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*Master Thesis
"Spatial planning to face urban sprawl.
Evidence from Japan"*

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Dedication

This thesis is especially dedicated to my whole family.
Thank you for all your love and support during this long journey. I
would especially dedicate this thesis to my mother Annamaria.

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List of Abbreviations

TFR	Total Fertility Rate
DID	Densely inhabited district
MIC	Ministry of Internal Affairs and Communications Japan
GNP	Gross National Product
TCIO	Tokyo City Improvement Ordinance
NCRDP	National Capital Region Development Plan
TMA	Tokyo Metropolitan Area
LR	Land Readjustment
MOC	Ministry of Construction (MOC)

Abstract

The political and technical practices aimed at the arrangement of space play a key role in every society. Any social and economic activity needs space to unfold and through the arrangement of space can be promoted or addressed. For this reason, the origin of the processes of spatial governance and planning is lost in the mists of time, with their contemporary characters that have taken form with the establishment of the modern state. After the Industrial Revolution, the urban population showed a boom due to a rapid urbanization phenomenon related to the born of Fordist manufactories. As a consequence of this increase in urban population new shapes of urban fabric made their first appearance.

Japan as other most developed countries across the world experienced this phenomenon, with specific characters that rose up from the cultural and social background. Generally, the sprawl in Japan is defined as a small-scale development, especially residential ones, located where urban infrastructures are not adequately developed. So urban sprawl is always linked with a “failure” of the spatial planning system.

The proposed research thesis aims to understand and explore the urban sprawl issue - especially within the Japanese context - in order to evaluate what are the main characteristics of this phenomenon and what tools and policies were implemented to tackle it. In order to achieve this goal and answer the research questions that derive from it, the present thesis put together the result of a literature review on the concept of urban sprawl, of urban sprawl in the Japanese context, and on how the spatial governance and planning

system of Japan face this phenomenon. A small number of interviews with privileged observers were used to consolidate the result of the desk research, and to choose three relevant case studies upon which to test the developed hypothesis. The case studies, all located in the Tokyo Metropolitan Area, were explored through a socio-spatial analysis by GIS tools in order to provide quantitative evidence of the analyzed phenomena in their context, upon which to discuss the effectiveness of the policies implemented to face sprawl. As a result of this research's thesis. it was possible to develop an overall reflection upon the impact of the Japanese spatial governance and planning system on the reduction of urban sprawl and to provide input to future studies on the matter as well as on the development of new tools therein as well as in other countries.

Abstract

Le politiche e le tecniche finalizzate all'uso dello spazio svolgono un ruolo chiave in ogni società. Qualsiasi attività sociale ed economica ha bisogno infatti di uno spazio o contesto territoriale per svilupparsi; attraverso la pianificazione dello spazio può essere quindi promossa ed indirizzata. Per questo motivo, l'origine dei processi di governance territoriale e pianificazione spaziale si perdono nella notte dei tempi, con i relativi nuovi stakeholders che sono nati a seguito della comparsa dello stato moderno. A seguito della Rivoluzione Industriale, la popolazione urbana ha visto un boom a causa dello sviluppo di un rapido fenomeno di urbanizzazione legato principalmente alla nascita delle manifatture fordiste. Come conseguenza, nuove forme di tessuto urbano e sviluppo urbano hanno fatto la loro prima apparizione.

Il Giappone come altri paesi sviluppati in tutto il mondo ha sperimentato lo stesso fenomeno, con caratteri specifici che nascono dal background culturale e sociale. In generale, il fenomeno dello sprawl in Giappone è definito come uno sviluppo su piccola scala, in particolare modo di carattere residenziale, situato in aree in cui le infrastrutture urbane non sono adeguatamente sviluppate. Quindi il concetto di sprawl - in questo contesto territoriale - è collegato idealmente ad un "fallimento" del sistema di pianificazione spaziale.

La tesi di ricerca proposta ha come obiettivo quello di comprendere ed esplorare il problema dell'espansione urbana incontrollata - specialmente nel contesto giapponese - al fine di valutarne le caratteristiche peculiari in

prima istanza e di successivamente ricercare gli strumenti e le politiche che sono state implementate per affrontare questo nuovo fenomeno.

Per raggiungere questi obiettivi è stata svolta un'ampia ricerca bibliografica, sono state condotte delle interviste in loco con alcuni attori dei processi di pianificazione spaziale ed infine è stata condotta un'analisi socio-spaziale in ambiente GIS al fine di fornire osservazioni e risultati empirici per spiegare meglio il fenomeno dello sprawl e valutare l'efficacia delle politiche attuate. Come risultato, al termine della redazione della presente tesi è stato possibile fornire una valutazione dell'efficacia delle politiche per ridurre lo sprawl – seppur sulla base di un limitato quantitativo di casi studio – ed come ultimo suggerire alcuni spunti di riflessione che potrebbero rivelarsi futuri punti di partenza per eventuali nuove ricerche che verteranno sulla tematica dello sprawl non solo nell'ambito giapponese ma anche per altri contesti geografici e nazionali.

Acknowledge

I would like to thank everyone who participated in the interviews, my supervisors Giancarlo Cotella and Fumihiko Seta for providing useful insights and helpful suggestions and for their priceless help with proof-reading and editing.

“We are the first generation that can put an end to poverty, and we are the last generation that can put an end to climate change.”

“*Cities* are where the battle for sustainable development will be won or lost.”

United Nations Secretary General Ban Ki-Moon,
Before the adoption of the SDGs & The New Urban Agenda



Figure 2- View of Skytree from Asakusa neighborhood (Source: author elaboration)

1. INTRODUCTION

1.1 Introduction

This research thesis is born from the desire to investigate a distant and certainly different context, that could have provided an occasion for cultural enrichment as well as constituted a great experience to gain useful research's skills.

The first part dedicated to the literature analysis was followed by a period of stay in Japan, where, thanks to the collaboration of Prof. Seta (Tokyo University) it was possible to deepen several issues at the national and local level (related to the city of Tokyo and the surroundings). This first phase was the starting point for a proper investigation of the Japanese spatial planning system on which the thesis is focused.

Overall, the thesis provides a general and historical outline of the Japanese land and urban planning system, then, it focuses on three cases study located within the Tokyo Metropolitan Area, as a representative example where to evaluate the spatial planning policies and instruments and to recognize opportunities of innovation concerning the limitation of urban sprawl. As a result, this analysis also provides an opportunity to further investigate the phenomenon of urban sprawl which affects many metropolitan cities through the world, and to discuss useful perspectives and propositions to face this problem, which are described in the last part of the thesis work.

1.2 Background

Japan's population began to decline after peaking at about 128 million in 2008 and is estimated to fall to about 121 million in 2025 and about 97 million in 2050, according to the median projection by the National Institute of Population and Social Security Research. Japan has thus fully become a population-declining society. Japan's total fertility rate turned upward after falling to 1.26 in 2005 and reached 1.42 in 2014. But it still falls far short of the population replacement level of 2.07. Even if the TFR recovers in the future, Japan's population will continue declining over several tens of years (MLIT, 2015).

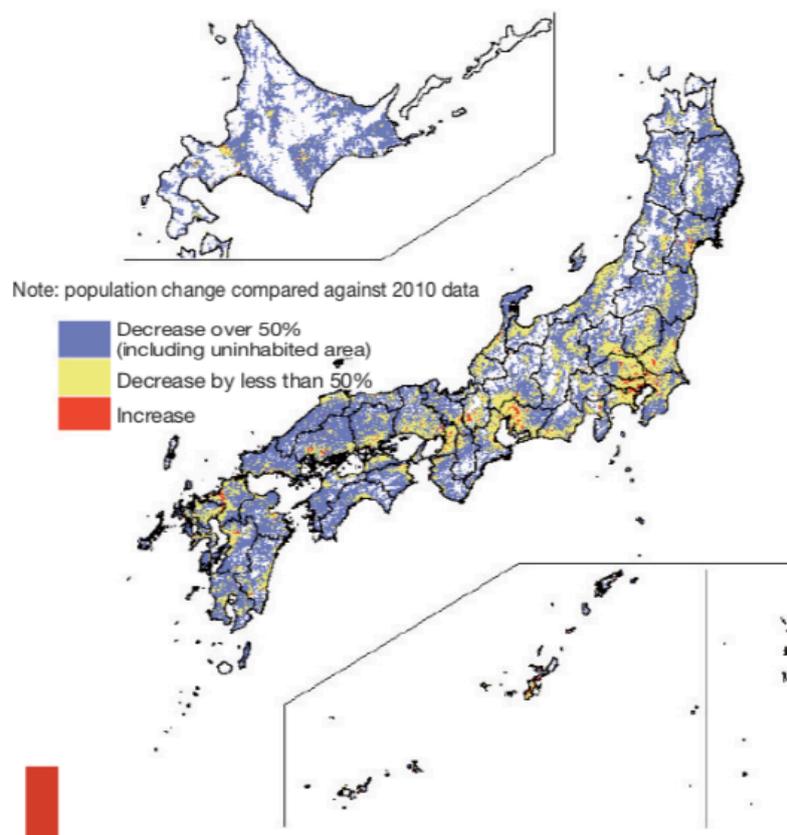


Table 1- Population change in 2050 (Source: National Census Report by MIC)

A continuous outflow of population from rural regions to urban ones has continued in the last decades, as a result, the geographical distribution of the population in Japan has been becoming more heterogeneous. Especially, the concentration of the population in the Tokyo region (Kanto Area/関東地方) has been intensifying due to an inflow of population into the region, accelerating a decline in the rural young or productive population. The elderly's share of the total population in Japan exceeded 25% in 2013, indicating that Japan has become the world's most aged society. Particularly, the birth-rate fell, and baby-boomers aging has brought about a further fall in the young or productive population and a further increase in the elderly population over recent years, leading the aging of Japanese society to accelerate. The elderly's share of the population is expected to continue rising in the future, exceeding 30% in 2025 and approaching 40% in 2050. The elderly population is expected to peak in rural regions around 2025 and continue substantial growth in large metropolitan regions. These changes and a fast increase in the elderly's share of the population will lead residential zones in the suburbs of large cities to lose their vigor and have serious problems such as an increase in single-member elderly households (MLIT, 2015).

The international environment surrounding Japan has also greatly changed since the last decade. China continued its high economic growth even after the 2008 Lehman Shock and replaced Japan as the world's second largest economy in 2010. In 2013, China's gross domestic product was about double Japan's. Per capita GDP in Japan was surpassed by Hong Kong's in 2014, falling to the world's third highest position. The Association of Southeast Asian Nations and India have continued economic development, while Russia

has increased its presence on the strength of rich energy resources. In Asian trade, Japan's presence has declined, with China deepening relations with other countries or regions. International flows of people, goods, money, and information have grown more brisk and rapid. Under such situation, major Asian cities have grown more attractive through economic development and strategic, priority-oriented measures and increased their presence rapidly, intensifying international inter-urban competition (MLIT, 2015).

Japan conserved and developed its war devastated national land and made national efforts to prevent and reduce disasters following mega disasters. Nevertheless, the 1995 Hanshin-Awaji Great Earthquake, the 2011 Great East Japan Earthquake, and other earthquakes and tsunamis have inflicted great damage on Japan's national land. Furthermore, experts say Japan has a 70% chance of seeing devastating Tokyo epicenter and Southern Trough earthquakes within 30 years. Furthermore, rainfall is predicted to become even stronger and more frequent due to climate change accompanying global warming in the future. Therefore, wind and flood damage and sediment disasters are feared to grow more frequently and intensely. While urbanization, advanced land utilization, distribution system improvement, and information and communications technology development have improved convenience and efficiency, society has grown more vulnerable to more widespread and intense human and physical damage in the event of a disaster (MLIT, 2015).

The accident at Fukushima Daiichi Nuclear Power Station (TEPCO) and the successive shutdown of nuclear power plants have caused cost hikes through electricity shortages and power bill increases, affecting manufacturing and other corporations, including small and medium-sized enterprises. At the

same time, the government will reduce Japan's dependence on nuclear power generation as much as possible by spreading energy conservation efforts and renewable energy and by increasing the efficiency of fossil power plants. The planned Linear Chuo Shinkansen - located within this policy of low carbon - a high-speed magnetic levitation railway, is likely to greatly influence national spatial development, as did the Tokaido Shinkansen bullet train line in the past (MLIT, 2015).

National values have become diverse as society has matured. Citizens are thus allowed to realize lifestyles based on their various values regarding ways of working and living. In the past, rural residents had sought to live in urban areas due to the dominant perception that urban life would be excellent. Recently, however, urban residents have grown eager to live in rural regions. Particularly, a large percentage of young urban residents are hoping to move to rural regions. The number of consultations requested on rural living has increased. Local communities have been weakening due to a decline in multiple-generation families, the separation of residential zones from workplaces and residents' frequent flow into and from urban regions, and due to aging and declining community members amid young people' outflow and general population aging in rural regions. As a result, interactions between generations and between regions have declined, making the succession of local cultures and traditions difficult, reducing people's attachment to local communities, and leading communities to become vulnerable to disaster. As communities have weakened, various actors such as non-profit organizations have begun to complement or take over activities that communities had traditionally undertaken (MLIT, 2015).

People have grown more conscious of safety and security due to the large-scale earthquake and tsunami disasters such as the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake, wind and flood damage and sediment disasters that have occurred frequently and are expected to increase in line with global warming, and volcanic disasters and large-scale accidents. In particular, the Great East Japan Earthquake hit a vast region and inflicted heavy direct damage. Furthermore, it brought about wider-area damage through electricity and other supply chain disruptions. The earthquake and subsequent tsunami were combined with a nuclear disaster into a composite disaster. As a result, the disaster exerted great impacts on Japan's economic society, leading people to grow more conscious of not only residential safety but also crisis management regarding a wide range of economic and social systems, including energy supply, logistics, and urbanization process (MLIT, 2015).

The decline in population is exerting great impacts on national land space. In rural regions where the population has already been decreasing, problems have been emerging, including underutilized or unutilized downtown land, deserted farmland, forests which have not been managed adequately, and land lots whose owners are difficult to find. Vacant houses have increased in rural regions and suburbs of large metropolitan regions and are expected to increase further in line with a decline in the number of households. At the same time, a population decline can generate surplus spaces through a drop-in development pressure, providing an opportunity to manage such spaces systematically, strategically and slowly for improving natural and living environments (MLIT, 2015).

Japan is now at a turning point, in order to allow everyone to feel affluence even over the next several decades in which the population will continue declining, Japan will have to tackle national spatial development initiatives to adapt to the population decline also in relation to the urban sprawl phenomenon. At the same time, Japan will have to implement national special development measures to mitigate the population decline so that people's lifestyles will change to raise birthrates to stabilize the population in several decades. The Long-term Vision for Overcoming the Population Decline and Vitalizing Local Economy in Japan describes raising the total fertility rate back to the population replacement level as an essential condition for stopping the population decline and maintaining Japan as a vigorous society over the future. The TFR is expected to rise to around 1.8 if young people realize their hopes for marriage and childrearing. The initiative envisages that if the TFR's population replacement level of 2.07 is achieved thanks to policy effects, Japan may secure the population level of around 100 million in 2060. Japan is expected to maintain real annual GDP growth in the 1.5–2.0% range in the 2050s if the population is stabilized with productivity being improved (MLIT, 2015).



Figure 2 – Shibuya crossroads, one of the most crowded areas in the Tokyo Metropolitan Area (Source: author elaboration)

1.3 Thesis objective and research questions

The main objective of the present research is to investigate the urban and territorial policies and land-use governance in the specific Japanese contexts in order to understanding and evaluating the policies and instruments of the government of the territory and to recognized opportunities of innovation. The subsequent objective of this research is to deepen the knowledge about territorial policies that are putting in place actually in the metropolitan area of Tokyo especially in relation to the phenomenon of urban sprawling.

