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Analysis of Land Use Change Affected by Coffee Shop Industry: A Case Research in Batu City, Indonesia

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ABSTRACT

The growth of café industry in Batu City is increasing every year due to the tourism sector and the migration of students. These factors have significantly changed landscape of green agricultural land into industrial or productive land in Batu City. Therefore, this research aimed to examine land use change due to the growth of the café industry in Batu City. A solution framework was also developed for local governments in regulating or managing land use change using qualitative and case research methods. Additionally, data was obtained through semi-structured interviews with relevant stakeholders. This research used Geographic Information System (GIS), the data processing software to visualize landscape of land use change. The results showed that there was an annual exponential variation in land use change. Theoretical and practical contributions added to the discourse on coffee shop growth by including the sustainability of green land. A stakeholder commitment was also required to maintain green land sustainability and policy on investment mechanisms.

1. INTRODUCTION

Batu City is recognized by the public as a tourist destination in East Java Province for more than two decades. In this context, tourist enjoys natural and human-made tourism in the Batu City area. The government has focused regional development on the tourism and agricultural sector since the establishment of the city [1]. Tourism is capable of escalating local revenues through the collection of hotel, entertainment, and restaurant taxes [2]. The rapid growth in the region is also supported by the availability of wide access to the community [3]. The geographical conditions of the city have the potential to attract tourists and investors. The government enables the participation of various parties in participatory, sustainable, collaborative, and democratic tourism development [4].

Increased efforts in the development and implementation of policies certainly have an impact on improving the number of tourist visits [5]. As a city branding strategy to successfully attract tourists, Batu City has adopted the slogan 'shining Batu' [6]. The number of tourists reached 4.9 million by 2024 [7] which was less than half of the target of 12 million. Batu City is vibrant with the activities of tourists seeking to experience its diverse range of destinations and attractions.

High levels of tourist activity and visits implicitly promote the need for resting places such as cafes [8]. The café industry has grown following the initiatives of business people at various levels [9]. This can occur due to the competitive process of responding to the demands of preferences and tastes [10]. Another factor driving the development of cafes is the students who live in Malang City with 62 universities [11]. The total number of students according to the latest data in 2024 was no less than 330 thousand [12]. The growth of the cafe industry has increased due to the proximity factor between Malang and Batu Cities, as well as the preference of students.

Café industry has been developed in every corner of Batu City, impacting land use change [13]. Since 2008, the economy and tourism have converted 554.4 ha or 2.78% of agricultural land into built-up areas. In 2018, the conversion of agricultural land increased by 341.1 ha, followed by a change in the function of secondary forests of 9101.3 ha or 6.07% [14]. The number of cafes in Batu City had reached 126 in 2024 occupying 3332.621808 ha of built-up land. Several research showed that the change in land use from undeveloped to developed had a negative impact on the climate, including a decrease in environmental quality, temperature, and humidity [15]. In this context, an integrated assessment of climate change vulnerability and risk in the form of environmental disasters needs to be carried out. Local governments must also strengthen the adaptive capacity and include the agenda in development programs [16].

Land use changes in an area require serious attention. Proper construction of rules is necessary to control ecological harm, particularly land degradation [17]. This is the urgency of the need for rapid and accurate urban planning to accommodate the density of people in the urban area [18]. Furthermore, sources of information for urban planning through effective data collection are useful methods to maintain urban stability [19]. In Batu City, the increasing activity of green agricultural land conversion may threaten

food availability due to the unbalanced growth of agricultural and non-agricultural sectors [20]. Approximately 5% to 10% of the agricultural land has been lost to tourism, commercial and residential development [1].

To investigate the phenomenon, this research aimed to examine land use changes in Batu City. The impact of the massive coffee shop industry development was also analyzed through a qualitative method. The results provide input for policymakers in paying more attention to the ecological sector. In this context, the sustainability of environment and nature tourism sector should be maintained for future generations.

