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# Governing Dynamic Land Transformation



Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

MASTER THESIS

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# GOVERNING DYNAMIC LAND TRANSFORMATION

EXPLORING THE PRINCIPLES OF A COMPLEXITY-SENSITIVE  
SPATIAL PLANNING INSTRUMENT FOR BATU CITY, INDONESIA

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## Abstract

The dynamics of land transformation affects the significant degradation in ecological and production system globally, and at the same time faces the pressure from human overpopulation and the uncertainty in making a better spatial plan. In this research, the advantages and dilemmas of the zoning system and urban code are explored in four types of land transformation in Batu City. This case study conducts semi-structured interviews and document reviews. It is analyzed how the existing zoning system is dealing with the dynamics of land transformation and how to propose a complexity-sensitive spatial planning instrument in Batu City.

This research found that the planning principles to deal with the complexity of land transformation should be considering the place-based approach, integrative thinking, collaborative process and adaptive capacity. The Hybridization between patterning-instrument (zoning system) and framework-instrument (urban code) would be a favourable idea to provide certainty as well as the flexibility of planning instruments in regards to govern the complexity of land transformation in Batu City.

**Keywords:** Land transformation, complex land system, land governance system, spatial planning instrument, zoning system, urban code.

## Summary

This thesis has academic relevance in bridging the conceptual gap between dynamic land transformation and spatial planning instruments using complexity theory and governance theory approaches. The societal relevance of this thesis is to propose a complexity-sensitive spatial planning instrument for Batu City by evaluating the advantages and dilemmas of the zoning system in Batu City and urban codes in the US cities. This thesis has an objective to explore the principles and dilemmas of a complexity-sensitive planning instrument for governing the dynamic land transformation in Batu City.

From a theoretical perspective, there are clear conceptual links between dynamic land transformation, complex land system, land governance system and spatial planning instruments. Such links are valuable to explore the complexity-sensitive planning principles that consist of place-based approach, integrative thinking, collaborative process and adaptive capacity. Such principles are adopted by considering the spatial contexts, integral linkages, diverse perspectives and temporal changes of land transformation.

This thesis applies qualitative research approach by exploring the perspectives and ideas from different actors involved in the issues of land transformation and spatial planning in Batu city. Semi-structured interviews and document reviews are conducted for data collection, while manual coding is used for data analysis.

This thesis has three main findings. First, the dynamic land transformation could be reframed as a complex land system and responded by a land governance system. The land governance system produces spatial planning instruments to steer the complexity of land transformation. Second, in Batu City, conventional zoning system has advantages in provisioning certainty of land use plans by accommodating local circumstances and comprehensive sectoral interests. But it faces dilemmas in facilitating the inclusive planning process and adjusting contents based on the emerging situation. Third, the hybridization between zoning system and the urban codes would be a favourable idea to provide certainty as well as the flexibility of spatial planning instruments by considering the typology of land transformation in Batu City.

In conclusion, this thesis produces the complexity-sensitive planning principles that are valuable to be adopted by the local government in Batu City. While this thesis also addresses the theoretical debate in land use theorization from complexity and governance perspectives by proposing a framework that is reframing the conceptual gap between land transformation and spatial planning.

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# CHAPTER

# 1

# INTRODUCTION

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 1

## Introduction

### 1.1 Background of research

The land is a limited resource that provides vital ecosystem services to humanity (Pimentel, et al., 2010). As a key element in attaining many global ambitions for sustainable development, policymakers require insight into what future land use might look like and how this affects the ability of the land system to continue supplying ecosystem goods and services (Enemark, 2007). Many forms of land use are limited by local biophysical conditions, influenced by multi-level governance and hampered by ongoing land degradation and climate change.

The dynamics of land transformation continuously gain more attention from a lot of scholars, politicians, and wider society because it affects the significant degradation in ecological and production systems globally, and at the same time faces the pressure from human overpopulation (Singh, et al., 2017). Traditionally, the world's landscape is formed by the principal types of land cover or land use such as forest area, agricultural area, and the built area (Arhnyawat & Shrestha, 2016). In 1990 forests made up 31.6% of the world's land areas or some 4,128 million hectares. Because of deforestation, the forest area had changed to 30.6% in 2015, or some 3,999 million hectares (Food and Agriculture Organization, 2016). The pressure on land and in particular its conversion and exploitation for agricultural purposes have led to adverse impacts on the environment through the degradation of the soil and the ecosystems it supports, the pollution of waterways and the deterioration of forests. During the 1980–2000 period, more than half of new agricultural land in the tropics is created by converting intact forests, and another 28% from disturbed forests. (Food and Agriculture Organization, 2016). Such trends are raising concerns about biodiversity and environmental services globally.

Land use affects individual and collective wellbeing and is an important factor in meeting environmental sustainability goals, economic growth, and social inclusion. Public policies to support these objectives are made through spatial plans and environmental regulations. This instrument limits how land can be used. They take a long time to ensure a significant change.

Generally, they provide limited opportunities for efficient, community-driven and market-driven land use patterns to emerge. Land use zoning is the strategy that commonly proposed to control land transformation and to promote environmental conservation and its benefits (National Academy of Public Administration, 2003). Each country has different political and legal frameworks to maintain their zoning ordinance (Hirt, 2010). Many policy instruments within the domain of land use planning systems create incentives to use land in specific ways (Wu, 2008). In many countries, planning systems still have difficulty to achieve their objectives due to overwhelming pressures from contradicting land developments.

Indonesia as one of the developing countries is undergoing a rapid transformation from a rural to an urban economy, with the nation's cities expanding at a rate of 4.10 % per year and growing faster than in other Asian countries (World Bank, 2016). The dynamics of land transformation in the local context of Indonesia is well-represented by the extreme case of Batu City, a tropical resort town that experienced rapid urban growth.

Batu City was established as an autonomous city in 2001, with an area of 19,908.72 Ha and consists of 5 urban sub-districts and 19 rural sub-districts. Batu City is located in the upstream area of Brantas Watershed. The watershed covers an area of 12,000 km<sup>2</sup> and has a population of 16.71 million. Therefore, due to its geographical location, Batu City is ecologically sensitive, and the environmental change in the city will affect the other 13 cities/ regencies along the watershed (Rahayu, 2012). Slope highland dominates Batu City with 57% of the city's area is being forested. In its history, Batu City is known as 'Klein Zwitserland' of East Java, a natural resort for nobles and officials in the Dutch Colonial Era. Today, tourism is the leading sector, and it triggers rapid urbanization and land transformation. The development pattern in Batu City is reflecting a transformation from 'Klein Zwitserland' to 'Little Singapore'. Natural landscapes have been transformed into artificial developments. As a consequence, in 2016, Batu city experienced 98 natural disasters, which is a 300% increase compared to 2015 (Subagyo, 2017). Uncontrolled urban growth and land transformation are suspected as the contributors to the frequent disaster. On the other hand, Batu City has a comprehensive zoning ordinance to control the land transformation (Planning agency of Batu City, 2010). It consists of zoning map and zoning text, incentive-disincentive scheme, budget sources, and enforcement mechanism.



*Figure 1 Uncontrolled settlement growth in Batu City (Planning Agency of Batu City, 2016)*

However, the existing single-use zoning ordinance has a huge deviation from the land transformation pattern because of the top-down planning process, lack of public socialization by local government and ineffective spatial law enforcement. It is allegedly incapable to create appropriate solutions for the increasing complexity of land transformation problems in cities (Elliot, 2012). The local government even revised the zoning ordinance several times due to the deviation with existing land use conditions, and the changes in development programs. Overall, the existing zoning ordinance in Batu City allegedly has failed to manage the uncertainty of land transformation. Therefore, a study to explore the alternative spatial planning instrument is needed to deal with such an uncertain reality.

## 1.2 Research objectives and questions

Based on the background explanation, the existing zoning ordinance in Batu City allegedly has failed to govern the uncertain and complex land transformation system. Therefore, this study aims to explore the principles and dilemmas of a complexity-sensitive spatial planning framework for governing the land transformation. This research analyzes the practices of the spatial planning system and land management in Batu City, Indonesia.

The main question of this research is:

“What are the principles and dilemmas of a complexity-sensitive spatial planning instrument for governing land transformation in Batu City, Indonesia?”

Means of three sub-questions will answer this main research question.

1. *How to understand the role of complexity and governance theories in bridging the gaps between the dynamics of land transformation and the spatial planning instrument?*

This theoretical question focusses on reframing the concept of dynamic land transformation and its relation with spatial planning instrument. It examines the role of complexity theory and governance theory to link the concepts in a theoretical framework. Such theoretical framework will be used as a guide for analysis stages in this research.

2. *What are the advantages and dilemmas of conventional zoning system in dealing with the dynamics of land transformation in Batu City?*

This question wants to examine the typologies and driving factors of land transformation in Batu City. Then identify the complex relationship among key driving factors, and how the diverse stakeholders are responding. The capability of existing planning instrument in dealing with dynamic land transformation in Batu City will be examined.

3. *What are the advantages and dilemmas of an alternative complexity-sensitive spatial planning instrument to govern land transformation in Batu City?*

This question wants to propose the alternative spatial planning instrument in dealing with the complexity of land transformation governance in Batu City. It compares the advantages and dilemmas between the flexible framework-instrument (urban code) and the existing rigid patterning-instrument (zoning map). Moreover, it will explore the prospective idea to develop the hybrid planning instrument.

### 1.3 Location of case study

This research is conducted in Batu City, a city in the East Java Province of Indonesia. Batu City is selected because it is representing the extreme case of a new city with rapid population and economic growth in the ecologically-sensitive area. Batu became an autonomous city legalized by an act in 2001. Batu City is a medium city with a population of 190,000 (Central Bureau of Statistics of Batu City, 2017) equivalent to the population of Bern, Switzerland. It lies on an upstream area of Brantas watershed, shown in figure 2.

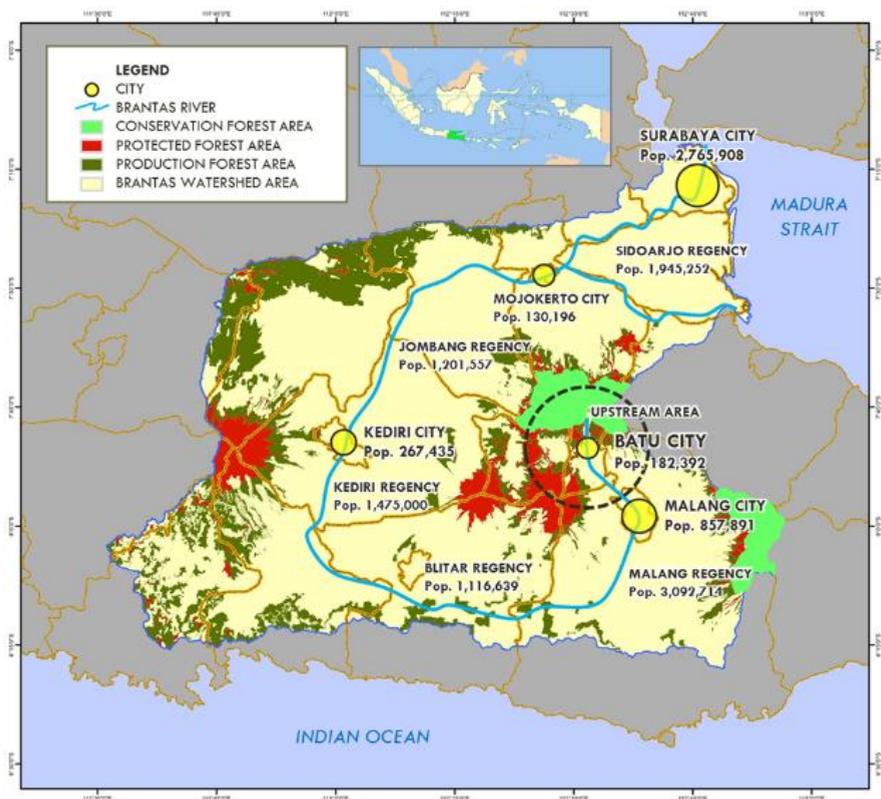


Figure 2 The location of Batu City in the upstream area of the Brantas Watershed (Environmental Office of East Java Province, 2015)

Batu City was developed as a recreational site for the Dutch colonial officers in the Dutch Colonial Era before the independence of Indonesia. Batu City is located in a fertile mountainous area surrounded by agricultural land. In the 19th century, the Dutch East Indies government developed Batu as a mountain resort. Villas and resort facilities were already built in Batu during this period (Yuliati, 2012). Today, Batu City is experiencing rapid economic growth and urban expansion due to massive tourism development in the area. Land transformation in Batu City allegedly affects the environmental degradation over Brantas Watershed and threatening the sustainability of local settlement development and greater eco-region conservation. Moreover, Batu City is experiencing dynamic land transformation from its establishment until now that valuable to grasp the nuance of reality and to construct the theory.

## 1.4 Structure of Thesis

This thesis is systematically divided into eight chapters.

**Chapter one** forms the introduction of the thesis that includes the background of research, research objectives and questions, the location of the case study, and the structure of the thesis.

**Chapter two** presents the theoretical framework of this research. This chapter proposes a conceptual model that explains the links between four blocks of theories, include dynamic land transformation, complex land system, land governance system, and spatial planning instruments.

**Chapter three** explain the methodology for this research is arranged. This chapter consists of the research approach and design, data collection method, data analysis method, and ethical issues of the study.

**Chapter four** presents the results of dynamic land transformation analysis. It explains the dynamics of land function, the timelines of land transformation, types of land transformation in strategic areas with different spatial contexts, and the driving forces of land transformation.

**Chapter five** presents the results of complex land system analysis. It explains the relations among driving forces of land transformation, the non-linear feedback, the multi-scale interactions in the complex land system and the cross-sectoral linkage in each type of land transformation.

**Chapter six** presents the result of land governance system analysis. It explains the issues of stakeholder interdependency, the stakeholders mapping, the formal and informal institutions and the stakeholder's involvement in four types of land transformation.

**Chapter seven** presents the result of spatial planning instrument analysis. It explains the evaluation of existing planning instrument (zoning system) in Batu City, the evaluation of alternative planning instrument (urban code) in American cities, and the possibility for planning instrument hybridization.

**Chapter eight** includes the conclusion and reflection of this research. The conclusion part is elaborating on the dimensions of land transformation and the principles of planning instrument, advantage and dilemmas of existing planning instrument in Batu City and the idea for a complexity-sensitive planning instrument. The reflection part would explain the limitation of the study and further research.

# CHAPTER

# 2

## THEORETICAL FRAMEWORK

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 2

## Theoretical Framework

### 2.1 Theoretical background

In order to conceptualize the relation between land transformation and the planning instrument, we will use reflections from the emerging theoretical debates in spatial planning and multi-disciplinary views. First, we summarize the theorization tradition of land transformation. Second, we choose the possible bridging theories for land transformation and the planning instruments. Third, we develop blocks of concept to explore the main planning principles in dealing with land transformation issues.

#### 2.1.1 Theorization of land transformation

Based on the theorization tradition criterion, land transformation studies are classified into three main groups (Briassoulis, 2000).

1. *Spatial economics* theorization tradition such as Land Rent Theory (Von Thunen, 1966), Urban Land Market Theory (Alonso, 1964), Agent-based Theories of Urban and Regional Spatial Structure (Krugman, 1995), Spatial Economic Equilibrium Theory (Losch, 1954), Cumulative Causation Theory (Myrdal, 1957), Growth Pole Theory (Perroux, 1955), Keynesian Development Theory (Cooke, 1983) and other theories in regional science such as Social Physics (Carey, 1858) and Urban and Regional Mathematical Ecology (Dendrinis & Mullaly, 1985).
2. *Sociological* theorization tradition such as Human Ecological Theories (Johnston, et al., 1994), Concentric Zone Theory (Burgess, 1925), Radial Sector Theory (Hoyt, 1939), Multiple Nuclei Theory (Mckenzie, 1933), Planning Circles Theories (Webber, 1964), Urban Land Nexus (Scott, 1980), Spatial Fix (Harvey, 1982), Core-Periphery Theories (Friedmann, 1966), Unequal Exchange and Dependency Theories (Frank, 1967), and Uneven Development-Capital Logic Theories (Lipietz, 1977).
3. *Nature-society* theorization tradition such as Humanities-based Theories (Richards, 1990), Natural Science-based Theories (Merchant, 1990), and Social Science-based Theories (Sack, 1990).

The three theorization traditions are dominated by the classical thinking approaches such as positivism, reductionism, linearity and static worldviews. Since the 1980s, land transformation studies are exhibiting shifts away from such classical thinking to complex system approach illustrated in figure 3. It moves towards alternative epistemologies, holism, and nonlinear and dynamic worldviews.

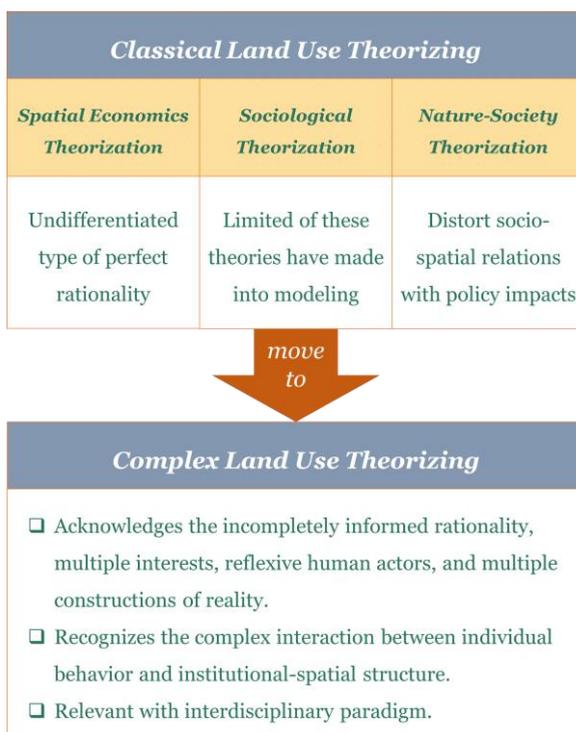


Figure 3 The shift of land transformation theorization (Briassoulis, 2008) modified.

The sustainability discourse has revived classical integrated and ecological equilibrium theories and has renewed interest in classical and contemporary human environment theorizing in geography (Turner, 2002). However, Von Thunen's agricultural land-rent and Alonso's urban land-rent theories still dominate the studies and modelling applications because economic factors remain the principal land transformation drivers. They are used either independently or in conjunction with a complex system approach (Briassoulis, 2000). Therefore, complex land use theorizing is more appropriate in explaining the discourse of land transformation studies from the perspective of complexity in the era of uncertainty.

### 2.1.2 Bridging the conceptual and practical gaps

Several theories are reflecting the complexity, uncertainty, nonlinearity and path dependence of spatial patterns emergence and land transformation (Portugali, 2006). In the 1980s, complex systems thinking diffused into land transformation theorizing within a broader trend towards integrated approaches to the study of socio-environmental problems and complexity-science applications in geography, economics, and the natural, social, and policy sciences. The emergence of complexity theory studies and the conceptualization of land transformation within the complex socio-spatial system fits well into the contemporary spatial planning and policy issues. Complexity approach emphasizes the multiscalar determinants of land transformation, their different spatial reaches, and the contextuality and contingency of spatial relationships (Briassoulis, 2008). Therefore, the deep understanding of complexity theory in spatial planning is important to explore the new potential approaches in dealing with land transformation issues from a complexity perspective.

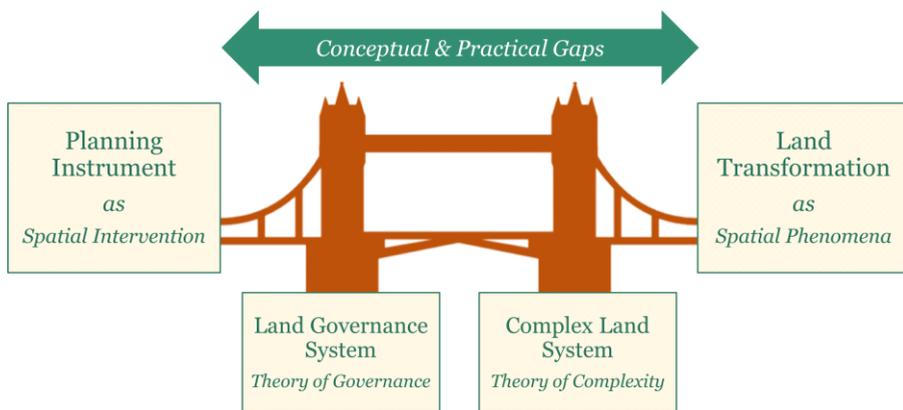


Figure 4 The gaps between land transformation and planning instrument.

Complexity theory is an interdisciplinary theory that grew out of systems theory in the 1960s (Cham & Johnson, 2007). It is taken from research in the natural sciences which examines uncertainty and non-linearity (Grobman, 2005). Complexity theory emphasizes interactions and the accompanying feedback loops that constantly change systems. While it proposes that systems are unpredictable, they are also constrained by order-generating rules (Burnes, 2005). For example, the complex land system is responded by a governance system as a set of rules to generate order. While the governance theory is an interdisciplinary theory focussing on the network

aspect of decision-making. It explains that a governance system has a complex network of actors in producing institutions. For example, a land governance system produces spatial planning instrument to steer dynamics land transformation. There are strong conceptual links between complexity theory and governance theory illustrated in figure 4. Both theories are relevant to be applied in conceptualizing dynamic land transformation and spatial planning instrument.

### 2.1.3 Four blocks of concepts

Conceptual links between dynamic land transformation, complex land system, land governance system and spatial planning instrument are presented in a conceptual diagram in figure 5.

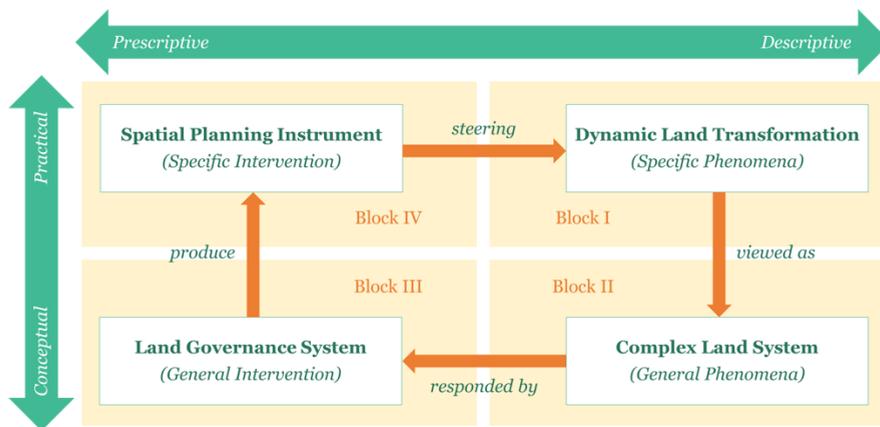


Figure 5 The links between four blocks of concepts

Dynamic land transformation is seen as a specific phenomenon that is observed in a physical-terrestrial dimension. However, such phenomena can also be understood as the surface of the iceberg. So, the land transformation could be reframed as a complex land system that responded by a land governance system. A complex land system consists of interrelated physical and societal phenomena indicated by the emergence and uncertainty of the outcomes of land transformation. While the governance system consists of decentralised networks of decision making in dealing with the complex land system. Moreover, land governance system produces spatial planning instrument as a defined intervention in steering the land transformation for a certain period of time. Such links between four blocks of concepts are valuable for further theoretical construction.

## 2.2 Dynamic land transformation

Land transformation studies have diverse definitions of their principal terms such as land, land cover, land use, and land transformation. These terms vary with the purpose of the application and the context of their use. Land cover refers to the biophysical state of the earth's surface and immediate subsurface (Turner, et al., 1995). Land use is the function, arrangements, activities, and inputs that people undertake in a certain land cover type (Di Gregorio & Jansen, 2005). Land use or land cover change is understood as quantitative changes in the aerial extent (both increases or decreases) of a given type of land use and land cover, respectively (Briassoulis, 2000). But, the conception of land transformation is defined as changes in land function (built and natural area) and not limited to quantitative changes but also the qualitative changes within the land function. In this part, we will explore the types, driving forces and impacts of land transformation.

### 2.2.1 Types of land transformation

Base on the land function change and the terrestrial state change, land transformation could be classified into two types, active and passive transformation, illustrated in figure 6.

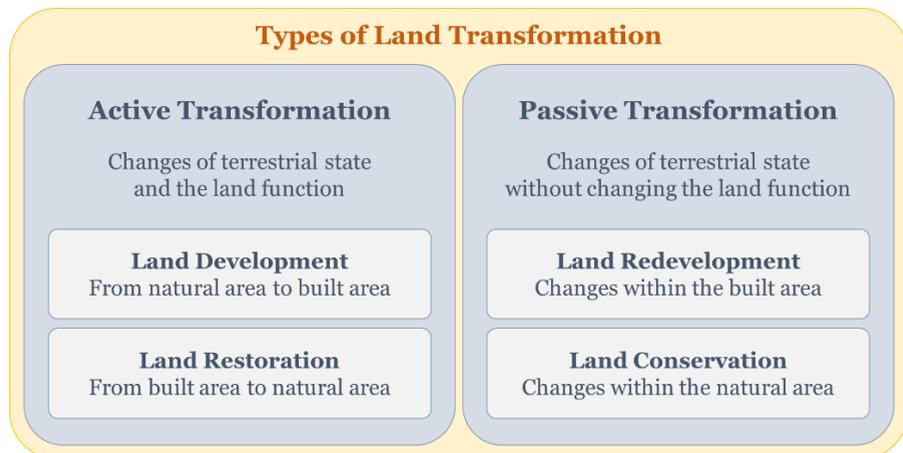


Figure 6 Types of land transformation, Inspired by the conceptualization of land function (Silva, 2011).

**Active transformation** comprises changes of terrestrial state of land as well as the land function. The active land transformation consists of land development and land restoration.