In conclusion, the main question is:

- How spatial planning can solve the urban sprawl issue?

Sub questions:

- What is urban sprawl?
- What are the impacts of urban sprawl?
- What is the characteristic of urban sprawl in Tokyo?
- What type of physical problems has been occurred in Tokyo due to the sprawl?

The objectives of this research, therefore, listed as follow:

- To understand the concept of urban sprawl;
- To understand briefly the impact of urban sprawl;
- To define the characteristics of urban sprawl especially in the Tokyo metropolitan area;

- To evaluate the present situation in Tokyo-region due to the sprawl (cases study);
- To evaluate the urban planning practices for mitigating urban sprawl impacts already implemented by the Japanese government.

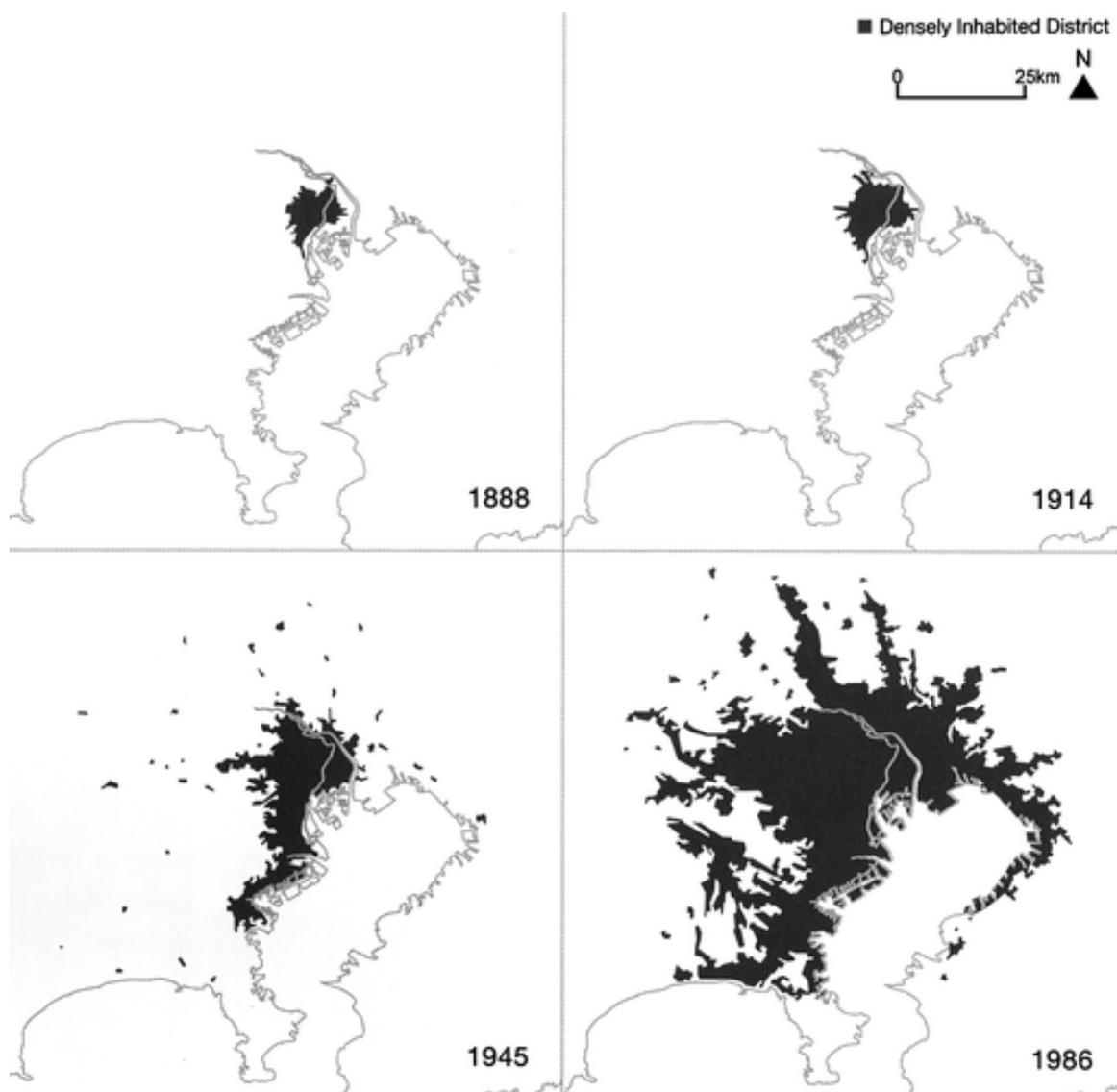


Table 2 - Densely Inhabited District in Tokyo area from 1888 to 1986 (Source: Okata J., Murayama A. - 2011)

1.4 Structure of the thesis and expected outcomes

This thesis of research consists of 9 chapters. Chapter 1 presents an introduction, including the overview of Japan's background, the problem statements, the general objectives and the structure of this dissertation. Chapter 2 provides a review of the research design and the used methodology. Chapter 3 is discussed about the phenomena of urban sprawl at the general level as a base for the research. The objectives of this chapter are exploring the causes and driving forces of urban sprawl and urbanization as well as investigating the local factors affecting urbanization and rapid urban development. Chapter 4 presents an analysis of the urban sprawl in Japan identifying the socio-economic phenomena and main urbanization trends which caused urban issues as sprawl. Chapter 5 discusses the Japanese spatial planning approach to urban sprawl at the national, regional and local levels. This chapter will show the tools and practices which are put in place to face the urban sprawl in Japan in different spatial contexts especially about the Land readjustment tool. Chapter 6 starts with the criteriums selected to choose the case study of Urawa, Omiya and Ageo towns and the explanation of urban sprawl phenomena which has taken place there; and in the last chapter, there will be a conclusion which consists of wrap up synthesis including giving recommendation for the policymaker regarding the planning effort or policy scenarios to be developed to address urban problems to support more productive, comfortable, and sustainable development.

This thesis is not intended to be a critique of Tokyo-region's current growth management strategies, as it is clear planning documents released are steps in the right direction for a city roundly criticized for its approach to urban

planning. Indeed, provisions made in Tokyo's more recent planning strategies clearly show a shift towards advocating a more 'compact city' style of urban development, and a shift away from predicting and providing for peripheral urban expansion. The purpose of this thesis is to suggest ways in which this can occur so that the Tokyo-region experience can contribute to a more sustainable urban future also in other developed countries.



Figure 3 - Tokyo metropolitan area (Source: NASA Earth Observatory, Story Tokyo at Night, 2008)

2. RESEARCH DESIGN AND METHODOLOGY

2.1 Introduction

This chapter gives a general outline of the research methods that were followed in the research's thesis. It provides information on the interviewed, the criteria for inclusion and participation in the study and who they are. The researcher describes the research design that was chosen for the purpose of this study and the reasons for this choice and in conclusion, the procedures that were followed to carry out this thesis are included.

2.2 Research design and methodology

The two concepts of research design and research methodology need to be defined firstly, in order to have a clear definition regarding their usage, particularly by emerging researchers.

A number of definitions have been proposed by different scholars and researchers through the years, working in different fields.

Saunders, Lewis, and Thornhill (2003) define research as “...something that people undertake in order to find out new things in a systematic way, thereby increasing their knowledge...”

From the definitions of Saunders, Lewis, and Thornhill we can say that research is a planned activity, aimed at establishing new facts and information about a particular phenomenon in various fields. The research process involves the identification of a particular problem or area of interest, translating that problem into a research problem, collecting data, analyzing the data and at the end of this process; reporting the findings of the research.

Leedy (1997) defines research design as a plan for a study, providing the overall framework for collecting data. MacMillan and Schumacher (2001)

define it as a plan for selecting subjects, research sites, and data collection procedures to answer the research questions. They further indicate that the goal of a reliable research design is to provide results that are judged to be credible. For Durrheim (2004), the research design is a strategic framework for action that serves as a bridge between research questions and the execution, or implementation of the research strategy. Schwardt (2007) defines research methodology as a theory of how an inquiry should proceed. It involves an analysis of the assumptions, principles, and procedures in a particular approach to inquiry. According to Schwardt (2007), Creswell and Tashakkori (2007), and Teddlie and Tashakkori (2007), methodologies explicate and define the kinds of problems that are worth investigating; what constitutes a researchable problem; testable hypotheses; how to frame a problem in such a way that it can be investigated using particular designs and procedures; and how to select and develop appropriate means of collecting data (Mafuwane, 2011).

The research design of this thesis was carried out under qualitative research, according to Van der Merwe (cited by Garbers, 1996) is a research approach aimed at the development of theories and understanding. Denzin and Lincoln (2005) define qualitative research as a situated activity that locates the observer in the world. It involves an interpretive, naturalistic approach to the world, i.e. qualitative researchers study phenomena in their natural settings, attempting to make sense of, or interpreting phenomena in terms of the meanings people bring to them. Qualitative research implies an emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured (Denzin & Lincoln, 2005). In concert with Denzin and Lincoln (2005), Patton (2001) defines qualitative research as "...an approach that uses a naturalistic approach which seeks to understand phenomena in context-specific settings, such as real world settings, where the

researcher does not attempt to manipulate the phenomena of interest...it is any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification, but instead the kind of research that produces findings derived at from real-world settings where the phenomena of interest unfold naturally.” Weinreich (2009) indicates that the purpose of qualitative research is to provide the researcher with the perspective of target audience members through immersion in a culture or situation and direct interaction with the people under study. This implies that in the qualitative paradigm the researcher becomes an instrument of data collection, and the result may differ greatly depending on who conducts the research (Mafuwane, 2011).

The objective of qualitative research is to promote better self-understanding and increase insight into the human condition. Unlike quantitative research which has, as its objective, collecting facts about human behavior that will lead to verification and extension of theories, qualitative research emphasizes the improved understanding of human behavior and experience. Qualitative methods include direct observation, document analysis and overview, participant observation, and open-ended unstructured interviewing. These methods are designed to help researchers to understand the meanings people assign to social phenomena and to elucidate the mental processes underlying behaviors. Worthen and Sanders (1987) characterize qualitative inquiry as —a research approach that is generally conducted in natural settings, utilizing the researcher as the chief —instrumentl in both data gathering and analysis. The benefits of qualitative inquiry are embedded in its emphasis on thick description, i.e. obtaining real, rich, deep data that illuminates everyday patterns of action and meaning from the perspective of those being studied. This view emphasizes the importance of the voice of the

researched and gaining first-hand information regarding the lived experiences of the researched on a particular subject. It tends to focus on social processes, where the established relationship between the researcher and the respondents is valued, rather than primarily or exclusively on outcomes. Qualitative inquiry involves employing multiple data gathering methods, especially participant interviews, and uses an inductive approach to data analysis, extracting its concepts from the mass of particular detail which constitutes the database (Mafuwane, 2011).

In conclusion, the strength of qualitative research is its ability to provide descriptions about the topic of the research. The qualitative research shares characteristics, which are searching the answer to questions, produce findings that were not determined in advance and produce findings that are applicable beyond the immediate boundaries of the study.

Four research phases were conducted during the research work for this thesis. The first consists of a general understanding of the Japanese planning system, the second phase is identification with the result of findings, the third phase is the case study selected (Tokyo) examination. The fourth phase is discussion and analysis followed by the conclusion and recommendation. The research design is shown in the diagram below (see the research flow diagram).

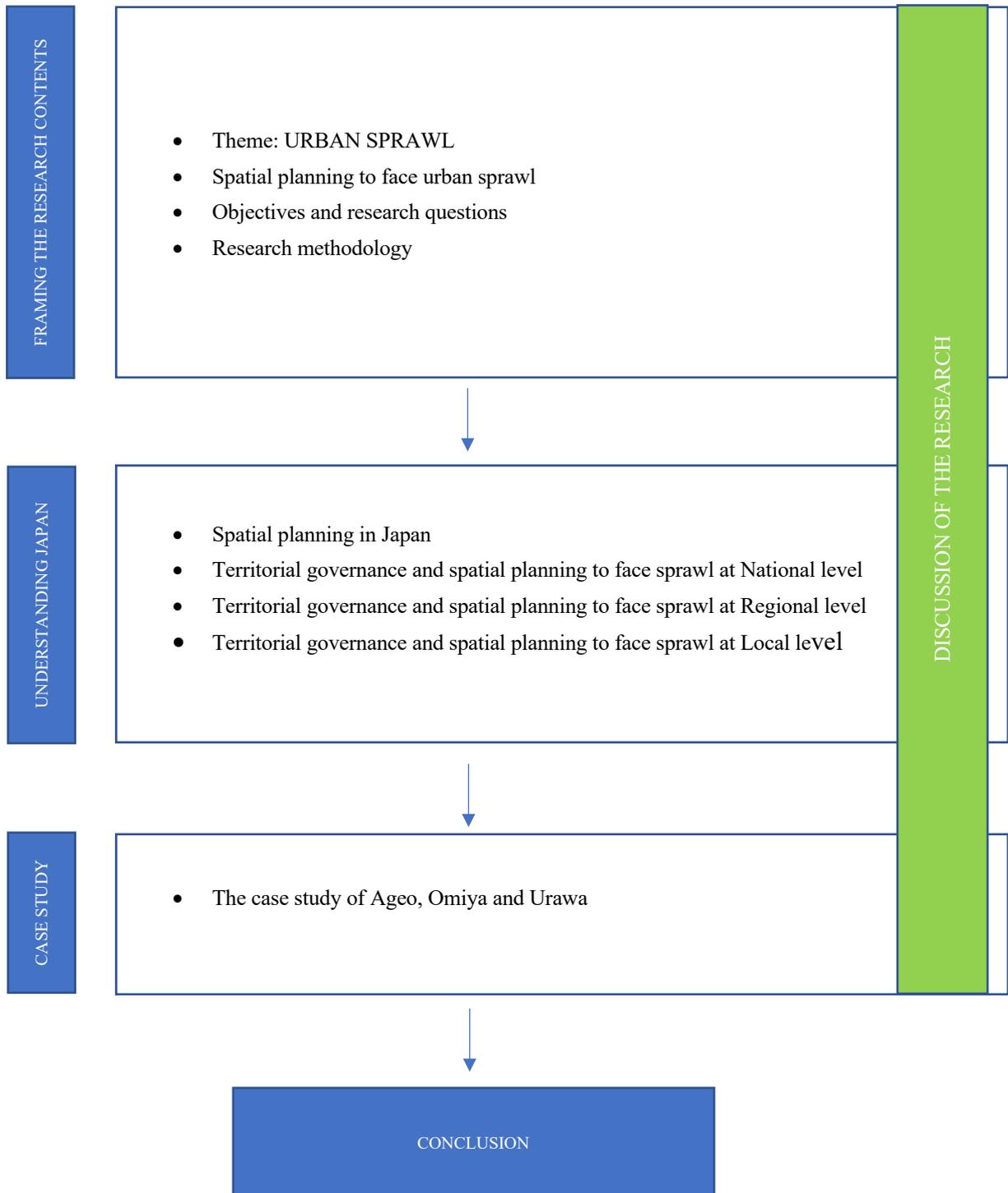
The first phase consists of the general understanding of the land planning system in Japan; this phase was done by literature review, interviews, workshops and also site visits to some areas located in the Tokyo metropolitan area.

The second phase is to make identification of the selected area based on the thesis questions and objectives. The aim of this phase is to get the

findings of the land planning system and the characteristics of urban sprawl phenomena.

The third phase is case study selection and examination, as a representative example within Japan context conducted by GIS tools which are better explained in chapter six. The fourth and last phase is data analysis and discussion.

RESEARCH FLOW DIAGRAM



2.3 Research method

Literature reviews, interviews and case study

The process to collect information and data for the purpose of the present research consists of **literature reviews**, **interviews** and **case study** (by GIS tools).