2. RELATED WORKS

Global economic development has led to increasing changes in land use, specifically agricultural land. Land use change is defined as transforming landscapes by human activities, and converting natural ecosystems to settlements, industry, and other land uses [21]. Land use change occurred largely during Industrial Revolution, which triggered variations in resource use, production, urbanization, and global trade. The phenomenon is driven by various factors, such as economic development, population growth, and changes in government policy, with significant implications for environmental resilience and sustainability [22]. Alberca and Parte [23] emphasized that land use changes affected carbon balance and climate change, suggesting profound ecological implications. Moreover, land use change often occurs in urban and tourism areas experiencing rapid urbanization. The growing tourism sector leads to increased demand for facilities such as hotels and coffee shop [24]. Urban areas relying on the tourism sector create the need for stopover places such as hotels and coffee shop. Therefore, land use change becomes an interesting discussion, affecting environment, the economy, and the social community.

The issue of land use change in developing countries has become a major concern for scientists, policymakers, and environmental community [25]. The complexity of the phenomenon is shown by recent literature. Jamilah et al. [26] explained that residential and industrial expansion, particularly in tourist areas, was a driver of land change in developing countries, such as in Southeast Asia. In Ghana, land conversion cannot be separated from the current climate change [27]. Similarly, in Kolkata, India, rapid urbanization caused increased land conversion [28]. Land use changes also have an impact on the reduction of the Ecological Network in Selangor, Malaysia [29]. Therefore, the concept continues to expand, with evidence of shrinking green areas. Some previous research explained the impact of rapid urbanization on the shrinking of green land in urban areas. However, research on land use changes caused by leisure and hospital activities is still limited.

Governments in developing countries that rely on the tourism sector often prioritize economic development to the exclusion of environmental issues, raising concerns about sustainability [30, 31]. Ababneh et al. explained that as a developing country, Indonesia experienced a significant conversion of green land to the tourism sector [32]. This is because the tourism sector is categorized in the National Development Plan 2015-2019 (RPJMN) to increase GDP, foreign exchange, competitiveness index, employment, and foreign tourists. These conditions have an impact on the economy, environment, and the well-being of the community. The development of tourist areas requires several spaces for the construction of facilities, resulting in the loss of natural ecosystems. Ababneh et al. [32] argued that residential areas, such as hotels, were growing around Jordan's historic tourist attractions. The construction of tourist facilities is often dense, leaving no space for open land, which affects the surrounding air quality. Meanwhile, Pandya et al. [33] described the dynamics of the Corbett Tiger Reserve, India, where ecotourism led to significant changes in local land use since the 1990s. The change started with the purchase of local land to build hotels and resorts in the countryside. This changed the use of agricultural land to tourist attractions. The research provides an overview regarding the win-win solution for ecotourism development while prioritizing environmental concerns.

The dynamics of land use in developing countries or tourist areas affect the construction of accommodation and stimulate the growth of food services such as coffee shop [34-35]. The development of coffee shop often changes the function of green areas with natural nuances. This is because the natural landscape is seen as an added value and tourist attraction [36]. Failure to monitor changes in land use has a negative impact on environmental sustainability. Therefore, government has an important role to play in creating policies to balance economic interests and environmental sustainability [28].

In the context of urban development, space management should prioritize the principles of environmental sustainability [31, 37]. Furthermore, environmental sustainability refers to the appropriate interaction with environment to minimize the depletion or deterioration of natural resources and ensure long-term quality [38]. The concept has become increasingly central in urban planning and land use research, specifically in the context of rapidly growing commercial industries such as coffee shop sector. Urban expansion driven by lifestyle-based consumption has been connected to the transformation of land functions, resulting in the conversion of agricultural or green open spaces into commercial areas [39, 40].

Mabon and Machoň [41] asserted that commitments and policies focused on environmental principles reduced negative impacts. Environmental policies are strategies and regulations designed to manage the interaction between humans and nature. In formulating the policies, the impacts of land use change are measured using environmental, economic, and social indicators [42]. This method allows policymakers to identify potential impacts and make informed decisions. The concept explains the effect of urban land use on local ecosystems since urbanization leads to the loss of green spaces and increased air pollution. In contrast, the Urban Green Spaces (UGS) method offers a new understanding of the importance of assessing environmental, economic, and social impacts of land use change through environmental policy [43, 44]. Land conversion and environmental damage can be minimized through the UGS method.

3. METHODS

This research used a qualitative method to answer the main question [45] with a case study design [46]. The city of Batu was selected as the most popular tourist destinations in Indonesia. Several immigrants settle in Batu which has natural exoticism located in the highlands. Therefore, there are many changes in land use due to the activities of tourists or future communities.

