activity will necessitate that everyone's requirements are addressed. In addition, social consequences will arise and intensify, such as the presence of informality and low-income families who require care and the satisfaction of their needs, including employment to support their households and spaces to move around. In short, the issues in the city will step up in terms of the availability of affordable housing, urban congestion, and environmental degradation. The recommendations for these issues are summarized in the table

**TABLE V.1**  
**Recommendations summary**

<b>Infrastructure Planning</b>	<b>Conservative Planning</b>	<b>Others</b>
<p>Integrated planning with a comprehensive and coordinated planning strategy is required. Regarding Surabaya's spatial planning, consideration must be given to the province plan and the surrounding districts (RTRW in Gresik, Sidoarjo and Mojokerto).</p> <p>To ensure that all community demands are satisfied, the planning process must also incorporate all stakeholders by establishing policies based on a community participation approach. The implementation should also adopt a smart city concept by utilizing technology to capture big data in order to improve the effectiveness and efficiency of the available resources.</p> <p>Immediate development is required in Surabaya in the form of affordable housing, integrated public transit, and infrastructure supporting public transportation.</p>	<p>The availability of sufficient green space is one of Surabaya's positive characteristics that must be maintained. This must be extended in the future so that the quality of life and public health continue to improve. In order to reduce the horizontal expansion of development, additional parks and green areas should be constructed. The good existing example is the mangrove area in east side of the city. The development strategy should be implemented into spatial planning in order to achieve land use control balance.</p> <p>Therefore, in a long-term, Surabaya can adapt to the potential dangers of climate change.</p>	<p>Financial considerations must be made in urban planning to ensure execution. The adoption of payment mechanism choices, such as public-private partnerships to support diverse types of urban development initiatives, is one possibility.</p> <p>Regular monitoring and assessment must also be regarded in order to adopt the appropriate actions and reactions.</p>

### 5.3 Limitations and Future Works

Obstacles in conducting research are probably certainly encountered by all; it is a barrier to research. Consequently, there are a number of limitations and potential improvements that can be made to the current study, some of which are detailed below.

1. Processing a large amount of data takes intense and sustained concentration. In addition, it is vital to support specialized technology in order to achieve results that meet expectations. The endeavor of this research has been to collect statistical data as thoroughly as possible.
2. The availability of satellite image data according to the expected timeline is not always attained, preventing the LULC map from meeting commonalities between time periods. The optimal outcome is a combination of three distinct years, namely 2000, 2013, and 2021 for MLPNN and 2000, 2003, and 2021 for ANN-CA. Combining the length of the time difference with a different temporal difference would improve future studies.
3. The spatial driver utilized in this study is still limited and cannot be altered to attempt different combinations in determining the optimal formulation; in the future, it will be advantageous to test different combinations in order to identify the optimal formulation.
4. Currently, this research is limited to Cluster 4 because this cluster will be the most adversely impacted by urbanization in the near future compared with other clusters. In the future, it will be important to empirically demonstrate the relationship between this statistical calculation and spatial examination.
5. The rules governing spatial planning have not been taken into account, even though they have a significant impact on the spatial expansion of urban areas. Future research should, if at all possible, include spatial planning while making the estimations.