This research focuses mainly on the urban sprawl issue for this purpose, an extensive and relevant literature review was conducted in an attempt to provide a theoretical foundation for the research project. The **literature review** provided scientific explanations for the research question(s) and enabled me to verify my findings and to compare these with the work of other scholars in the field of instructional leadership. According to Neuman (1997), a literature review is based on the assumption that knowledge accumulates and that we learn from, and build on, what others have done. Literature reviews can take various forms, namely: contextual, historical, theoretical, integrative, methodological and meta-analysis. Each type of review has a specific goal (Mafuwane, 2011).

Neuman (1997) indicates that the goals of a literature review are: *demonstrating the researcher 's familiarity with a body of knowledge that already exists about the subjects of research and establishing the credibility of such knowledge; showing the path of prior research and how the current project is linked to already completed research; integrating and summarizing what is known in and about his/her area of research; learning from others, and stimulating new ideas.*

This research thesis, in line with Neuman 's (1997) goals above, used existing literature to investigate the evolution of the recent scholars related to the sprawl theme in various contexts; but also exploring the widely accepted

models, definitions and theories, and how the concept manifests itself as an accepted practice in the improvement of learner achievement.

Another way to investigate is by interviews, Seale, Giampietro, Gubrium and Silverman (2004) define an **interview** as a *social encounter where speakers collaborate in producing retrospective and prospective accounts or versions of their past or future actions, experiences, feelings, and thoughts*. One type of interview was used in this study, namely structured interviews.

Collection of the structured interview data involved interaction between the researcher and the respondents which needed to be documented. For the purpose of this study, I took notes about the key points expressed. After the interviews, I reviewed the notes and wrote down direct quotes that were found to be relevant. As the interviewer, I served only as a facilitator who encouraged the interviewees to respond. For the purpose of this study, I used two methods to analyze the data from the structured interviews: an interpretative phenomenological analysis, and a hermeneutical analysis (Mafuwane, 2011). The interpretative phenomenological analysis refers to the structure and essence of an experience of the respondents with regard to the phenomenon being studied, in this case, instructional leadership and its impact on learner performance. The principals responded to questions that required them to express themselves in terms of their experiences as principals (Medico, 2005).

The hermeneutical analysis is also an interpretative approach that emphasizes the importance of the views of the participants based on their experience and their standpoint (Ozkan, Davis & Johnson, 2006). Implicit in hermeneutical analysis, according to Willis, Jost and Nilakanta (2003), is the concept of —hermeneutic circles‖ which suggests that:

“...we come to understand a complex whole from preconceptions about the meanings of its parts and their interrelationships...the movements of

understanding are constantly from the whole to the part and back to the whole. Our task is to extend in concentric circles in the unity of the understood meaning.” Based on Willis et al. (2003), the purpose of structured interviews was to obtain the interviewee's lived experiences with regard to their roles as instructional leaders, taking into consideration their subjectivity and their socio-historical backgrounds (Mafuwane, 2011).

Structured interviews were conducted with two professors (Prof. Fumihiko Seta, Prof. Akito Murayama) and one student (Hiroshi Obara) during the time that I have spent in Japan at the University of Tokyo. This enabled me to induce first-hand information from them with regard to their experiences, challenges, frustrations, and opinions. The questions are mostly open-ended, making it possible for the interviewer to add new questions during the interviewing process, depending on the responses of the participants. These interviews were focused on five main questions, which were designed to get the first base information about the Japanese planning system framework, actors and recent developments as is reported below.

- How is structured the present land planning system in Japan?
- What is the vision? What are the main goals?
- Do you think there were big changes in the last decades?
- Who are the actors/stakeholders which are playing a role (who, roles, relationships)?
- What is the role of the Central Government at the local level?

According to the definition of **case study** research methodology, there is no doubt that this way of investigation is one of the most powerful methods used by researchers to achieve practical and theoretical aims. Case study

research has a level of flexibility that is not readily offered by other qualitative approaches such as grounded theory or phenomenology. Case studies are designed to suit the case and research question and published case studies demonstrate wide diversity in study design (Hyett, Kenny, & Dickson-Swift, 2014). This is particularly true in today's environment to cope with the growing frequency and magnitude of changes in technology and managerial methods (Voss, Tsiriktsis, & Frohlich, 2002), researchers in technology and innovation management need to use more field-based research methods (<https://journals.sagepub.com/doi/10.1177/1609406918817954>). A case study is expected to capture the complexity of a single case, and the methodology that enables this has developed within the social sciences. Such methodology is applied not only in the social sciences, such as psychology, sociology, anthropology, and economics, but also in practice-oriented fields such as environmental studies, social work, education, and business studies (Johansson, 2003).

Dul and Hak (2008) define the case study as a study in which *one case* (single case study) *or a small number of cases* (comparative case study) *in their real-life context are selected and scores obtained from these cases are analyzed in a qualitative manner*. In our case, I decided to take three case studies located within the Tokyo metropolitan area in Saitama Prefecture and suitable to explain the evolution of urban sprawl phenomena especially in the urban fringe and suburban settlements.

3. THE CONCEPT OF URBAN SPRAWL

3.1 Introduction

The formation of urban planning can be dating back to the primary cities. On the other hand, the contemporary theory of urban design begin to develop in Britain in the mid-nineteen century "...as a reaction against the industrialization which had created such great inequalities in living conditions by exploiting for profit whatever did not have to be paid for directly, such as housing, air, water and workers' health" (Relph, 1987).

Elkin, (1991) believes that before the industrial revolution, people preferred to live in rural areas. Although cities had been planned for decades, after the industrial revolution only a small percentage of people lived in cities (Arbury, 2005). After the Industrial Revolution urban areas extended further than any other period of time in history. This process is called urbanization (Shirkhanloo, 2013). This phenomenon is taking place in developed or developing countries where human beings live. Most countries have the basic potential of this universal phenomenon that is mainly responsible for increasing the population and economy (Sudhiraa & Ramachandraa & Jagadishb, 2004). The excessive growth rate of the population as a result of urbanization has led to upward growth of cities, which as consequence cities missed their realms and boundaries (Habibia & Asadib, 2011; Daramola & Ibem, 2010). Unplanned urbanization and dynamic urban development led to different types of urban forms that urban sprawl is a primary form of urban development (Bhatta, 2010; Sudhira, 2008; Arbury, 2005). The word sprawl is given birth in North America during the mid of the '60s, when characteristics, determinants, and results of this strange phenomenon of rapid urban expansion became a subject of the interest among planners and policymakers and started to be formally analyzed (Altshuler, 1977).

Urban sprawl has been the main feature of Urbanization since World War II in several advanced countries such as the USA, Australia, Canada, Japan and most of the industrialized European countries. According to this introduction, the aim of this chapter is clarifying definitions and main characters of urban sprawl.

3.2 Defining urban sprawl

Based on extensive studies, urban sprawl is extremely difficult to define. The urban sprawl phenomenon has been deeply investigated by North American researchers (e.g. Downs 1999, Ewing et al. 2002, Hasse and Lathrop 2003, Lopez and Hynes 2003 as cited in Shir Khanloo, 2013). There are innumerable reasons for these difficulties. One of these reasons is that the word “sprawl” is used in different discussions such as science, public, and policy. Therefore, there are countable definitions of urban sprawl (Maier & Franz & Schrock, 2006). In the Oxford dictionary, the term has been defined as “the disorganized and unattractive expansion of an urban or industrial area into the adjoining countryside”. Sprawl has been expressed in the “European Environment Agency” (EEA) as the physical plan of low-density growth of large urban zones, under market requirements, chiefly into the surrounding agricultural zones (Habibia & Asadib, 2011).

Many scholars tried to define urban sprawl. Brueckner (2000) described urban sprawl as an excessive spatial expansion of cities. “Sprawl ... is composed of areas of essentially urban character located at the urban fringe but which are scattered or strung out, or surrounded by, or adjacent to undeveloped sites or agricultural uses” (Harvey & Clark, 1965). “The scattering of new development on isolated tracts, separated from other areas by vacant land” (Ottensmann, 1977). According to Ewing (2008) viewpoints, sprawl can be introduced in four aspects

which can be evaluated and criticized: residential density; neighborhood composed of houses, job, and facilities; strength of activity centers; also ease of movement. In another study, Ewing (1997) claims that the main indicators can be defined as poor accessibility and less functional open spaces. “Continuous low-density residential development on the metropolitan fringe, ribbon low-density development along major suburban highways, and development that leapfrogs past undeveloped land to leave a patchwork of developed and undeveloped tracts” (Altshuler & Gomez-Ibanez, 1993. P.67). In other research, Song and Zenou have described urban sprawl as low-density expansion in the border of cities. In this development, the use of land is more than the growth of the population. Sierra club defines sprawl in their report of *The Dark Side of the American Dream* as “low-density development beyond the edge of service and employment, which separates where people live from where they shop, work, recreate and educate—thus requiring cars to move between zones”. Therefore, scholars in the Sierra Club believe that the definition of sprawl is not only based on its characteristics but also is based on its effects (Shirkhanloo, 2013). Longley et al. (2002) interpreted that based on numerous crucial elements a definition of urban sprawl can be fed accordingly. Based on the last interpretation of sprawl, urban sprawl can also be defined in these ways:

Sprawl definition based on the urban form: With respect to this type of definition, sprawl is not a particular urban form, but ranging from strip to scattered development. Accordingly, Ewing (1994) and Pendall (1999) refer to these types of urban sprawl over a linear pattern of compact development to scattered development (Maier& Franz & Schrock, 2006 as cited in Shirkhanloo, 2013).

Sprawl definition based on land use: Another criterion for defining urban sprawl is land use layouts. In (1998), “The Transportation Research Board” has listed the characteristics of urban sprawl such as low-density housing expansion, single-family houses with dispersed blocks, mixed uses such as shopping malls and etc. As a whole, the essence of this approach is that sprawl is defined as low-density urban development with a separation of functions (Maier& Franz & Schrock, 2006 as cited in Shir Khanloo, 2013).

Definition based on impacts: Ewing (1994) and Johnson (2001) believe that different urban forms including sprawl are extremely debatable and important. Therefore, these terms are not distinguishable, and it is suggested, that urban sprawl be defined by its costs and negative impacts. Al Gore (cit. in Wassmer 2002) believes that in such a circumstance, all negative impacts of urban form could be referred to urban sprawl, as the “enemy” (Shir Khanloo, 2013).

Definitions of sprawl based on density: Scholars and researchers gave many more definitions of sprawl based on the density criteria. Generally, sprawl is directly related to low-density urban growth. In many definitions, density in urban sprawl acts as an indicator of land-use intensity which represents the ratio between the inhabitants of an area and a given land area (Maier& Franz & Schrock, 2006 as cited in Shir Khanloo, 2013).

Varied definitions of urban sprawl have been mentioned, but still, there is a lack of a precise definition. Although, there is an absence of a clear definition of urban sprawl, however, few definitions have gotten general acceptance defining a number of characteristics. In this respect, urban sprawl

defines as a certain form of urban development that described by low-density, leapfrog, commercial strip expansion and discontinuity (Ewing, 1997; Downs 1999; Galster et al., 2001; Malpezzi and Guo, 2001). Therefore, based on studies and researches a beneficial definition of urban sprawl could be provided with a measure that lets us clearly distinguish time and place of urban sprawl. Unfortunately, scholars believe that none of the commonly used definitions fulfill this requirement (Maier& Franz & Schrock, 2006 as cited in Shirkhanloo, 2013).

3.3 Characteristics of Urban Sprawl

As mentioned above, innumerable of the sprawl's characters have been mentioned by scholars in the last decades. Burchell et al. (1998) give a list of following characteristics of urban sprawl:

- Low residential density;
- Leapfrog development;
- No centralized ownership of land or planning of development;
- Spatial segregation of different types of land uses through zoning regulations;
- Transportation dominated by privately motor vehicles;
- Unlimited extension of new development;
- Widespread commercial strip development along major roadways;
- Fragmentation of governance authority over land uses between many local governments;

Accordingly, a broad wide discussion will be brought with this classification the main problem with this list is that the limitation and distinction between causes, characteristics, and consequences of sprawl is vague (Maier& Franz & Schrock, 2006 as cited in Shirkhanloo, 2013). Galster

et al (2001) give the most explicit delineation of characteristics of urban sprawl.

Galster characterizes sprawl in 8 main dimensions:

- Density: is a widely used indicator of sprawl whereby different types of density can be described.
- Continuity: is the degree to which the unused land has been built densely in an unbroken fashion. Sprawl can be continuous or discontinuous in other places.
- Concentration: describes the degree to which development is located disproportionately rather than spread evenly.
- Clustering: sprawl is frequently clustered what means that it only occupies a small portion of the respective land area.
- Centrality: the loss of centrality is one of the most serious issues about sprawl;
- Nuclearity: describes the extent to which an urban area is characterized by a mononuclear pattern of development;
- Mixed uses: sprawl is seen as a process that separates the different kinds of land uses;
- Proximity: proximity is the degree to which land uses patches are close to each other (residential, tertiary, commercial, etc.).

Besides what mentioned earlier as the characteristics of urban sprawl, some scholars characterized urban sprawl as different spatial forms which will be discussed in the next section (Harvey and Clark 1971; Gillham 2002 as cited in Shirkhanloo, 2013).

3.4 Driving forces for Urban Sprawl

According to statements of scholars in various researches, sprawl is a feature of development on urban settlements strictly related to land-use changes and urban transformation. In this respect, millions of separate choices that have been made by individuals and governments are the end result of the transformation of land uses which have contributed to the urban sprawl phenomena. As will be explained in the forward paragraph there is a wide range of driving forces of urban sprawl in the different debates which will be mentioned a summary of these causative agents (Shirkhanloo, 2013).

Urban Expansion and Population Growth

As a whole, increasing the population of urban settlements is the primary and main reason for the expansion of urban areas throughout the world. Hence, there is no doubt that the growth of population is an indisputable fact and the majority of this population is becoming urbanized. In this regard, can be noted rapid expansion of cities is dominated by two factors: immigrations and the natural population growth (Bhatta, 2010 & Günay, 2007). Generally, cities provide a better opportunity for residents including higher wage rates, better services and lifestyles so, urban areas perceive as demanding places where one could have a better quality of life. Moreover, the perceived better access to services stimulates poor people from rural areas. Thus, seeking better economic prospects is one of the reasons that people mainly move into urban areas. Also, these conditions dramatically increased throughout the revolution era from a pre-industrial society to an industrial one (Bhatta, 2010 as cited in Shirkhanloo, 2013).

By and large, the rapid urban population growth may be a crucial factor contributing to cause unplanned and uncontrolled urban expansion such as sprawl. The explosive growth of urban areas puts increasing strain beyond their capacity to provide basic amenities such as energy, public services (health care and education), public transportation, sanitation infrastructure, and physical security. Since the growth of government revenue has declined to spend on the basic maintenance of cities and the provision of public and utility services, urban settlement turns into areas of massive sprawl and major environmental issues (Bhatta, 2010 as cited in Shir Khanloo, 2013).

Consumer Demand

There is no doubt that rather than two other factors, finding a definition for social factors and understanding their ultimate impacts on land-use pattern is extremely difficult, due to the transformation of land use at urban fringe is not always depending on environments factor but also human decisions play an important role in the development of an area. For instance, the outward extension of housing areas which are the major underlying factors for the development of sprawl is closely associated with the households' demand. Besides changes in lifestyle, major environmental issues in cities such as increased air pollution, noise, and crime in the center gave rise to move to suburbs (Günay, 2007 as cited in Shir Khanloo, 2013).