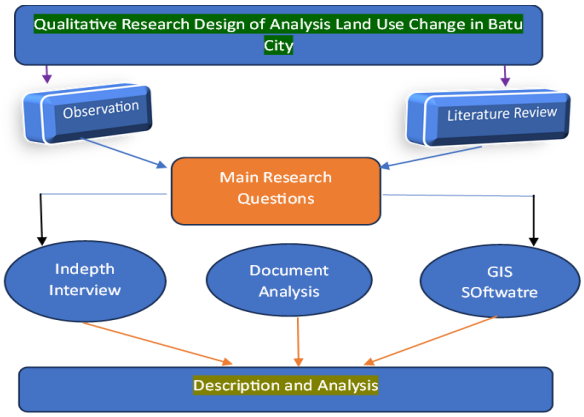


Figure 1. Research workflow
Source: Author's analysis

Primary and secondary data were obtained directly and indirectly from the source and documents or research, respectively. Data was collected through in-depth interviews, observation, literature review, and document desk analysis. Furthermore, interviews were carried out with various stakeholders consisting of 10 coffee shop owners/managers, 25 communities, 4 government representatives, and 2 environmental activists in Batu City. The selection of informants was purposive based on competence and relevance to land use change process. This number was sufficient to describe the research phenomenon, where the data was considered valid when the majority of informants had similar answers. A combination of observation, interviews, and document research was used to examine the impact of coffee shop industry on land use patterns of the community.

Figure 1 shows the descriptive and analytical model for explaining the results. The data were analyzed using triangulation [47] and reduction was carried out after data collection. In this step, only data related to the main phenomenon was selected. The reduced data was grouped based on topics or themes, such as land use change and coffee shop industry. Furthermore, a comprehensive data interpretation was carried out to explain each section. The data validation process was performed by comparing the sources.

4. RESULT AND DISCUSSION

4.1 Coffee shop industry in Batu City: A dynamic

The growth of coffee shop industry has increased significantly in recent years (see Figure 2). This industry is needed by actors in regional development, spatial planning, and use. The effort receives the most attention from local authorities for the benefit of urban development. This is confirmed by the results of research on the dominance of land ownership or usage connections under the influence of the primary characteristics of productive forces [48]. Land use value allocated to the development can meet the needs of Batu City, which includes aspects of economic and social sustainability.

The development of urban areas is inseparable from the given legality. To establish coffee shop building, the Batu City Government only sets requirements in the form of filling out a building permit application form based on the Minister of Public Works Regulation Number: 24/PRT/M/2007. Coffee shop, which is classified as a type of business activity, must have an Indonesian Standard Business Field Classification regulated based on Government Regulation No. 5 of 2021 on the Implementation of Risk-Based Business Licensing. In addition, the permit to establish coffee shop business should also be based on the regional spatial planning policy in the Batu City Regional Regulation Number 4 of 2020, which includes important corridors related to the availability of green open spaces, sewerage networks, stormwater, landfill, and other facilities to support the carrying capacity of environment. The massive land conversion is also caused by policies focused on the investment and economic sectors, without being balanced with an awareness and urgency of sustainability. In 2024, the Batu City One-Stop Integrated Service Investment Office reported that tourism became the highest sector in investment performance with a contribution of IDR 199 billion, or about 49.4 percent. However, the city is threatened by land and ecosystem crisis, leading to an agricultural and food crisis. The lack of discipline in enforcing regulations is a factor assisting businessmen in building coffee shop without balancing the idea with an understanding of environmental sustainability and the negative effects of massive land conversion. Coffee shop industry also uses a lot of non-environmentally friendly equipment, such as plastic cups and foam food packaging. Several coffee shops do not comply with the established zoning and are not orderly in reporting administration to the city government. The impact of pollution from improper disposal or distribution of waste occurs when these business activities are not properly monitored. The Batu City government has participatory supervision of environmental issues through https://awase.dlh.batukota.go.id/ but possesses a limited impact on practices in the field.