1. *Land development* describes the land function change from natural area to built area. Land development is also sometimes advertised as land improvement or land amelioration. Land development also refers to any variety of projects that increase the value of the property (Buitelaar, et al., 2012). It refers to investments making land more usable by humans such as developing building land or agricultural land.
2. *Land restoration* describes the land function change from a built area to a natural area. Land restoration could increase the supply of valuable ecosystem services that benefit people in dealing with pollution or natural disasters (Matzek, et al., 2017). It refers to the process of ecological restoration of a site to a natural landscape and habitat, safe for humans, wildlife, and plant communities.

**Passive transformation** comprises changes of terrestrial state of land without changing the land function. The passive land transformation consists of land redevelopment and land conservation.

1. *Land redevelopment* describes the terrestrial changes within the built area. Variations on land redevelopment include urban infill, urban densification, and adaptive reuse (Næss, 2014). Urban infill redevelops sites on vacant parcels that have no existing activity but were previously developed, especially on Brownfield land. Densification is a type of redevelopment with denser land usage, such as the redevelopment of a townhouses block into a large apartment building. Adaptive reuse is a type of redevelopment where older structures are converted for improved current market use. Overall, land redevelopment is defined as any new construction on a site that has pre-existing uses.
2. *Land conservation* describes the terrestrial changes within a natural area. Land conservation has objectives to maintain biodiversity and providing an indicator for that conservation's progress. Land conservation is improving habitat and protection from hunting for threatened and endangered species. Land conservation supports ecological processes that cannot survive in the most intensely managed landscapes (Dudley & Alexander, 2017). In general, land conservation is important for improving the environmental quality and maintaining natural resources reserves.

The application of land cover, land use, and land transformation classification systems are sometimes semantically inconsistent, and the typologies become more complex as the scale is enlarged, covering more detail characteristics of areas, and as the focus of land classification shifts (Wolman, 1987). However, in this study, we are consistent to use such active-passive land transformation typology based on land function and terrestrial state changes.

### 2.2.2 Driving forces and impacts

The central topics in examining land transformation process revolve around the drivers and the impacts. The land transformation has two principal drivers, classified into biophysical and socio-economic drivers (Briassoulis, 2000).

1. *Biophysical drivers* include the characteristics and processes of natural planetary environment such as weather and climate variations, landform, topography, and geomorphic processes, volcanic eruptions, or plant succession (Gutiérrez, 2005).
2. *Socio-economic drivers* comprise demographic, social, economic, political and institutional factors and processes such as population and population change, industrial structure and change, technology and technological change, policies and rules, or values (Long, et al., 2007).

Based on figure 7, the dynamics in the land use system are influenced by the globally systemic change in the social system and ecological system. From both systems, the biophysical drivers, socio-economic drivers, and technological change influence aggregate action of land managers in transforming land use and/or land cover. In parallel, the dynamics of land use and land cover produce certain impacts on the ecological and social system.

The impacts of land transformation are broadly categorized into environmental and socio-economic impacts. Such environmental impacts include land degradation, habitat destruction, climate change. While the socio-economic impacts related to food security, water scarcity, population displacement, human security and settlement vulnerability to natural hazards (Meyer & Turner, 1996).

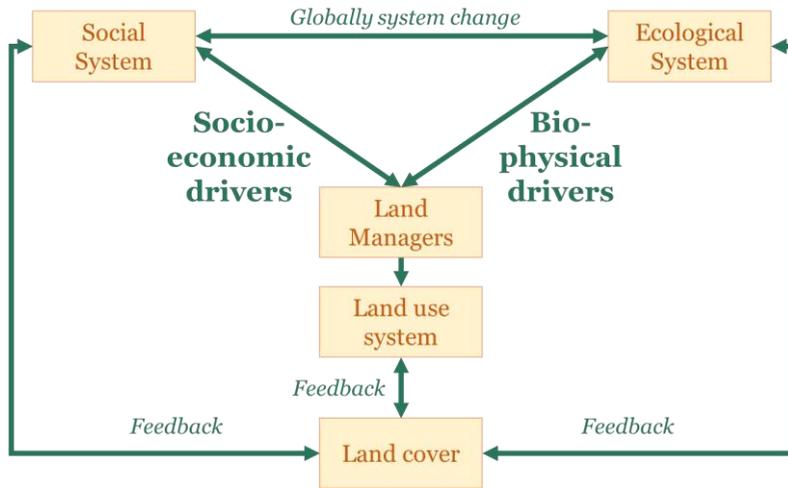


Figure 7 Driving forces of land transformation (Briassoulis, 2000) modified.

Land transformation issues are the melting point between nature and society aspects. Therefore, in examining the comprehensive, diverse driving forces and the impacts of land transformation system, we need to refer to related theoretical concepts of land use studies that are constructed from multidisciplinary perspectives and theorization traditions.

### 2.2.3 Synthesis: spatial context and place-based approach

In this part, we already discuss the type of land transformations and the driving forces behind it. Land transformation is classified as active land transformation (which is changing the land function) or passive land transformation (which is changing the terrestrial state, but the land function remains). Land transformation is driven by biophysical forces and socio-economic forces. Therefore, we can conclude that every place has a different form of active or passive land transformation, due to the spatial context resulted from biophysical and socio-economic forces.

figure 8 shows the connection between dynamic land transformation and the embeddedness of spatial context. Therefore, a complexity-sensitive planning instrument should recognize spatial context by applying a place-based approach, rather than directly adopting normative national directives of spatial guidelines.

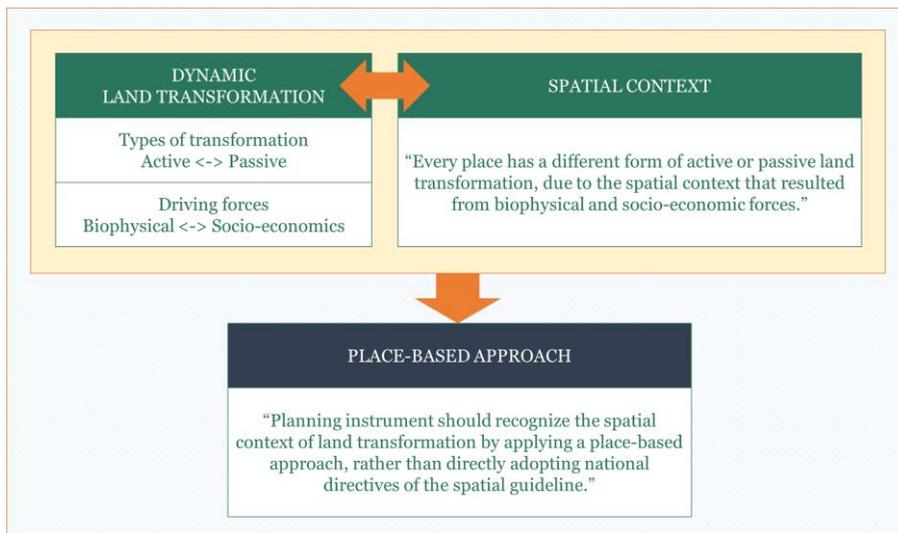


Figure 8 Spatial context and place-based approach relation

## 2.3 Complex land system

From a complex system perspective, land transformation emerges from the interactions among the various components of the entire system, which themselves create non-linear feedback that influences the subsequent development of those interactions. Land transformation is a spatial property observed at the landscape scale. It is the sum of many small, local-scale changes in land allocation that reinforce or cancel each other. These changes are the product of multiple decisions resulting from interactions between diverse agents, who act under certain conditions, anticipate future outcomes of their decisions, and adapt their behaviours to changes in external and internal conditions. In most cases, these decisions are made without central direction, unless there are central planning systems (Batten, 2001). Land use change is thus a complex, large-scale spatial behaviour that emerges from the aggregate interactions of less complex agents.

### 2.3.1 Non-linear feedback

In the systems thinking approach, non-linear feedback is typically classified as reinforcing and balancing feedback (Richardson & Pugh, 1981). Such feedback is presented using a causal loop diagram, illustrated in figure 9.

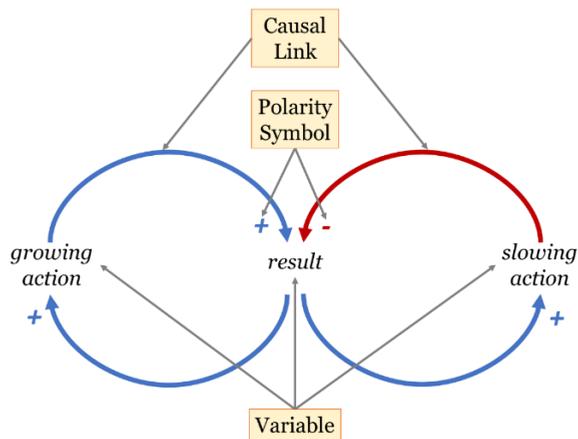


Figure 9 Causal loop diagram (Richardson & Pugh, 1981)

**Reinforcing feedback** is an action that produces a result which influences more of the same action thus resulting in growth or decline. A positive, or reinforcing, feedback loop reinforces change with even more change. This can lead to rapid growth at an ever-increasing rate (Sterman, 2000). This type of growth pattern is often referred to as exponential growth. Note that in the early stages of the growth, it seems to be slow, but then it speeds up. Thus, the nature of the growth in a management system that has a positive feedback loop can be deceptive. If you are in the early stages of an exponential growth process, something that is going to be a major problem can seem minor because it is growing slowly. By the time the growth speeds up, it may be too late to solve whatever problem this growth is creating. Sometimes positive feedback loops are called vicious or virtuous cycles, depending on the nature of the change that is occurring. Other terms used to describe this type of behaviour include bandwagon effects or snowballing.

**Balancing feedback** is an action that attempts to move some current state (the way things are) to the desired state (or goal) through some action (whatever is done to reach the goal). A negative, or balancing, feedback loop seeks a goal (Sterman, 2000). If the current level of the variable of interest is above the goal, then the loop structure pushes its value down, while if the current level is below the goal, the loop structure pushes its value up. Many management processes contain negative feedback loops which provide useful stability, but which can also resist needed changes. In the face of an external environment which dictates that an organization needs to change, it continues on with similar behaviour. A negative feedback loop with a substantial delay can lead to oscillation. The specific behaviour depends on

the characteristics of the particular loop. In some cases, the value of a variable continues to oscillate indefinitely. In other cases, the amplitude of the oscillations will gradually decrease, and the variable of interest will settle toward a goal.

By identifying the reinforce and balancing feedback of land transformation, we could understand the dynamic behaviour of its driving factors as well as its impacts.

### 2.3.2 Multi-scale interactions

Multi-scale interactions within a complex adaptive system include the two-way interactions between macrostructure and micro agency (Cetina, 2005). The concept of multi-scale interactions is illustrated in figure 10.

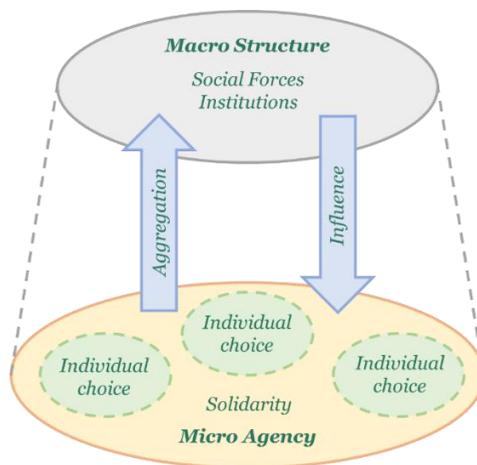


Figure 10 Multi-scale interactions diagram (Cetina, 2005)

**Macro Structure** is the recurrent patterned arrangements which influence or limit the choices and opportunities available. Macrostructures, often simply called 'structure', correspond to the overall organization of society, described at a rather large-scale level, featuring, for instance, social groups, organizations, institutions, nation-states and their respective properties and relations (Tepperman & Rosenberg, 1998). The example of macrostructure are the regulations about land use.

**Micro Agency** is the capacity of individuals to act independently and to make their own free choices. Agency may either be classified as unconscious, involuntary behaviour, or purposeful, goal-directed activity (intentional

action). An agent typically has some sort of immediate awareness of their physical activity and the goals that the activity is aimed at realizing. In the 'goal-directed action' an agent implements a kind of direct control or guidance over their own behaviour (Tepperman & Rosenberg, 1998). The example of micro agency is the individual pressure over land use.

By identifying the macrostructure and micro agency of land transformation, we could understand the pressure of land policy and plan from macro level and the aggregate of land utilization based on the preferences of landowners from micro level.

### 2.3.3 Synthesis: integral linkage and integrative thinking

In this part, we already discuss the non-linear feedback and multi-scale interactions within the complex land system. Non-linear feedback in the complex land system could reinforce the existing land use pattern or balance the situation by moving to the desired land use pattern. The land system is also influenced by top-down intervention from macrostructure and bottom-up initiative from micro agency. Therefore, we can conclude that land transformation is a complex system encompass integral linkage of non-linear feedback from cross-sectoral elements including the multi-scale interactions between macro-structure and micro-agency related to land system.

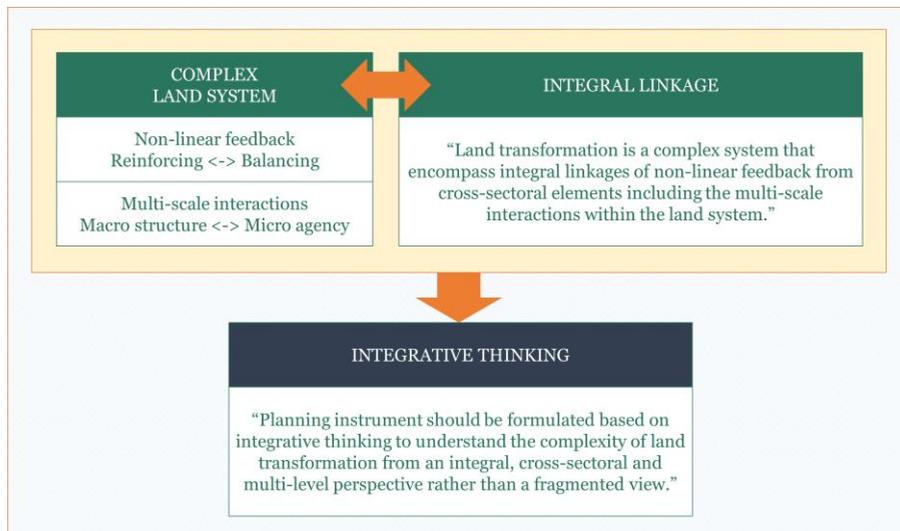


Figure 11 Integral linkage and integrative thinking relation

Figure 11 shows the connection between a complex land system and the existence of integral linkage. Therefore, a complexity-sensitive planning instrument should be formulated based on integrative thinking to understand the complexity of land transformation from an integral, cross-sectoral and multi-level perspective rather than a fragmented view.

## 2.4 Land governance system

From an institutional perspective, a governance system refers to the rules and the structures that govern and mediate relationships, decision-making and enforcement. While, land governance system concerns the rules, processes and structures through which the decisions are made about the use of and control over land, the manner in which the decisions are implemented and enforced, and the way that competing interests in land are managed (Simone, 2015). It includes state structures such as land planning and land administration agencies, courts and ministries responsible for land, as well as non-statutory actors such as traditional bodies and informal agents. It covers both the legal and policy framework for land as well as traditional and informal practices that enjoy social legitimacy.

### 2.4.1 Stakeholders interdependency

Stakeholders have different degrees of involvement in influencing land use plan formulation, and they have different degrees of power to control and execute the land use plan. Therefore, the land governance approach should be considering the interdependency between stakeholder power and stakeholder participation as illustrated in figure 12 (Mayers, 2005).

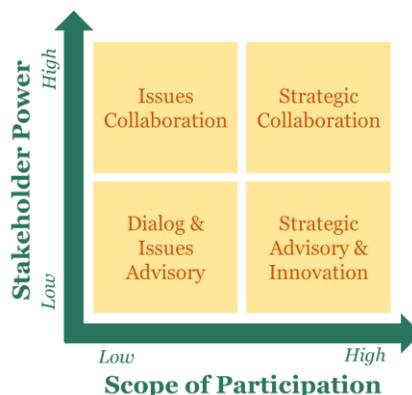


Figure 12 Stakeholder mapping diagram (Mayers, 2005)

**Stakeholder power** in land governance is understood as the ability of stakeholders to enforce or execute the land utilization. It mainly refers to private landowners and the government who control public land based on land tenure system. Land tenure is the relationship, whether legally or customarily defined, among people, as individuals or groups, with respect to land. A land tenure system as a set of institutions defines the granted rights to use, control, and transfer land, as well as associated responsibilities and restraints. A land tenure system also determines who can use what resources for how long, and under what conditions (Mayers, 2005). Therefore, the legal system grants land ownership with the power to utilize their land based on the preference under the guidance of land regulations.

**Stakeholder participation** in land governance is understood as the involvement of stakeholder in the land planning process. It mainly refers to government and public participation in land use planning. The emergence of a new philosophy of participation has changed the way society governed. Participation is shifting from just being a peripheral issue to commanding a central role in the design and application of land management. The broadening of the public area that reserve for participation is justified by the rise of a new awareness among people that demands the return of public space, transparency in government management, the provision of basic services and the certain stakeholder participation in the land planning process (Mayers, 2005).

By identifying the stakeholder power and stakeholder participation within land governance system, we could understand the constellation between actors based on their power over land ownership and their participation in providing a spatial plan.

#### 2.4.2 Institutional arrangement

In many countries, land governance system comprises formal and informal institution. Institutional arrangements are interpreted as coalitions for collective action and inter-agent coordination, ranging from public-private cooperation and contracting schemes, organizational networking to policy arrangements. Institutions are commonly defined as the 'rules of the game', including norms, beliefs, values, habits, and behaviour (Menard, 2000).

The institution is also defined as rules and procedures (both formal and informal) that structure social interaction by constraining and enabling

actors' behaviour (Helmke & Levitsky, 2004). Based on figure 13, institutions are classified into formal rules and informal norms.

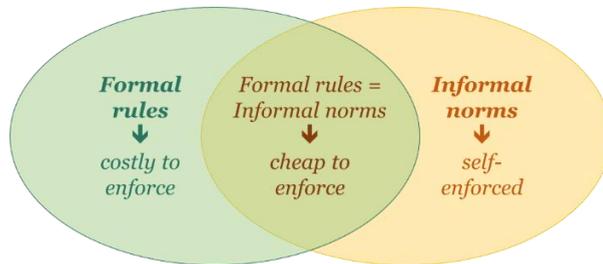


Figure 13 Formal and informal institutions diagram (Silva & Acheampong, 2015)

**Formal rules** are understood as written rules created by entities such as the government and public services. It includes formal planning instruments, such as the national, regional, and municipal development plans, the environmental impact assessment, and the regulation related to land administration and spatial planning (Silva & Acheampong, 2015).

**Informal norms** are understood as socially shared norms, which are unwritten and yet are often known by all actors. It includes informal planning instruments, such as the consensus resulted from participatory planning, the agreement from conflict mediation, and the community mission statement (Silva & Acheampong, 2015).

By identifying the formal rules and informal norms within land governance system, we could understand that land use planning system is not only conducted in formal procedures but also should be synergized by the informal channels.

#### 2.4.3 Synthesis: diverse perspective and collaborative process

In this part, we already discuss the stakeholder interdependency and institutional arrangement within land governance. The main issues in land governance are the gap between the participation of actors in formulating a land use plan and the power of actors to utilize their land based on their own preferences. Moreover, in formulating land use plan, it is possible to apply formal rules as well as informal rules. Therefore, we can conclude that land transformation is reflecting the constellation of diverse perspective, mainly the preferences of landowner and the referrals of land planning which is facilitated through formal and informal participation.

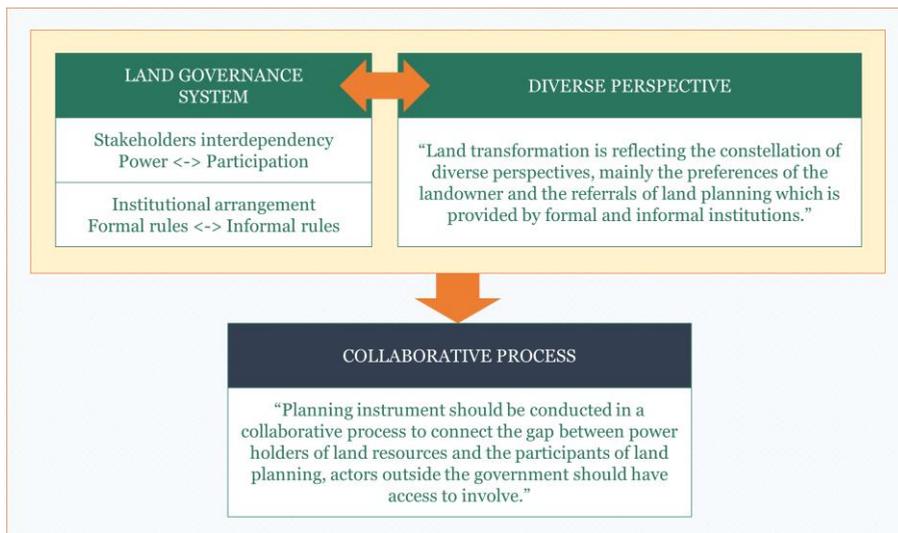


Figure 14 Diverse perspective and collaborative process relation

Figure 14 shows the connection between the land governance system and the diverse perspective of the actors. Therefore, a complexity-sensitive planning instrument should adopt a collaborative process to bridge the gap between power holders of land resource and the participants of land planning. Actors outside the government should have access to be involved.

## 2.5 Spatial planning instrument

Spatial planning system encompasses the method or approach used by the public or private sector to influence the distribution of population and activities in various scales of spaces. The form of planning largely diverges and co-evolves with societies and the governance systems (Allmendinger, 2009). Spatial planning systems are made up of different actors, different planning perspectives and diverse planning instruments (Van Assche & Verschraegen, 2008). In general, perspectives, actors and institutions change over time, influencing both the types and the implementation methods of spatial planning instruments.

### 2.5.1 Types of planning instrument

Abstract rules and principles could serve as a planning framework for overcoming the major drawbacks of land-use planning. These dilemmas include the incompatibility of planning with complex urban dynamics, the

partial and insufficient implementation of land-use plans resulting from the need to introduce flexibility to the static land-use plans, and the inconsistency of land-use planning with basic principles of democratic governance resulting from the deal-making dynamics of local planning (Alfasi, 2017). Agents' actions in space take place within certain rules, which may be more or less favourable to the creation of viable emergent orders. This idea can be schematized using four correlated concepts of framework-rules, individual actions, time dimension, and emergent order, illustrated in figure 15.

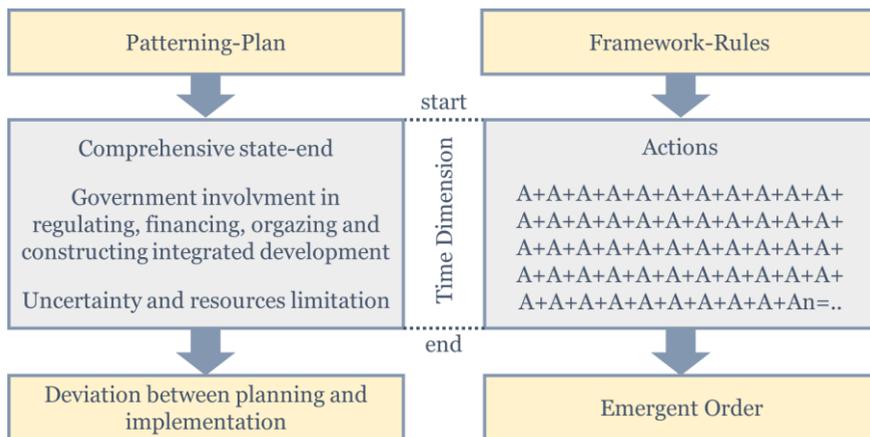


Figure 15 Patterning and framework-instruments diagram (Moroni, 2015)

As the core of spatial planning, land use planning has two alternative approaches in dealing with the complexity of land transformation. First, increasing the stakeholder collaboration in producing **patterning-instruments**. Second, the idea of shifting the emphasis to **framework-instruments** such as urban codes. (Moroni, 2015)

To select the appropriate approach, we have to consider the functions of spatial planning (Alexander, et al., 2012).

1. If the planning subject is acting as an organization to achieve defined goals through strategic action, it should use patterning-instruments such as plans, program, project designs to direct and coordinate its actions.
2. If the planning subject is acting as an institution that affects behaviour to effectuate collective values, it should adopt framework-instruments such as laws, rules, and codes to achieve its purposes.

The implementation of framework-rules approach provides the opportunity for self-organization process in urban development governance through an instrument that facilitating flexibility at micro-level while setting aggregate condition at the macro level of planning (Cozzolino, 2017). A paradigmatic example of a framework-instrument is an urban code (Moroni, 2015). Urban codes are based on non-directional but relational rules that are few, simple, generic, end-states-independent, and long-run oriented. The characteristics of urban codes include (Moroni, 2015):

1. Few in number, plain and unambiguous in their formulation, such as rules that eschew technicality, intricacy, and indeterminacy;
2. Refer to general types of situations or actions and apply equally to everyone, or at least to extremely broad classes of individuals;
3. Independent of any specific end-state,
4. Must serve in the long run, be stable, deal with general aspects of local urban reality and do not claim to control its details;
5. Merely prohibit individuals from interfering with the private domain of other individuals, rather than imposing some active duty or action.

Considering adaptive planning approach, in which come with a shift in focus, instead of content and process, it is first of all about creating conditions for development which support a city's capacity to respond unpredictable change (Rauws & de Roo, 2016). Procedures and guidelines have been widely exploited to design more effective policy-making and implementation processes by providing pathways for better management of spatial planning (Howlett, 2005). Yet, practically, they have tended to become highly standardized and overlapped with, rather than substituted for, more stringent legal norms governing land use in specific areas (Savini, et al., 2015). On the other hand, urban codes as the alternative spatial planning instrument have a potential to explore future directions of land development in a more open way to endow flexible or participative local governance in dealing with complex nature of land transformation.