Employment and Economic Development

Generally, rapid expansion in the economic base can contribute to higher aggregate demand for new housing or more living space for individuals (Boyce 1963; Giuliano 1989; Bhatta 2009 as cited in Shir Khanloo, 2013). “Developments in information and communication technology have been a

major driver in economic expansion. New technologies have changed the economics of spatial decisions, both for consumers and businesses, and are facilitating the existing trend toward a more dispersed economy. Although the new technologies will technically enable firms and residents to disperse to rural areas, they are more likely to relocate both to lower cost metropolitan areas and to suburban and exurban locations within metros” (Heimlich and Anderson 2001 as cited in Shir Khanloo, 2013).

Infrastructure and Transportation

Evidence of urban planning shows that organically growing cities have tangible and predictable stages of development. After constructing new houses, people demand to have a better lifestyle such as new schools and the primary infrastructure is increased. As a consequence, density steadily rose. The new housing developments are built and occupied, the new residents realize they need new schools and improvements in the roads, sewers, and water supplies servicing the new housing; consequently, the expanded infrastructure then attracts more housing at higher densities. When a critical mass is reached, shopping centers and businesses follow the population, to serve them and to be closer to the labor force. Since infrastructure provides the base framework for new development, investments in this field act as one of the most important features of urbanization and urban sprawl (Heimlich and Anderson 2001). With the extensive explosion of population, wide main roads such as expressways and highways can act as the causative reason for congestion (Harvey and Clark 1965). So, a high level of population growth and demand on land requires closer access to the better-serviced areas which are along the roadsides. Due to this reason, sprawl firstly occurs through transportation axes in general (Shir Khanloo, 2013).

Poor planning quality

In many cases, there is a debate that, absence of consistent and well-experimented planning and development strategies may also contribute to urban sprawl (Bhatta, 2010). Local governments have minimal policy instruments to appreciate coming growth facing them, and there has generally been a lack of adequate planning policies and programs before population growth overcomes them (Günay, 2007). In some cities, authorities use exclusive zoning regulations; this means the separation of land uses. Zoning ordinance and regulations created isolated island fabrics for each type of development. Accordingly, in most cases, reliance on the automobile had become a mass-consumption commodity for transportation between residential units and the separate types of land uses, generating major issues of automobile dependency and excessive use of fossil fuels to raise environmental concerns such as pollution (Bhatta, 2010). As mentioned earlier, poor planning policies cause changes in the landscape and with the growth of population people's tendencies to move to suburb has been increased, hence, population growth, basic demands, and land-use change are connected (Günay, 2007 as cited in Shirkhanloo, 2013).

Lack of Affordable Housing

Increasing the costs of living is another reason for urban sprawl. "Affordable housing is a term used to describe dwelling units whose total housing costs are deemed affordable to those that have a median income" (Sani et al., 2012). Commonly community-wide affordability can be measured as the number of homes that a household with an average percentage of median income and property can afford. For instance, in a well-balanced real estate market, the median household income (and as well as the half of the

households that have greater income) could officially afford the median price of housing option, while those with lower wage-earner than the median household income could not afford to buy the median home (Shirkhanloo, 2013). As a result, a shortage of affordable housing in cities drives people to set their residences out of the communities in the countryside (Bhatta, 2010 as cited in Shirkhanloo, 2013).

4. URBAN SPRAWL IN JAPAN

4.1 Introduction

Japan as the other developed countries are experimenting with the sprawl phenomenon besides the rapid economic growth since the late 1950s until the present in this recession and depopulation phase. The chapter tries to describe the evolution of this phenomenon in the last century till today in Japan dividing this period of time into four main periods.

4.2 Socio-economic development and urbanization trends in Japan

1) Rapid Economic Growth and Urbanization (1950s to Early 1970s)

Since the late 1950s, Japan experienced rapid economic growth due to its expanding domestic demand and its overseas market. Real GNP increased by 1.53 times in 1960 and by 3.95 times in 1970. Economic growth brought about urbanization; which is clearly visible from the population's data. In 1950, the urban population was only 29.0 million (35% of the country's total), and this increased to 40.8 million (43%) in 1960, then to 55.5 million (53%) in 1970, or an annual growth rate of 3.0%. Urbanization concentrated in three main metropolitan areas, namely Tokyo, Osaka, and Nagoya. In 1962, migration to these three metropolitan areas peaked. In 10 years, from 1970 to 1980, more than 3.3 million people migrated to the Tokyo metropolitan area alone. For its industrial structure, the share of the secondary industry constantly increased from the 1950s to 1970. It shows that economic growth in this period was mainly driven by industrialization. Urban agglomerations formed in the three metropolitan areas mentioned above together with industrial clusters, boosting economic growth (World Bank, JICA, 2011).

2) Motorization and Expansion of Urban Areas (Mid-1970s to Mid-1980s)

Notwithstanding the negative economic performance due to two oil shocks in 1973 and 1979, this period experienced continuous economic growth at an annual growth rate of 4%. Japan's industrial structure changed with a shift from heavy industries to processing/assembly and the increase in the share of the third sector, services. The urban population also continuously increased at an annual growth rate of 2.3% from 1970 to 1980. Motorization ratcheted up as the economy and the Japanese people became stronger. While the national number of vehicles stood at only 358,000 in 1950, this dramatically increased to 2.3 million by 1960, then 18.2 million in 1970, and 37.9 million in 1980. Vehicle ownership per 1,000 population jumped from 4.3 vehicles to 24.6 in 1960, 175 in 1970, and 324 in 1980. The increase in urban population and motorization accelerated sprawl in the urban areas. Since the area of densely inhabited districts (DIDs) increased at a pace exceeding that of DID populations, DID population density decreased continuously since the middle of the 1970s. At the same time, concentration in big metropolitan areas diminished from the late 1970s to the early 1980s partly due to economic slowdown after the oil shocks. The subsequent economic recovery resumed the flow of population into metropolitan areas; the overconcentration in the Tokyo metropolitan area accelerated further (World Bank, JICA, 2011).

3) Bubble Economy (Mid-1980s to 1990s)

In the 1980s, Japan entered a bubble economy and experienced annual economic growth rates of over 6% especially in the latter part of the decade. The high dependence of the economy on the tertiary sector, together with the informatization and internationalization trends, encouraged the location of corporate headquarters in central Tokyo; due to these phenomena, the

concentration of population in the Tokyo metropolitan area also continued. As a result, demand for office spaces in central Tokyo rapidly increased which was followed by the increase in land prices in commercial areas and the urban center since the early 1980s. Such a rise in land prices started to spread throughout the Tokyo metropolitan area. A survey conducted in 1986 showed that commercial land prices in the fringe areas of Tokyo, at major terminal areas, and in southwestern Tokyo increased by 20% to 30%. Likewise, residential land prices in areas within 5 km from the city center increased by 22.7%, by 12.3% within 10 km, and 7.7% within 15 km from the city center. After peaking in 1987, land prices in commercial areas stopped increasing and those in the residential areas registered negative growth during that year. Land price increase in the bubble economy contributed to further suburbanization of residential areas (World Bank, JICA, 2011).

In the early 1990s, the bubble economy collapsed as a result also the overconcentration in the TMA decreased consequently. In the meantime, the expansion of urban areas continued as economic growth and motorization.

4) Economic Recession and Depopulation (2000s)

Population increase started to slow down from the early 2000s and Japan officially entered a depopulation period in 2005. Even in medium-sized cities, populations started to fall in 2005 and this trend is expected to start in metropolitan areas by 2015. On the other hand, overconcentration in the Tokyo metropolitan area continues. Along with population decrease, Japanese society now faces an accelerating change in its social structure including an aging population and declining birth rate. If the percentage of the population over 65 years old was 12.1% in 1990, its share increased to 17.4% in 2000 and 22.5% in 2010. The rate is estimated to reach 27.8% by 2020. Along with the trend

toward a nuclear family and the increasing rate of unmarried people, the number of households increased from 38.0 million in 1985 to 46.8 million in 2000 and 48.2 million in 2005. The percentage of single-member households was 29% in Japan and 32% in the Tokyo metropolitan area in 2005 (World Bank, JICA, 2011).

4.3 Urban sprawl and subsequent urban problems

Urbanization and motorization resulted in suburbanization and consequently the expansion of urban areas. The population density in the DIDs continued to decline since the late 1960s, which was particularly visible in medium-sized cities. DID population density in metropolitan areas, such as Tokyo, Osaka, Kanagawa, and Aichi, increased or was stable since the late 1980s; that in other medium-sized cities declined. The decline in population density in the central areas and the expansion of urban areas, combined with emerging large-scale suburban shopping centers, caused the deterioration of the central urban areas. Central shopping streets hollowed out, and vacant stores started becoming prominent. The percentage of central shopping streets with more than 10% of vacant stores increased from 28% in 2000 to 30% in 2003 and 38% in 2006 (World Bank, JICA, 2011).

A city with dispersed urban areas faces serious problems in public transportation. The modal share of railway, including JR and private rail in medium-sized cities, decreased continuously from 26.3% in 1967, 18.0% in 1975, and 10.0% in 1998. It further fell to 8.0% in 2003. This trend is particularly evident with regard to bus transportation whose modal share declined to 8% in 2003 from 45.9% in 1967. The decline in the use of public

transportation has increased accordingly the dependence on private cars, which had a modal share of 84% in 2003 as is possible to observe in the graph below.

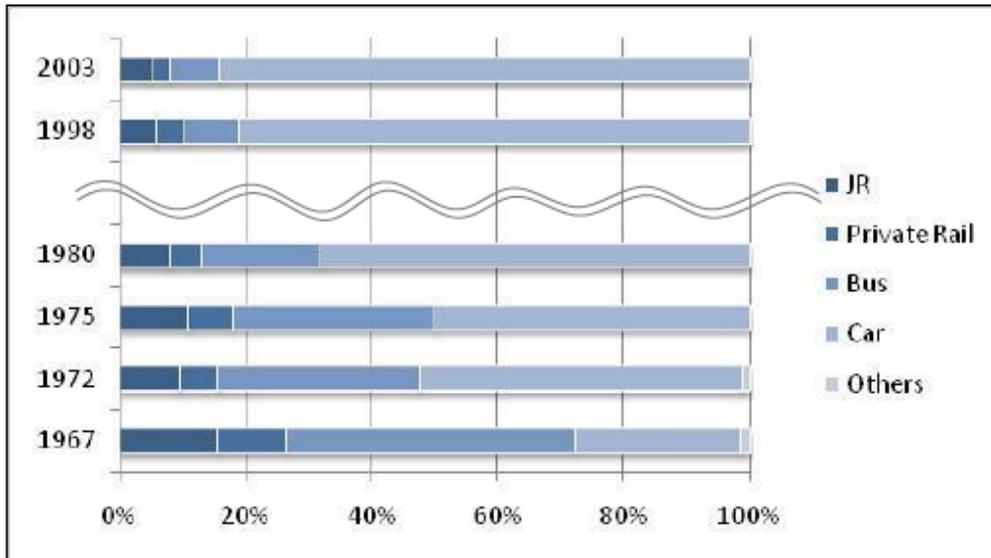


Table 3 Trend of modal shares in medium-sized cities (Source: MLIT)

Another subsequent urban issue arisen from economic growth (the 1950s to 1970s) is the air pollution problem. Smoke and dust due to coal-based industrialization just after World War II seriously affected air quality and caused respiratory problems. Pollution and its associated health problems became major social concerns. Pollution in the early stage of Japan's economic growth was mostly attributed to specific sources, which are mainly factories, or end-of-pipe pollution. Since the contaminant sources were agglomerated in industrial areas, it was easy to identify pollutant sources and take action against end-of-pipe pollution. As a result, environmental conditions of air, water, and so on, improved greatly after a series of countermeasures (World Bank, JICA, 2011).

However, in the late 1970s, urban-oriented pollution became predominantly and sources were dispersed throughout the whole city. The increase of motorization engendered a different type of pollution, i.e., air

pollution due to vehicle emissions. Another indicator of air pollution is nitrogen dioxide (NO₂) density, which rapidly increased in the late 1970s, somehow improved in the 1980s owing to the introduction of vehicle emission regulations; but photochemical oxidant density even became worse after improvements in the 1980s due to the gas emitted by diesel cars. Economic growth and urbanization increased also the volume of wastes. From the 1950s and 1960s, Japan turned into a mass production and mass consumption society due to the socio-economic changing, resulting in the rapid increase of generated waste. The annual total amount of generated solid waste was about 7,000 tons in 1955, and this jumped to 30,000 tons in 1970, or an increase of 3 times within 15 years (World Bank, JICA, 2011).

Along with urbanization issues, it became more difficult to provide incinerators and final waste disposal sites within urban areas due to environmental problems.

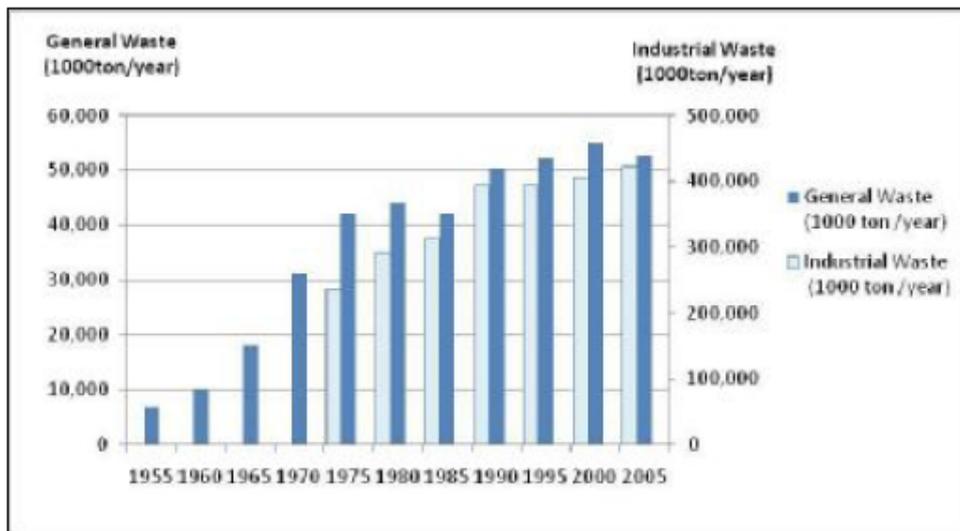


Table 4 Total amount of general and industrial waste from 1955 to 2005 (Source: MIC, 2020)

5. THE JAPANESE SPATIAL PLANNING APPROACH TO URBAN SPRAWL

5.1 Introduction

The chapter aiming to give an overview of Japan's country under geographical and demographical aspects. "A country's geography influences the development of its society and culture in many ways. Its location in relation to other nations has an effect on intercultural influences; its size affects demography, the development of social structures, and its position in the international community. Its topography dictates to a large extent where and how its people earn their livings, and its climate influences its" (<http://afe.easia.columbia.edu/japan/japanworkbook/geography/japgeo.html>). The map reported in the next chapter will show these and other aspects related to the influence of geography on national development.



Figure 4 View of a tourist hotspot in Tokyo - Demboin Temple Garden -where is possible to observe a melting pot of cultures (Source: author elaboration)

5.2 Japan's urban and geographical context



Figure 5 Cartography of Japan (Source: www.treccani.it)

Japan is an island nation situated off the eastern seaboard of the Eurasian continent in the northern hemisphere. The islands form a crescent-shaped archipelago stretching from northeast to southwest parallel to the continental coastline with the Sea of Japan in between. It consists of five main islands of Hokkaido, Honshu, Shikoku, Kyushu and Okinawa, and more than

6,800 smaller islands of varying sizes. Its surface area totals approximately 378,000 square kilometers (MIC, 2018).

Based on the surveys of 2014, forestland and fields covered the largest portion of the nation's surface area. There are approximately 254,000 square kilometers of forestland and fields (which equates to 67 percent of the nation's surface area), followed by approximately 45,000 square kilometers of agricultural land (12 percent). Together, forestland, fields and agricultural land thus cover approximately 80 percent of the nation. Besides these data, it's also important to highlight the constant increase of developed land (around 5%) from 13.9 to 19.2 in the last years (approximately 20,000 square kilometers) (MIC, 2018).