Another factor contributing to the escalation of development and the number of coffee shop is the high level of tourist visits. This is in accordance with BPS data [49, 2] reported that high levels of tourist mobility and activity in an area enabled the development of demand or the need for stopover places such as cafes. This is accompanied by the interest of local businesses to take advantage of the opportunity to maximize profits from tourism activities [50]. Based on data published by the Central Bureau of Statistics, the number of tourist visits in 2023 reached 7,096,034 visits. This is a representation of the many nature tourism enthusiasts in Batu City, which is a market for local coffee shop businesses with the conditions of enforcement of land use regulations. Similar to tourists, students in Malang City also act as consumers creating demand for the café industry. According to previous data, Malang City receives no less than 330 thousand students spread across 62 universities each year [11]. This is closely related to the geographical location of Malang and Batu Cities in balancing the accessibility between students' activities and the preferences for interest in visiting places such as cafes [13].

The majority of coffee shop are spread across three sub-districts of Batu City. This data was obtained from Geographic Information System (GIS) satellite images, where the largest number of coffee shop was in the Bumiaji sub-district, reaching 66 buildings. Bumiaji sub-district is known as the center of natural and artificial tourist attractions. There are 15 tourist attractions in the 127.98km^2 area [51], including Bukit Jengkoang, Coban Talun, Selecta Recreational Park, and Batu Love Garden. Bumiaji sub-district as the center of tourist attraction is directly proportional to the level of tourist visits, the demand for stop-over places such as coffee shop, as well

as the supply process from business people. Therefore, the area is the most dominant place for the development of coffee shop industry. This is supported by the shift in community economic attention from young people to creative businesses, including coffee shop industry.

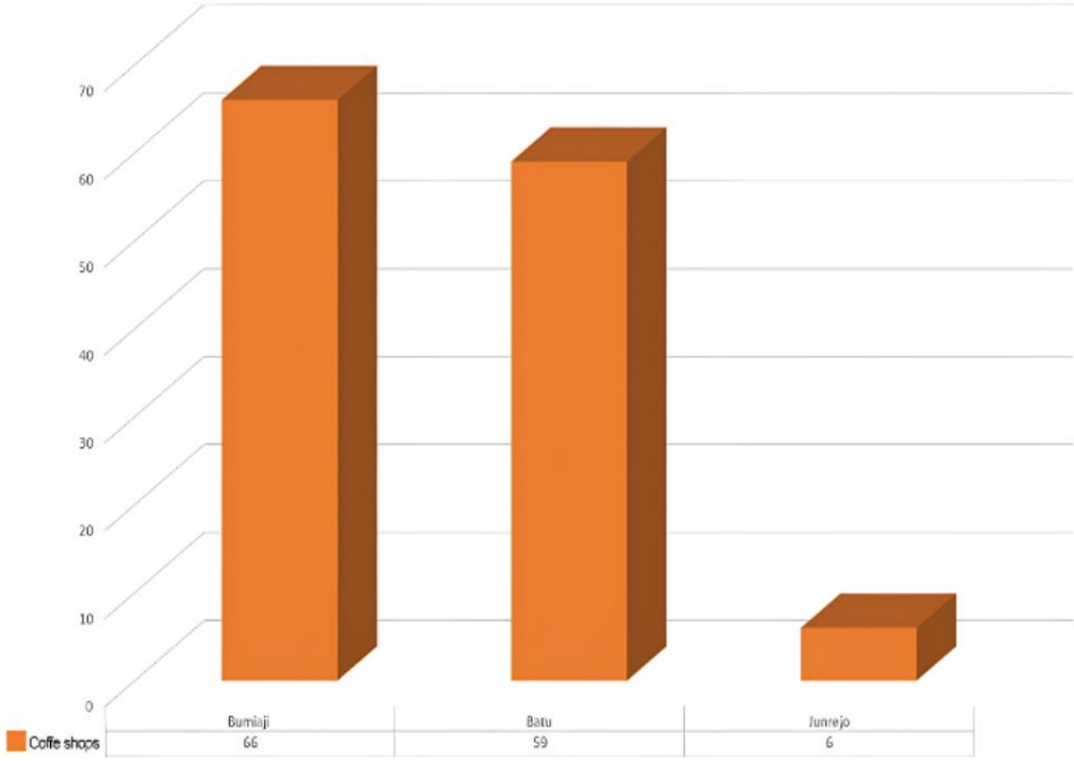


Figure 2. Growth and number of coffee shop buildings in Batu City
Source: Author's analysis from GIS

The demand for land leads to the conversion of agricultural land and natural habitats into built-up areas [50]. In contrast, government policies such as land use regulations can significantly influence the patterns [52]. The growth in the number of coffee shop in the Batu sub-district also shows similar conditions, with a total of 59 coffee shop buildings. Batu sub-district is distinguished from Bumiaji based on the characteristics of the area, which is the center of activity and central point of government. This sub-district is active in micro, small, and medium enterprises and social activities. Additionally, the Junrejo sub-district has 6 coffee shop buildings. This phenomenon has the potential to increase every year when the government and relevant stakeholders fail to prioritize environmental issues over economic growth. Economic, environmental, and social sustainability should be prioritized to create a sustainable city [53].