### 2.5.2 Methods of implementation

Spatial planning is understood as a state activity that regulated the land market and associated with legislative control of land use. Such control was typically exerted by the imposition of a spatial plan which is encompassing a large number of individually owned properties and produced under a planning act or ordinance that unilaterally modified existing private property rights over land. While such a modification can enlarge the original

bundle of rights, in practice, it invariably attenuated, compromised, or extinguished existing private property rights. Concerning the power relation between public and private institutions within a legal framework, spatial planning can be implemented in two methods: planning by edict and planning by contract as illustrated by figure 16 (Lai, 2016).

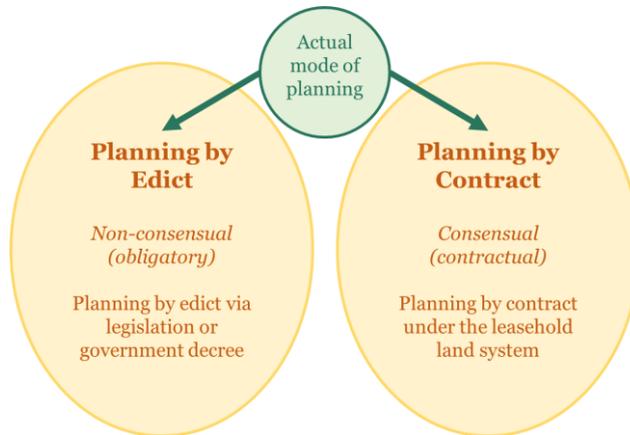


Figure 16 Methods of planning implementation diagram (Lai, 2016)

**Planning by edict** imposed by the state is seen as a product of rational design representing the public interest. It includes hierarchical rational decision-making by government planners to impose constraints on the market, and individuals. Planning by edict is an obligatory spatial plan enforced by legislation.

**Planning by contract** among individual landowners is seen as an outcome of the impersonal forces of supply and demand based on private interest. It includes contractual rational decisionmaking by individuals subject to legal constraints and competition. Planning by contract is an agreement between parties about land utilization under the framework of spatial regulations.

Both methods of implementation have different cost and benefit. In general, planning by edict is more powerful to provide legal certainty for all citizen. But, the cost for monitoring and enforcement is higher. While planning by contract is flexible to be reviewed by the involved stakeholder, but it is only facilitating limited and specific actors using voluntarily approach.

### 2.5.3 Synthesis: temporal change and adaptive capacity

In this part, we already discuss the type of spatial planning instrument and the methods of planning implementation. A planning instrument could be a patterning plan (plotting the land use distribution and delineation such as zoning map) or framework rules (providing standards and guidelines for land utilization such as urban codes). The mode of implementation could be classified as planning by edict (regulation for all with certainty to be enforced) or planning by contract (agreement between parties with flexibility to be reviewed). Therefore, we can conclude that land transformation is a dynamic process of temporal change. However, it is expected effectively responded by planning instrument and implementation methods that bring certainty as well as flexibility.

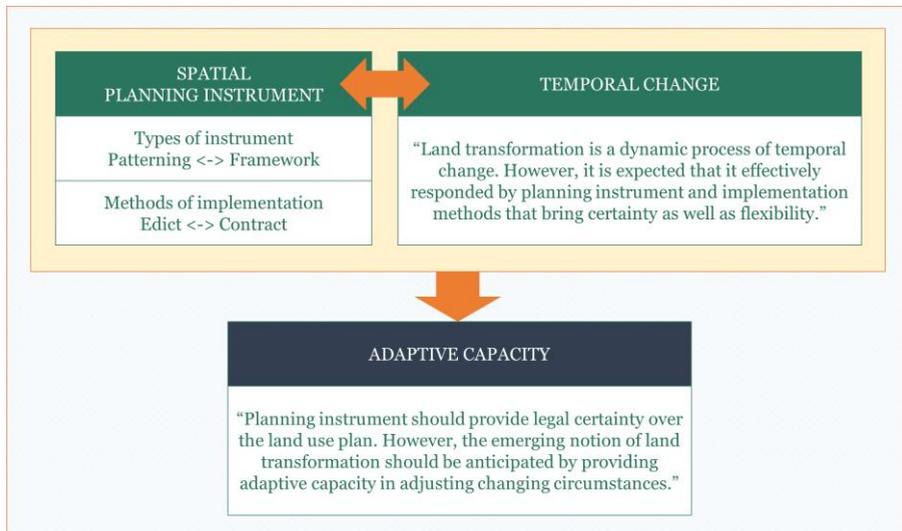


Figure 17 Temporal change and adaptive capacity diagram

Figure 17 shows the connection between spatial planning instrument and the challenge of temporal change. Such complexity-sensitive spatial planning instrument should provide legal certainty in regards to arrange the land use plan. However, the emerging notion of temporal change should be anticipated by providing adaptive capacity in adjusting changing circumstances.

## 2.6 Constructed theoretical framework

This research aims to answer the challenge in dealing with uncertain nature of dynamic land transformation and the drawbacks of spatial planning instruments by connecting the issues to the concepts of a complex land system and a land governance system. At the previous part, why both theories are relevant to the issues have been explained. In theoretical perspective, there are conceptual connections between dynamic land transformation (A), the complex land system (B), land governance system (C) and spatial planning instrument (D) that valuable to explore the complexity-sensitive planning principles. The constructed theoretical framework is presented in figure 18.

The conceptual model consists of four aspects which have been discussed in this chapter. The model is useful as a guide to analyzing:

1. The typology of dynamic land transformation and its driving forces (A);
2. The non-linear feedback and multi-scale interactions within the complex land system (B);
3. The stakeholders interdependency and institutional arrangement within land governance system (C);
4. The typology of spatial planning instrument and the implementation methods (D).

Based on the model, the land transformation is viewed as a complex system. Therefore we need to identify the types and the driving factors of dynamic land transformation (A). Then, we explore the complex relationship between factors that include non-linear feedback and multi-scale interactions within the complex land system (B). Such a complex land system is responded by a land governance system, and we will examine the governance capacity in responding to the complex interactions of land transformation system, by analyzing the stakeholder interdependency and institutional arrangement (C). At last, we provide an analysis of how the patterning-instrument and the framework-instrument differ in governing land transformation and which are the appropriate implementation methods (D). Overall, this framework explores the added values and drawbacks of spatial planning instruments based on the key principles of complexity-sensitive planning instrument.

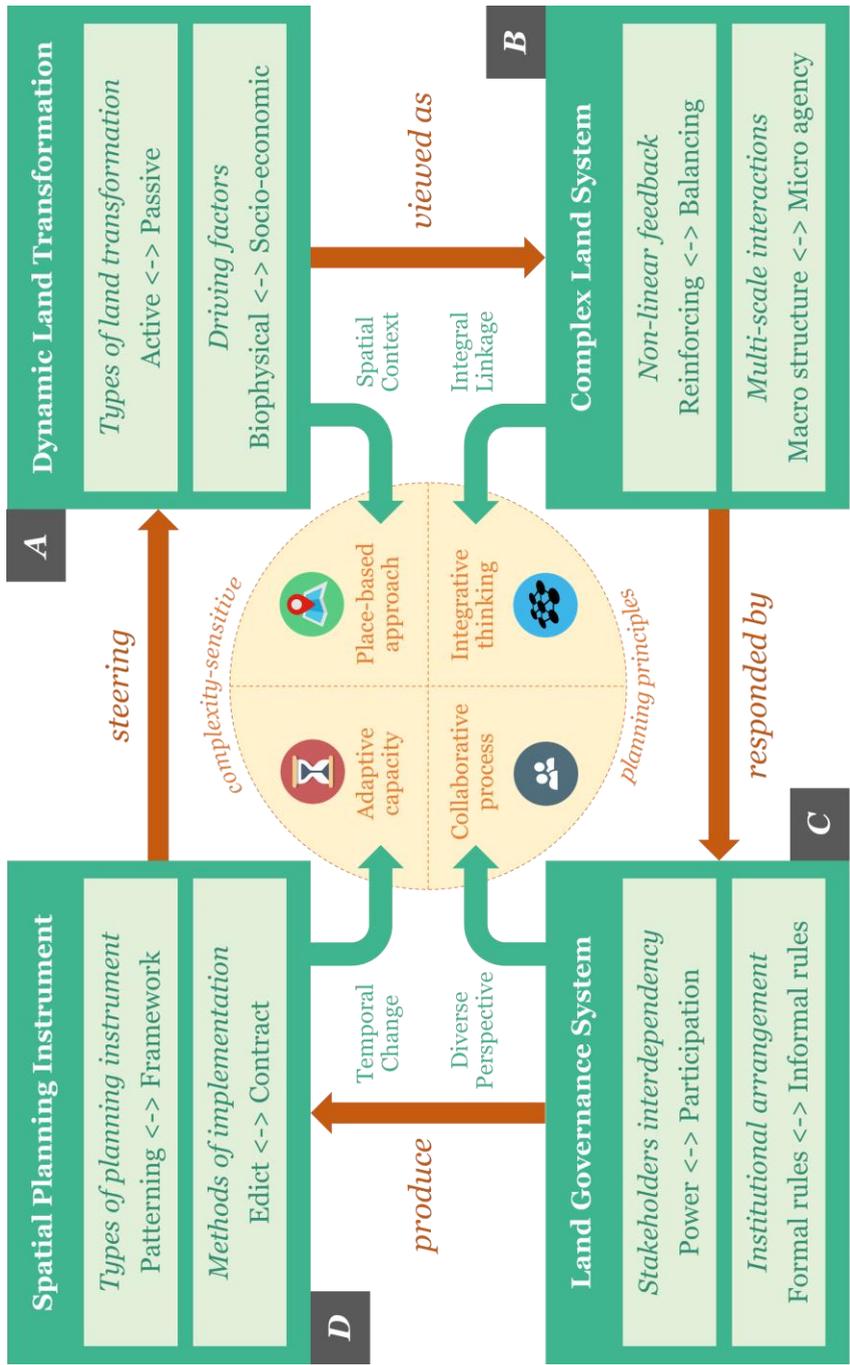


Figure 18 Constructed theoretical framework

# CHAPTER

# 3

# METHODOLOGY

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 3

## Methodology

### 3.1 Research approach and design

This study applies a qualitative research approach since the main question is to explore the principles and dilemmas of a complexity-sensitive spatial planning framework for dynamic governing land transformation in Batu City. It could be answered better by exploring the perspectives and ideas from different actors involved in land transformation and spatial planning issues within the local context.

In this study, the extreme cases approach is employed because the main purpose of this research is to highlight the most unusual variation of dynamic land transformation. This case is characterized by the on-going rapid urbanization and land use change in an ecologically-sensitive area that actually has limited carrying capacity for urban development.

Initially, this study also considers the use of other methods such as spatial quantitative method, but the output is resulting from such method is focus on generalization, which is not in line with the objectives of this study that wants to discuss in-depth the uniqueness of land transformation types and the driving factors. Using this case study approach, we could examine more the qualitative data by in-depth knowledge (Saldaña, 2011).

In operationalizing this approach, research design is arranged by identifying the appropriate data collections and the relevant analysis methods. The research design is shown in table 1.

Table 1 Research design

Research Question	Required Data	Data Sources	How to obtain the Data	How to analyze the Data
How to understand the role of complexity and governance theories in bridging the	Literature related to land transformation, complexity, governance and spatial planning instrument	Electronic academic database	Academic search engines	Literature review

Research Question	Required Data	Data Sources	How to obtain the Data	How to analyze the Data
gaps between the dynamics of land transformation and the spatial planning instrument?				
What are the advantages and dilemmas of conventional zoning system in dealing with the dynamics of land transformation in Batu City?	Development plan, land use change (2001 and 2016); Drivers of land transformation	Planning agency, Central Bureau of statistics, Google Earth, Stakeholders and experts	Document review; Interview	Dynamic land transformation analysis
What are the advantages and dilemmas of an alternative complexity-sensitive spatial planning instrument to govern land transformation in Batu City?	The storyline of comprehensive land transformation	Stakeholders and experts	Interview	Complex land system analysis
	The constellation of actors and the existing rules	Stakeholders and experts	Interview	Land governance system analysis
	Performance of existing zoning system; and the examples of urban code	Planning agency; Website of US EPA; Stakeholders and experts	Document review; Interview	Spatial planning instrument analysis (evaluative)
What are the advantages and dilemmas of an alternative complexity-sensitive spatial planning instrument to govern land transformation in Batu City?	Ideas or lessons for an alternative planning instruments	Stakeholders and experts	Interview	Spatial planning instrument analysis (prescriptive)

### 3.2 Data collection methods

This research applies semi-structured interviews and document reviews for data collection methods. The interviews are conducted over tele-video calling and encouraging open-ended responses. While the document

reviews are conducted for examining the existing data from policies documents, map album and official statistical publication.

### 3.2.1 Semi-structured Interview

The semi-structured interview is a good way to learn about the experiences of actors using open questions. Through this process, respondents can show the complexity of the situation, the contradictions of the situation, different steps in the process, and where mistakes are made in the process (Grindsted, 2005). Semi-structured interviewing is one of the most important data collection methods that can be used for case studies. Interviews in this study are valuable to give broad views of land transformation situation in Batu City. To accomplish this, selected relevant actors are interviewed based on their roles and capability. The list of stakeholders and experts involved in this study is shown in table 2.

*Table 2 List of stakeholders and experts involved in interviews*

Representing	Amount	Detail list of key informants
Government agencies	4 persons	Head of Investment and Permit Agency Department head in Planning Agency Member of Legislative Council Secretary of Rural Empowerment Bureau
Business Sectors	4 persons	Director of Amusement Park Company Owner of Real Estate Company Planner of State-owned Forestry Company Manager of Property Trading Company
Community groups	4 persons	Activist of farmer group Social activist and land realtor Environmental activist Facilitator of Forest-Rural Organization
Experts/ universities	5 person	Urban planner of Batu City Expert in Urban Planning Expert of Urban Governance Expert of Planning System Expert of Agrarian Law

### 3.2.2 Document review

Document review is used to collect specific information as an input for research from secondary data. Relevant documents are selected based on the reliability and accuracy of the information resource. In this research,

map album, statistical publications and policy documents are collected to further analyzed using the appropriate methods based on the conceptual model that came out from the theoretical review. The main provider of such data is the local government in Batu City. The list of secondary data for document review is shown in table 3.

*Table 3 List of secondary data for document review*

Type of data	Detail list of secondary data
Map album	Landsat imagery from Google Earth and land use map of Batu City in 2001 and 2016 from planning agency.
Statistical publications	Batu City in figures 2002, 2012, 2017 from Central Bureau of Statistics.
Policy documents	Development plan, zoning ordinance, and related regulations from Planning Agency.

### 3.3 Data analysis methods

Methods for data analysis in this research are based on the constructed theoretical framework. The data analysis mainly uses coding from interview transcripts and document reviews. This study also conducts spatial analysis by comparing map from different timelines. The systematics of data analysis in this study includes dynamic land transformation analysis, complex land system analysis, land governance system analysis, and spatial planning system analysis.

#### 3.3.1 Dynamic land transformation analysis

Dynamic land transformation analysis aims to examine the difference in land utilization between the beginning and the end of a certain period in the same designated area. In this research, land use change analysis is conducted in selected parts of Batu City, reflecting the strategic areas designated in the local development plan. It also examines the biophysical and socio-economic driving factors of each type of land transformation. The stages of land use change analysis are shown in table 4.

*Table 4 Stages of dynamic land transformation analysis*

Stage	Input	Output
Select strategic areas based on development plan	Development plan, include spatial structure map	Map of selected strategic areas for further analysis

Stage	Input	Output
Compare the spatial change between 2001 and 2016	Landsat images or land use map 2001 and 2016	Typology of land transformation
Identify the driving factor using interview #1	Typology of land transformation Interview #1	List of driving factors for each type of land transformation

### 3.3.2 Complex land system analysis

Complex land system analysis aims to examine the complex interaction among factors within land transformation system by identifying the reinforcing and balancing non-linear feedback. Then, it identifies the multiscale interaction between macrostructure and micro-agency. The stages of complexity analysis are shown in table 5.

*Table 5 Stages of complex land system analysis*

Stage	Input	Output
Identify the storyline of land transformation using interview #2	List of driving factors Interview #2	Non-linear feedback loop
Identify the multi-scale interactions using interview #3	Non-linear feedback loop Interview #3	Multiscale interactions diagram
Identify the leading sectors of each type of land transformation	Interview #2 Interview #3	List of leading sectors in each type of land transformation

### 3.3.3 Land governance system analysis

Land governance system analysis aims to identify the stakeholder interdependency in land transformation issues by recognizing their power and influence. This analysis also identifies the institutional responses including formal and informal ways that conducted by the stakeholders. The stages of governance analysis are shown in table 6.

*Table 6 Stages of land governance system analysis*

Stage	Input	Output
Identify the constellation of stakeholders using interview #4	List of relevant stakeholders Interview #4	Stakeholders quadrant of power and importance

Stage	Input	Output
Identify the institutions/ rules in land governance system using interview #5	List of institutions/ rules Interview #5	Typology of stakeholders and institution
Identify the diversity of actors involvement in each type of land transformation	Interview #4 Interview #5	List of actors involvement in each type of land transformation

### 3.3.4 Spatial planning instrument analysis

Spatial planning instrument analysis – the evaluative part focuses on evaluating the existing spatial planning instrument in Batu City. It examines the related procedural system as well as the contents of zoning ordinance document which is the main legal instrument for zoning regulation and land development management. The stages of policy analysis (evaluative) are shown in table 7.

*Table 7 Stages of spatial planning instrument analysis (evaluative)*

Stage	Input	Output
Identify the characteristics of existing zoning ordinance	Zoning ordinance document and related regulations	Characteristics of existing zoning ordinance
Evaluate the existing zoning ordinance based on four complexity-sensitive planning principles	Characteristics of existing zoning ordinance Interview #6	Evaluation results

Spatial planning instrument analysis – the prescriptive part focuses on proposing an alternative spatial planning instrument for Batu City. It examines the promising urban code as a framework-instrument that has capacity in responding to the complexity of land transformation. Theoretically, this approach offers some added values to improve the rigidity of zoning ordinance. Therefore, it is important to analyze the feasibility of urban code approach for Batu City. Moreover, we can explore what the principles of such approach that valuable for Batu City context and what dilemmas in adopting and applying this concept. The stages of policy analysis (prescriptive) are shown in table 8.

Table 8 Stages of Spatial planning instrument analysis (prescriptive)

Stage	Input	Output
Explore the opportunity and characteristics of urban code as a proposal	Literature review Interview #6	Characteristics of urban code
Compare the characteristics of existing zoning ordinance and urban code	Characteristics of existing zoning ordinance and urban code Interview #6	Table of comparison
Explore the possibility of hybridisation using interview #6	Table of comparison Interview #6	Diagram of proposed hybrid system
Identify the advantages and dilemmas of the proposed spatial planning instrument	List of key principles Interview #6	List of advantages and dilemmas

### 3.4 Ethical Issues

This study deals with several norms prevailing in the wider Indonesian society, including norms of manners in conducting the interview with the stakeholders, legal norms in regards to governmental and public issues, and moral norms that include good intention in the research for the benefit of society and knowledge in spatial planning.

The ethical principles in this study include: researchers respect the rights of respondents; researchers consider the rights of respondents to obtain open information related to the course of research. Respondents have freedom of choice and are free from coercion to participate in research activities. Therefore, the researcher prepares the informed consent form; researchers respect the privacy and confidentiality of research subjects; The research will give effect to the disclosure of individual or institutional information, including personal and limited information. This research is conducted honestly, cautiously, professionally, humane, and attention to factors of accuracy, precision, precision, intimacy, psychological, and religious feelings of respondents.

# CHAPTER

# 4

## DYNAMIC LAND TRANSFORMATION

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 4

## Dynamic Land Transformation

In this chapter, the results of dynamic land transformation analysis are explained. The analysis aims to understand the nature of dynamic land transformation. This analysis includes several stages such as identifying the dynamics of land function, examining the timeline of land transformation, selecting the examples of land transformations in strategic areas with different spatial contexts to construct the typology of land transformation and recognising the driving forces in each land transformation type.

### 4.1 Dynamics of Land function

The function of land can be classified as built area (its main function to support human activity) and natural area (its main function to support ecosystem cycles). This dichotomy is based on the objectives of spatial planning to determine which areas might be developed for human activities and which areas should be protected because of its ecological significance.

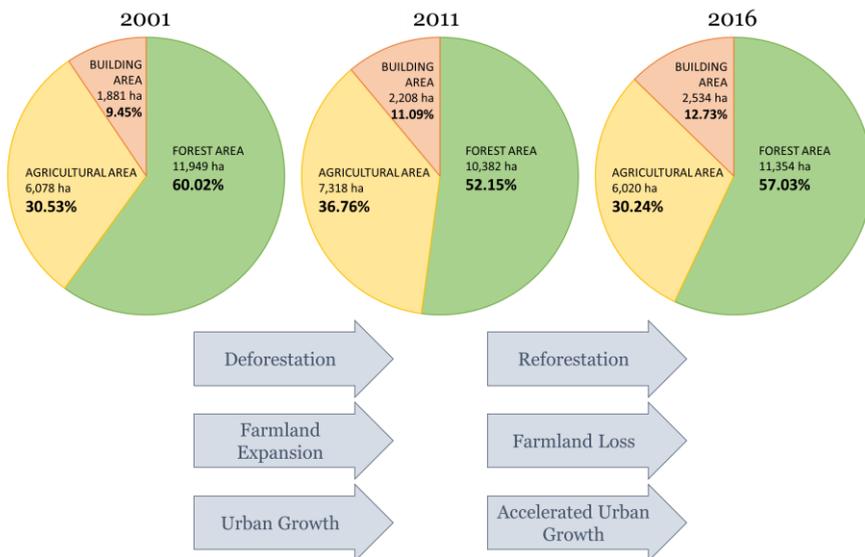


Figure 19 Land use diagram of Batu City in 2001, 2011 and 2016 (Central Bureau of Statistics of Batu City, 2002; 2012; 2017)

Figure 19 shows the dynamics of land transformation in period 1 (2001-2011) and period 2 (2011-2016).

1. The first period experienced deforestation, while the second period experienced reforestation.
2. In the first period, agricultural land was expanded, while in the second period it was converted.
3. The growth of building area in the second period was accelerated, compared to the first period.

Based on the land use change analysis, we conclude that there are different patterns of land transformation in the first and second period. Based on land function classification, the building and agricultural areas belong to the built area, while forest area belongs to the natural area. There is a different speed of land function change from the built area to the natural area and vice versa. Such dynamics indicate that many factors drive the land function change, such as macroeconomic changes, investment in the agricultural sector, investment in tourism, urbanisation, the expansion of residential areas and natural disasters. Such factors not only changes the extent of the built area and the natural area (we call it as active transformation) but also changes of terrestrial state of the land. The changes of terrestrial state of land can be understood as the changes of building density in the built area or the changes of vegetation density in the natural area although its land function still remains (we call it as passive transformation). To understand the forms of land transformation, both active and passive, we must recognise the different characteristics of the built area and natural areas, illustrated in figure 20.

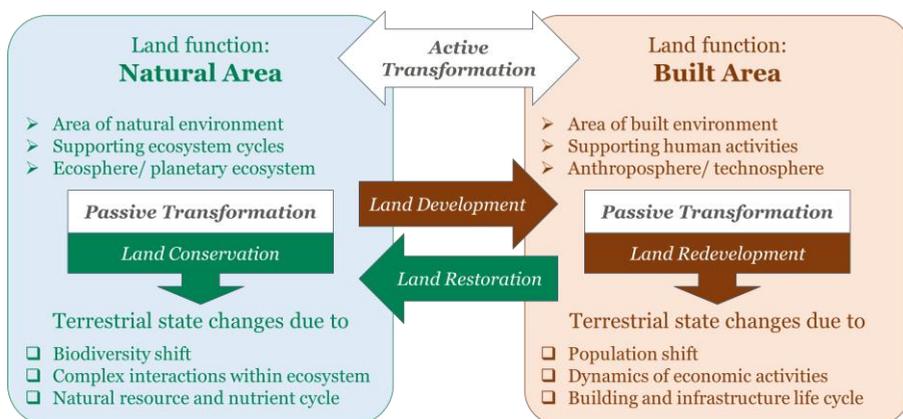


Figure 20 Characteristics of natural area and built area

#### 4.1.1 Natural Area

The natural area consists of the natural environment that encompasses all living and non-living things occurring naturally, not artificial. The natural area includes forest, grassland, desert, tundra, taiga and other ecosystems in which human occupation or at least the exploitation of resources is limited. The natural area has the main function to maintain broader ecosystem cycles. The intensity or quality changes in the natural area influence the environmental quality and environmental balance. The intensity or quality changes are caused by biodiversity shifts, complex interaction within ecosystems and natural resources/nutrient cycles. In Batu City, 57% of its territory identified as natural areas, consists of tropical rainforest, caldera and river areas (Rahayu, 2012). The intensity changes are mainly caused by changes in forest vegetation, the diversity of endemic animals and the exploitation of water resources.

#### 4.1.2 Built Area

The built area consists of built environment or human-made surroundings that provide the settings for human activity, ranging in scale from buildings, farmlands to parks. The main function of the built area is to support human activities. The built area includes urban and rural settlement, industrial areas, agricultural areas and infrastructure systems. The intensity or quality changes in built areas are caused by population shifts, dynamics of economic activities, and the life cycle of building and physical infrastructure. In Batu City, 43% of its territory is identified as built area including agricultural and settlement areas (Rahayu, 2012). The intensity or quality changes are mainly caused by the changes of building intensity and the economic activity, which have an impact on mobility and environmental externalities.

### 4.2 Timelines of land transformation

Using the time series map from satellite imagery and socio-economics verification, we can generate the pattern and the trend of land use change. This is an important input for planners in formulating spatial plan assumptions. These projections are presented to the stakeholder, especially to the local government. The spatial plan could be formulated by trend or by target. Planning by trend tries to adjust the trend of land use change; the expectation is that the program will be easier to be implemented because it follows the existing developments pattern.