(1,000 square kilometers)							
Year	Total	Forestland and fields	Agricultural land	Inland water	Roads ¹⁾	Developed land ²⁾	Others
1980	377.7	256.8	55.9	13.1	9.9	13.9	28.1
1990	377.7	255.2	53.3	13.1	11.4	16.0	28.7
2000	377.9	253.8	49.1	13.5	12.7	17.9	30.9
2010	377.9	253.5	46.7	13.3	13.6	19.0	31.9
2014	378.0	254.0	45.4	13.4	13.7	19.2	32.3
Percentage distribution (%)							
2014	100.0	67.2	12.0	3.5	3.6	5.1	8.6

1) Including farm roads and forest roads, etc. 2) Such as residential and industrial land.

Table 5 Surface Area by Use Japan (Source: MLIT 2018)

From the eighteenth century through the first half of the nineteenth century, Japan's population remained steady at about 30 million. Following the Meiji Restoration in 1868, it began expanding in tandem with the drive to build a modern nation-state. In 1926, it reached 60 million, and in 1967, it surpassed the 100 million mark. However, Japan's population growth has slowed in more recent years, with the rate of population change about one percent from the 1960s through the 1970s. Since the 1980s, it has declined sharply. Japan's total population was 127.09 million according to the Population Census in 2015. This was a decrease by 962,607 people as compared to the previous Census

(2010), indicating the first population decline since the initiation of the Population Census in 1920. In 2017, it was 126.71 million, down by 227,000 from the year before. In 2015, Tokyo Metropolis had the largest population of 13.52 million among Japan's 47 prefectures, followed in decreasing order by the prefectures of Kanagawa, Osaka, Aichi, and Saitama. These five prefectures each had a population of 7 million or more and together accounted for 36.4 percent of the total population. In addition, the population density in Tokyo Metropolis was the highest among Japan's prefectures, at 6,168.7 persons per square kilometer. This was almost 18.1 times the national average (MIC, 2018).

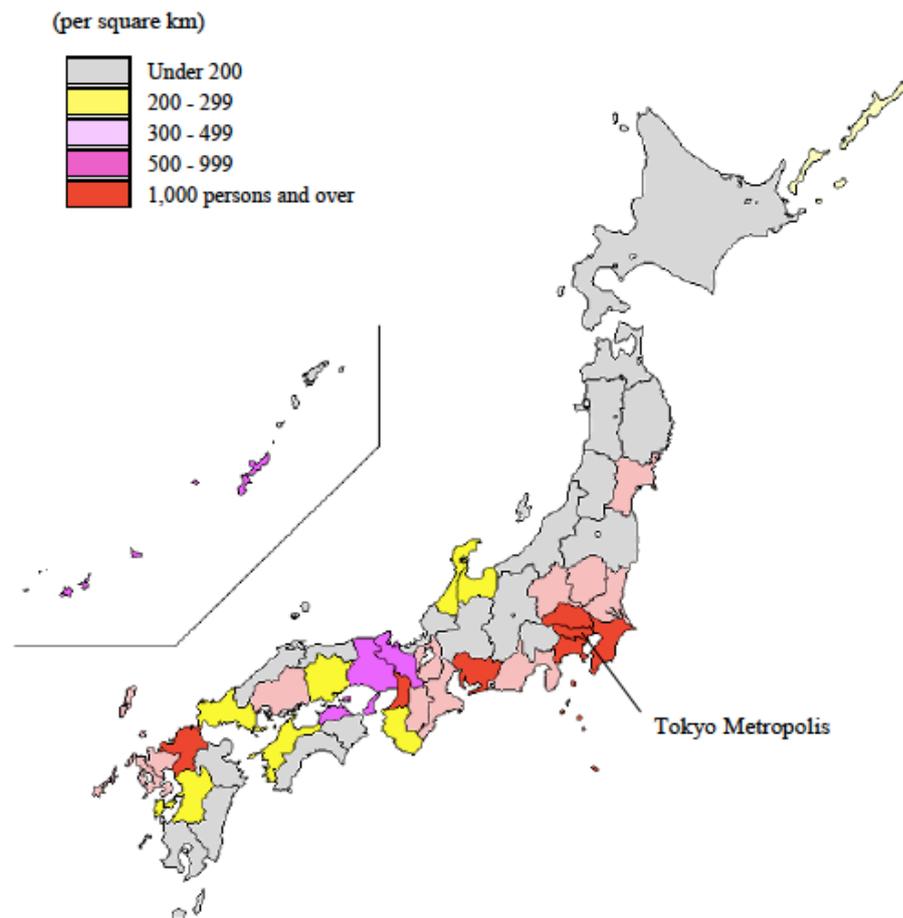


Table 6 Population Density by Prefecture 2015 (Source: MIC Statistics Bureau 2015)

The Ministry of Land, Infrastructure, Transport, and Tourism has estimated the population for each 1km² in a grid of Japan in 2050, indicating that population in the year will fall by at least 50% from the present levels in about 63% of inhabited grid squares and to zero in about 19% of such squares. Squares with a lower population will see faster drops in population. Regions including such squares will lose shopping, medical care, nursing care, and other life support services remarkably and have difficulty in maintaining the present living standards (MLIT, 2015).

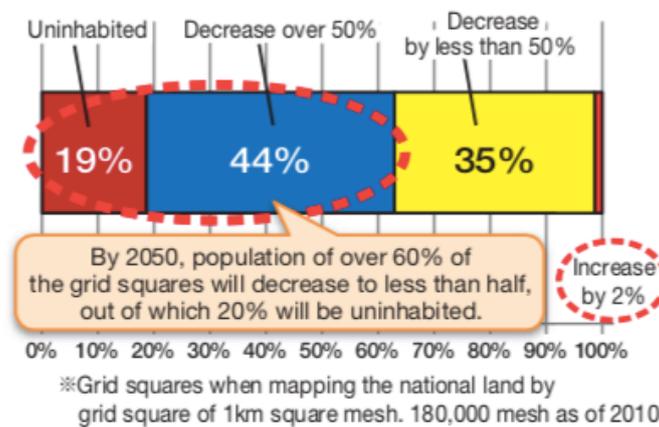


Table 7 Number of grid squares by population change rate from 2010 to 2050 (Source: MLIT, 2015)

In order to mitigate the uneven population distribution, Japan will have to cap the outflow of the population from rural regions to the Tokyo region and correct the excess concentration in Tokyo.

The elderly's share of the total population in Japan exceeded 25% in 2013, indicating that Japan has become the **world's most aged society**. Particularly, the birth-rate fell, and baby-boomers' aging has brought about a further fall in the young or productive population and a further increase in the elderly population over recent years, leading the aging of Japanese society to accelerate. **The elderly's share of the population** is expected to continue

rising in the future, exceeding 30% in 2025 and approaching **40% in 2050**. The elderly population is expected to peak in rural regions around 2025 and continue substantial growth in large metropolitan regions (MLIT, 2015).

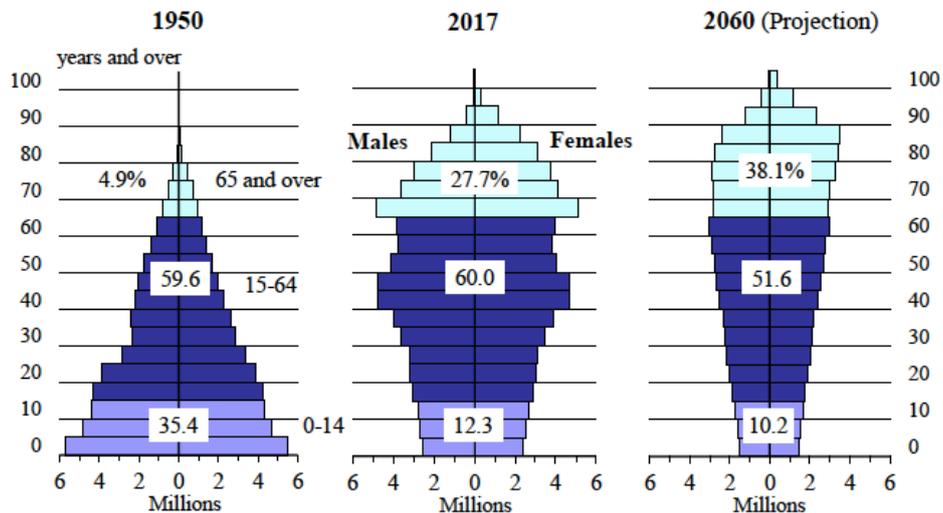


Table 8 Changes in the Population Pyramid (Source: MIC, 2018)

The decline in population is exerting great impacts on national land space. In rural regions where the population has already been decreasing, problems have been emerging, including underutilized or unutilized downtown land, deserted farmland, forests which have not been managed adequately, and land lots whose owners are difficult to find. Vacant houses have increased in rural regions and suburbs of large metropolitan regions and are expected to increase further in line with a decline in the number of households. At the same time, a population decline can generate surplus spaces through a drop-in development pressure, providing an opportunity to manage such spaces systematically, strategically and slowly for improving natural and living environments (MLIT, 2015).

5.3 Overview of the spatial planning system in Japan

New settlement planning was practiced in the Japanese archipelago by ancient times, and the Tokugawa (military regime), who imposed a sense of social order on the city through spatial hierarchy within its castle towns. Today, these urban structures underlay the urban fabric that characterizes many of Japan's greatest cities. Following Meiji Restoration (1868), Meiji government officials once again looked outward for models of urban planning and architectural practice. This was an age of experimentation as the newly formed imperial government encountered Western cities and ideas after centuries of self-imposed isolation (Sorensen, 2002 as mentioned in Hauk, 2015).

As a product of this first phase in 1888 was adopted Tokyo City Improvement Ordinance (TCIO), while visionary plans produced by foreign specialists, such as William Beckmann and Hermann Ende, remained on the periphery of City (Hein, Fievé, Waley, 2003). Nevertheless, Western ideas and techniques were gradually folded into Japanese urban planning and architecture through small-scale projects and planning law. The planning legislation that emerged out of this context, such as the 1919 City Planning Law, shaped the development of Japan's cities throughout the following century, establishing the framework through which the central government would affect urban change (Hauk, 2015).

After the end of World War II, the nation began to revise its planning laws and propose new legislation that would enable the country to reconstruct its cities, and with it, its national identity. While many of the reconstruction plans produced in the fifteen years after the war ultimately had little effect such as the National Capital Region Development Plan (NCRDP) of 1958, on the

other hand, the 1963 New Residential Town Development Act, paved the way for the conceptualization and construction of new towns across the nation (Amati, 2008 as mentioned in Hauk, 2015). From ancient Japan to the Western-style new towns built during the post-war period, city planning in Japan functioned as a technology wielded by the state to construct a new urban, social, and political vision.

The first regional plans for Tokyo also emerged out of this context, with Tokyo governor Matsuda Michiyuki's Tokyo Plan published in 1880. His plan referenced Paris as a model by concentrating commerce near the port and redeveloping central buildings into multi-story stone buildings across Tokyo's fifteen wards (Sorensen, 2002). Although the Meiji Period produced no influential plans for the city and integration of Western thought into architectural and urban planning practice was in its infancy, it did give rise to the nation's first wave of planning legislation that would shape how Japanese cities would develop in the following century (Hauk, 2015). In 1873, the Meiji government passed the Land Tax Act, dramatically transforming land ownership and revenue collection through the assessment of land value. This created a class of small-scale landowners as well as a system of land registration that allowed land to be bought or sold (Sorensen; 2002). The cabinet passed the first comprehensive planning system with the inauguration of the TCIO in 1888, establishing a "national program [oriented] toward the modernization of the imperial capital of Tokyo through the improvement of public facilities such as roads and parks" (Watanabe, 2010 as mentioned in Hauk, 2015).

The TCIO was essentially an infrastructural plan, not a building code or a visionary plan for the city, focusing first on the development of water

infrastructure (1888-1899), road improvements (1900-1910) and finally sewerage projects (1911-1918). It also enabled the development of Hibiya Park, one of Tokyo's only large parks, although it was intended more as a statement of monumentality than a place for public leisure. These efforts did not succeed in reorganizing the city or creating public space, but they did concentrate planning power in the hands of the central government and begin the process of modernizing the city. The nation's first city planning system was finally introduced with Ikeda Hiroshi's 1919. At the same time, Tokyo Imperial University professors, Sano Toshikata, Uchida Yoshizō, and Kasahara Toshiro drafted the nation's first building code (Sorensen, 2002). The city planning system consisted of five main parts: land-use zoning, a building code, a building line system, facility designations, and a land readjustment policy. Although the law did not require a rigid separation of land zone types, it did establish a framework for the city and designated special zones meant to preserve scenic and cultural areas, as well as establish fire prevention zones. The introduction of a land readjustment policy also enabled the government to move forward more easily with the development of hard infrastructure. This would later prove critical to urban planning and reorganization throughout the twentieth century, particularly in the construction of large-scale housing estates and new towns following World War II (Hauk, 2015). Although it ultimately failed to introduce coveted green space into the city or radically transform it, the 1919 city planning system did help the government to gain some control over the already rapidly developing urban fringe, creating more orderly cities and defining street grids (Sorensen, 2002). Ultimately it established the framework through which the central government would impact the city.

The institutional nature of city planning in postwar Japan, which revolved around the close relationship between the bureaucracy and academia, was rooted in the city planning practices and relationships of the early twentieth century. The planning laws and practices established during the Meiji Period (1912-1926) continued to frame the evolution of Japan's cities throughout the early twentieth century until revisions were introduced following the war. (Even then, these revisions did not introduce a major shift from the past, but rather built upon the earlier laws.) The first revision to the City Planning Law was enacted in 1940 to enable the purchase and designation of space for air defense and greenbelts. This was the product of growing interest in a decentralist metropolitan planning that grew out of the 1924 Amsterdam International City Planning Conference. This interest was reflected in the Kantō Region Metropolitan Structure Plan proposed by the Home Ministry earlier that year that incorporated the garden city model, including greenbelts and satellite cities, and designated areas for industrial development (Sorensen, 2002).

The idea of the greenbelt and satellite city would continue to linger throughout the early postwar period. During World War II, planning power became even more concentrated in the hands of the central government than it had been in the early twentieth century; this was reinforced by a series of legislation in the late 1940s and 1950s that introduced new ways for the government to enact change in the city. World War II had left the nation in a state of disrepair, necessitating a large-scale reconstruction effort and refocusing the nation on economic growth. In 1948, the Ministry of Construction (MOC) took full control of urban planning on a national level and a hierarchical system of national, prefectural, and municipal levels was put in place, and in 1950, the Buildings Standard Act was passed, revising the 1919

city planning system to “encourage orderly city planning” through a new set of building regulations (Hauk, 2015). In 1954, the 1919 city planning system's land readjustment regulations were consolidated into a new Land Readjustment Act that eased the national government's ability to “subsidize local government initiated projects,” and enabled public housing agencies to pre-emptively purchase any lot that came to market in order to gain the necessary land holdings for large-scale housing estate and infrastructure development (Sorensen, 2002 as mentioned in Hauk, 2015).

When the Ministry of Construction's New Residential Town Development Act (New Town Act) followed in 1963, it took advantage of the Land Readjustment Act, promoting the construction of large-scale residential new towns by the Japan Housing Corporation (JHC), local housing agencies, and municipal governments across the nation in the following decades. By 1975, 188 new towns spanning more than 50,000 hectares were completed under this program (Sorensen, 2002).