4.2 Land use change

The tourism sector as the productive strength of Batu City promotes the development of coffee shop. Weak regulations have led to the development of coffee shop that are not environmentally friendly. The allocation of green land for coffee shop development is based on the exotic scenery presented. The uncontrolled conversion of green land to coffee shop industry raises concerns about the resilience of the surrounding environment. This is based on the pattern of land conversion in developing countries, where urban environmental interests are sidelined in favor of economic growth [34]. To determine the dynamics of land use change, GIS analyzed the location of changes from green land to built-up area. In this context, location data are integrated by linking to the map [5].

This allows research to understand patterns, relationships, and geographical context, leading to improved understanding and efficiency, as well as better management and solutions. The system is also used to compare spatial land use and measure conversion.

Figure 3 explains that land use change in 2004-2014 was dominated by forests and agricultural land. The shift to developed land/coffee shop was not very significant. This can be seen in the red color markers showing the location of development during the period. Based on the BPS data, Batu City was dependent on the agricultural sector such as fruit, vegetable, and rice farmers. There were about 35,427 farmers out of a total working population of 95,679. However, the need for housing became high with the increased population. After some time, only 5,426 people were still farmers in 2021 [51].

The decline in the interest of people has an impact on the sale of agricultural land for development. DPKP (*Agriculture and Food Security Office*) Batu City stated that the area of agricultural land decreased significantly by 162 hectares from 4,939 in 2022 [54]. The decline is due to people moving into the service sector, such as opening coffee shop.

Table 1. Depreciation of agricultural land and green land in Batu City

No.	Year	Land Shrinkage	
		Ha (Hectare)	Percentage
1	2020	663 Ha	7%
2	2021	300 Ha	4%
3	2022	162 Ha	3%

Source: Obtained from various sources

Data from the Central Statistics Agency (BPS) shows a decrease in the area of agricultural land from 2,373 hectares in 2013 to 1,998 in 2020. This shows an average decrease of 53.57 hectares per year during the period. In addition, Table 1 demonstrates decline of agricultural land in Batu City. Also, other analyses reported that the shrinkage of agricultural land ranges from 5% to 10% per year.