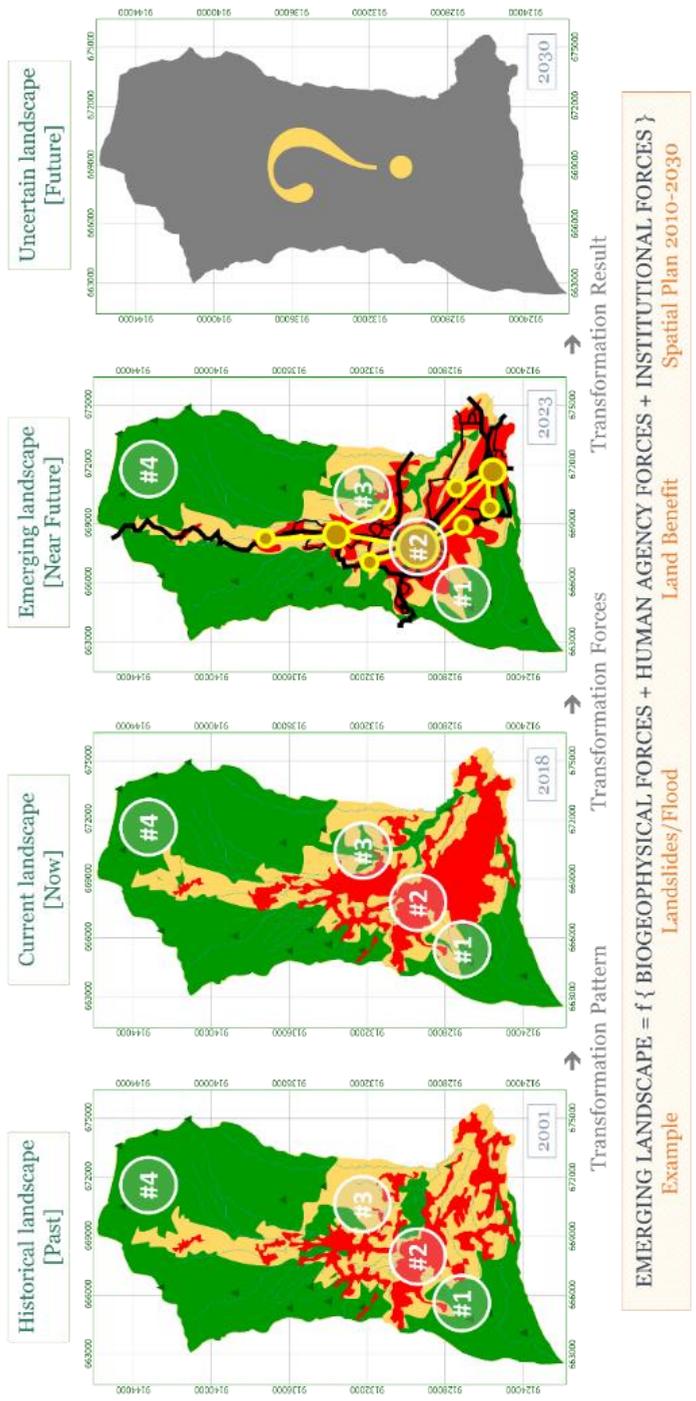


Figure 21 Timeline of land transformation

Planning by target is trying to manipulate the trend of land use change. So, they create a spatial pattern map based on the stakeholder's preferences to steer the land use change. There is no guarantee that the plan will be the end-state of the future landscape. But it is likely to affect the emerging landscapes that will occur in the near future. To understand the timeline of land transformation in Batu City, the classification of four types of temporal landscape shown in figure 21. The figure shows the historical landscape, the current landscape, the emerging landscape and the uncertain landscape.

#### 4.2.1 Historical landscape

The historical landscape is a spatial description of land use, land cover or land function in a certain area in the past. By looking at the historical landscape, we can recognise the narrative of the land transformation. When we look at the satellite imagery of Batu City in 2001, when the city was established, it shows that the settlement areas are sporadic, linear (following the road network) and surrounded by agricultural areas. The landscape indicates that major settlement areas are characterised as rural settings, in which housing is scattered close to agricultural areas. This is consistent with the statistical data that shows that most of the population are farmers. The landscape in 2001 indicated that Batu City previously is composed of rural settlement areas, agricultural areas and surrounded by forest areas.

#### 4.2.2 Current landscape

The current landscape is reflecting the latest achievement of socio-economic development and environmental protection. If we want to get an overview of Batu City in general, we can look at the latest spatial pattern map. After seventeen years since the establishment of Batu City as an autonomous region, it was followed by densification of the settlement area, land conversion in the agricultural areas and some extensive changes that occurred in the forest areas. Direct observations indicate that the intensity of buildings in the downtown area is increasing and the various functions of activities such as trade and tourism are growing. The branding of Batu City as a tourist city has influenced its landscape into an urban settlement area. This data is also supported by the increase of the tertiary sectors share in GDP. The current landscape also shows that there is a shift in agricultural areas that penetrate forest areas. However, some settlement areas next to

the riverbank already restored to forest area for environmental safety reasons.

### 4.2.3 Emerging landscape

What will happen with the landscape in the next five years? Could we extrapolate them from the pattern of land use change in the past to project the trend in the future? We could use some projections only for approximation. Because temporally land is transformed to follow the environmental dynamics that are affected by diverse forces. In general, such diverse factors could be classified into three major forces.

First, the land transformation is influenced by biogeophysical forces. Land as a component of the earth's terrestrial will naturally change to follow the earth's activity such as volcanism, tectonics and land movement. Land transformation is influenced by the changes in ecosystems and the regeneration of natural resources such as forest vegetation which is affecting the provision of water reserves, soil stability, soil fertility, and species migration. Biogeophysical forces are seen as a barrier for humans to utilise all the lands. Therefore, the growth of settlements will be in an area that naturally provides valuable resources and low risk of natural disasters.

Second, the land transformation is influenced by human agency forces. Human agency is closely related to the rational choice of land utilisation. Human agency forces usually choose an area that provides profitable and strategic land resources. Human agency develops technology such as landscape engineering and building structures to mitigate and adapt to natural challenges and biogeophysical limitations. Human agency forces that are autonomous and emergent cause the land development to be faster than the ability of ecosystems to regenerate natural resources. Therefore, the tragedy of common has happened, and human agency forces should have recognised and anticipated it.

Third, the land transformation is influenced by institutional forces. Institution is an important instrument to anticipate and steer human agency. Land use plan is one of the main institutions to influence land transformation. Institutional forces are part of social engineering in which they try to influence human agency. Institutional forces can be provided to trigger or to limit human agency. Therefore, institutional forces in macro policies or societal rules that influence the behaviour or preference of human agency to utilising the land.

Emerging landscape is illustrated by indicative maps of several forces. For example, the land use change in Batu City in the near future is influenced by the combination of these three factors. A concrete example of these three factors is as follows. First, biogeophysical forces are represented by the maps of environmental disasters risk and natural resource reserves resulting from regular field observations. Second, the human agency forces are represented by the maps of land price and land benefit which are becoming the basis for investment. Third, the institutional forces are represented by the map of zoning plans that control and direct land use change based on political consensus. Combined maps of environmental disaster risk, natural resource reserves, land price, land benefit, and zoning plan, resulting in some indications for approximating the emerging landscape.

#### 4.2.4 Uncertain landscape

It is actually very difficult to estimate land use or land cover changes in the future, for example in the next 20 years. Several factors and complexities make it impossible to establish an exact projection. The uncertain landscape in Batu City in the future can be examined from three aspects. First, Batu City is geographically surrounded by volcanoes and particularly vulnerable to eruption and earthquake. The impact of such major disasters on environmental degradation and land use change becomes difficult to predict. Second, the current and projected economies of Batu City depend on the tourism sector. This sector is sensitive to the domestic and international economic crises. Changes in tourist visitation will be affecting dramatic changes in the economic structure, and the land use will adapt to and therefore change the needs of restructured economic activities. Third, long-term development is strongly influenced by political commitment, especially from the city mayor and legislative members. The succession of power holders in government is more likely to affect significant changes in the land use plan. The changes in leadership vision for urban development will affect spatial allocation strategy and shift the spatial disparity. Therefore, the uncertainty in the geophysical environment, economic activities and politics make the landscape in Batu City in the future remains uncertain.

#### 4.3 Types of land transformation in strategic areas

Based on the development vision in Batu City which is explained in the long-term development plan of the region 2005-2025 (Legislative Council of Batu

City, 2012) and the city’s spatial plan for 2010-2030, the regional development directives include four strategies (Planning Agency of Batu City, 2011).

1. Prioritizing regional development for tourism and agriculture sectors
2. Rearranging central areas for commercial and services activities
3. Protecting the ecology of springs, riverbanks and landslide-prone areas
4. Managing the conservation in protected forest areas and forest parks

In understanding the diversity of spatial contexts, this study selects several locations that reflect the development direction in Batu City. There are four strategic areas with distinct locations and types of land transformations, as shown in table 9.

*Table 9 Strategic areas and the type of land transformation*

Strategic Area	Location	Type of land transformation
Orchard and tourism area	Kelurahan Ngaglik (#1)	Land Development (AT)
City centre area	Kelurahan Sisir (#2)	Land Redevelopment (PT)
Riverbank area	Desa Bumiaji (#3)	Land Restoration (AT)
Great forest area	Desa Sumber Brantas (#4)	Land Conservation (PT)

Based on the explanation in the theory chapter, land transformation is classified into two types: active transformation (AT) and passive transformation (PT). Active transformation includes changes of land function, from natural area to built area and vice versa. While passive transformation, it includes changes of terrestrial state such as the intensity of buildings or vegetation without changing the land function. This study selected four examples of strategic areas that represent four types of land transformation.

#### 4.3.1 Active Transformation

The active transformation in Batu City is indicated by the changes in the extent of built area (agricultural and building area) and natural areas (forest area). There are two examples of active transformation taking place in Batu City. First, land development that located in Kelurahan Ngaglik. Previously this area is dominated by community forest area but later converted into agricultural, housing and man-made tourism areas. On figure 4.2, this

location is indicated by code #1. Second, a land restoration that is located in Desa Bumiaji. Previously this area was dominated by agriculture and rural settlement but was later converted into an on-site ecological protected area. In figure 4.2, this location is indicated by code #3.

#### 4.3.2 Passive Transformation

The passive transformation in Batu City is indicated by the unchanged land function of the built area or the natural area. But there are changes in the intensity of the building or the type of activity in the built area, and there are changes of vegetation intensity or the quality of the ecosystem including biodiversity in the natural area. Spatially there is no extensive change of land function, but physically there are dynamics at the terrestrial state. There are two types of passive transformations that occur in Batu City. First, land redevelopment that occurs in Kelurahan Sisir, in the city centre area. Previously, this area is dominated by low-density settlement and commercial area. Nowadays, the building density is getting higher, and the type of commercial activities are getting more diverse. In figure 4.2, this location is indicated by code #2. Second, land conservation in Desa Sumber Brantas. Previously, this area experienced deforestation but was later revitalized by reforestation. Therefore, the ecosystem quality and vegetation density have improved. In figure 4.2, this location is indicated by code #4.

#### 4.4 Driving forces of land transformation

Based on the theoretical chapter, the driving forces of land transformation theory consists of biophysical and socio-economic forces. However, in this research socio-economic factors are separated into human agency forces (based on rational economic preferences), and institutional forces (based on the needs for collective or social control). So, there are three types of land transformation forces namely biogeophysical, human agency and institutional forces.

##### 4.4.1 Driving forces of land development in Kelurahan Ngaglik

From the biogeophysical aspect, apple orchard and man-made tourism area in Kelurahan Ngaglik deserves to be developed as a built area because it is a geologically stable area and it is excluded from the disaster-prone area. Therefore, based on environmental observation and assessment, there is no biogeophysical barrier to conduct land development.



*Figure 22 Satellite image of orchard and tourism area in Kelurahan Ngaglik*

From the human agency aspect, this area initially was classified as an unattractive to be developed suburb area. Moreover, the cost of land clearing, construction and provision of infrastructure is relatively higher. This is a consequence of the development in a new planned area that must provide proper basic infrastructure to connect with the other existing built areas. On the other hand, the increased demand for the orchard, tourism, hotel and housing development, trigger investment to develop the potential land in Kelurahan Sisir. However, the relatively higher cost of infrastructure and services affect the land development in this area that slowly implemented. At the same time, many citizens are favouring land development to meet their housing needs and investment opportunity.

From the institutional aspect, the government of Batu City is aware of the economic potentials in this area. The main consideration is this area excluded from disaster-prone areas, so it is potentially to be developed for agricultural land, settlement and integrated economic area. Concerning the high cost of infrastructure and services provision, the local government issued a policy to prioritise and subsidise the construction of road infrastructure, electricity and clean water networks adopted in the government's development plan and spatial plan. In 2016, the government intervention triggered the land development significantly in this area. Investment of apple orchard, housing and tourism park has been realized thanks to government policies that support the growth in this area.

#### 4.4.2 Driving forces of land redevelopment in Kelurahan Sisir

From the biogeophysical aspect, the city centre area in Kelurahan Sisir is located outside the disaster-prone area, so it is already feasible to be maintained as built area. The topography of the city centre area is relatively flat and adjacent to the river branches which becomes the natural drainage for Batu City. If there is heavy rain, then the water will flow directly into the river branches. Therefore, geophysically this area has feasibility for land redevelopment.



*Figure 23 Satellite image of city centre area in Kelurahan Sisir*

From the human agency aspect, the city centre area is economically an attractive area for investors. This area has ease of accessibility and infrastructure services that are already well-developed. This has led to changes in land use from the housing and retail area, into large-scale commercial areas such as shopping centres, modern markets and hotels. In general, Floor Area Ratio (FAR) in this area has increased for intensive utilization. On the other hand, land redevelopment causes higher land prices. The existing landowners sell part of their property to investors and earn high profits. They remain to live in a very densely populated area because of it is a strategic location surrounded by public facilities. This raises issues related to livability and environmental health in the city centre area. Population density, high mobility, improper drainage channels mixed with grey water disposal and lack of green space create complex environmental health issues. Those issues affect the potential to reduce the urban attractiveness and could lead to urban decline because local people do not feel comfortable living in urban centres.

From the institutional aspect, the government of Batu City conduct interventions with various urban environmental management programs, aimed to increase the livability in the city centre area. This area has a strategic value for the local government, especially in supporting the vision of Batu City as a tourism city. The city centre area is a barometer of the livability of a city. This area host the government facilities, the main market, town square and various shopping centres. Therefore, Batu City's government made a policy of controlling the intensity of development in this area, including regulations about the height of the building. Specifically, the regulation wants to organize urban landscapes, and the residents of Batu City remain to enjoy the scenery of the natural landscape.

#### 4.4.3 Driving forces of land restoration in Desa Bumiaji

From the biogeophysical aspect, the Brantas riverbank area in Desa Bumiaji is considered as a disaster-prone area that is sensitive to erosion and

landslides. This area experienced annual flood, landslide and building damage. Because of its vulnerability to environmental disaster, this area is designated as an on-site ecologically protected area and prohibit for land construction and intensive agriculture. Such development will cause land degradation and affect greater ecosystem sustainability.



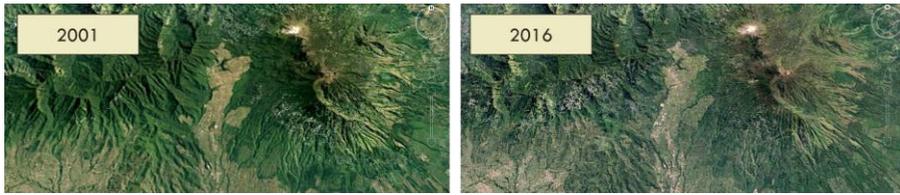
*Figure 24 Satellite image of riverbank area in Desa Bumiaji*

From the human agency aspect, the riverbank area in Desa Bumiaji is traversed by the road system and therefore has good accessibility. This area is also connected to the power grid provided by a state-owned electrical company. The access to basic services and social facilities is also affordable, although the settlements of this region are relatively scattered. With the availability of good infrastructure and services, this encourages the land utilization in the dominated built area. On the other hand, the increase of disasters frequency such as landslides, river water pollution by chemical fertilizers and household garbages, makes environmental conditions in the riverbank area not feasible for human settlement. However, the squatter buildings and illegal land plantation remain to exist in this area.

From the institutional aspect, the government of Batu City set up the area as an on-site ecologically protected area, conduct land acquisition, and promoted land restoration. Restoration is also conducted voluntarily by the community in riverbank area. The surrounding villagers made an agreement to avoid potential landslides by converting the built area into the community-owned forest area.

#### 4.4.4 Driving forces of land conservation in Desa Sumber Brantas

From the biogeophysical aspect, the great forest area in Desa Sumber Brantas is an area that has a steep slope and sensitive to erosion. Therefore, intensive vegetation cover is necessary to prevent erosion that affects the watershed ecology. In addition, the area also includes an active volcanic mount includes Mount Welirang and Mount Arjuno. Therefore, this area has a high risk of volcanic and tectonic disasters.



*Figure 25 Satellite image of great forest area in Desa Sumber Brantas*

From the human agency aspect, the area has abundant natural resources such as springs, timber and other forest products. Therefore, this area is vulnerable to resource exploitation conducted by individuals, communities or companies. This area also has the potential of nature tourism, such as Cangar hot springs resort. The air is fresh, and the natural landscape is beautiful, which led investors to develop tourism activity in this area. On the other hand, this is a remote area with the extreme topographic terrain, limited road access, so there is a much higher cost for the provision of proper basic infrastructure in this area.

From the institutional aspect, the great forest area is not managed by the government of Batu City, but under the administration of forest service of East Java provincial government. While the other natural areas are managed by the State-owned Forestry Company. The management of forest areas by specific agencies or landscape government aims to prevent land conversion into the built area. Forestry agencies have separated planning system from local governments and under the supervision of national or provincial government directly. It is to ensure that land conservation program is not marginalized by the development agenda of local governments.

Table 10 shows the forces of land transformation in four locations with different spatial context. Driving forces in each type of land transformation could be summarized as follows. First, biogeophysical forces mainly determine the ecological viability of land use such as the risk of environmental hazard. Second, human agency forces determine the trend and speed of land conversion based on economic preferences such as the benefit of environmental quality and the cost of infrastructure and service. Third, the institutional force that triggers or limits the land conversion by creating spatial planning and policy. Overall, each type of land transformation involves different nature of driving forces.

Table 10 Forces of land transformation

Driving Forces	Area for Land Development	Area for Land Redevelopment
<b>Biogeophysical forces</b>		
Risk of environmental hazard (Precondition)	Low	Low
<b>Human agency forces</b>		
Benefit of environmental quality (Condition)	High	Low
Cost of infrastructure and services (Condition)	High	Low
<b>Institutional Forces</b>		
Role of planning and policy (Intervention)	Growth Management	Urban Arrangement
Driving Forces	Area for Land Restoration	Area for Land Conservation
<b>Biogeophysical forces</b>		
Risk of environmental hazard (Precondition)	High	High
<b>Human agency forces</b>		
Benefit of environmental quality (Condition)	Low	High
Cost of infrastructure and services (Condition)	Low	High
<b>Institutional Forces</b>		
Role of planning and policy (Intervention)	Ecological Expansion	Ecological Protection

The explanation about diverse precondition, condition and intervention of land transformation shows that every place has its own unique spatial context. Therefore, in making a complexity-sensitive planning instrument, we should be aware of the characteristics of land transformation forces in each specific place.

# CHAPTER

# 5

# COMPLEX LAND SYSTEM

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 5

## Complex Land System

In this chapter, the results of a complex land system analysis are explained. This analysis aims to understand the complex interactions between cross-sectoral components that affect land transformation and construct a land system using the integrative perspective. This analysis includes several stages such as identifying relationships between forces of land transformation, showing non-linear feedback of land systems, understanding the multi-scale interactions and recognizing the leading sectors affecting land transformation.

### 5.1 Relations between forces

Land transformation as a complex system is indicated by the non-linear feedback generated by the interaction between components or forces. The relations between forces of land transformation is presented in figure 26.

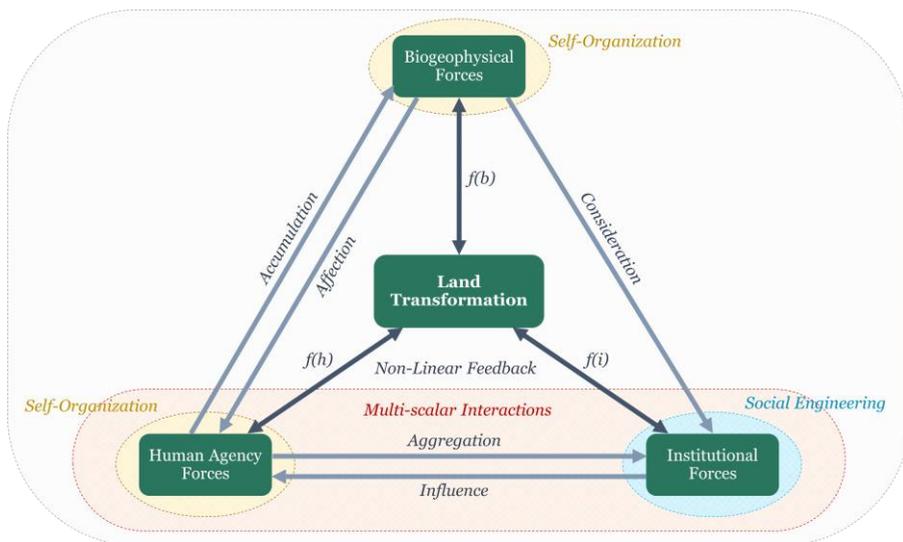


Figure 26 Relations between forces of land transformation

Self-organization occurs in the biogeophysical forces and human agency forces, where both forces have spontaneous orders such as patterns of

earthquakes and landslides (biogeophysical) and growth patterns and migration of human settlements (human agency). While institutional forces are part of social engineering that aims to influence the behaviour of human agency and steer the societal change. In this chapter, the explanation is given of the relationship between the three forces of land transformation.

### 5.1.1 Biogeophysical forces with Human Agency forces

Biogeophysical forces are influenced in two ways. First, it is shaped by the dynamics of the self-organization of the ecosystem and the planetary system that causes activity such as regeneration of resources, tectonism, volcanism, and various other natural activities. Second, it is influenced by the accumulation of human agency forces that affect the ecology system, including changes in land use and land management. In Batu City, massive urbanization, expansion of settlement and conglomeration of tourism areas have changed the ecological conditions in the region. The examples include rising temperatures, decreasing the number of springs, river water pollution, and more frequent landslides. While human agency forces are generated by individual preferences in utilizing land for settlement and economic activity that exploit natural resources. The transformation caused by biogeophysical forces have impacts on human agency forces. For example, landslide disaster that occurred in Desa Bumiaji and northern area of Batu City have damaged the farmlands and buildings owned by residents. Such incidents caused residents to leave the area and avoid that the same disasters happen in the future. Residents also made various responses, including strengthening the construction of buildings and the soil structures. In addition, the conversion of agricultural area into forest area is conducted to mitigate the risk of erosion.

### 5.1.2 Human agency forces with Institutional forces

The relationship between human agency forces and institutional forces include a multiscale interaction between individual preferences that have self-organization, as well as collective societal preferences that aim to influence the human agency. Institutional forces could be formal or informal rules. An example of a formal rule in Batu City is the provision of building's height restrictions. Massive construction of villas and hotels in Batu City trigger concern within the wider community. They worried about the existence of natural landscape because it is blocked by hotel and villa buildings. Local governments acknowledge these concern by setting local

regulations that can restrict investors and individuals who want to build constructions as tall as possible and monopolize the access to natural scenery. Another example related to informal norms is the agreement between street vendors who utilize public space in the downtown area. This area is crowded with tourists who enjoy the local cuisine. In 2001, the area was very disorganized and occupied by street vendors. In recent years, regular discussions and dialogue among the street vendors are organized. Now, they work together to arrange the street vendor zone in order to provide comforts for tourists and provide equal business opportunities for their members. Informal norms built through the dialogue is proven to transform the downtown area to be more ordered effectively.

### 5.1.3 Biogeophysical forces with Institutional forces

The relationship between biogeophysical forces and institutional forces is one-way, which is biogeophysical forces are giving considerations to institutional forces. Institutional force as social engineering only influence human agency. However, institutional forces have significant power to anticipate biogeophysical forces by controlling and directing human agencies indirectly. An example is the control mechanism for forest conversion. Because of temperature changes, potato and apple farmers move their plantation locations to the higher land. In the highland, they could get more agricultural productivity due to the climate suitability. The farmers' actions cause massive forests conversion into an agricultural area. On the other hand, a forest area has the vital function to regulate the temperature and soil stability. So, this phenomena illustrates the irony of getting short-term economic benefit by losing long-term ecological sustainability. In anticipating such tragedy of commons, the government creates regulations that control the types of plants that may be cultivated in certain areas by considering the carrying capacity. The rate of forest conversion for potato and apple plantations is reduced. The government also supports farmers by promoting more sustainable cultivation techniques.

While an example of an informal norm that considers biogeophysical forces is the awareness to preserve the springs. In Batu City, the existence of springs are beneficial for all and attracting investment. In the northern area of Batu City is difficult to access groundwater which requires deep drilling. The community understands that the area around the spring must be preserved, and water resources can be used together for household and agricultural needs. But in 2011, a private company built a hotel near to

spring and monopolised the water usage. the community did protests in responding to this matter. Demonstrators asked the government to cancel the permit for hotel operations. This case illustrates that the informal norm is able to mobilize public awareness and restrict the individual agency that violating biogeophysical considerations.

## 5.2 Non-linear feedback

Non-linear feedback between three forces of land transformation can be visualized through a causal loop diagram in figure 27. The diagram includes diverse components related to the complex land system. In the diagram, biogeophysical forces are indicated by environmental hazard. Based on the interviews, human agency forces are represented by the needs for housing, farmland and economic facilities and the needs for ecological improvement and protection. Then, institutional forces are indicated by the growth control, intensity control and fiscal provision.

The dynamics of land transformation are shown by the reinforcing loop and balancing loop. Several examples of reinforcing and balancing loops that occur in the land system will be elaborated. The first example, reinforcing loops encourage continuous land development and redevelopment caused by the impact of investment and economic activity. While the balancing loop is inhibiting land development and redevelopment, caused by the environmental hazard impact resulted from the investment and economic activity. A second example is the reinforcing loops show the feedback that triggers land restoration and conservation as a result of environmental hazard. While balancing loop shows the feedback that inhibits land restoration and conservation caused by the fiscal burden.