A New City Planning Law was finally passed in 1968, replacing the early 1919 city planning system and further centralizing planning power in the hands of national bureaucrats at the expense of the individual municipalities. It did this by delegating planning responsibilities to municipal governments while dominating “legal controls, financial controls, and personnel transfers” (Watanabe, 20010). The 1968 New City Planning Law, which aimed to control urban growth through the division of the city into two urban zones, the Urban Promotion Area and the Urban Control Area, remains in effect to this day (Amati,2008). In addition to prompting a revision of planning legislation, the destruction wrought by World War II encouraged a series of reconstruction plans for Japan's capital city, Tokyo, that, although mostly unrealized, created the theoretical framework for the development of Japan's post-war new towns.

The central government also began to issue regional reconstruction plans in an effort to take advantage of the opportunity to reimagine the Japanese city (Hauk, 2015). At the same time concern about the over-concentration of the city prompted renewed interest in decentralist policies while a fixation on economic growth prioritized the industrial in urban planning policy. In the 1950s the National Capital Construction Law and the Comprehensive National Land Development Act, planning efforts were focused on the city of Tokyo, and in 1946 the National Capital Regional Development Law followed, promoting decentralist policies for the city. By 1956 the National Capital Sphere Redevelopment Act was passed and in 1958 the first National Capital Region Development Plan (NCRDP) was released, marking Tokyo's second attempt to establish a greenbelt and series of new satellite towns around Tokyo a scheme based on Ishikawa Hideaki's visionary 1946 plan for the reconstruction of Tokyo that shared strong parallels with contemporary plans in Europe, most notably Sir Patrick Abercrombie's Greater London Plan 1944 (Hauk, 2015). These plans were also not realized, again due to "fierce opposition from farmers and municipalities neighboring Tokyo," as well as a lack of support from the central government, who in reality was more interested in centralist schemes that would bolster economic growth (Amati, 2008).

On a national scale, the Comprehensive National Development Plans (CNDP) were passed in 1962, intensifying urbanization by designating fifteen New Industrial Cities in an attempt to encourage industrialization and balance national development. These plans were heavily focused on the development of industrial zones and supporting infrastructure economic growth was the central government's preoccupation at the time but generally neglected the development of residential zones, civic space, or sewerage, perpetuating an

ongoing housing crisis that developed during the war (Amati, 2008). Interestingly enough, both the CNDPs and the NCRDPs served to further concentrate Japan's urban areas rather than decentralize them, as they focused on economic resources and industrial development in specific zones. While national reconstruction plans and new legislation ultimately did not, for the most part, alter the existing urban structure of Japanese cities in any imaginative or visionary way, they did pave the way for the development of large-scale housing projects, most notably new towns, that relied on laws like the 1954 Land Readjustment Act to move forward. In many ways, what the central government produced in the first fifteen years following World War II was a system of urban management that enabled them to produce prototypes of modern living through the post-war new towns (Hauk, 2015).

When Japan broke ground on its first new town in 1961, it did so within a national planning framework that had been in development for nearly a century. Much of what this framework produced was pragmatic, not visionary, as Hein has clearly shown in her chapter "Visionary Plans and Planners: Japanese Traditions and Western Influences," in *Japanese Capitals in Historical Perspective: Place, Power, and Memory in Kyoto, Edo, and Tokyo*. The wave of legislation and regional plans that grew out of the need to reconstruct Japan's largest cities continued to appropriate contemporary Western urban theory and practice to propose a new landscape for a modern, healthy and democratic nation. In the following years were adopted four plans, starting from the 1st Comprehensive National Development Plan that was formulated in 1962, the national and regional planning after the WWII had been centered around the Comprehensive National Development Plan, based on the Comprehensive National Land Development Act; The Comprehensive National Development Plan, which was established five times in the past, has

been formulated and promoted to solve various problems reflecting the needs of each era (Hauk, 2015).

5.4 System organization, powers's distribution and tools to face urban sprawl

Local government in Japan has its basis in the nation's Constitution, adopted in 1946, establishing the age of "local government," providing a legal basis for local government and recognizing the system of local government as part of the Constitutional system.

The Constitution of Japan, which went into effect on May 3, 1947, is based on three core principles: the sovereignty of the people, respect for fundamental human rights and pacifism. To control governmental power effectively through checks and balances, governmental power is separated into three independent branches: legislative, executive and judicial, and each contains a separate set of agencies and personnel (MIC 2018).

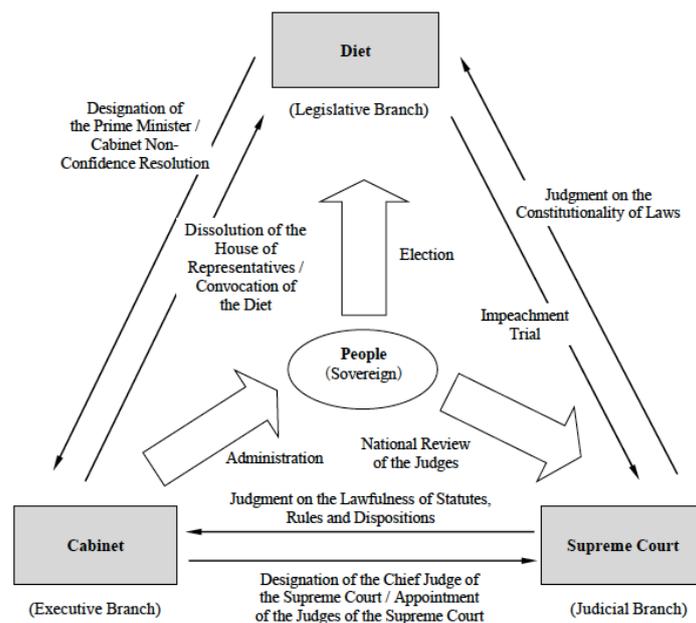


Figure 6 Separation of Powers under the Constitution of Japan (Source: Prime Minister of Japan and His Cabinet, 2018)

The Diet is the highest organ of state power and is the sole law-making organ of the State. The Diet consists of the House of Representatives and the House of Councillors. Both Houses consist of elected members, representative of all the people. The most important responsibility of the Diet is to enact legislation. The Diet also has the authority to fulfill a number of additional functions, including the deliberation and passage of the budget and other matters of fiscal importance, the approval of treaties, the designation of the Prime Minister and the initiation of motions to amend the Constitution. Each House may conduct investigations relating to the government, and demand the presence and testimony of witnesses, and the production of records. For the Diet to pass a resolution, the agreement of both Houses of the Diet is necessary. However, when the two Houses differ in their resolutions regarding legislative bills, draft budgets, the approval of treaties or the designation of the Prime Minister, under the terms of the Constitution, the decision of the House of Representatives overrides that of the House of Councillors (MIC, 2018).

The Cabinet exercises its executive power on the basis of the laws and budgets adopted by the Diet. The Cabinet, composed of the Prime Minister and other Ministers of State, is collectively responsible for the Diet, regarding the exercise of the executive power. The Prime Minister is elected in the Diet from among its members. The majority of the ministers of state to be appointed by the Prime Minister must be Diet members. Thus, Japan adopts the parliamentary Cabinet system, in which the organization and existence of the Cabinet rest on the confidence in the Diet (MIC, 2018).

The affairs of local governments are conducted on two levels in Japan: by the **prefectures** and by the **municipalities** within each prefecture. As of

April 1, 2018, Japan has 47 prefectures, within which there are 1,718 municipalities, plus the 23 Cities in metropolitan Tokyo. In order to strengthen the administrative and fiscal foundation of the municipalities, municipal mergers were promoted by law. Consequently, the number of municipalities was reduced by nearly half from the 3,232 existing at the end of March 1999. Municipalities that satisfy certain population criteria (i.e., 500,000 people or more) are eligible for designation as "Ordinance-designated cities". This designation gives them administrative and fiscal authority equivalent to those of prefectures. With the addition of Kumamoto City in April 2012, there are presently 20 cities that have earned this designation (MIC, 2018).

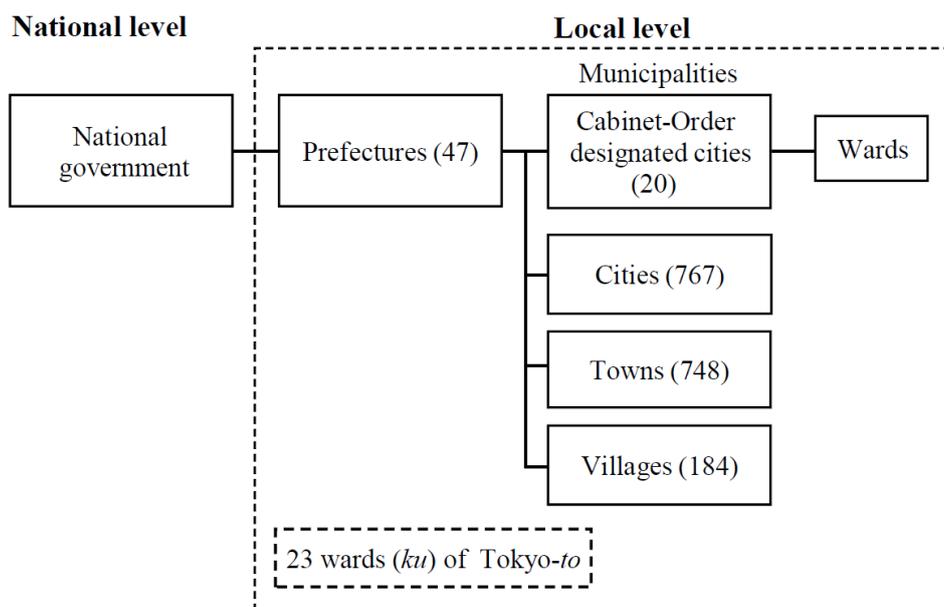


Table 9 Government System by Level (Source: Ministry of Internal Affairs, 2016)

Accordingly, a number of laws were enacted concerning local government, but the core legislation for dealing with its organization and management is the Local Government Law. The provisions of the Local Government Law deal mainly with residents' affairs, elected councils, and their executive bodies—all that which forms the core of local government. The

Law also defines the status of local governments, including their relationship with the national government as well as with other local governments, and has legal provisions for their financial affairs and other important administrative matters. As such, local government is clearly defined in Japan's Constitution and other national laws. The Local Government Law specifies that the basic units of local government shall be the prefectures and the municipalities.

Local government in Japan is based on a system introduced by the national government as part of its drive to modernize the country at the end of the last century. At that time the system reflected stronger national governmental control than that of today; the former practice of centrally appointed governors is just one example of how strong the control was. Much of that early system has been passed down to the present, though it has to be said that the local government's authority has increased substantially since the early post-war period, despite little structural change (MIC, 2018).

In any system of local government, the number of tiers is usually directly related to such factors as geographical conditions, population levels, the nature of local administration and the corresponding level of centralization. In Japan, local government is two-tiered: prefectures serving wider areas, and municipalities providing local services. In addition, there is a system by which municipalities of a certain size can deal with what is generally considered to be prefecture administrative work. By government decree, they are called designated cities, core cities or special case-cities (CLAIR, 2006).

Japanese planning systems is a complex set of ingredients covering legal and legislative controls, plan-making, land use planning, zoning, control over population density carried out at three levels - national, regional and local.

5.4.1 National level

Japanese territory is divided into 47 units called prefectural governments. Each of them has its own administrative organization. The prefectural governments differ from the municipalities which are locally based public organizations, in that they are concerned more comprehensively with a wider local area. Municipalities are the collective term of the city (called *shi*), town (called *machi*), village (called *mura*), and district (called *Ku* which exists only in Tokyo) and each municipality also has its own administrative organization. There are 767 cities, 748 towns, 184 villages and 23 districts in Japan (Tominaga, 2011).

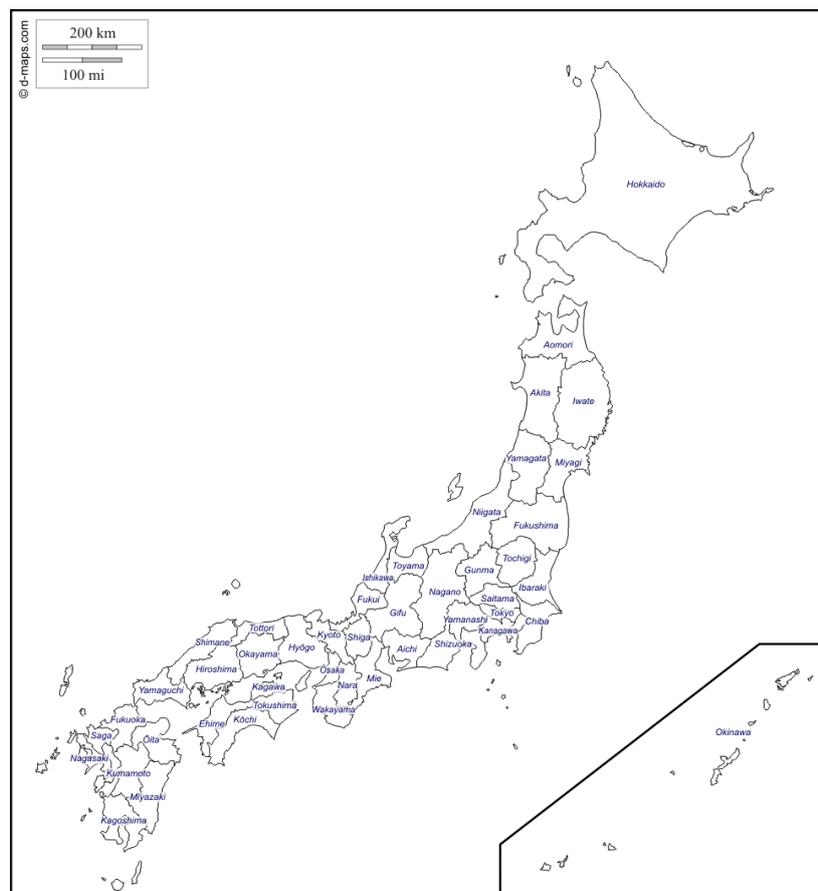


Figure 7 Japan's prefectures subdivision (Source: MLIT, 2018)

National Land Use Planning Law is a **land-use plan** and also a regulation that aims **to use the national territory comprehensively and systematically**. The law establishes National Planning, Prefectural Planning, and Municipal Planning. The general plan for land use is as the basis for National and Prefectural Planning. The Prefectural Planning sets out five regions in each prefecture; a city region which is an area that needs to be developed and maintained as an integrated city.