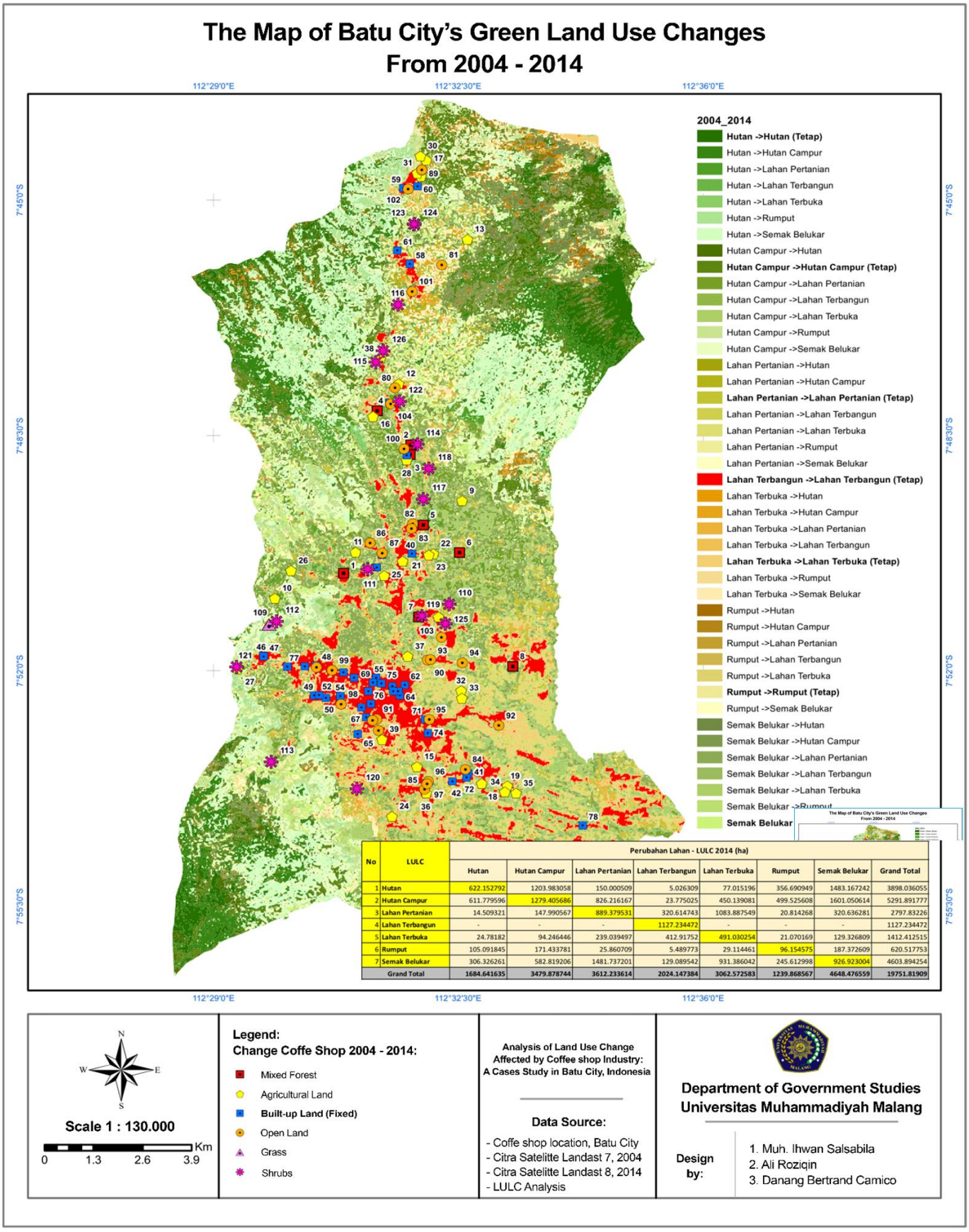
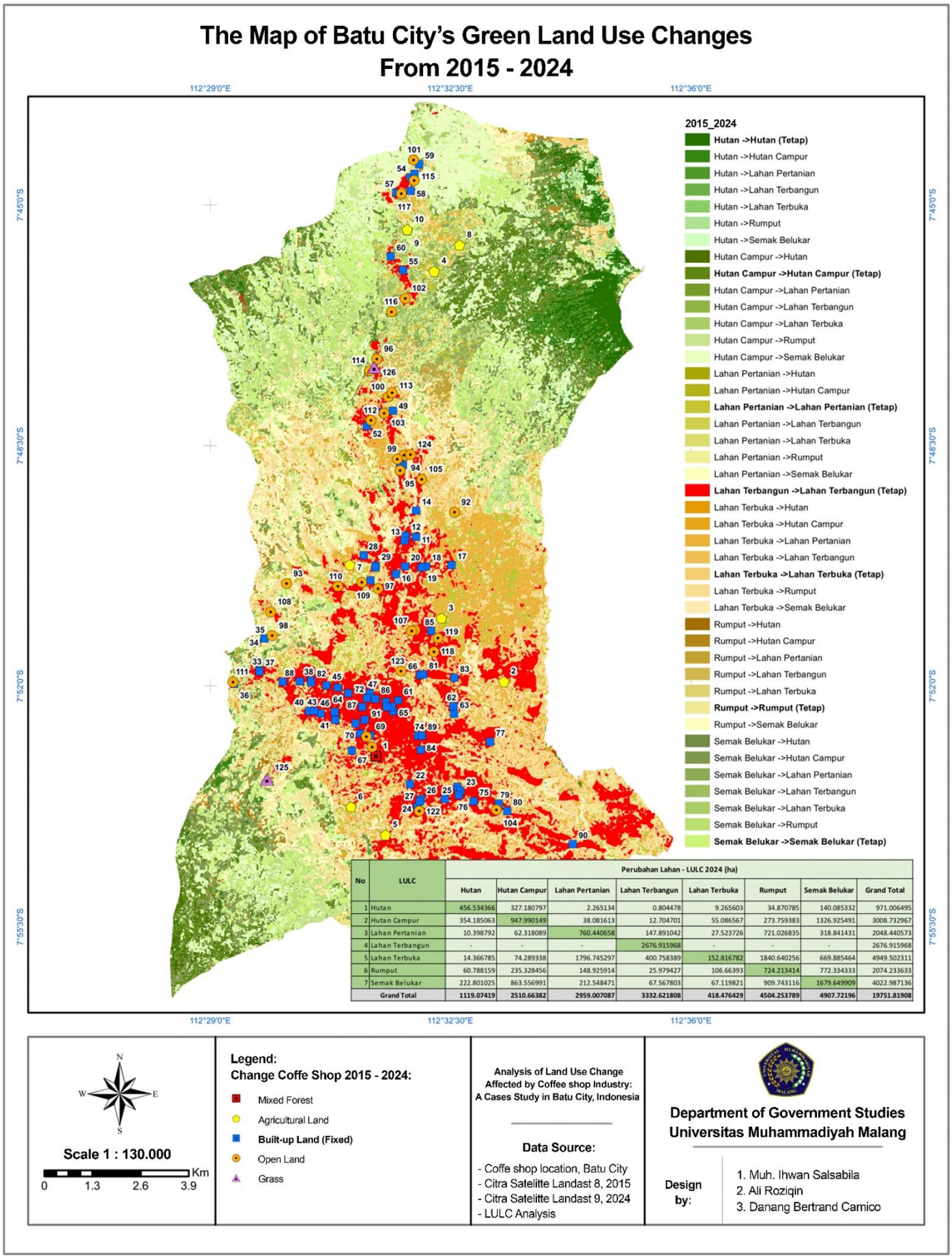