### 5.2.1 Reinforcing loop of land development or redevelopment

In general, the reinforcing loop that increases land development and redevelopment are caused by the increase in investment and economic activity. Below a reinforcing loop is being described is the reinforcing loop that increased land development or redevelopment.

*Population growth →<sup>+</sup> Needs for housing, farmland, and economic facilities →<sup>+</sup> land development/ land redevelopment →<sup>+</sup> Built area/ built area intensity →<sup>+</sup> Supply of housing, farmland, and economic facilities →<sup>+</sup> Investment and economic activities →<sup>+</sup> Population growth*



The loop shows that population growth or urbanization in Batu City increases the need for housing, agriculture and economic facilities. This need encourages the increase of land development and redevelopment that also expands and increases the intensity of the area built. Such land development and redevelopment directly increase the housing, agricultural and economic supply and indirectly encourages investment and new economic activities and urbanization. This will continually trigger the needs of land development or redevelopment.

### 5.2.2 Reinforcing loop of land restoration or conservation

In general, a reinforcing loop that increases land restoration and conservation are triggered by the increase of environmental hazard. Below a reinforcing loop is being described is the reinforcing loop that increases land restoration and conservation.

*Population growth →<sup>+</sup> Needs for housing, farmland, and economic facilities →<sup>+</sup> land development/ land redevelopment →<sup>+</sup> Built area/ built area intensity →<sup>+</sup> Environmental Degradation →<sup>+</sup> Environmental Hazard →<sup>+</sup> Needs for ecological improvement and protection →<sup>+</sup> Fiscal provision →<sup>+</sup> land restoration/ land conservation →<sup>+</sup> Natural area/ natural area intensity →<sup>+</sup> Environmental quality →<sup>+</sup> Population growth*

The loop indicates that population growth and urbanization in Batu City have impacts on increasing the extent and intensity of the built-up areas that encourage environmental damage and trigger environmental hazard. Environmental hazard improvements are responded to by increasing demand for ecological improvement and protection. These needs require a fiscal provision to conduct land restoration and land conservation. The impacts of land restoration and land conservation are increasing the extent and intensity of natural areas and improving environmental quality. Improving environmental quality will encourage more urbanization. This will continually trigger environmental hazard and the needs of land restoration or conservation.

### 5.2.3 Balancing loop of land development or redevelopment

In general, balancing loops that restrict land development and redevelopment are caused by the increase of environmental hazard. Below

a reinforcing loop is being described is the balancing loop that restricts the land development or redevelopment.

*Population growth →<sup>+</sup> Needs for housing, farmland, and economic facilities →<sup>+</sup> land development/ land redevelopment →<sup>+</sup> Built area/ built area intensity →<sup>+</sup> Environmental Degradation →<sup>+</sup> Environmental Hazard →<sup>-</sup> Supply of housing, farmland, and economic facilities →<sup>+</sup> Investment and economic activities →<sup>+</sup> Population growth*

The loop shows that population growth or urbanization in Batu City increases the need for housing, agriculture and economic facilities. This need encourages the increase of land development and redevelopment that also expands or increases the intensity of the area built. Land development and redevelopment are triggering the increase in environmental degradation and environmental hazard. The environmental hazard reduces the supplies of housing, farmland and economic facilities. However, such supplies are important to increase investment and economic activity and attract urbanization. In conclusion, with the reduced supply of housing, farmland and economic facilities will automatically restrict the urbanization and restrict the need for land development or redevelopment.

#### 5.2.4 Balancing loop of land restoration or conservation

In general, a balancing loop that restricts land restoration and conservation are caused by the increase of fiscal burden. Below a reinforcing loop is being described is a balancing loop that restricts land restoration or conservation.

*Population growth →<sup>+</sup> Needs for housing, farmland, and economic facilities →<sup>+</sup> land development/ land redevelopment →<sup>+</sup> Built area/ built area intensity →<sup>+</sup> Environmental Degradation →<sup>+</sup> Environmental Hazard →<sup>+</sup> Needs for ecological improvement and protection →<sup>+</sup> Fiscal provision →<sup>+</sup> land restoration/ land conservation →<sup>+</sup> Natural area/ natural area intensity →<sup>+</sup> Fiscal Burden →<sup>+</sup> Limitation on acquisition/ maintenance →<sup>-</sup> land restoration/ land conservation →<sup>+</sup> Environmental quality →<sup>+</sup> Population growth*

The loop indicates that population growth and urbanization in Batu City have impacts on increasing the extent and intensity of the built-up areas that encourage environmental damage and trigger environmental hazard. The increase of environmental hazard is responded to by the increasing demand for ecological improvement and protection. These needs require fiscal provision to conduct land restoration and land conservation. The impact of

land restoration and land conservation is increasing the extent and intensity of natural areas, on the other hand also create a more fiscal burden. Fiscal burden restrict the acquisition of land for land restoration and restrict the maintenance of land for land conservation. In fact, land restoration and conservation are important to improve environmental quality and attract urbanization. In conclusion, the fiscal burden will restrict the ability to conduct land restoration or conservation.

### 5.3 Multi-scale interactions

The complex relations among land transformation forces are identified not only by non-linear feedback but also the multi-scale interaction between human agency forces (self-organization and emergent human actions) and institutional force (social engineering to influence human actions). These multi-scale interactions are shown in figure 28.

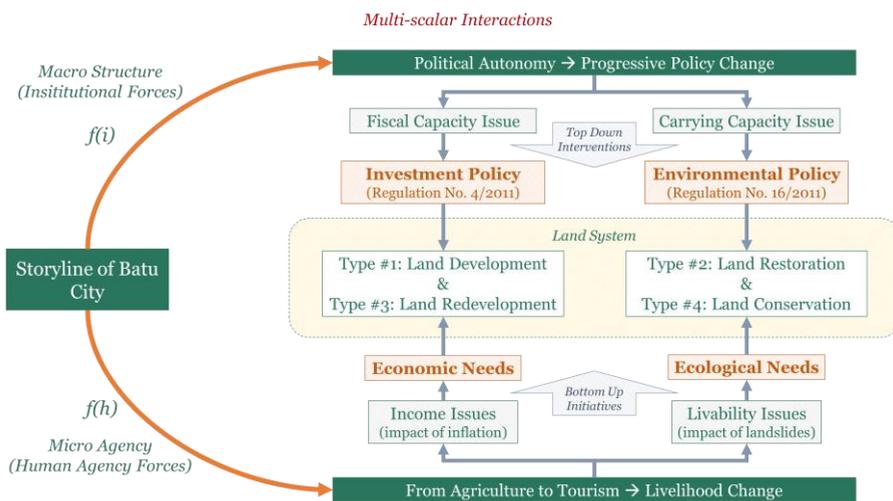


Figure 28 Multi-scale interaction of complex land system in Batu City

The multi-scale interaction diagram shows that land transformation in Batu City is influenced by top-down intervention and bottom-up initiatives. Top-down intervention is strongly influenced by the macrostructure of Batu City's post-establishment that created political autonomy for progressive political change. The provision of investment policy and environmental policy are conducted to respond to the issue of fiscal capacity and the issues of carrying capacity in Batu City after autonomy era. While bottom-up initiatives are influenced by the micro agency of Batu City's post-

establishment, which is represented by the livelihood change from agricultural sector to the tourism sector. The increase of economic needs and ecological needs of Batu City's residents are responding to the issue of household income and neighbourhood livability that they experienced along the landscape transformation in Batu City. The explanation of the dynamics of macrostructure (investment policy and environmental policy) and micro agency (economic needs and ecological needs) in Batu City will be elaborated.

### 5.3.1 Macrostructure - investment policy

As a newly established city in 2001, the main issue for local governments is to prepare the fiscal independence of Batu City because they are effectively separated from the Malang Regency. On the fiscal side, the autonomy of Batu City has positive and negative aspects. The positive aspect is that the city owns its budget which is transferred by the central government and they have the flexibility to allocate the budget based on the vision of local development. The negative aspect is the initial period that the budget is mainly allocated for governmental bureaucracy only. In addition, some potential local assets never have been transferred to Batu City, such as the corporation of Songgoriti Tourist Area which is still managed by the government of Malang Regency although located in Batu City. As a result, Batu City government got the externalities such as more cost for infrastructure maintenance but lack to get the equal revenue from the company.

To solve the fiscal issues in the newly created city, the government of Batu City strives to explore the potential of local revenues and facilitates investment in various sectors such as apple plantation, textile industries and man-made tourism park. In the first five-year period since the establishment of Batu City, a lot of investments emerge out of government control. This is happening due to two things. First, the local government needs the local treasury to meet the initial bureaucratic arrangement, and the idea is to allow diverse investments to come. Second, Batu City did not have its own spatial plan from 2001 until 2003. At that time, Batu City applied the spatial plan of Malang Regency, but the spatial plan of regency is too general and can not to be used for referencing the investment permit. Therefore, Batu City experienced difficulty in managing spatial development and controlling the investment appropriateness.

In 2011, the government of Batu City legalised the new spatial plan and regulation about building permit. It explains the procedure to process building, and land utilization permits based on detail spatial plan. The set of spatial plans and local regulations provide legal certainty for land utilization in Batu City. The creation of such planning instruments has made Batu City as an attractive city for investment in various sectors such as agriculture, housing and tourism.

### 5.3.2 Macrostructure - environmental policy

Batu City is located in an ecologically-sensitive upstream area of Brantas Watershed. The establishment of Batu City raises concerns about its sustainability. If urban development has already been facilitated in such area, it is likely to damage the ecosystem balance in Brantas watershed region including 13 cities/regencies in East Java Province. As a city, the physical landscape of Batu City is unique because of its land cover is dominated by forest area. It shows that Batu City has extreme topography, so only a few of its territory are suitable and feasible to be developed into the built area. Batu City is the example of an area with mixed urban, rural and landscape setting.

The rapid growth of tourism sector in the second five-year period has changed the face of Batu City. The vision of international tourism area led to various resorts, hotels and villas development in the area that previously was forest area. The three natural potentials of Batu City, namely beautiful scenery, fresh air and clear water become the main strength of tourism visitation. The development of tourism in Batu City affect increased urbanization and settlement needs. Land conversion for the built area has increased dramatically and reduced the water catchment areas. It allegedly increasingly affects natural disasters such as landslides, flood, and forest fires to happen. The government of Bau City issued a regulation about environmental protection in 2011. The purpose of this regulation was to tackle the environmental problems, through the provision of tightening rules on development requirements and monitoring of environmental quality.

### 5.3.3 Micro agency - economic needs

Batu City has been transformed from “apple city” (agricultural city) to instead becoming “tourism city”. The rapid tourism investment has

significantly affected the increased land price. Many farmers sell their land to tourism developers or investors because of the high benefit. Then the farmers buy new land in the peripheral area or outside the area of Batu City to continue their farming activities. Besides, there are some farmers that also identify the business opportunities in the development of the tourism sector. They converted their agricultural land into villas or guesthouses with a higher return on their investment.

The changes in the profession from farmers to villas serviceman, tourism workers and other tertiary sectors are following the demand of tourism-based development in Batu City. While the agricultural sector is increasingly unprofitable with the high price of fertilizer, and it has a lower return on investment. Most of the people are not ready to change their profession from farmers to service workers. On the other hand, land prices and basic needs continue to rise. This is a common trend in many touristic areas that have relatively higher inflation.

The issue of increasing cost of living drives society of Batu City to transform. They took the initiative to convert their farmland into a built area, or they sell it to developers at a relatively higher sale price. In fact, they take profit by utilizing their house as a villa during the weekend, due to high tourist visits from outside the city. It is shown that human agencies occurred in dealing with tourism development and inflation, that trigger the individual preferences utilize land intensively in Batu City.

#### 5.3.4 Micro agency - ecological needs

The transformation of Batu City from an agriculture-based city to a tourism-based city encourages the expansion of built areas and the conversion of forest areas. This has an impact on increasing temperature perceived directly by the residents of Batu City, especially in dense settlement areas in central and southeastern part of the city. Temperature changes in Batu City create difficulty for farmers to cultivate horticultural commodities such as apples, oranges, strawberries, vegetables and flowers. Currently, they can only plant these commodities in the northern highland regions, which is prone to erosion. In addition, conventional farming techniques in the past have had an impact on the decrease of soil fertility and increase soil pollution caused by chemical fertilizers and excess pesticides.

By recognizing the decline in agricultural productivity due to soil degradation and temperature changes, local farmers are encouraged to

make innovations. Within the farmer groups, they promote organic farming techniques that are environmentally friendly. But the implementation is not easy; they have developed several locations as a pilot project of organic agriculture and even ancient method of farming, which avoid using chemical fertilizers and pesticides. They also build initiatives to improve the condition of critical lands by doing reforestation. It aims to restore the local climate to be cooler. People in urban centres also voluntarily provide green spaces in private lands and marginalized public lands.

Environmental improvement actions occurred sporadically both individually and in groups which are indicating public concern about livability issue. They also move actively to deal with the problem of waste generated from tourism and trade activities. Various reuse-reduce-recycle units have been created to empower economic potential of solid waste. The society also takes initiatives to utilize cow farming as an alternative source of biogas energy that supply to several houses next to the site. There have been many efforts from citizens to reduce the impact of rapid development. It is shown that human agencies are emerged to maintain the quality of the environment by preserving forest areas and conducting various environmental innovations.

#### 5.4 Cross-sectoral linkage in four types of land transformation

From the results of a complex land system analysis, land transformation in Batu City is interrelated with various sectors. The non-linear feedback diagram shows that the forces that trigger or restrict land transformation are an investment and economic activity, environmental hazard, fiscal provision and fiscal burden for environmental program financing. While the multi-scale interactions diagram shows that land transformation is influenced by investment policy, environmental policy and people's preference on economic need and ecological needs. These economic and environmental sectors could be specified by identifying the leading sector in each type of land transformations.

##### 5.4.1 Leading sectors of land development in Kelurahan Ngaglik

Land development is driven by the increased of investment in agriculture and tourism which are facilitated by local regulations on investment, detail spatial plan and sectoral master plans. Agricultural area expansion in Batu City is formulated through the master plan of Agropolitan area development.

The expansion of tourism area is formulated through the master plan of tourism development. The type of tourism that encourages land development is man-made destination such as an amusement park. The creation of Agropolitan and tourism sector master plans is a business intervention of Batu City's government to complement technical directives of spatial plan instrument.

#### 5.4.2 Leading sectors of land redevelopment in Kelurahan Sisir

Land redevelopment is triggered by the increase in accessibility and facilities provision in the city centre area. This led to the conversion from being an agricultural area and low-density residential area into a high-density residential area and commercial area. The rising of land values encourages more the economically intensive land utilization. Land redevelopment entirely refers to the investment regulation especially related to the arrangement of buildings and provisions in the detailed spatial plan.

#### 5.4.3 Leading sectors of land restoration in Desa Bumiaji

Land restoration is mainly improving the quality of the environment on critical land through reforestation. It is facilitated by governmental regulation about the environment and conducted by acquiring land for the public interest. Reforestation in the riverbank area is part of the disaster mitigation policy framework and green infrastructure policy framework associated with the normalization program of Brantas Watershed.

#### 5.4.4 Leading sectors of land conservation in Desa Sumber Brantas

Land conservation is the management of protected areas and their ecosystems facilitated by environmental regulations, special provincial regulations for great forest park areas and state-owned forestry company regulations for production and protected forest areas. Land conservation policies are closely linked to forestry planning and natural resource management such as the springs utilization and recreational activities.

Table 11 shows the leading sectors of land transformation in four selected locations. Leading sectors in each type of land transformation could be summarized as follows.

Table 11 Leading sectors in each type of land transformation

Active Transformation	Passive Transformation
Type #1: Land Development In Orchard Area and Tourism Area Leading Sector: Agriculture and Tourism	Type #2: Land Redevelopment In City Center Area Leading Sector: Commerce and Housing
Type #3: Land Restoration In Riverbank Area Leading Sector: Disaster Mitigation and Green Infrastructure	Type #4: Land Conservation In Great Forest Area Leading Sector: Forestry and Natural Resource Management

First, agricultural and tourism sectors are dominating the trigger for land development in Batu City. Second, sectors that reinforce land redevelopment in Batu City are commerce and housing. Third, land restoration in Batu City is mainly under the framework of disaster mitigation and green infrastructure sectors. Fourth, sectors of forestry and natural resource management are dominating the governance of land conservation in Batu City. In conclusion, each type of land transformation involves different leading sector; it means the principle for complexity-sensitive planning instrument should consider the integrity of cross-sectoral linkage.

# CHAPTER

# 6

## LAND GOVERNANCE SYSTEM

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

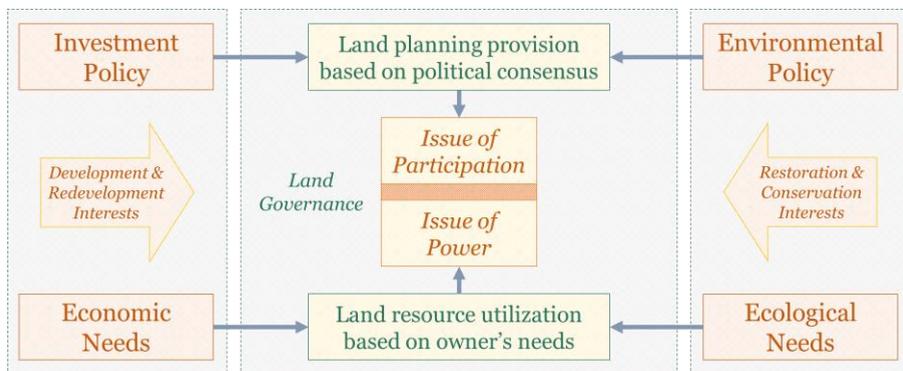
# Chapter 6

## Land Governance System

In this chapter, the results of a land governance system analysis are explained. This analysis aims to understand the interactions among stakeholders that affect land transformation and create institutions for managing land use planning and land utilization. This analysis includes several stages such as identifying stakeholder interdependency issues within land governance, mapping the power and participation of stakeholders, understanding formal-informal institutions of land planning and land utilization and recognizing the diversity of participants and power holders in every type of land transformation.

### 6.1 Issues of stakeholder interdependency

Land governance is formed by the combination between of top-down intervention and bottom-up initiatives. Top-down intervention refers to land planning provision based on political consensus. While the bottom-up initiative is more likely reflecting the actual land resource utilization based on the owner's preferences.



*Figure 29 Stakeholder interdependency issues of land governance*

In the provision of land planning, there is an issue about who are eligible to participate in making decisions about the spatial plan (issues of participation). While in the land utilization aspect, there is an issue about the right of landowners to use its land based on their preferences (issue of

power). Such conceptualization is presented in figure 29. In practice, not all landowners have access to planning. And the land planning is made without considering the preferences of the landowners. So, in land governance, there are two fundamental issues, which are the issue of participation and the issues of power.

### 6.1.1 Issue of participation

Land planning is an approach to influence land use distribution and allocation based on political consensus. It is also considering related regulations such as local investment regulation and the environmental regulation. In Batu City, a planning instrument is basically a local regulation about land use order set by the Batu City government and the legislative council. What distinguishes it from other common regulations is the detailed utilization directives of each land parcel that potentially violates the right of the landowner in determining the land utilization based on their preferences. Differences in preference to land use plans could occur because in the process of preparing the plan did not involve the wider community participation. It is limited to government agencies, consultant and expert group which are actively involved in formulating the plan.

The issue of participation in land planning provision is a fundamental issue because it only privileges some group of societies. Even the socialization of the designated plan to the community groups and private sectors is limited. Therefore, the insights of stakeholders outside the government about the planning process and planning instrument are limited. Although several public discussions have been conducted in both development planning process and spatial planning process, the community representatives have no equal opportunity to voice their interests. They argue that it is merely just a formality to fulfil the legal procedures of the planning process. Therefore, some community groups in Batu City chose not to participate in the process of preparing the spatial plan.

In the case of private sectors, they only focus on their land and their business interests. They are not really willing to involve in comprehensive plan discussion that is not relevant to their business. They prefer to participate in informal lobbying to the government agencies and the legislative council. This indicates that stakeholder participation in land planning is not balanced and more political because it is determined mainly by the agreement between the city government and the legislative council.

### 6.1.2 Issue of power

Land utilization is determined by the preferences of landowners with or without considering the spatial plan. In a rational way, land utilization is directed to gain higher social-economic benefits. However, these individual preferences are sometimes contradictive with the government's set of plans. The local government consider that land planning is provided to avoid the externalities arising from land use, such as congestion, pollution, flooding and safety threats.

The provision of a spatial plan is ideal to accommodate the individual rights and the public interests over land utilization. Public interests tend to be biased because it can create benefits for certain groups of people and bear harm to other groups. For example, the placement of schools and hospitals will limit the right of the landowners next to them to build large-scale commercial facilities. This is indeed in accordance with the principle of activities alignment within land use. But the question is how to determine the proposed location of socio-economic facilities with a set of fair rules? Because such facilities have externality and mandatory requirements that directly and indirectly restrict the land use in the surrounded area.

Landowners who have access to local politics are able to protect their interests. Even if the spatial plan is contrary to their interests, landowners still can continue their own plan and keep up to build. Then, the government is finally forced to revise the spatial plans to update with existing land utilization.

### 6.2 Stakeholders mapping

The stakeholders involved in land governance in Batu City could be categorised into four groups, which are government agencies, corporations, expert groups and community groups. The government of Batu City, the legislative council and the village governments, have a high degree of powers in determining the utilization of state-owned lands through discretion. They are also actively involved in the process of formal land planning. Real estate developers, tourism and hotel companies and state-owned forestry corporations are those who control large-scale land ownership but did not involve actively in the process of formal land planning. They usually conduct informal lobbying to government agencies for maintaining their business interests. Urban planners and expert groups are involved intensively in the formal land planning process, but they do not have the power in the

implementation aspect. While the farmer groups and environmental advocacy groups are lack of opportunity to involve in the formal land planning process, and their power to access land ownership is relatively limited. The stakeholder constellation based on their power to control land utilization (land ownership) and the level of their participation in formal land planning is shown in figure 30.

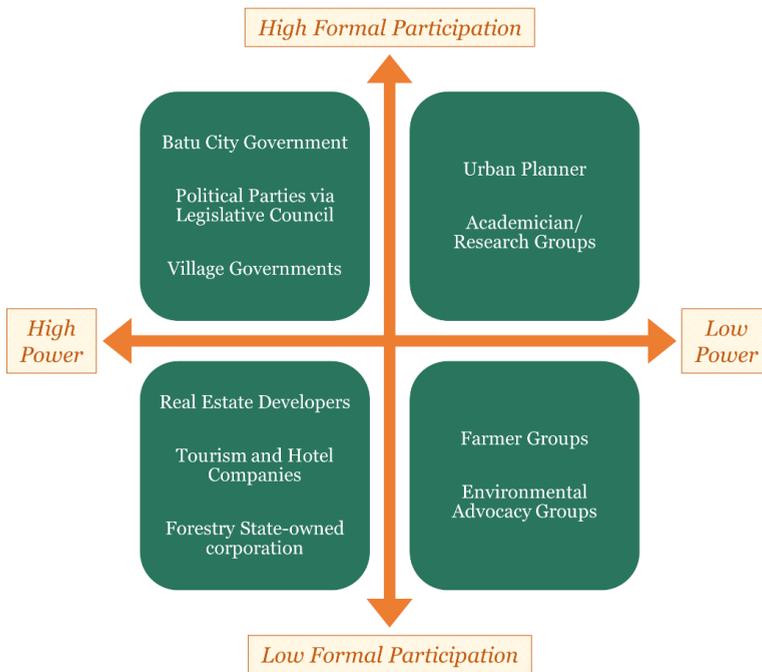


Figure 30 Stakeholder mapping of land system

The degree of power and the level of participation of various stakeholders in affecting land transformation in Batu City are described as follows.

### 6.2.1 Batu City Government

The government is the main actor who plays a role in the land planning process. In accordance with the mandate of the law on local government, the executive is entitled to establish the vision and program of urban development. The Batu City government is obliged to prepare the spatial planning process from the budget provision, tendering, supervision until legalization. In every stage of planning, the Batu City Government has the flexibility to influence the planning content developed by the consultant.

This is conducted to ensure that the government programs are translated into the spatial plans.

The Batu City Government also plays a role as the controller of development permits to ensure that community and private sector developments are in line with the planning instrument. In addition, the local government also has mandates to manage the state-owned land asset. This allows them to manage and utilize land use in accordance with government's discretion, more specifically the discretion of the city mayor elected through the general election. In general, Batu City Government has dominant roles in formulating the spatial plan and control the utilization of state-owned lands. The local government is the most influential actor that steer land transformation.

### 6.2.2 Political Parties via Legislative Council

The legislative council is an elected representation council. The members of the legislative council are local politicians who are the representation of political parties. They have the functions of establishing local regulations, approving budgets and overseeing local government. In drafting the local regulations on investment and spatial planning, legislative council has a significant role in influencing the content of the regulations. They seek to represent the interests of their constituents in a certain constituency district. In practice, during the spatial planning process, the legislative members will steer the development of public facilities and beneficial infrastructure in their constituency district.

The significant influence of legislative council over spatial plan legalization is also exploited by private parties. Big corporations choose to persuade legislative members to include their business interests in the spatial plan. However, the roles of legislative council are essential. The legislative council is the official political channel to discuss land issues, and together with the city government, they establish a politically acceptable spatial plan.

### 6.2.3 Village Governments

Batu city consists of 19 Desa (village or rural sub-district) with greater autonomy and 5 Kelurahan (urban sub-district) with direct control of city government. Village administration has the characteristics of extensive farmland and forest areas, so the agriculture sector is still dominant. The village governments have the autonomy to manage their village's affairs. The community in village administration has strong social cohesion.

The village government is also authorized to develop village development planning that will be the input for Musrenbang (development planning discussion) at the district and city levels. The village government also has a village-owned land that can be utilized based on the consensus in village level and the decision will be legalized by the village leader and the village representative council. For example, in Oro-oro Ombo Village, the village government leased the village-owned land to the Jatimpark Group for 35 years to be developed into a recreational park.