Comprehensive National Development Plan is based on the Comprehensive National Land Development Act of 1950 and is determined by the Prime Minister of the country, in consultation with concerned ministers (Tominaga, 2011). The **First Plan** was approved in 1962. The high growth of industrial activity following World War II caused an excessive concentration of population and industry in the larger metropolitan regions, leading to both overcrowding and to socio-economic decline in rural areas. With complementing regional development plans, the Growth Pole development strategy was adopted to encourage the development of industrial cities away from the existing large metropolis. As a part of this strategy, the New Industrial City Development Act was enacted in 1964. Fifteen new industrial cities were designated from 1964 through 1966 (Tominaga, 2011). Prefectural level plans covered such issues as industrial development targets, population, land use, roads, harbors, factory sites, and housing (Srinivas H., Japan Overview of Planning, 2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

The emphases and strategies in national plans have also to be seen in the context of various economic strategies and changes in employment structures that took place during this period, which led to sustained economic

growth. For example, the share of the primary industry declined from 48.5 percent in 1950 to 32.7 percent in 1960, and to 10.9 percent in 1980. During this period, higher economic growth was pursued by encouraging heavy and petrochemical industries in the Pacific Coast areas. A notable government policy was the 1960 National Income Doubling Scheme, and its target was achieved in 1967, two years before the deadline. The **Second Plan**, which was published in 1969, attempted to further the basic goals set out in the First Plan by constructing a nationwide transportation network of motorways and rapid national railways ('Shinkansen') system together with the implementation of large-scale industrial development projects. Measures were also taken to relocate industries from over-concentrated areas ("removal areas") to less developed areas ("promotion areas"). The **Third Plan** (1977) set forth a settlement scheme that put emphasis on the creation of self-contained quality environments for human habitation, in the form of "comprehensive development projects for human habitation". This emphasis was seen as a supportive strategy for the industrial development plans of earlier plans. The **Fourth Plan** (1989) differs from earlier plans with its emphasis on the National Capital Region (NCR) and its positive role that it plays in the development of Japan as a whole. Growth in population, strong industrial growth coupled with globalization and information-driven economy, and heavy investment in social infrastructure characterized the period until 1989. The Fourth Plan covers the period from 1989 to the year 2000 (15 years). The NCR was divided into two zones - the Tokyo Metropolitan Area and the 'Outer Areas'. This strategy envisaged the development of the NCR as a national and international center of political, economic and cultural activities. The NCR's interrelation with its suburbs (Outer Areas), as well as other regional urban centres, was seen within a supportive multicore framework, where natural and

man-made environments also received prominence (Srinivas H., Japan Overview of Planning, 2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

With the population decrease that is started in 2005 in the background, feelings of anxiety and uncertainty exist among the Japanese public. Also, in terms of national land policy, pressing issues are emerging, such as population decrease mentioned above, expansion of areas where maintaining the local community is going difficult, rapid devastation of farmlands, and the expansion of forests that are not properly maintained. From an international perspective, the East Asian economic bloc is growing rapidly, so that close collaboration with East Asian countries is crucial for maintaining and developing our vigor in an economic society through the 21st century. In order to cope with these pressing domestic and international issues properly, national and regional plans, which are long-term, comprehensive and spatial plans, are required to clearly show the future vision of territory and people's lives (MLIT, 2006).

The table below resumes the main goals of the five National Development Plan developed during the last decades:

	Comprehensive National Development Plan	New Comprehensive National Development Plan	3rd Comprehensive National Development Plan	4th Comprehensive National Development Plan	Grand Design for the 21st Century
Date of Approval by the Cabinet	October 5, 1962	May 30, 1969	November 4, 1977	June 30, 1987	March 31, 1998
Prime Minister	Hayato Ikeda	Eisaku Sato	Takeo Fukuda	Yasuhiro Nakasone	Ryutaro Hashimoto
Background	1. Transition to high growth economy 2. Overpopulation and disparity in income 3. National income-doubling plan (Pacific Belt Zone Project)	1. High growth economy 2. Concentration of population and industry in metropolitan areas 3. Advancement of information technology, globalization, and technical renovation	1. Stable economic growth 2. Signs of decentralization of population and industry 3. It became obvious that national resources and energies are limited	1. Concentration of population and various functions in Tokyo 2. Employment issues in non-metropolitan areas are more serious for reasons such as drastic structural changes in industry 3. Advancement of full-scale globalization	1. Global age(Global environmental issues,megacompetition, and exchanges with Asian nations) 2. Decreasing population and the aging society 3. Information-oriented society
Target Achievement Year	1970	1985	about 10 years from 1977	around 2000	2010-2015
Basic Objectives	Well-balanced development between regions	Creation of a rich environment	Improvement of the general living environment	Formation of a multipolar country	Prepare the basics for a multiaxial structure

Development Method	<u>Development of regional hubs</u>	<u>Large-scale project development</u>	<u>Stable settlement concept</u>	<u>Interactive network concept</u>	<u>Participation and Cooperation</u>
	Decentralization of industry is needed to achieve the objectives of this plan. Efforts must be made to develop regional hubs, by organically relating them to and promoting interaction with the existing production mass in Tokyo and other metropolitan areas, with a new transportation and communication network. Such development shall be performed by maintaining the characteristics of the peripheral areas and achieving a chain reaction that promotes regionally balanced development.	Promote large-scale projects by developing transportation networks, such as the Shinkansen (bullet train) and expressways, to mitigate the uneven use of land and solve problems such as overpopulation, depopulation, and regional disparities.	Promote development of non-metropolitan areas while controlling the concentration of population and industry in metropolitan areas. Make efforts to achieve a well-balanced use of the national territory while responding to the issues of overpopulation and depopulation, with the aim of creating a better living environment for citizens.	Establish a multipolar pattern territory with the following initiatives: (1) Promote a creative/innovative improvement of each area of national territory by maximizing regional characteristics (2) Develop backbone transportation, information, and communication networks nationwide in accordance with the national program or initiatives led by the national government (3) Establish various interaction opportunities through a joint effort between the national government, each regions, and private institutions.	– This plan conceives the participation of diverse entities and cooperation between regions as the basis for national and regional development.– (Four Strategies) 1. Build nature-rich residential areas (small cities, agricultural and fishing areas, hilly and mountainous areas) 2. Renovate metropolitan areas (renovation, renewal, and effective use of spheres in large cities) 3. Form regional cooperation corridors (regional partnership taking the form of axis) 4. Form international spheres of interaction on a large scale (which has global interactive functions)

Table 10 Comparison of Comprehensive National Development Plans (Source; MLIT, 2006)

However, the Comprehensive National Land Development Act, the law governing the Comprehensive National Development Plan that sets the grounds for Japan's national land policy, was orientated to quantitative development, with the social and economic background in 1950 when the Act was formulated. Therefore, a drastic review of the planning system has been required to cope efficiently with the decentralization, and domestic and

international collaboration, to facilitate qualitative development, and to show the vision of our territory that is adequate for a mature society oriented to attain safety, complacency, and stability in people's lives.

As for the reform of the national planning system, the goal specified in the 5th Comprehensive National Development Plan, the "Grand Design for the 21st Century", was to establish a national and regional planning system to meet requirements such as clarifying the philosophy of the national and regional planning, reacting to reforms such as decentralization, and enhancing the function as a guideline. Reviewing the Comprehensive National Development Plans and National Land Use Plan was also specified in the "2nd Decentralization Promotion Plan (MLIT, 2006).

In this context, investigations, and discussions were carried out in the National Land Council, and the "National and Regional Planning in the 21st Century," was reported by the Policy Section of the National Land Council and the Planning Section of the Land Policy Council in November 1999, and the "Future Vision of National Land and the New National and Regional Planning System," was reported by the Basic Policy Section of the National Land Council in November 2002. Furthermore, in the "Structural Reform and Medium-Term Economic and Fiscal Perspectives" adopted by the Cabinet meeting in January 2002, it was decided that the Comprehensive National Development Plan should be fundamentally reviewed (MLIT, 2006).

In June 2003, the Investigation Reform Section was established in the National Land Council. The Section examined the "reform of the national and regional planning system" and "Comprehensive Examination of National Land," which was to review the current state and issues of national land and to show the basic direction of national land policy from a long-term perspective. "Comprehensive Examination of National Land," was reported by the

Investigation Reform Section of the National Land Council, showing the current state and issues of national land, and the basic direction of the national land policy in the future. The report proposed that national and regional planning be reformed drastically, based on the new trends that caused turnaround in national land policies, such as “decreasing and aging population,” “interregional competition beyond national borders,” “elicitation of environmental issues,” “budgetary restraint” and “limitations of dependency on the central government” (MLIT, 2006).

Based on the past discussions in the National Land Council, the Ministry of Land, Infrastructure, and Transport attempted to establish the national and regional planning system that responds appropriately to requirements of the new era, including the decrease of population. In order to achieve this, it introduced the “Bill for partial amendments to the Comprehensive National Land Development Act and other laws in order to promote sustainable development of the national land” to the 162nd Diet session following the Cabinet approval on March 1, 2005. This amendment bill suggested the fundamental revision from the Comprehensive National Land Development Act to the National Land Sustainability Plan Act, by revising the previous Comprehensive National Development Plans into the “National Land Sustainability Plan”, by increasing the items to be planned, by introducing proposal systems from prefecture governments, and by establishing the Regional Plans. Following active discussions in the diet, the Bill was passed on July 22, 2005, declared on July 29, 2005, and enforced on December 22, 2005 (MLIT, 2006).

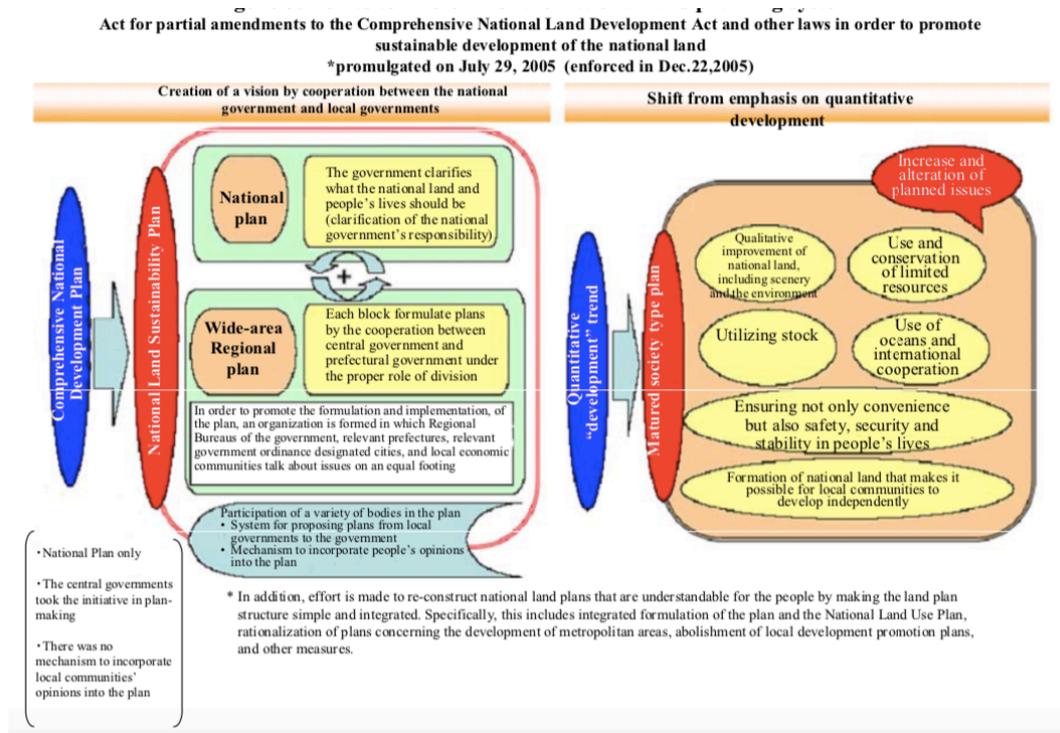


Figure 8 Act for partial amendments to shift toward actual National Plan to quantitative development (Source: MLIT, 2006)

Main points of the “Act for partial amendments to the Comprehensive National Land Development Act and other laws in order to promote sustainable development of the national land” are as follows:

- In order to focus more on the qualitative development than the quantitative development of national land, that used to be the base of the existing national and regional plans, the national and regional plans were reformed so that it will comprehensively *promote measures concerning the utilization, improvement, and conservation of national land* by reviewing what should be planned;
- In order to encourage the participation of various stakeholders in the planning process, a proposal system from local governments and system to reflect on public opinions were introduced;

- In order to respect the autonomy of regions and realize the partnership between the central government and local governments, in addition to the National Plan, the Regional Plans were also introduced. The plans are planned in each block by mutual collaboration and cooperation of central and prefecture governments, under appropriate divisions of each role; and
- In order to make the national and regional planning system understood easily by the public, it streamlined and consolidated the national and regional planning system (MLIT, 2006).

National Plan

a) Contents of the plan

- As a guideline for measures concerning the comprehensive formation of national land, it stipulates basic policy; objectives; and basic measures that are necessary from a nationwide perspective.
- It should be in accordance with the fundamental plans of the central government on environmental conservation.

b) Planning process

- The Minister of Land, Infrastructure, and Transport should take necessary measures to reflect on opinions from the public, discuss with the head of administrative bodies involved, listen to opinions from prefectures and government-designated cities, through investigations and discussions in the National Land Council, prepare draft for the plan and obtain cabinet approval as is shown in the figure below.
- Prepare the plan and the National Plan of the National Use Plan in an integrated way (MLIT, 2006).

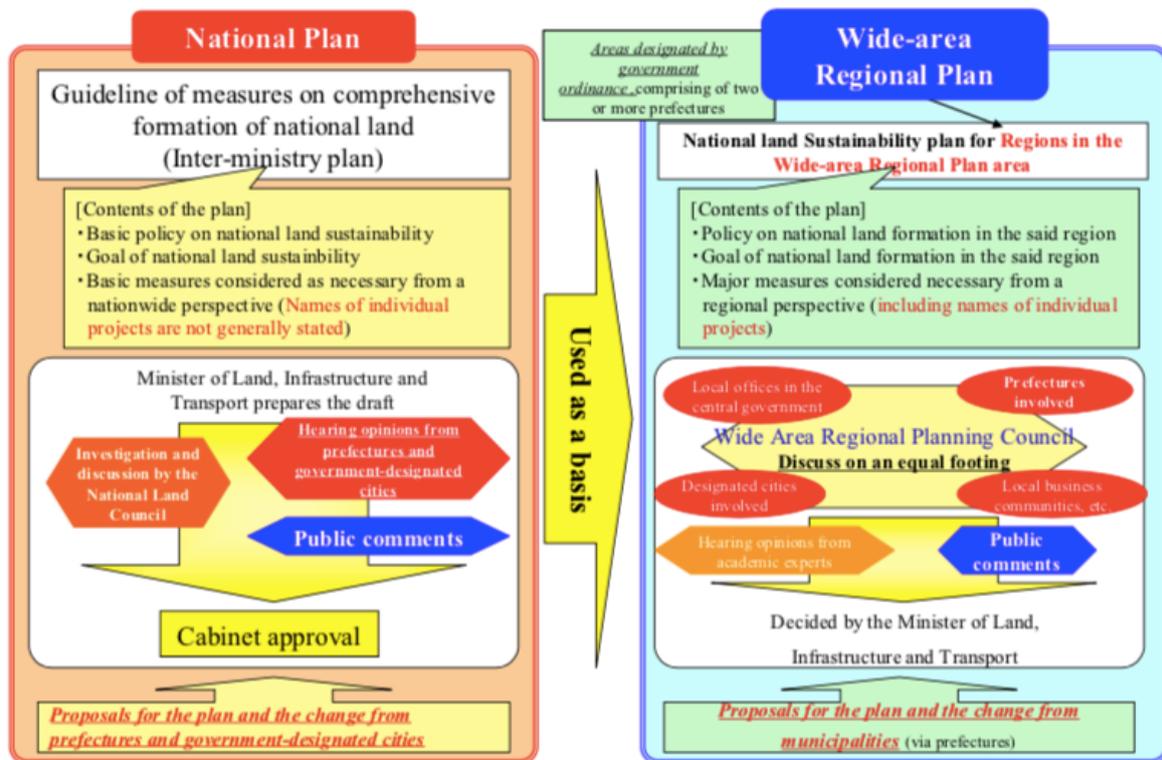


Figure 9 The New Framework of the New National Land Sustainability Plan (Source: MLIT, 2016)

In cities where the land utilization density has declined due to the population decline, urban centers must be made more compact to prevent any further density fall resulting from suburban development. In urban centers, the effective utilization of unused land and vacant houses should be promoted to improve regional value. In regions where new land utilization measures are required, they should be implemented appropriately with consideration given to convenience, natural environments and other regional conditions (MLIT, 2006).

While the development of cadastral data for clarifying land ownership borders is indispensable for facilitating land transactions, private land development, and national infrastructure arrangements, and for accelerating disaster prevention, post-disaster restoration and reconstruction, as well as for providing the base for national land utilization, the cadastral survey progress

rate (at the end of 2014) is limited to 51% in Japan—24% in urban regions and 44% in rural regions. In preparation for the anticipated Southern Trough earthquake, sediment disasters and other disasters in the future, we will further clarify priority survey targets, including cities where population and functions concentrate. For rural regions where cadastral data have rapidly been lost, we will consider efficient cadastral survey methods (MLIT, 2006).