Figure 3. Analyzed by GIS, land use change in Batu City in 2004-2014
Source: Author's analysis



No	LULC	Perubahan Lahan - LULC 2024 (ha)							
		Hutan	Hutan Campur	Lahan Pertanian	Lahan Terbangun	Lahan Terbuka	Rumput	Semak Belukar	Grand Total
1	Hutan	456.534366	327.180797	2.265134	0.804478	9.265603	34.870785	140.085332	971.006495
2	Hutan Campur	354.185063	947.990149	38.081613	12.704701	55.086567	273.759383	1326.925491	3008.732967
3	Lahan Pertanian	10.398792	62.318089	760.440658	147.891042	27.523726	721.026835	318.841431	2048.440573
4	Lahan Terbangun	-	-	-	2676.915968	-	-	-	2676.915968
5	Lahan Terbuka	14.366785	74.289338	1796.745297	400.758389	152.816782	1840.640256	669.885464	4949.502311
6	Rumput	60.788159	235.328456	148.925914	25.979427	106.66393	724.213414	772.334333	2074.233633
7	Semak Belukar	222.801025	863.556991	212.548471	67.567803	67.119821	909.743116	1679.649909	4022.987136
Grand Total		1119.07419	2510.66382	2959.007087	3332.621808	418.476429	4504.253789	4907.72196	19751.81908

Figure 4. Analyzed by GIS, land use change in Batu City in 2015-2024
Source: Author's analysis

Rapid land use changes due to urbanization and expansion of economic activities occur in Batu City. The same condition also occurs in several cities in the ASIA region, such as Kolkata located in the eastern part of India experiencing rapid urban growth [28]. Land use changes occur quite quickly in the mangroves forest areas using GIS in Bangladesh [55]. Similarly, land use changes in Putian China are due to economic factors [50]. This shows that land use changes still occur in protected areas.

Figure 4 shows the significant change in land use from agriculture to developed land during the period 2015-2024. Batu City experienced massive development after COVID-19 with the aim of economic recovery. In this context, the development of tourism and coffee shop played an important role in the economic recovery. As shown in the red marker, the development was carried out in every corner of the city. This has a positive impact on economic improvement, creating vulnerabilities for environmental resilience. In contrast, the Batu City government has not recorded the typology of coffee shop industry due to a lack of waste management procedures. Coffee shop often discharges liquid waste into nearby waterways, affecting the quality of farmers' land.