Even though the village government has greater autonomy, their fiscal and politics remain under the supervision of the city government. The village governments are unable to reject the development plans and programs designated by the city government. Because such plans and programs are considered the result of Musrenbang (multi-level public discussion to formulate development plan). In reality, the results of Musrenbang at the village level could be different with the Musrenbang results when it is decided at the city level. However, the village government still has a strong influence in village-level land planning, and they control large-scale village-owned lands that can be utilized based on public consensus.

#### 6.2.4 Real Estate Developers

Land construction sector experienced significant growth in Batu City and the major construction conducted by the developer. They have financial, technological and human resources in managing large-scale development. The growth of the construction sector in Batu City caused by the increase of investments in tourism. Tourism development triggers other facilities development, such as the construction of hotels, villas, and resorts. The attractiveness of the tourism-based economy in Batu City has impacts on the increase of urbanization and housing needs. The housing sector is growing rapidly, marked by the number of newly built residential areas by local and national developers.

The development of the property sector is also significantly increased the land price in Batu City within the last ten years. The high price of land is a major obstacle for developers to expand their property business. However, the existing property market in Batu City remains attractive, especially the demand for villas and mix-use housing complex. The role of developers is remained significant in influencing the land transformation in Batu City. By using business analysis, they are actively changing the area of community-owned forests or farmland into new residential areas. By conducting regular

land surveys, they gain information about feasible and profitable areas to be developed into housing, villas, hotels and recreational attractions. They coordinate their business plan with the government to ensure that the spatial plan allows for such development. Financially, real estate developers are powerful, although they do not directly participate in the planning process. They maintain the business communications with the government and legislative council to ensure the certainty of their business plan.

### 6.2.5 Tourism and Hotels Companies

The economy of Batu City is dependent on the existence of hotel and tourism companies. Large companies such as the Jatipark Group make major contributions to job creation in Batu City. The multiplier effect of large-scale recreational areas in Batu City generates various supporting economic businesses such as transportation service, culinary service and agricultural-based tourism attractions. They are actively changing the image of Batu City that was formerly an agricultural city into a tourism city. Jatipark group, as the largest tourism company in Batu City, has established 9 tourism destinations since its establishment in 2001. There is a trend that tourism companies are continuing to expand their business by opening new attractions to avoid tourism saturation. They developed tourist areas in the suburbs that are not crowded, and the land price is relatively lower. But now with the presence of various tourism areas and the supporting facilities caused the land price increased dramatically. Tourism companies are continually acquiring the surrounding land for future developments.

### 6.2.6 State-owned Forestry Corporation

More than half of the Batu City's land cover is forest areas. It classified into the community-managed forest area, provincial great forest park and forest area administered by state-owned forestry corporation. State-owned forest corporations are the largest landowners that include protected forests (forest areas for absolute conservation functions) and production forests (forest areas that can be utilized as other functions such as agriculture, tourism and non-permanent buildings). State-owned forestry corporation gain mandate to manage production forest areas and to conserve protected forest areas based on forestry laws. The delineation of forest area that becomes their administration is set by the ministry of forestry.

In practice, state-owned forestry corporations have huge power and autonomy; even the local government cannot intervene in their operation. They have full authority in planning and utilizing production forest and even built cooperation with surrounding villagers within forest management framework. This greatly complicates the integration of forest area planning with integrated local development planning. State-owned forestry corporations tend to follow central government directives rather than coordinate with the local governments. The fiscal system in the local government also prohibits local budget's expenditure for programs in production and protected forest area administered by State-owned forestry corporation. Practically, the duality of land planning in Batu City exists between the area under state-owned forestry corporation's control and the rest of Batu City's territory.

### 6.2.7 Urban Planner or Consultant

The formulation of planning content is mainly facilitated by independent planning consultants. They are applying planning rules and planning guidelines set by the spatial and agrarian ministries into Batu City context. The urban planning consultant is selected through an open tender mechanism. The team leader's experience is a considerable aspect for local government to choose the tender winner. Mr Ibnu Sasongko, as the team leader of the spatial planning project in Batu City, explained that he communicated intensively during the planning process with government representatives, especially the planners in development planning agency. There are two types of planners involved, which are planners in a government agency and planners from an independent consultant. Planners in government agencies are considered to understand the local context of Batu City development better. While the role of planners from independent consultants is to provide references about the latest innovation in planning practices that can be beneficial for Batu City context.

In general, governmental planning agency tends to be administrative and procedural, while planning consultancy tends to be technical and practical about planning content. Planners have a considerable influence in determining the direction of the development in Batu City through the draft of the plan that he compiled. However, the plan still must be adjusted with various political considerations because the legalization process is on the domain of Batu City Government and legislative council. Planners must consider ethical aspects and scientific foundations in formulating the spatial

plan. Moreover, planners should be open-minded and accommodate the perspectives of various stakeholders.

### 6.2.8 Academician or Research Groups

In the process of regulation formulation, the government at all levels always involve academic groups or expert representatives from universities to construct and compile the academic review. In making a strategic or sensitive policy, Batu City Government always involves universities to conduct a politically neutral study. Studies conducted by academics are used by the government as a basis for more transparent policy-making. For example, in any large-scale construction project, it must be accompanied by an environmental impact assessment conducted by an expert. Therefore, the role of academics is significant in guarding strategic issues that require in-depth study in various development sectors.

### 6.2.9 Farmer Groups

Batu City has a significant agricultural sector share because geophysically it is located in the fertile land surrounded by volcanoes. Horticultural agriculture is the main contributor although in the last five years there is a downward trend. Farmers in Batu City are actively involved in various farmer groups. Farmer Group is an organization that aims to improve the productivity and the welfare of farmers. They facilitate the exchange of knowledge and technology related to agriculture. They cooperate with the agricultural service sectors in supporting agricultural post-production and marketing. The farmer group also built the initiative of environmentally friendly organic farming, the protection of water springs for irrigation purposes and the development of agriculture-based tourist attractions. Farmer groups are also actively struggling to get a fair incentive from the Batu City government due to the pressure for farmland conversion.

### 6.2.10 Environmental Advocacy Groups

Environmental advocacy groups are the actors with the most critical views over government policies that seem less considerate to environmental sustainability. They perceive that local government is more concerned about facilitating investments made by large companies. Environmental advocacy groups are actively conducting and publishing studies about the development condition in Batu City that do not become aware of

environmental aspects. They are also the force of the community movement in protesting against ethically inappropriate development. An example is the case of a Rayja Hotel construction near a spring. They build solidarity of Bumiaji District residents to do demonstration and class action. Such groups also play a significant role in encouraging communities to become more involved in monitoring urban development and implementing environmental innovation such as organics agriculture and biogas energy.

Overall, actors in governmental agencies have a high power of land ownership as well as high formal participation in formal land planning. They appoint consultants and experts to take care of the technical aspect of formal land planning. While the private sectors are avoiding to involve in formal land planning, they have a high power of land ownership and prefer to use informal lobbying. For community groups, they have limited participation in formal land planning as well as the limited power of land ownership, but they use social solidarity to maintain their common interest.

### 6.3 Formal and informal institutions

Formal institutions such as the formal planning process and law enforcement are insufficient in governing the complexity of land transformation. Many actors conduct informal institutions, such as closed lobbying and public discussion about land issues. Informal institutions have potentials to complement and to synergize the formal institutions. Formal and informal institutions of land governance are shown in figure 31.

Aspect	Formal Insitution	Informal Insittution
Land Planning Provision	Formal planning process	Informal public consensus
Land Resource Utilization	Law enforcement	Interests mediation

**Participants**  
of land planning

**Power holders**  
of land ownership

Figure 31 Formal and informal institutions of land system

#### 6.3.1 Formal planning process

The formal planning process includes the procedures for formulating the development plan and spatial plan based on the existing law which is legislation no. 25 year 2004 about national development planning system and legislation no. 26 year 2007 about spatial planning. Development planning is conducted through Musrenbang (development plan discussion)

from neighbourhood level, hamlet level, village/ sub-district level, district level, city/ regency level, provincial level and national levels. A layered planning system leads to substantial differences in the proposed development plan at each level. In practice, higher level has more power in deciding and adjusting development plans. The results of Musrenbang in Batu City must be considering national and provincial development plans. It is legalized as local regulations and consist of a long-term development plan (20 years) and the mid-term development plan (5 years). The mid-term development plan is a guideline for operationalizing annual development programs funded by public budget and other funds.

A spatial plan is drafted by planning consultants with the involvement of various experts, sectoral agencies and community representatives. There are two types of spatial plans in Batu City, namely City's spatial plan (RTRW) at Batu city level and detail spatial plan (RDTR) at the district level. The content of the spatial plan is reflecting the directives in the long-term development plan. Stakeholder engagement in the formal planning process varies. Planners, experts and government officer are more involved in the formulation of plans. While the public and private parties have a very limited role and information in the formal planning process.

### 6.3.2 Law enforcement

Law enforcement of legislation at the national level is conducted by the police agency and attorney, including the government decree about the national spatial plan. Meanwhile, law enforcement of local regulations (such as city's spatial plan and detail spatial plan) is conducted by the local police agency (Satpol PP). However, the public, in general, considers that the local police agency is not capable and legitimate to enforce the spatial plan or land use regulation. The main responsibility of local police agency is to control public corridor order, not to control on private-owned land utilization. Therefore, spatial law enforcement in Batu City is not optimally implemented. Land utilization is only monitored by permit licensing office. Extra monitoring is conducted if there is complain from a community about inappropriate or illegal land utilization.

### 6.3.3 Informal public consensus

The informal consensus is usually conducted by individuals who are the member of a community group. The community group could be created

based on area consideration (such as community group in a hamlet or neighbourhood) or issue consideration (such as farmers group or villa owners group). Village government as the lowest level of government tends to involve in informal public consensus to build cooperation with a community group. For example, the village government in Oro-oro Ombo and several community groups discussed the plan for village-owned lands. They create an informal public consensus to gain appropriate and acceptable land planning. If the planning content and design are approved by the forum, then village government produce a decree as legal standing. This informal land planning using public consensus has benefits to increase community participation in village level. However, there is no effort from Batu City government to synergize informal public consensus within the formal planning framework in city level.

#### 6.3.4 Conflict Mediation

Informal land use conflict mediation is usually facilitated by local leaders or village government, particularly in the conflict of interest between companies and the surrounding communities. Conflict mediation is relatively faster in finding win-win solutions because it directly brings together the relevant parties to understand each other and discuss the problem. Win-win solutions if the main benefit of conflict mediation such as proposing negotiable land utilization to reduce the externality for affected parties. This negotiation is impossible to gain using formal legal enforcement. However, informal conflict mediation with relatively lower social costs has not been optimally utilized by the government in solving the land use conflict between corporations and community groups in Batu City.

#### 6.4 Stakeholders involvement in four types of land transformation

From the results of governance analysis, land transformation in Batu City is strongly influenced by stakeholder perspective. The stakeholder mapping diagram shows that each stakeholder has a different degree of power in land ownership and different degree of participation in land planning. While the formal-informal institutional diagrams show that land governance does not only rely on the formal planning process and law enforcement, but also on informal public consensus and conflict mediation. Stakeholders involvement in each type of land transformation is varied. The diversity of stakeholders involved in each type of land transformation is elaborated.

#### 6.4.1 Participant and power holder of land development

Actors who want to become participants in land development are relatively diverse ranging from farmer groups, housing developers, tourism developers and various other sectors. This is related to the potential benefits derived from land development activities. Land development will trigger economic productivity and create jobs, so many parties want to get involved. On the other hand, the ownership of the natural areas is very limited. Most are controlled by the local government or state-owned forestry corporation. Therefore, in areas which are experiencing land development, the number of landowners are limited, but the parties who want to involve are diverse.

#### 6.4.2 Participant and power holder of land redevelopment

Actors who become participants in land redevelopment are relatively diverse ranging from housing developers, business developers and various other sectors. This is also related to the profit prospects gained from land redevelopment activities. Land redevelopment will encourage increased density of city centre area, that attracts various parties to involve. On the other hand, the ownership of the built areas is already diverse. Land ownership is distributed to individuals, corporations, or governments. Therefore, in areas that are experiencing land redevelopment, landowners are diverse, and parties who want to participate are also diverse.

#### 6.4.3 Participant and power holder of land restoration

Actors who become participants in land restoration are relatively limited to local government. This is because land restoration is transforming land that originally was built area into natural land with ecological consideration. Parties who have the interest to be involved in land restoration planning are environmental advocacy groups and local government environmental agencies. Because it provides important environmental benefits and required financing in the restoration process, the land will be acquired by the government. On the other hand, the ownership of the built areas are diverse. The land can previously be controlled by individuals, companies, or government. Therefore, in areas which are experiencing land restoration, the landowners vary, but the parties who want to involve is limited.

#### 6.4.4 Participant and power holder of land conservation

Actors participating in land conservation are also relatively limited to local government and state-owned forestry corporation. This is because land conservation seeks to improve the ecological quality of the land, such as vegetation density, water sustainability, biodiversity and avoiding unsustainable economic exploitation in natural areas. Parties that are intensively involved in natural area planning are local government, state-owned forestry corporation and environmental advocacy groups. The ownership of the natural areas is limited to local government and state-owned forestry corporation. Therefore in areas that are experiencing land conservation, the landowners are limited, and the parties who want to involve are also limited. Each type of land transformation has different participant and power holder characteristics shown in table 12.

*Table 12 Stakeholder constellation in each type of land transformation*

Active Transformation	Passive Transformation
Type #1: Land Development In Orchard Area and Tourism Area Participants: Diverse Power Holders: Limited	Type #2: Land Redevelopment In City Center Area Participants: Diverse Power Holders: Diverse
Type #3: Land Restoration In Riverbank Area Participants: Limited Power Holders: Diverse	Type #4: Land Conservation In Great Forest Area Participants: Limited Power Holders: Limited

The diversity of actors involved in each type of land transformation could be summarized as follows. First, areas that are experiencing land development have limited landowners, but diverse parties are willing to involve in planning process. Second, areas that experiencing land redevelopment have a diverse set of landowners, and diverse parties are willing to involve in planning process. Third, areas that experiencing land restoration have diverse landowners, but limited parties are willing to involve in planning process. Fourth, areas that experiencing land conservation have limited landowners and limited parties are willing to involve in planning process. In conclusion, each type of land transformation shows the different diversity of planning participants and landowners; it means that the principle for complexity-sensitive planning instrument should consider the diverse perspective of stakeholders who involved in the land governance.

# CHAPTER

# 7

## SPATIAL PLANNING INSTRUMENT

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 7

## Spatial Planning Instrument

In this chapter, the results of the spatial planning instruments analysis are explained. This analysis aims to understand the type of planning instrument in steering land transformation and determine the most appropriate method of implementation to support the planning instrument. This analysis includes several stages such as identifying the type of planning instrument based on flexibility or certainty, showing land volatility in each type of land transformation, understanding types of planning functions and method of implementation, and recognizing the planning functions and method of implementation in each type of land transformation.

### 7.1 Type of planning instrument

Based on the explanation in the theoretical framework chapter, spatial planning instruments are classified into the patterning-instrument and the framework-instrument. Characteristics of the two type of planning instruments can be distinguished based on the aspect of participation and power aspects. The difference between both planning instruments is shown in figure 32.

Planning Instrument	Participation	Power	<i>Land use plan</i>
	Land Planning Provision	Land Resource Utilization	
<b>Patterning</b> (eg. Zoning system)	Inflexible (Diverse participants)	Certain (Defined land use)	Appropriate in area for <b><i>certain land use</i></b>
<b>Framework</b> (eg. Urban code)	Flexible (Limited participants)	Uncertain (Undefined land use)	Appropriate in area for <b><i>flexible land use</i></b>

*Figure 32 Type of planning instrument*

Patterning-instruments such as zoning systems involve diverse stakeholders and detailed arrangements, so they are less flexible in the planning process. From the power aspect, zoning system provides defined land use as the foundation of law certainty for landowners in utilizing the land. In contrast, the framework-instrument such as urban codes involves limited stakeholders in the formulation process; this makes it more flexible in the interpretation of the spatial regulation. From the power aspect, urban codes do not provide defined land use so that there is no law certainty for

the landowner, so they should conduct interpretation and consultation about land utilization.

### 7.1.1 Patterning-instrument (certain land use)

A patterning-instrument is a spatial control instrument using a set of spatial utilization rules and translated into a detailed map (zoning) which regulates land use in every land plot under the jurisdiction of local government. So, every land plot has its designated zone. A zoning map became the basis for processing development permit. A zoning system is created by the local government to fulfil some principles of planning. First, the government wants to show clearly, the area that could be utilized as built areas and should be protected as a natural area by considering ecological aspects and cultural values. Second, the government wants to guarantee land allocation for public facilities and infrastructure system based on the development scenario set by the local government. Third, the government wants to ensure the harmony of land use and avoid the externalities of certain activities. Based on these three reasons, the government set a zoning map that provides legal certainty about land use directives for landowners. The existing zoning system in Batu City is an example of a patterning-instrument.

### 7.1.2 Framework-instrument (flexible land use)

The instrument framework is a control instrument using a set of rules that describe the principles and conditions for land utilization. The instrument is not translated into explicit land use plan maps. So, every landowner is having more flexibility in deciding the preferable land use if it is not violating the existing rules. This system requires a gradual understanding and interpretation of existing rules before the landowners apply for permits to the local government. This system is also encompassed by mechanisms in case of conflicts of land use interests through judicial or outside judicial agreements. The examples of a framework-instrument have been widely practised in several cities in the United States. This instrument is relatively newly implemented compared to a patterning-instrument. The reason for using this instrument is the emergence of the argument that zoning system has violated the freedom of property ownership rights with discriminatory spatial rules. This instrument provides flexible land use based on landowner preferences, but still under the regulatory framework set by the local government.

## 7.2 Type of land use volatility

Land use volatility is defined as the sensitivity level of land use changes. Based on the speed and impact of the changes, land use volatility is classified into areas with high volatility and areas with low volatility. This division is useful for determining the level of detail of land control formulated in the planning instrument.

### 7.2.1 Area with high volatility

Areas with high volatility are experiencing relatively rapid land use changes. Based on the trend of land use volatility, there are three types of locations with high volatility. First, urban centres with high economic value and accessibility, which attract dynamic and diverse investments. Second, the new development areas that previously were natural areas and have a relatively lower land price, but that has potentials for agricultural, settlements and other economic development. Third, farmland and settlement in disaster-prone areas that cause abandonment or conversion into protected areas for ecological purposes. Areas facing high volatility are uncertain and difficult to predict. If we look at the zoning map of Batu City, there are many deviations between the existing condition and the direction of land use plan. This is because zoning regulations are too rigid in setting the type of land use in each land plot, while the landowners have a very dynamic land use preference.

### 7.2.2 Area with low volatility

Areas with low volatility are relatively slow in experiencing land use change. The example of an area with low volatility is conservation areas that designated as a protected area by regulation. Land conservation is experiencing passive transformation which is a change in biodiversity, natural resources and the quality of ecosystems based on the natural cycle. In Batu City, protected policy in areas that experiencing land conservation is enforced by the zonation map as a legal instrument to prevent massive exploitation and land use change. Another area with low volatility is the undeveloped suburbs, in which government intervention is needed to stimulate land development. The example for this case is the orchard and tourism area in Kelurahan Ngaglik before the road infrastructure is built. Infrastructure provision alters the land use volatility in such area.

A summary of the degree of land use volatility in each type of land transformation is presented in table 13.

*Table 13 Land use volatility in each type of land transformation*

Active Transformation	Passive Transformation
Type #1: Land Development In Orchard Area and Tourism Area High Volatility Lower land price in urban peripheral	Type #2: Land Redevelopment In City Center Area High Volatility The attractiveness of urban centre
Type #3: Land Restoration In Riverbank Area High Volatility settlement change in disaster-prone area	Type #4: Land Conservation In Great Forest Area Low Volatility The natural process of regeneration

The table shows that high volatility land use occurs in areas facing land restoration (changes from built area to natural area), land development (changes from natural area to built area), and land redevelopment (changes of land use type in the built area). While low volatility land use is associated with the area of land conservation, in which the land use remain forest or ecological area.

### 7.3 Planning functions

The combination between types of planning instrument and the land use volatility indicate the type of planning functions that are expected. For areas with low volatility, both planning instruments work to protect existing land use. However, in areas with high volatility, a patterning-instrument serves to direct the existing land use. While the framework-instrument is beneficial to adjust the existing land use with the emerged land use changes. The functions of planning instrument are shown in table 14.

*Table 14 Functions of planning instrument*

Type of Planning Instrument	Planning Function	
	In Areas with High Volatility	In Areas with Low Volatility
<b>Patterning (Certain Land Use)</b>	Directing land use change	Preventing land use change
<b>Framework (Flexible Land Use)</b>	Adjusting land use change	Allowing land use change

In general, based on the type of planning instrument and level of land use volatility, the planning function is divided into four types, which are preventing, directing, adjusting and allowing land use change.

#### 7.3.1 Preventing land use change

This planning function aims to prevent changes to existing land use in static areas (low degree of volatility) using patterning-instruments. In the case of Batu City, this function is appropriate to prevent land transformation in protected areas.

#### 7.3.2 Directing land use change

This planning function aims to direct existing land use into preferable land use specifically in dynamic areas (high degree of volatility) using a patterning-instrument. In the case of Batu City, this function is appropriate to direct land transformation in disaster-prone settlements to become protected areas. Or to direct land transformation in underdeveloped areas to become new growing areas.

#### 7.3.3 Adjusting land use change

This planning function aims to adjust land use plan based on the real emergent land use in dynamic areas (high degree of volatility) using a framework-instrument. In the case of Batu City, this function is appropriate to adjust diverse land use change in the city centre areas.

#### 7.3.4 Allowing land use change

This planning function aims to allow land use change in the static area (low degree of volatility) using a framework-instrument. In the case of Batu City, this function is appropriate to allow new development in underdeveloped areas for flexible utilization.

### 7.4 Methods of implementation

Based on the methods of implementation, planning is classified into planning by edict and planning by contract. Characteristics and the examples of both methods of implementation are shown in Table 15.

Table 15 Methods of implementation of planning instrument

Methods of Implementation	Characteristic	Example
<b>Edict (Regulation)</b>	Applicable to all citizens in the jurisdiction of Batu city. The review process requires a complicated political process.	National spatial plan, provincial spatial plan, city's spatial plan, detail spatial plan and zoning regulation
<b>Contract (Agreement)</b>	Applicable to the parties involved in the agreement The review process is easier as agreed by the relevant parties	Partnership agreements about forestry, tourism, market development, and water resources management

#### 7.4.1 Edict (regulation)

Edict-based or regulatory planning is a conventional plan established by the government and legislative councils through legal instruments such as local regulations. The regulation has a legal binding force. The Batu City spatial plan applies to all legal subjects in the administrative area of Batu City. Exceptional area planning is also established through other specific regulations established by the provincial or central government. An example is the government regulation on production forest and protected forest areas administered by state-owned forestry corporation and East Java provincial regulation on great forest parks area that make exceptions for land management in certain forest areas. the advantages of using edict-based planning are the universal interpretation of detailed land use decisions that guide the realization of investment and law enforcement. On the other hand, the edict-based planning process has complicated bureaucratic and political communication procedures before being established into a binding legal instrument for all.

#### 7.4.2 Contract (agreement)

Contract-based or consensual planning establishes an agreement about land management by limited parties under leasehold land system. The contract system also has a binding legal force for the parties involved. The contract sets out the land planning agreement to be implemented as well as the division of roles and responsibilities of each party. The advantage of contract-based planning is the flexibility in reviewing their decisions because it only involves certain parties. Contract-based planning aims to maximize the benefits of cooperation and anticipate externalities. However,

contracts made must not violate any applicable laws and regulations. Examples of the application of contract-based planning are conducted by the State-owned Forestry Corporation and forest village community organization in managing production forest areas for the benefit of the community's economy and environmental sustainability. The planning of production forest areas through the contract system is permitted based on forestry ministerial regulations relating to the social forestry program. The planning contents drawn up between State-owned Forestry corporation and forest village community organization in the contract should not conflict with the various regulations applicable in Batu City.

## 7.5 Planning function and instrument

The conformity between the planning function and the methods of implementation is important in managing the complexity of land transformation. The planning functions and methods of implementation in each type of land transformation are explained as follows.

### 7.5.1 Planning function and instrument for land development

A zoning system is directing land development in orchard areas and tourism areas. Zoning system delineates specifically areas that might be developed as an orchard or tourism area. The municipal government also made several contracts with investors about the management of tourist areas in government-owned lands. Through the zoning system, the government wants to ensure that land development could be controlled by preventing sprawl and consolidating compact development.

### 7.5.2 Planning function and instrument of land redevelopment

Land redevelopment is applied based on the regulation about building intensity which is part of the zoning system. Batu City Government also controls government-owned lands for public facilities such as the main market complex and makes contracts with investors for the management of the area. However, the government's control of land ownership in the city centre is limited. It is difficult for the government to control the dynamic land use change in such area. Therefore, the existing detailed zoning system experiences deviation with several types of existing land utilization. The city centre area needs more flexibility to adjust dynamic land use change because of the massive land redevelopment in this area.

### 7.5.3 Planning function and instrument of land restoration

The zoning system is directing land restoration in the riverbank area. The zoning system deliberately delineates areas that must be converted into on-site ecological protection areas and physically becoming natural areas. Based on the zoning map, the Batu City government has a legal basis to control the land use and land acquisition. This zoning system is ideal to ascertain in detail areas that have an environmental hazard risk and have ecological value that should be protected from development pressures. However, there is no specific agreement between local government and affected parties (landowners) about the implementation of land restoration program.

### 7.5.4 Planning function and instrument land conservation

Land conservation is conducted based on the city's spatial plan and forest area technical plan. The extent and delineation of forest areas in Batu City are clear and have legal certainty. Most of the natural areas are controlled by the State-owned Forestry Corporation, and local governments, both provinces and cities. The control and maintenance of natural areas provide a large operational cost burden. Therefore, the State-owned Forestry Corporation makes contracts with forest village community organization and investors about the utilization of production forest area. This contract causes problems because based on the zoning system, such utilization is unlawful. The contract affects land conversion from forest area to other land use although temporary. The state-owned forestry corporation still implements such contract to finance land conservation program.