Based on the description above, land use change has led to a reduction in agricultural land, affecting productivity. In addition, fruit farmers face challenges in dealing with pests and viruses reducing yields. Based on the data [56], the harvested area decreased from 1,059.00 to 797.00 hectares. Agricultural productivity also fell from 69.70 (ku) to 66.34 (ku). The production of rice, vegetables, and fruits decreased from 6,763.00 (t GKG) to 5,287.00 (t GKG). Furthermore, land conversion indirectly affects the welfare of farmers in Batu City. The government has to consider different policies since a joint solution is needed to overcome the problem.

4.3 A future direction

The dramatic increase in the number of coffee shop has improved land use change. Landscape of the city located in the mountains has slowly been filled with tourist facilities. Green areas used for agriculture and greening are gradually being turned into closed buildings. Therefore, the government needs to consider the concept of UGS in an integrated manner. UGS can play an important role in promoting sustainable development and improving the quality of life [57]. Every city should have adequate UGS according to the population and area [58]. This aims to provide comfort and sustainability of city life towards well-being. The UGS enables an interdisciplinary method to improve sustainable land management. The integration of various disciplines such as geography, economics, sociology, and urban planning aspects is expected to provide a comprehensive understanding of future spatial planning.

UGS includes locations planned and managed by urban dwellers, recreational areas, naturally vegetated woodlands and parks, historic sites, roadside vegetation, railway corridors, and greenbelts. Green open space is defined as land consisting of uncovered, permeable, and 'soft' surfaces such as soil, grass, shrubs, and trees. Therefore, the Batu city government needs to provide UGS that are comfortable and easily accessible to the community. The government can collaborate with the private sector to create UGS like cities in other countries through regulations. Instead of replacing it with built-up areas. Meanwhile, the majority of industry players have replaced the original function of the green space with the theme of the café. Productive green spaces such as rice fields or fruit and vegetable gardens are not transformed into coffee nuances. Therefore, policies are needed to regulate these green areas to prevent loss. For example, China can be emulated by establishing agricultural land in a spatial landscape regulated by law [59, 60]. This has successfully reduced the loss of agricultural land to industrialization.

The city government needs to be more open in the management of coffee shop industry to protect environmental sustainability in the future. This will increase public accountability in the spatial planning mechanism of the city [61, 62]. In addition, the government needs to conduct regular environmental audits as a form of control mechanism and accountability for urban management [63]. The roles of different actors can show the effect of collaborative governance on sustainability. The rapid growth of coffee shop industry needs to be considered by local governments in sustainable urban planning. The development of an integrated model that preserves the balance of the local ecosystem needs to be prioritized [64]. Roadmaps, blueprints, and long-term regional spatial plans need to be developed and socialized by all stakeholders. This is strengthened by providing incentives, such as certain tax exemptions and strict sanctions, to coffee shop operators for the commitment to environmental protection.

5. CONCLUSION

In conclusion, Batu City was reported as the most popular tourist destination for the national community. The geographical location was close to the city of Malang in East Java Province. In this context, an important economic activity that continued to grow was coffee shop industry. The growth of coffee shop industry in terms of land use change was significant over the past two decades. Therefore, a lot of green land, including agricultural land owned by residents was converted into industrial coffee shop buildings. The need for complementary leisure activities to tourism activities was the main reason for the rapid growth of coffee shop industry.

The government as the official authority focused on the modern economy without paying attention to environmental conditions and sustainability in the future. The original economic activities such as agriculture were experiencing a decline in productivity due to the diminishing land. The cool atmosphere and mountainous nature were converted into physical buildings such as coffee shop. Therefore, a strong commitment from stakeholders in Batu City was needed to address the issue. The government created a framework of accountability and transparency in the granting of business licenses for coffee shop industry, which was included in a long-term and pro-environmental master plan for urban development. The collaborative environmental governance framework could be a medium for sharing responsibility and cooperation between parties to create sustainable cities. The government also provided certain incentives for industry players who provided sanctions when there were environmental violations.

This analysis had a limitation focused on Batu City since the results might not be fully generalizable to other areas with different characteristics. This was because the pattern and dynamics of land conversion were caused by the paradigm of economic development. Conceptually, this research extended the discourse on the relationship between the growth of coffee

shop industry and land use change, specifically in areas under urbanization pressure. The contribution was expected to be the latest discourse on sustainable urban planning without reducing environmental aspects. Practically, this analysis guided local governments to formulate more sustainable land management policies and the promotion of green investments. Future research could be developed on the local community's perception of land use change and a comparative analysis from various cities.

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