Table 16 shows the planning function and instrument in four types of land transformation. Planning function and instruments applied in each type of land transformation could be summarized as follows. First, land development in orchard and agricultural area aims to direct land use change using planning by edict and planning by contract to provide certainty. Second, land redevelopment in the city centre area that aims to direct land use change using edict and contract, but it needs flexibility more. Third, land restoration in riverbank area aims to direct land use change using planning by edict to provide certainty, but it needs further planning by contract for affected landowners. Fourth, land conservation in the great forest area that aims partially to prevent land use change using edict and contract, but it needs certainty more.

Table 16 Planning function and instrument in each type of land transformation

Active Transformation	Passive Transformation
Type #1: Land Development In Orchard Area and Tourism Area Directing land use Using Edict and Contract Provide certainty	Type #2: Land Redevelopment In City Center Area Directing land use Using Edict and Contract Need flexibility
Type #3: Land Restoration In Riverbank Area Directing land use Using Edict Provide certainty	Type #4: Land Conservation In Great Forest Area Partially protecting land use Using Edict and Contract Need certainty

In conclusion, each type of land transformation shows different combination between planning function and method of implementation; it means the principle for complexity-sensitive planning instrument should consider the adaptive capacity by providing certainty as well as flexibility.

## 7.6 Evaluation of existing spatial planning instrument (zoning system)

Zoning system in Batu city as the existing planning instrument is evaluated to find out its advantages and dilemmas in managing the land transformation. This evaluation begins with an explanation of existing planning products and procedures in Batu City.

### 7.6.1 Existing spatial planning products

In general, under legislation number 26 of 2007, spatial planning aims to create harmonization between the natural environment and the built environment by:

1. Creating an integrated plan between artificial resources, and natural resources by considering human resources
2. Create a land protection plan and prevent negative impacts of land utilization on the environment.

Legislation number 26 of 2007 sets spatial plans at the national, provincial and district/ city levels. The national spatial plan (RTRWN) regulates the designations of urban systems, national and international infrastructure networks, the spatial allocation for conservation and cultivation areas, and the strategic areas. The provincial spatial plan (RTRWP) is a provincial level spatial plan and regulates the regional infrastructure system and the

utilization of the cultivation area for agricultural and settlement areas. The city's spatial plan (RTRWK) is a city level spatial plan that proposes the local infrastructure system and the classification of land uses in settlement areas such as residential area, commercial area, industrial area, tourism area and other areas. Spatial plan in each level contains the goal, policy and strategy of spatial plan, the spatial structure plan, the spatial pattern plan, strategic area designation, spatial utilization directives, and spatial control mechanism.

In accordance with the implementation of government regulation number 15 of 2010 in article 59 concerning the implementation of spatial planning, each regency or city spatial plan shall determine the part of its territory whose detail spatial plan (RDTR) needs to be drawn up. Part of the area to be drafted with detail spatial plan is an urban area or strategic area of the regency or the city.

Batu City is divided into 3 parts of urban areas with its own detail spatial plan. The detail spatial plan of Batu District has been legalized. The detail spatial plan of Junrejo District is approved by Batu City government and legislative council and on the process of review by the provincial government. The detail spatial plan of Bumiaji District will be tendered in this year, the city's spatial plan is a general directive of spatial planning for economic development and environmental conservation. A detail spatial plan is more operational. The detail spatial plan is the legal basis for land use utilization.

The detail spatial plan content includes the goal of planned area, spatial pattern plan, infrastructure network plan, prioritized sub-planned area, spatial utilization directive and zoning regulation. The difference between planning contents between the city's spatial plan and detail spatial plan is visualized in figure 33.

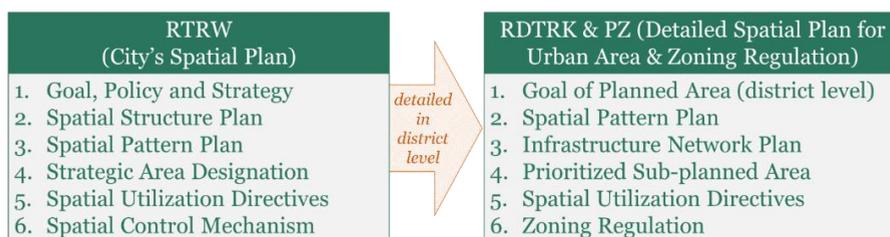


Figure 33 The contents of RTRW and RDTR

## 7.6.2 Existing spatial planning procedure

The explanation of the existing spatial planning procedures will focus on the detail spatial plan in which includes zoning regulation. The detail spatial plan drafting procedures are broadly divided into five stages as illustrated in figure 34.

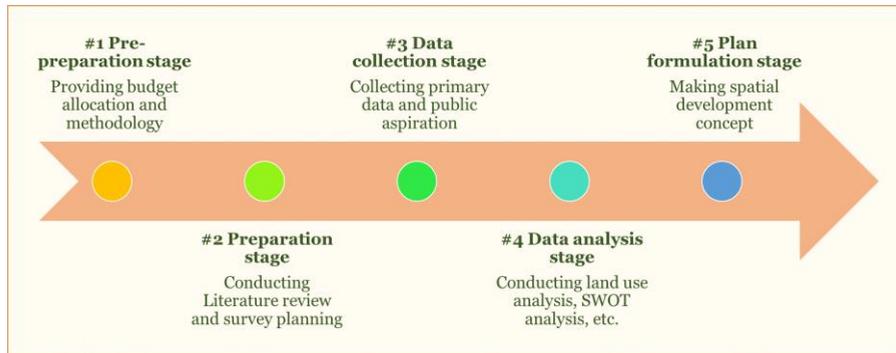


Figure 34 Procedure of spatial plan making

### a. Pre-preparation stage

In the pre-preparation stage, the drafting team must understand the user's request as set in the Terms of Reference (TOR). Then it is translated into project implementation methodology and work plan that is created by taking into account time, human resources and budget constraints. By the completion of this stage, the drafting team is ready to work.

### b. Preparation Stage (Secondary Data Assessment, Survey Plan)

At the preparation stage, the drafting team attempted to understand the study area using available secondary data. This is conducted as a form of initial orientation to understand the profile of the study area. From the results of this secondary data study, the drafting team can determine how long the survey will take to verify and supplement the data obtained.

### c. Data collection

At the data collection stage, the drafting team will explore the study area by field observations to gain a sense of existing land utilization. The team will collect specific information about the physical environment, population,

economy, public facilities and urban infrastructure aspects. Furthermore, the team will conduct interviews and discussions with stakeholders to get their aspirations about the spatial use conditions of the area.

#### d. Processing and Data Analysis

At the processing and data analysis stage, the drafting team is required to find out the main issue of land utilization in the study area. This will form the basis for planning assumptions. The team will compile and analyze the data for planning formulation stages. Data analysis is carried out at least on land suitability analysis, carrying capacity, population projection, economic projection, public facility and infrastructure needs projection.

#### e. Formulation of Planning Concepts

At the drafting stage of the planning concept, the drafting team create the detail spatial plan draft as directed by the PU Ministerial Decree 20/2011, which is the objective of planned area arrangement, spatial pattern plan, infrastructure network plan, sub-BWP priority development and spatial utilization directives and zoning regulations. The team can also create the regulation draft about the detail spatial plan at this stage.

In preparing the detail spatial plan, the drafting team is required to involve the community. This is governed by legislation number 26 of 2007 article 65, government decree number 15 of 2010 article 20 and government decree number 68 of 2010. Legislation number 26 of 2007 article 65 states that "the government with the involvement of the community" The role of the community in spatial planning as referred to in paragraph (1) shall be conducted, through:

1. The participation in the preparation of the spatial plans;
2. The participation in the utilization of space; and
3. The participation in controlling the utilization of space.

The last verse states that "the manner and form of society's role in paragraph (1) are governed by government regulations on the Form and Procedures of the Role of the Society in Spatial Planning. PP 15/2010 section 20 states that "as referred to in article 19 paragraph (1) includes:

1. The process of preparing the spatial plans;
2. Involving the society in formulating the concept of the spatial plan, and
3. Discussion of draft spatial plans by stakeholders

The rules above show the paradigm shift in the spatial planning provision from the original technocratic nature to be more participative. Openness in terms of community engagement is a positive indication that the direction of development is no longer determined by a small group of people, but by shared roles and responsibilities among stakeholders.

### 7.6.3 Advantages and dilemmas of existing zoning system

The advantages and dilemmas of existing spatial planning instrument are evaluated based on four complexity-sensitive planning instrument principles as follows.

#### a. Place-based approach

The existing planning instrument is adopting the principles of a place-based approach because the instrument provides a specialized planned area (BWP) based on local competitiveness. The division of Batu City into three planned areas with different detail spatial plan is enough to represent the uniqueness of territorial character in the 3 BWP.

1. Planned area 1 in Batu District as a city centre area with high-density settlements, trading activities, artificial tourism and tourism services.
2. Planned area 2 in Junrejo District as a medium-density settlement area, food crop farming, military area and higher education area.
3. Planned area 3 in Bumiaji District as a low-density settlement area, plantation, horticulture, nature tourism, forestry and conservation areas.

The designation of area's functions is representing the physical and socio-economic characteristics in the three districts. The planning instrument in Batu City also regulates investment planning and strategic area design such as the arrangement of the city centre area, Songgoriti tourist area and higher education complex of the State Islamic University of Malang. Such detailed planning gives clarity for directing development based on the spatial context in each location.

The dilemma in fully adopting the principles of place-based approach is the existence of national directives that adjust the spatial plan at the local level. The impact is the planning process at the city level should adopt the provincial plans that are not necessarily in accordance with local characteristics. An example is a provision of sustainable agricultural land for

paddy fields with the extent of the area set by the provincial government. Whereas in practice, Batu City does not have enough flat land for the development of paddy fields. The suitable farmland in Batu City is horticultural orchard that utilizes sloped areas. Such provision makes the burden for Batu City because land needs for other purposes such as housing and tourism are also growing rapidly. On the other hand, Malang Regency, the neighbouring area of Batu City, has a surplus of abundant agricultural land including paddy field. But there is no mechanism for inter-local compensation in providing paddy field. The existence of national directives has been proven to limit regional planning instruments in accommodating spatial context.

Another problem facing Batu City is the limited resources to identify the spatial context of the planning area. Limited planning project cycles within planning timeline do not allow for time-series data collection about site characteristics. Planning surveys are conducted as a requirement for obtaining planning analysis within planning project. When the planning project is completed, there is no activity to monitor continuous spatial changes. The unavailability of these time-series spatial data is a dilemma for the planner when it comes to formulating a spatial plan with a place-based approach principle.

### b. Integrative thinking

The existing planning instrument is adopting the principle of integrative thinking. In the planning process, planners from independent consultancy and Batu City planning agency will invite sectoral agencies to accommodate the sectoral interests in City's spatial plan. Moreover, in the preparation of the city's spatial plan and detail spatial plan also involves the views of experts from a various discipline such as civil engineering, environmental science, sociology, economics, tourism, law, agriculture and urban planning.

The dilemma in the implementation of integrative thinking is the difficulty to synergize the sectoral interests. The spatial plan is only collecting various programs from all sectors, but the program could be disharmony or counterproductive. Such as the spatial plan maintains the agricultural area, but on the other hand, there is a tourism area expansion plan that will surely penetrate the agricultural area. It shows that there is no clear common goal to synergize the two main sectors. The reality of agriculture is only a complement of the development of the agro-tourism concept. This is exacerbated by the absence of joint oversight between sectors about of ex-

post land utilization progress. As the impact, planning tends to accept the various changes that have occurred, although shifted from the original plan. It shows that the sectoral development agenda is applied independently. But, the major sectoral interests are accommodated comprehensively in Batu City's spatial plan.

### c. Collaborative process

The existing planning instrument has a limitation in the adoption of the principle of a collaborative process. Planners and planner teams conduct interviews with community representatives as inputs to develop development plans. This is a good step even though the interview has a limited number of respondents, because of the time and budget constraint in planning project. The planning system also provides petition procedures to compensate for the limitations of interviewing the wider community. Communities can propose petitions if the planning draft violates their rights as an individual or as a group.

The dilemma in the implementation of the collaborative process is the limited participation of the broader community because the procedures of planning are dominated by the role of consultants and government officials, especially the planning agency. Discussion of planning content is seen as sensitive issues because it concerns land use rights of each landowner. For example, the plan of land acquisition by the government for public interests that could be creating externality will be rejected by the affected community. In another case, the planning for public facility construction in a certain location will also increase the land price in the surrounding area significantly, that create a higher cost of land acquisition by the government. The other dilemma is that the planning process failed to engage investors in a public discussion about their business plan. As a result, they prefer to do closed lobbying with local government officials or legislative members to support their investment interests in Batu City's spatial plan.

### d. Adaptive capacity

The existing planning instrument is lacking in adopting the principle of adaptive capacity. Batu City's spatial plan and detail spatial plan are valid for 20 years, but the contents can be reviewed every five years to be adjusted to the real land use changes. The flexibility aspect is seen from the ITBX table on the zoning regulations (part of detail spatial plan) which provide some

alternative types of land use in a zone. Therefore, the zoning system is not limited to one type of land use but can be some types of land use depending on the provisions in the activities (ITBX) matrix.

The dilemma in applying adaptive capacity is the absence of a mechanism for planning contents adjustment within a five-year period. For example, if there is a large-scale disaster affecting the planned area, then the plan cannot be directly corrected technically by the planner or government officials. Instead, it should be reviewed using the amendment process by political discussion and involving the legislative council which further complicate the legalization procedure. In the process of reviewing the spatial plan, The Batu City government has to get approval from the provincial government, Ministry of Spatial Planning and Agrarian Affairs, Geospatial Information Agency and Ministry of Interior Affairs. Procedural simplification is very important to ensure legal certainty of government development projects and investments made by companies and communities.

Table 17 Advantages and dilemmas of existing planning instrument

	Place-based Approach	Integrative Thinking	Collaborative Process	Adaptive Capacity
Advantages	<ul style="list-style-type: none"> <li><input type="checkbox"/> Provide Districts planning based on local competitiveness</li> <li><input type="checkbox"/> Provide special design for strategic area development</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Combine various government's sectoral institutions program</li> <li><input type="checkbox"/> Combine experts from various disciplinary during planning process</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Conduct interview with representation of communities</li> <li><input type="checkbox"/> Allow public to make petition againts the draft of spatial plan</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Provide spatial plan review each five years for content modification</li> <li><input type="checkbox"/> Allow alternative options of land utilization in each land use zone</li> </ul>
Dilemmas	<ul style="list-style-type: none"> <li><input type="checkbox"/> Adopt national directives that contrary to local circumstances</li> <li><input type="checkbox"/> Has limited resources to identify the spatial context of planned area</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Collect the sectoral program without sinerigizing the goals</li> <li><input type="checkbox"/> Lack of cross-sectoral oversight for ex-post land utilization</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Has limited participants, dominated by consultant and government officer</li> <li><input type="checkbox"/> Interfered by closed lobby from powerfull stakeholders</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lack of mechanism for content adjustment within five years period</li> <li><input type="checkbox"/> Has complicated bureaucratic procedures for legalization process</li> </ul>

Based on table 17, patterning-instrument has the advantages in adopting the place-based approach and integrative thinking. The place-based approach is provided by the district planning based on local competitiveness and the special design for strategic area development. Integrative thinking is provided by combining various government's sectoral institution programs and combining experts from various disciplinary during the planning process.

## 7.7 Evaluation of alternative spatial planning instrument (urban code)

Various examples of the framework-instrument as alternative planning instruments are evaluated to find out its advantages and dilemmas in managing land transformation. This evaluation begins with an explanation about the classification of frameworks-instrument (urban code) in several cities or counties in the United States. Then, the analysis of its advantages and dilemmas will be elaborated.

### 7.7.1 Classification of framework-instrument (urban code)

Framework-instruments are widely well-developed and implemented by the city/ county governments in the United States. A framework-instrument provides codes that are beneficial for a community to implement its vision.



*Figure 35 Classification of framework-instrument*

The Environmental Protection Agency makes the classification of smart codes in the form of framework-instruments into six categories shown by the figure 35. However, when the framework-instruments are out of date or do not line up with the community's vision, the codes can actually keep communities from getting the development they want.

### a. Unified Development Code

Unified Development Code is a single comprehensive document that includes all development-related regulations, including zoning and subdivision regulation (U.S. Environmental Protection Agency, 2009). Durham in North Carolina is the example of a city that uses this type of framework-instrument. The Unified Development Ordinance applies the comprehensive plan's theme of a tiered system that reflects the different characteristics and priorities found throughout the region. Five "development tiers" were developed: Rural, Suburban, Urban, Compact, and Downtown. Standards for the Rural and Suburban tiers prioritize environmental protection and compatibility with the existing patterns of development in the unincorporated portions of the county. Standards for the Urban, Compact, and Downtown tiers encourage a more diverse pattern, including incentives for mixed-use, pedestrian-scaled development, while incorporating appropriate natural resource protection measures.

The focus of unified development code is encouraging on the strategy of stimulating and accommodating infill growth and development. This is achieved through residential density incentives, commercial and mixed-use height incentives, reductions or exemptions from parking requirements, modifications to buffer and landscape requirements, and other incentive-based measures.

### b. Form-Based Code

Form-Based Code is a code that outlines a specific urban form rather than zoning by use (U.S. Environmental Protection Agency, 2009). Arlington County in Virginia is the example of a county that uses this code. The form-based code is an optional development approval process designed to help revitalize the Columbia Pike corridor of Arlington County. It uses simple and clear graphics prescriptions and parameters for height, siting, and building elements to address the necessities for forming good public space. The code includes regulating plans, required building lines, parking setbacks, building envelope standards, architectural standards, and streetscape standards. Developers who use the form-based code process receive an expedited approval process and, if developing in a revitalization district, are eligible for county investment.

### c. Transit-Oriented Development

Transit-Oriented Development is a concept with moderate to high density, mixed-use neighbourhoods built around transit hubs and designed to maximize access to and use of public transportation (U.S. Environmental Protection Agency, 2009). The city of Palo Alto in California updated its zoning ordinance to reflect its updated comprehensive plan. The first phase analyzed existing standards through the development of prototypical designs for a variety of site and development contexts. Context-based design guidelines incorporate innovative zoning techniques and a form-based, design-oriented approach through the development of building and site planning design prototypes. The context-based design guidelines for the pedestrian- and transit-oriented overlay district for California Avenue and the mixed-use zoning regulations provide developers and the city with key guidelines to ensure development meets the city's needs.

### d. Design Guidelines

Design Guidelines is a set of standards that aim to maintain a certain level of quality and architectural or historical character, addressing features such as building façades, public spaces, or landscaping (U.S. Environmental Protection Agency, 2009). Mountain View in California is the example of a city that implements design guidelines. The regulations and guidelines establish how streets, pathways, and open spaces work together to organize development and provide guidance for character-defining architectural and site planning elements. The rowhouse design guidelines describe how new rowhouse development should be designed to create desirable residential developments and ensure seamless integration with existing neighbourhoods. The R4 zone is designated to encourage high-density residential development in standard residential zones, where previously such development was allowed only in certain Precise Plan areas.

### e. Street Design Standards

Street Design Standards are guidelines and standards related to travel-lane width, bicycle lanes, on-street parking, medians, sidewalks, landscaping, lighting, crosswalks, pedestrian refuge islands, bulbous, and accessibility ramps (U.S. Environmental Protection Agency, 2009). Aurora in Colorado is the example of a city that provides street design standards. These standards

will be applied to create a safe, comfortable, pleasant, and pedestrian-friendly multi-modal travel environment that helps in the creation of vibrant civic places and economic vitality in transit-oriented developments and urban centres. The Aurora Comprehensive Plan identifies various TOD sites and urban centres throughout the city. The development of urban street standards is recommended by the comprehensive plan for use in emerging areas of the city such as urban centres and transit-oriented development sites.

#### f. Zoning Overlay

Zoning Overlay is set of zoning ordinances, specifying land use and/or design standards for a designated portion of the underlying zoning within a defined district; typically used to keep architectural character and urban form consistent, make adjacent uses compatible, or accelerate the conversion of nonconforming land uses (U.S. Environmental Protection Agency, 2009). Nashville in Tennessee is the example of a city that uses zoning overlay. The Urban Zoning Overlay (UZO) district is a special type of zoning district. Overlay zoning districts such as the UZO are tools for dealing with special situations or accomplishing special goals. They can be placed "over" the base zoning for an area to alter some of the regulations. The UZO district was created to control development in the older urban areas of Nashville better. The current zoning code was designed for a newer suburban environment with a different development pattern. For example, in the UZO area, commercial buildings are often built right up to the edge of the sidewalk. In the suburbs, they are further back from the street. Lots in the UZO area are generally smaller than they are in the suburbs, and buildings are usually closer together. Most neighbourhoods in the UZO area have alleys, with garages behind houses instead of attached to them. Until the UZO was developed, the zoning for the UZO area did not fit this development pattern.

#### 7.7.2 Advantages and dilemmas of urban code

The advantages and dilemmas of the framework-instrument or urban code will be evaluated based on four principles of complexity-sensitive planning instrument as follows.

### a. Place-based approach

The advantage of the framework-instrument is to create regulation based on the generalization of local circumstances, and it could be used as a guide for further land use interpretation. Basically, the framework-instrument makes several standards for area planning based on its circumstances such as rural area planning, sub-urban area planning and urban area planning. The disadvantage is that it creates uniformity in areas that have the same typology (such as urban areas) in the distinct locations due to the same standards they used. Areas with the same characteristics do not necessarily require the same standards, because each location has its own identity and spatial context.

### b. Integrative thinking

The formulation of a framework-instrument refers to the various sectoral regulations. Framework-instrument as a regulation must be synchronized with other regulations. The advantage is that a framework-instrument considers the relevant sectoral regulations and the impact of the codes to sectoral achievements. So, the potential for inter-regulatory contradictions can be anticipated. But the dilemma is that it accommodates various sectoral rules into the instrument framework, which will lead to inefficient duplication. In practice, the framework-instrument only focuses on certain aspects such as road corridors arrangement, green spaces arrangement or buildings arrangement and combine several existing regulations related to environmental arrangement standards. Therefore, as a conceptual framework-instrument will bridging several regulations, but in reality, it creates new regulation with specific focus and not really adopting sectoral integration strategy.

### c. Collaborative process

The advantage of the framework-instrument is the opportunity for various stakeholders to make interpretation the codes created. They can actively propose their desired land use by conducting consultation with related parties, such as neighbours or the local government. Furthermore, the awareness and discussion culture about land use plans by the community will grow. They could talk about the externalities they experienced from land utilization in their neighbourhood. The dilemma of the framework-instrument is the limited public participation in the formulation process of

urban codes. Experts, bureaucrats and politicians are the most intensively involved parties. However, it does not really matter to an involved selected stakeholder in codes making. The code is generic for all stakeholders. The most important thing is that these codes give an opportunity for the public, in general, to interpret and equally discuss the acceptable land use preferences.

#### d. Adaptive capacity

The advantage of the framework-instrument is to provide the flexibility of land use as long as it does not violate the mandatory requirements. A framework-instrument provides land use codes that govern the impacts of development externalities. Thus, each landowner could determine and change the type of land use by fulfilling the codes. The dilemma of the framework-instrument is the lack of legal certainty of land use because everyone has their own interpretations. This will lead to land use conflicts due to different interpretations of externalities. Any conflicts of land use interest require mutual consent or a court decision as a solution to its resolution.

*Table 18 Advantages and dilemmas of framework-instrument (urban code)*

	Place-based Approach	Integrative Thinking	Collaborative Process	Adaptive Capacity
Advantage	<ul style="list-style-type: none"> <li>□ Allow further interpretation based on local circumstances</li> </ul>	<ul style="list-style-type: none"> <li>□ Accomodate broader relevant sectoral regulations</li> </ul>	<ul style="list-style-type: none"> <li>□ Allow multi-perspective and interpretation in the implementation</li> </ul>	<ul style="list-style-type: none"> <li>□ Provide flexibility to adjust the plan as long as not violate the rules</li> </ul>
Dilemma	<ul style="list-style-type: none"> <li>□ Lack of spatial context consideration, only general rules</li> </ul>	<ul style="list-style-type: none"> <li>□ Prioritize limited certain goals addressed by the regulation</li> </ul>	<ul style="list-style-type: none"> <li>□ Limited stakeholders involved in formulating the code</li> </ul>	<ul style="list-style-type: none"> <li>□ Lack of certainty over land use directives for future development</li> </ul>

Based on table 18, framework-instruments have the main advantages in providing a collaborative process and adaptive capacity. The collaboration process emerges because the public has to understand, interpret, consult and discuss the preferable and acceptable land use based on urban codes. While the adaptive capacity is greater because they have the flexibility to adjust the land use based on changing circumstances without zoning restrictions.

## 7.8 Possibility for hybridization

The existing zoning system (part of detail spatial plan) in Batu City gives benefits in providing legal certainty for utilization in each land plot. The arrangement of the zoning map has also considered the various sectoral interests and spatial context. On the other hand, urban code and other types of framework-instrument have advantages in providing flexibility for utilization in each land plot and improving the public involvement in interpreting and discussing the preferable and acceptable land utilization. Combining patterning-instruments (zoning system) and framework-instruments (urban code) is an alternative way to provide certainty as well as flexibility. We have understood that each type of land transformation has different driving forces, leading sectors and stakeholder diversity. Thus, any type of land transformation also requires appropriate planning instruments with a different degree of certainty or flexibility.

### 7.8.1 Planning approach in each type of land transformation

The opportunity for hybridization between a patterning-instrument and a framework-instrument could be adopted by dividing the area according to the type of land transformation and type of planning instrument (certain land use and flexible land use). Characteristics of each type of land transformation and the suitable methods of implementation are presented in table 19.

*Table 19 Types of land transformation and the planning approach*

Type of land transformation	Land use plan	Land use volatility	Methods of Implementation
<b>Land Conservation</b>	Certain	Low	Edict
<b>Land Restoration</b>	Certain	High	Edict & Contract
<b>Land Development</b>	Certain	High	Edict & Contract
<b>Land Redevelopment</b>	Flexible	High	Contract

#### a. land conservation

Land conservation occurs in the natural areas that have low land use volatility. The land conservation area is set with certain zoning to provide a clearly delineated zone. The zoning plan in the land conservation area is established through a legally binding edict. Therefore, all parties are prohibited from converting the land use in this area.

## b. land restoration

Land restoration occurs in the built areas that are directed to become natural areas, and it has high land use volatility. This area needs to be established with certain zoning to provide a minimum restoration target clearly. The zoning plan in the land restoration area is established through an edict that binds all parties. Land restoration also needs contracts between landowners (of the land plots that is planned to be restored) and the local government that will acquire the land plots. This contract regulates the timeline of land acquisition, compensation, restoration process, monitoring, and conflict resolution that may arise in the restoration process.

## c. land development

Land development occurs in natural areas that are directed to become a built area, and it has high land use volatility. This area needs to be established with certain zoning to provide a maximum limit of development area clearly. The zoning plan in the land development area is designated through an edict that binds all parties. The land development also needs a contract between investors (that will acquire some land plots) and communities in the area (that affect externalities) and the local government (that mainly owned the land plots). The Contract is to organize the timeline of area planning and design, environmental impact evaluation, monitoring, and conflict resolution that may arise in the development process.

## d. land redevelopment

Land redevelopment takes place in built areas that have high land use volatility. This area needs to be set with flexible zoning to facilitate dynamic land use change. The landscape design in the land redevelopment area is determined through a contract between the local government (as the provider of infrastructure and public facility) and the landowner in the redevelopment cluster area. The cluster plan and design should be guided by an urban code to ensure the minimum requirement. It should involve planning experts in the collaborative plan and design making. This contract is to organize the timeline for planning and design of the area, environmental impact evaluation, monitoring, and conflict resolution that may arise in the redevelopment process.

## 7.8.2 Proposal of hybrid planning instrument scheme

The proposal of hybridization between patterning plans and framework rules could be formulated by considering the appropriate planning instrument for each type of land transformation as is being illustrated in figure 36. The city-level consensus-making process is a collaborative process for discussing government programs, private investment proposals, community group interests and experts considerations. Five things to do during consensus making process in city level are elaborated.

### a. Reviewing sectoral policies and regulations

The review is necessary to understand and synergize the sectoral policies and regulations at the national, provincial and municipal levels related to spatial planning. The purpose of this policy review is to map the impact of sectoral programs on the sustainability of land management, and vice versa.

### b. Developing the spatial allocation map

A spatial allocation map is set up in the form of an edict, specifically dividing areas with certain land use plans (land conservation, land restoration, land development) and flexible land use plans (land redevelopment). Areas with certain land use plans will be equipped with detailed zoning maps as a reference for the land utilization permit. The area with a flexible land use plan is not provided with detailed zoning and allows for self-arrangement at the cluster level.

### c. Creating contracts for land development and restoration.

Contracts for the land development and restoration program created by parties involved with considering zoning map as a minimum spatial requirement. These contracts set out the details of each development or restoration project. It is established between the local government and relevant parties, such as the land developers or investors, the communities that are affected by land development externalities and the landowners that are affected by land restoration programs.

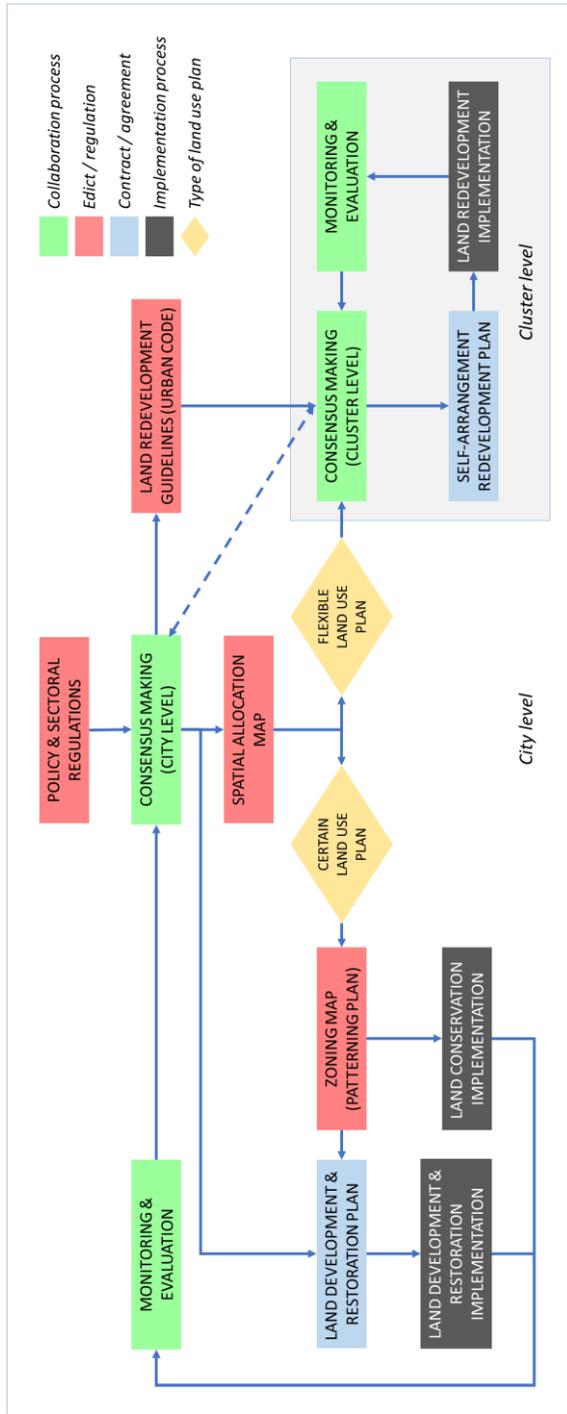


Figure 36 Proposed scheme of hybrid planning instrument

#### d. Formulating urban code

The urban codes is a set of spatial guidelines of land redevelopment defined by edict. The code will be a reference for plan and design making at the cluster level. The urban code could become a standard for road corridor arrangements, green space arrangements and building arrangements.

#### e. Evaluating land transformation

The evaluation of land transformation is conducted to ensure the suitability between the emerging land use and the established zoning maps. The evaluation is beneficial to know the constraints that arise in the implementation process. The evaluation results from collaborative land use monitoring activities conducted by various stakeholders.

In areas with flexible land use plan, the relevant stakeholders to land redevelopment could organize consensus making at cluster level to make self-arrangement plans based on the urban code. They also conduct monitoring and evaluation collaboratively to gain transparency and fair measurement about redevelopment proposals and achievements.

### 7.8.3 Complexity-sensitive planning principles on hybrid scheme

The hybridization scheme between the urban codes and the zoning map is expected to accommodate and adopt the four principles of a complexity-sensitive planning instrument.

#### a. Place-based Approach

The hybrid instrument is adopting a place-based approach by creating spatial allocation maps based on the spatial context of land transformation and is being detailed into specific land use order using zoning map. It is also facilitating a self-arrangement redevelopment plan according to local circumstances.

#### b. Integrative Thinking

The hybrid instrument is conducting a policy review to integrate and synergize between sectoral policies and regulations and is considering the

impact of spatial planning on the cross-sectoral interests and multi-level governmental interests.

### c. Collaborative Process

The most crucial function of a hybrid instrument is facilitating consensus making that create synergies between government programs, corporate investment proposals, community aspirations and experts considerations in land use planning, land transformation monitoring and land governance evaluation.

### d. Adaptive Capacity

The hybrid instrument has adaptive capacity in providing monitoring and evaluation mechanisms as a learning process in making a spatial plan. Flexibility for land use changes is also accommodated through self-arrangement redevelopment plan at the cluster level.

In general, the proposal of the hybrid instrument has several dilemmas such as needs for more investment in providing spatial database, negotiating interests from various sectors, need for more time in conducting a collaborative process. However, it has the combined advantages from a patterning-instrument and a framework-instrument which are adopting the place-based approach, integrative thinking, collaborative process and adaptive capacity. Moreover, the advantages of a hybrid planning instrument are valuable to provide certainty as well as flexibility in governing the complexity of land transformation in Batu City.

# CHAPTER

# 8

## CONCLUSION AND REFLECTION

Governing dynamic land transformation:  
Exploring the principles of a complexity-sensitive  
spatial planning instrument for Batu City, Indonesia

# Chapter 8

## Conclusion and Reflection

This chapter will answer the main research question and discuss the general conclusion. Moreover, some reflections on this research will be provided.

### 8.1 Conclusion

The main question of this research was formulated as followed: *“What are the principles and dilemmas of a complexity-sensitive spatial planning instrument for governing land transformation in Batu City, Indonesia?”*

#### 8.1.1 Reframing land transformation and planning instrument

Land transformation could be reframed as a complex system. It is responded by a land governance system that produces spatial planning instruments to steer the dynamic land transformation. In order to understand such complexity, we should recognise the spatial context, integral linkage, diverse perspective and temporal change of land transformation.

##### a. Key challenges in guiding the dynamic land transformation

###### **Theory 1: Spatial Context**

*“Every place has a different form of active or passive land transformation, due to the spatial context that resulted from biophysical and socio-economic forces.”*

###### **Theory 2: Integral Linkage**

*“Land transformation is a complex system that encompasses integral linkages of non-linear feedback from cross-sectoral elements including the multi-scale interactions within the land system.”*

###### **Theory 3: Diverse Perspective**

*“Land transformation is reflecting the constellation of diverse perspectives, mainly the preferences of the landowner and the referrals of land planning which is provided by formal and informal institutions.”*

### **Theory 4: Temporal Change**

*“Land transformation is a dynamic process of temporal change. However, it is expected that it effectively responded by planning instrument and implementation methods that bring certainty as well as flexibility.”*

In dealing with those four aspects of complex land transformation, we conclude that the planning instrument ideally should adopt the principles of place-based approach, integrative thinking, collaborative process and adaptive capacity.

#### **b. Key principles for a complexity-sensitive planning instrument**

##### **Principle 1: Place-based Approach**

*“Planning instrument should recognize the spatial context of land transformation by applying a place-based approach, rather than directly adopting national directives of the spatial guideline.”*

##### **Principle 2: Integrative Thinking**

*“Planning instrument should be formulated based on integrative thinking to understand the complexity of land transformation from an integral, cross-sectoral and multi-level perspective rather than a fragmented view.”*

##### **Principle 3: Collaborative Process**

*“Planning instrument should be conducted in a collaborative process to connect the gap between power holders of land resources and the participants of land planning, actors outside the government should have access to involve.”*

##### **Principle 4: Adaptive Capacity**

*“Planning instrument should provide legal certainty over the land use plan. However, the emerging notion of land transformation should be anticipated by providing adaptive capacity in adjusting changing circumstances.”*

Such principles are valuable to fulfil the needs for maintaining law certainty of the planning instrument while accommodating the needs for societal reflexivity by considering the spatial, inter-sectoral, inter-subjective and temporal dimensions of land transformation.

The constructed theories and principles also give significance for theoretical debate, especially in supporting the paradigm shift from classical land use

theorization to complex land use theorization by applying the complexity and governance theories in bridging conceptual and practical gaps between the dynamic land transformation and the spatial planning instrument.

### 8.1.2 Examining the existing planning instrument

The nature of land transformation in Batu City is represented by four strategic areas in Batu City with a different spatial context. Four types of land transformation include land development in the orchard and tourism area, land redevelopment in the city centre area, land restoration in riverbank area and land conservation in the great forest area. Each type of land transformation has different characteristics of Biophysical, Human Agency, and Institutional forces. The dynamics of land transformation in Batu City are expected to be steered by the appropriate spatial planning instrument. Batu City applied a zoning system to govern all types of land transformation.

Conventional planning instrument (zoning system) in Batu City has advantages in provisioning certainty of land use plan by accommodating local circumstances and comprehensive sectoral interests. But it has dilemmas in facilitating the inclusive planning process and adjusting contents based on the emerging situation.

### 8.1.3 Proposing an alternative planning instrument

The hybridization between the patterning-instrument (zoning system) and the framework-instrument (urban code) would be a feasible idea to provide certainty as well as the flexibility of planning instruments in regards to govern the complexity of land transformation in Batu City. The existing zoning system in Batu City gives benefits in providing legal certainty for utilization in each land plot. The arrangement of the zoning map has also considered the various sectoral interests and spatial context. On the other hand, urban code and other types of framework-instruments have advantages in providing flexibility for utilization in each land plots and improving the public involvement in interpreting and discussing the preferable and acceptable land utilization.

The hybrid planning instrument could be tested by conducting a pilot project in village scale. Because, since 2014, village governments are granted by national legislation to gain “village fund” from the national government. Village governments also have autonomy and resources to trial the pilot of the formal-informal development framework. The pilot project attempts to

facilitate consensus in providing spatial allocation, development guideline and a self-arrangement cluster plan in the village area.

## 8.2 Reflection

This reflection part shows the limitation of this research and some relevant research ideas to be conducted in the future.

### 8.2.1 Limitation of research

This research has some limitations, one of them is that the interviews are conducted using long-distance video calling; it makes a limitation to discuss the topic intensively. Besides, there is an issue about the knowledge gap among informants in regard to the existing planning system in Batu City. Moreover, this study focuses on an institutional aspect of the land system, without examining in-depth about the physical matter of land use change modelling or simulation.

### 8.2.3 Further research

Comparative studies or another case studies are needed to test or develop the constructed theories of land transformation and the principles of a planning instrument in different legal, societal and geographical circumstances. It would be interesting to examine the case of Houston, a city without zoning from the perspective of planning certainty. The other interesting case is how Singapore is able to maintain the inflexible zoning system in an era of uncertainty. Therefore, different cities with different planning background will be relevant to improve the conceptualization of complexity-sensitive planning instruments.

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# Appendix

## 1. Research Log

Date	Event
<i>26-02-2018</i>	Finalization of research instruments
<i>27-02-2018</i>	Applying permit for conducting research
<i>01-03-2018</i>	Secondary data collection from Planning Agency
<i>04-03-2018</i>	Interview with Mrs Maria (Lecturer at ITN Malang)
<i>05-03-2018</i>	Interview with Mrs Lubna (Individual Land Realtor)
<i>06-03-2018</i>	Interview with Mr Heru (Forest-Rural Organization)
<i>06-03-2018</i>	Interview with Mr Endro (Planning Bureau)
<i>10-03-2018</i>	Interview with Mr Ludi (Legislative Council)
<i>10-03-2018</i>	Interview with Mr Herry (Wahana Property, Ltd.)
<i>11-03-2018</i>	Interview with Mrs Nurul (Lecturer at ITN Malang)
<i>11-03-2018</i>	Interview with Mr Anwar (Farmers Group)
<i>14-03-2018</i>	Interview with Mr Luthfi (Environmental Group)
<i>16-03-2018</i>	Interview with Mrs Eny (Permit and Investment Bureau)
<i>17-03-2018</i>	Interview with Mr Wahyu (Empowerment Bureau)
<i>17-03-2018</i>	Interview with Mr Ibnu (Urban Planner of Batu City)
<i>20-03-2018</i>	Interview with Mr Agus (Lecturer at Brawijaya Univ)
<i>20-03-2018</i>	Interview with Mr Galuh (Lecturer at Kanjuruhan Univ)
<i>21-03-2018</i>	Interview with Mr Arie (State-owned Forestry Company)
<i>22-03-2018</i>	Interview with Mr Edy (Kusuma Agro Group, Ltd.)
<i>24-03-2018</i>	Interview with Mrs Titik (Jatimpark Group, Ltd.)
<i>April 2018</i>	Making the transcript of interviews
<i>May 2018</i>	Making the coding analysis
<i>June 2018</i>	Making the findings report

## 2. Interview Guide

Research Title:

Governing dynamic land transformation: Exploring the principles of a complexity-sensitive spatial planning instrument for Batu City.

General Information Interviewee:

- Government Agencies    Private Companies    Community Groups  
 Academician    Planning Practitioner

Detail: .....

Date of Interview: ..... / ..... / 2018

Name of Interviewee: .....

Prefers to be mentioned anonymously:

- Yes    No

Agrees with recording Interview:

- Yes    No

Duration of interview: ..... minutes

Introduction:

1. Explain the background of interviewer: Double degree master student at RUG and ITB.
2. Explain the research purpose: to explore the alternative spatial planning framework for governing the complexity of land transformation in Batu City.
3. Explain that understood as land transformation are the land use change. Based on preliminary analysis, they can be divided into deforestation, farmland loss, intensification and restoration.
4. Explain the definition of such terminology. Ask if it clear enough.
5. Explain that the questions will examine the land transformation from the establishment of Batu City in 2001 until nowadays.
6. Explain how the interview is designed. There are six chapters.
7. Driving factors (The factors causing land transformation)
8. Non-Linear feedback (Storyline of land transformation, the impacts and involved actors)
9. Multi-scalar interactions (The relation between rules/policies and individual actions)
10. Stakeholder interdependency (Capability and responsibility of stakeholders)
11. Institutional arrangement (Formal and informal ways)
12. Planning instrument (Existing zoning ordinance and the alternative proposal)
13. Based on these topics some starting questions are formulated. If needed, the follow-up questions are addressed for additional information if needed.
14. Ask if there are any questions in advance.
15. Ask if the interviewee would introduce her/himself: what is her/his background and what is the relevance to the case of land transformation in Batu City.

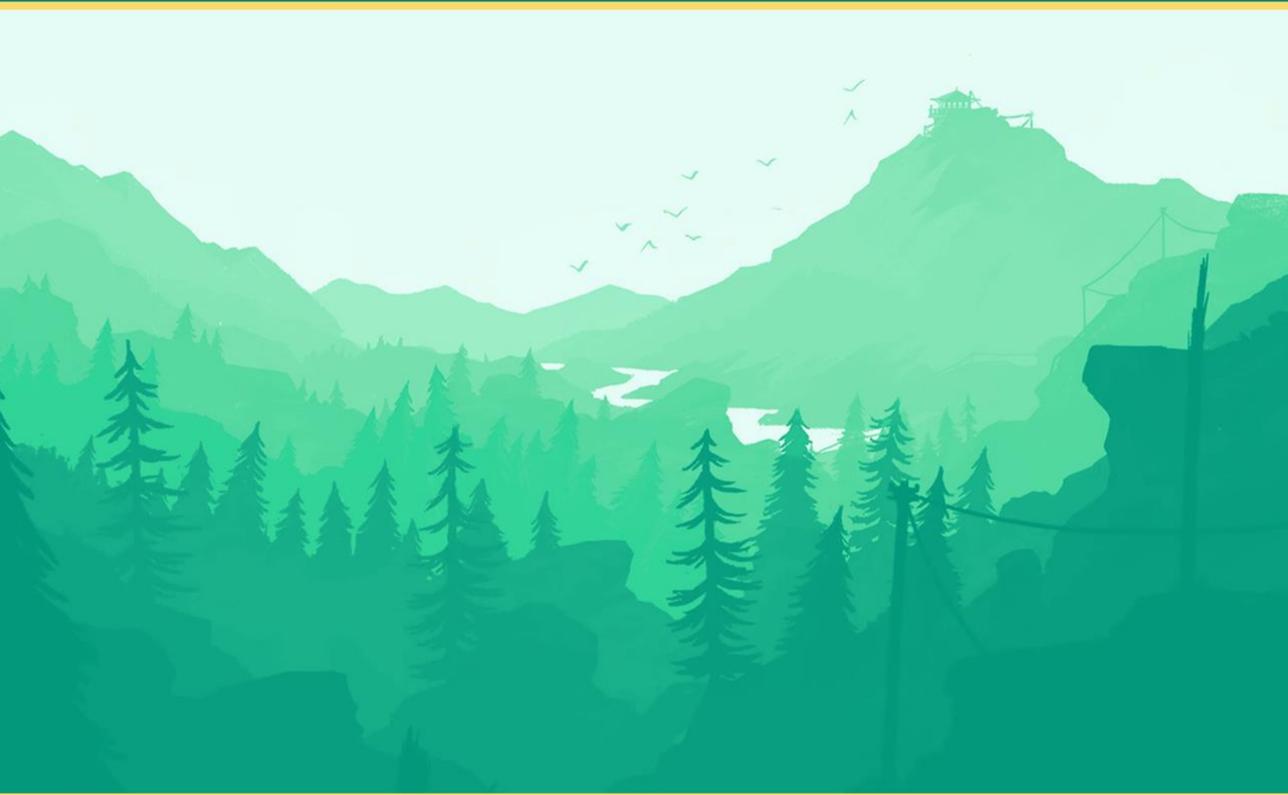
## List of Questions

Questions	Potential Follow-up Questions
<b>Section #1 Driving factors</b>	
What are the factors causing deforestation?	How significant the role of such factors?
What are the factors causing farmland loss?	
What are the factors causing intensification?	
What are the factors causing reforestation?	
<b>Section #2 Non-linear feedback</b>	
Could you explain how land use in Batu City significantly changed over the time from its establishment until now?	Do you think the pattern changed over the time?
What are the broader impacts caused by the land use changes?	How significant is it affecting the sustainability of urban development?
Who are the principal actors influencing the land use changes?	What are their roles?
<b>Section #3 Multi-scalar interaction</b>	
Which are rules/policies influencing land use change?	How are such rules/policies and individual actions connected?
Which are individual actions influencing land use change?	
<b>Section #4 Stakeholder interdependency</b>	
What are the capabilities owned by government agencies, private companies, and community groups in influencing land transformation issues?	Do they have conflict or collaboration? How they interact with each other?
What are the responsibilities of government agencies, private companies, and community groups in dealing with land transformation issues?	How they maintain their responsibilities?
<b>Section #5 Institutional arrangement</b>	
Which are the formal ways used by stakeholders in responding land transformation issues?	What are the benefits and pitfalls of both ways?
Which are the informal ways used by stakeholders in responding land transformation issues?	
<b>Section #6 Planning instrument</b>	
What are the advantages and dilemmas of existing zoning ordinance as an instrument for dealing with land transformation in Batu City?	Do you think the existing zoning ordinance is an ideal spatial planning instrument or not? Why?
If you were a Mayor of Batu City, what do you want to change or improve in existing spatial planning system?	Why such changes or improvements are crucial/urgent?

### 3. Coding Manual

Main group/category	Predefined code (Theoretical review)	Newly formulated code (New findings)
<ul style="list-style-type: none"> <li>Type of land transformation</li> </ul>	<ul style="list-style-type: none"> <li>Deforestation</li> <li>Agricultural land loss</li> <li>Urban expansion</li> <li>Reforestation</li> </ul>	<ul style="list-style-type: none"> <li>Land Development</li> <li>Land Redevelopment</li> <li>Land Restoration</li> <li>Land Conservation</li> </ul>
<ul style="list-style-type: none"> <li>Driving forces of land transformation</li> </ul>	<ul style="list-style-type: none"> <li>Bio-physical forces</li> <li>Socio-economic forces</li> </ul>	<ul style="list-style-type: none"> <li>Biogeophysical forces</li> <li>Human Agency forces</li> <li>Institutional Forces</li> </ul>
<ul style="list-style-type: none"> <li>Non-linear feedback of complex land system</li> </ul>	<ul style="list-style-type: none"> <li>Reinforcing loop</li> <li>Balancing loop</li> </ul>	
<ul style="list-style-type: none"> <li>Multi-scale interactions of complex land system</li> </ul>	<ul style="list-style-type: none"> <li>Macrostructure</li> <li>Micro-agency</li> </ul>	<ul style="list-style-type: none"> <li>Top-down intervention</li> <li>Bottom-up initiative</li> </ul>
<ul style="list-style-type: none"> <li>Leading sectors of land transformation</li> </ul>		<ul style="list-style-type: none"> <li>Environmental sectors</li> <li>Economics sectors</li> </ul>
<ul style="list-style-type: none"> <li>Stakeholders issues of land governance system</li> </ul>	<ul style="list-style-type: none"> <li>Participation</li> <li>Power</li> </ul>	<ul style="list-style-type: none"> <li>MUSRENBANG</li> <li>Land Ownership</li> </ul>
<ul style="list-style-type: none"> <li>Institutions of land governance system</li> </ul>	<ul style="list-style-type: none"> <li>Formal rules</li> <li>Informal Norms</li> </ul>	<ul style="list-style-type: none"> <li>Agrarian/ spatial law</li> <li>Consensus</li> </ul>
<ul style="list-style-type: none"> <li>Actors involvement in land transformation</li> </ul>		<ul style="list-style-type: none"> <li>Diverse involvement</li> <li>Limited involvement</li> </ul>
<ul style="list-style-type: none"> <li>Type of land use volatility</li> </ul>		<ul style="list-style-type: none"> <li>High volatility</li> <li>Low volatility</li> </ul>
<ul style="list-style-type: none"> <li>Type of land use plan</li> </ul>		<ul style="list-style-type: none"> <li>Certain land use plan</li> <li>Flexible land use plan</li> </ul>
<ul style="list-style-type: none"> <li>Type of planning instrument</li> </ul>	<ul style="list-style-type: none"> <li>Patterning-instrument</li> <li>Framework-instrument</li> </ul>	<ul style="list-style-type: none"> <li>Zoning system</li> <li>Urban codes</li> </ul>
<ul style="list-style-type: none"> <li>Implementation methods of planning instrument</li> </ul>	<ul style="list-style-type: none"> <li>Planning by edict</li> <li>Planning by contract</li> </ul>	<ul style="list-style-type: none"> <li>Governmental decree</li> <li>MOU</li> </ul>
<ul style="list-style-type: none"> <li>Key challenges/ dimensions of complex land transformation</li> </ul>		<ul style="list-style-type: none"> <li>Spatial Context</li> <li>Integral Linkage</li> <li>Diverse Perspective</li> <li>Temporal Change</li> </ul>
<ul style="list-style-type: none"> <li>Key principles of a complexity-sensitive planning instrument</li> </ul>		<ul style="list-style-type: none"> <li>Place-based Approach</li> <li>Integrative Thinking</li> <li>Collaborative Process</li> <li>Adaptive Capacity</li> </ul>

“We abuse land because we regard it as a commodity  
belonging to us. When we see land as a community to which  
we belong, we may begin to use it with love and respect.”  
- Aldo Leopold -



University of  
Groningen  
The Netherlands



Bandung Institute  
of Technology  
Indonesia