As a demographic shift to urban regions makes progress, land whose owners are difficult to find will increase further, mainly in rural regions. Therefore, we will consider how to find landowners and how to deal with the utilization of land whose owners are unknown.

5.4.2 Regional level

Japan is divided into eight regions. There are the three largest metropolitan regions National Capital (Tokyo), Kinki (Osaka-Kobe-Kyoto), and Chubu (Nagoya) Regions.

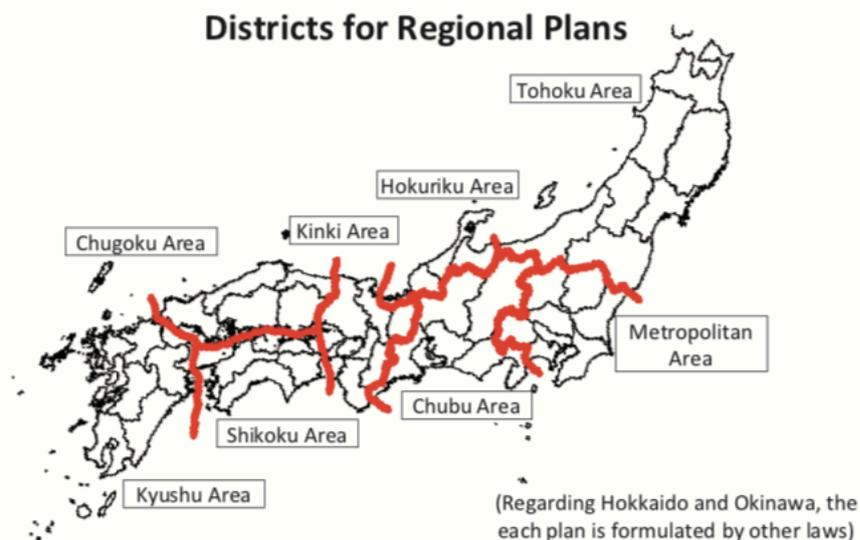


Figure 10 Districts for Regional Plans (Source: MLIT, 2018)

In addition to these, there is the Hokkaido, Shikoku, Kyushu, Tohoku and Chugoku region.

Creating Regional Blocks by the Collaboration of the National and Local Governments

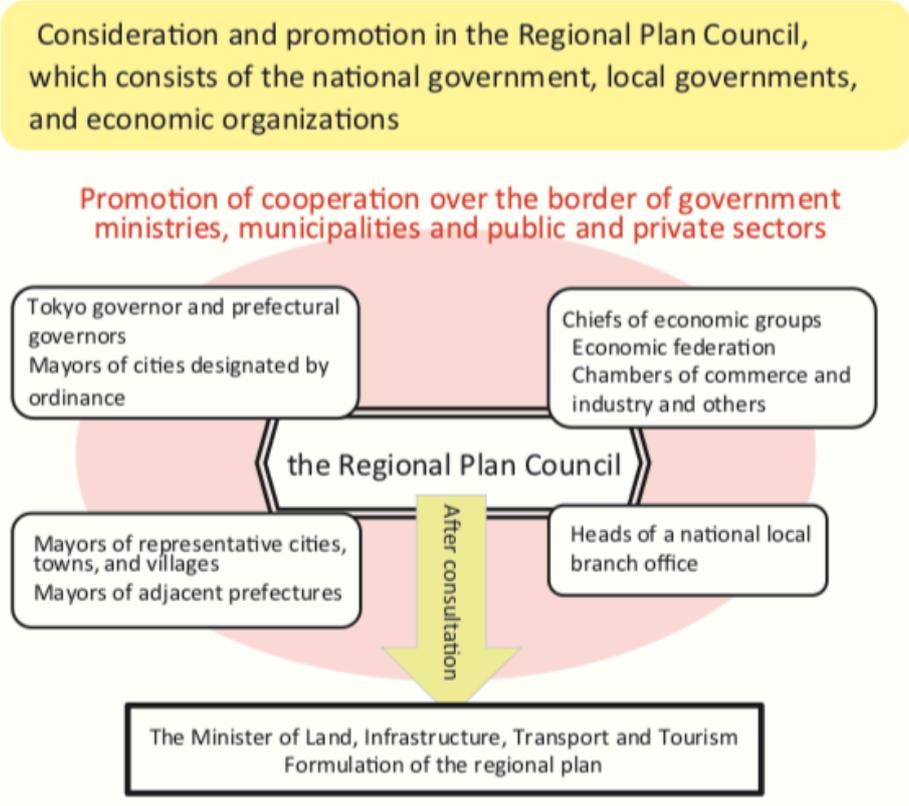


Figure 11 Workflow and collaboration between Regional Blocks and National and Local Governments (Source: MLIT, 2018)

The plans for NCR and the Kinki Region contain important strategic policies and projects, particularly industrial location control in central built-up areas, the development of industrial sites in suburban areas, large-scale new town plans, and the construction of metropolitan motorway networks. Green belts and other provisions in restricting physical urban expansion made under the First Plan (1958) could not be established - leading to planned urban development while preserving some of the green areas (Srinivas H., Japan

Overview of Planning, 2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

Most regional development acts were enacted in the 1960s with industrial and infrastructure provisions for special areas throughout the country. The Industrial Relocation Promotion Act of 1972, for example, specifies regions to which industry should be relocated and provides special financial assistance and tax incentives.

National Capital regional Basic

The NCR Basic Plan was a regional plan covering Tokyo and seven prefectures surrounding the city. Regional strategies underwent major changes as the population of Tokyo and three prefectures of southern Kanto (of which Tokyo forms a part) jumped from 15.4 million in 1955 to 27.0 million in 1975 - an increase of 11.6 million in only twenty years. The first 1958 plan covered an area of 100 km radius and was modeled after the Greater London Plan of 1944. It emphasized restriction of new construction that contributed to population concentration; development of green belts; and establishment of industrial areas in the suburbs. But many of these strategies could not stand the force of population increase and high economic growth. The 1968 Plan shifted the emphasis from the physical restriction of growth to that of promoting planned urban development. The further accent was provided for these strategies in the 1976 Plan taking into account the increases in population. Safety and environmental capacity, expansion of urban areas, housing and industrial development received prominence in these plans. The NCR Basic plans promote a number of projects including motorways, rapid transits, new towns, and water resource development projects (Srinivas H., Japan Overview

of Planning, 2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

Along with the restructuring of the National Land Plan System carried out in July 2005, the National Capital Region Development Act was partially revised, whereby the National Capital Region Development Plan became composed of the “Basic” and “Development” parts while the previous project plans were abolished.

Basic

Although this part used to be formulated as the framework of the Capital Region Development Plan before the revision of the Act, under the new Plan, it has become a guideline for plans concerning the capital regional development that clarifies the basic policy concerning future development of the Capital Region, the future vision for the Region to aim for and the direction of efforts towards the realization need to be addressed (Tokyo Metropolitan Government, 2019, http://www.toshiseibi.metro.tokyo.jp/eng/pdf/index_02.pdf?1503).

Development

Based on the Basic part, the Development part sets out what should be the foundation concerning the development of facilities specified in the National Capital Region Development Act for Roads, Railways, etc. in built-up areas, Suburban Development Zones, and urban development areas. The plan period for the current Development part is for about five years from the fiscal year 2006. This part sets out, not specified plans, the plan to proceed with the formation of disaster-resistant urban structure (e.g. development of disaster prevention bases) *by promoting the “renovation of the metropolitan area”* utilizing support from city development projects by private sectors and

existing stocks so that the Region can continue to develop, retaining the safe and comfortable living environment. This part also indicates that TMG divide the Capital Region into six regions (e.g. central Tokyo and suburb areas) and promote regional development according to the characteristics of each region, *reorganize and develop the urban spaces by enhancing advanced urban functions and reinforcing residential functions in central Tokyo*, and form highly-independent in suburbs by developing core business cities and promoting proper role sharing between these cities and central Tokyo (Tokyo Metropolitan Government, Basic laws and regulation, 2019, http://www.toshiseibi.metro.tokyo.jp/eng/pdf/index_02.pdf?1503).

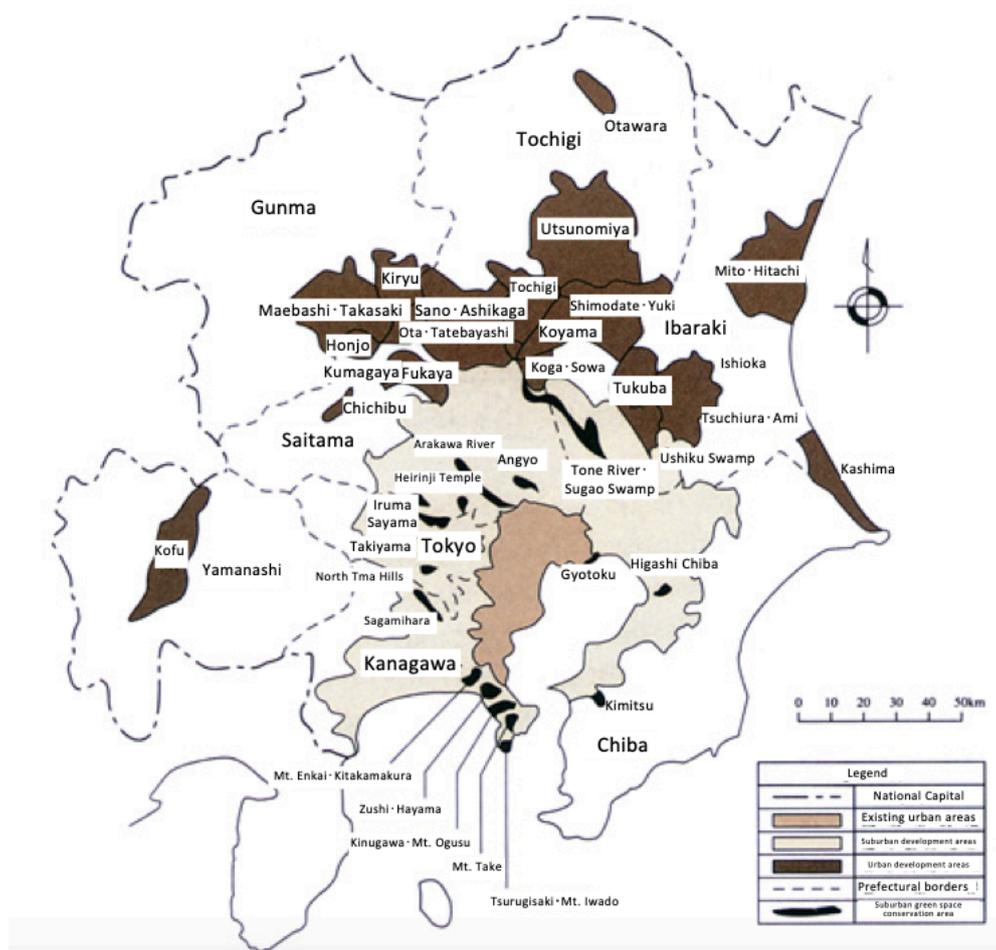


Figure 12 Map of the Capital Region policy areas (Source: www.toshiseibi.metro.tokyo.jp/eng/, 2019)

Kinki Region Basic Plans

The Kinki Region Basic Plan (1965, 1971, 1978, and 1985) covers eight prefectures, including Osaka, Kyoto and Kobe metropolis. As with the NCR Basic Plans, the basic strategy is to encourage dispersal of population and industry from built-up areas to surrounding suburban and urban development areas. The Kinki Region, however, is rich in history and culture and thus heritage conservation and preservation form important ingredients in the basic plans. This is complemented by further reinforcing the multi nuclei regional structure, and revitalization of regional economies with international linkages and information industries (Srinivas H., Japan Overview of Planning, 2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

5.4.3 Local level

In 1919, a general idea called City Planning Area was brought in the City Planning Law in Japan. According to the operational guideline of city planning, there are the areas which need to be adjusted, developed and maintained comprehensively as a unified city and these are also the areas which are designated as the compass that can be sufficient to arrange the lands and facilities.

The specific definitions of City Planning Area are as follows; 1) it has 10,000 people in the municipality and 50% of the total employed workers are involved in commerce and industry or urban business categories, 2) it can be expected to meet the preceding issue of 1) in 10 years over the pace of development and the prediction of population and industry, 3) the central area of the target municipalities have over 3,000 of population, 4) especially good environment of the city needs to be developed in the city since it has resources for tourism and is expected a lot of tourists come, 5) a disaster has ruined quite a few buildings in the city central area and there has been a need for recovering systematically. The City Planning Area covers only 25.7% of Japanese territory but 91.6% of the population lives in the area. However, it has to be careful that the City Planning Area is not always specified to a whole area of a municipality but there are 4 cases on how to set it. How to designate the city planning area is depends on the situation of the municipalities. *The purpose of specifying the City Planning Area is to make public investments more efficient and promote land use reasonably and soundly.* It is effective to designate the City Planning Area for the following reason. At first, it will be regarded as a target for Area Division. Second, the developments in the area are demanded development permissions. Third, it is applied to the group rule which is a

stipulation of the relationship between buildings and cities in the Building Standards Law (Tominaga, 2011).

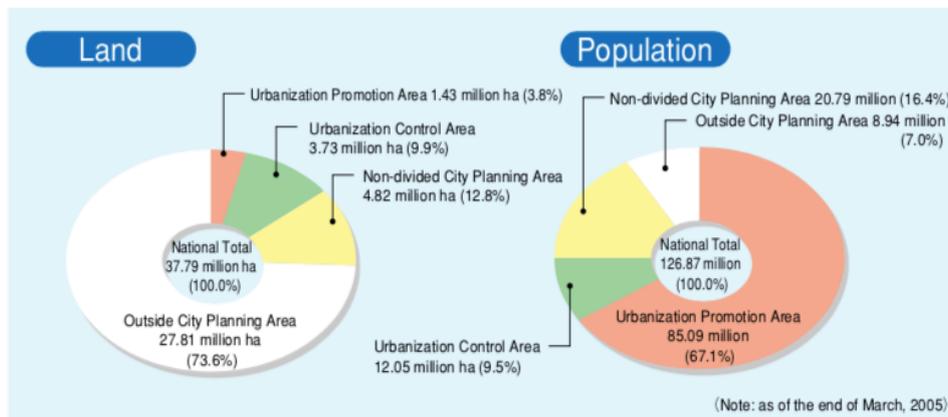


Table 11 Land and Population allocated in UCA and UPA in Japan (Source: City & Regional development Bureau, MLIT, 2003)

The regulation of land use

In the City Planning Area, it becomes to be possible to divide the area into two areas, Urbanization Promoting Area and Urbanization-restricted Area. According to the City Planning Law, the *Urbanization Promoting Area* is defined as an area which already forms urban area and should be urbanized preferentially and systematically during about 10 years and the Urbanization-restricted Area is defined as an area which should be controlled its urbanization as is possible to see in the figure below (Tominaga, 2011).



Figure 13 Area Division between UCA and UPA (Source: City & Regional development Bureau, MLIT, 2003)

Large urban cities have to mandatory divide the City Planning Area into two areas. This area division is effective to centralize the public investments in the Urbanization Promoting Area and control a certain amount of developments in the Urbanization-restricted Area. On the other hand, local cities can choose whether to divide the City Planning Area or not, because once the area divided, it turns to be more difficult to develop in the Urbanization-restricted Area. As options for Undivided City Planning Area, there are 12 different kinds of “Use Districts” in which control the purpose of land use and its figure. Local cities that are not divided in the City Planning Area can designate the Use Districts selectively and control developments because, in Undivided City Planning Area, all developments are allowed in principle (Tominaga, 2011).

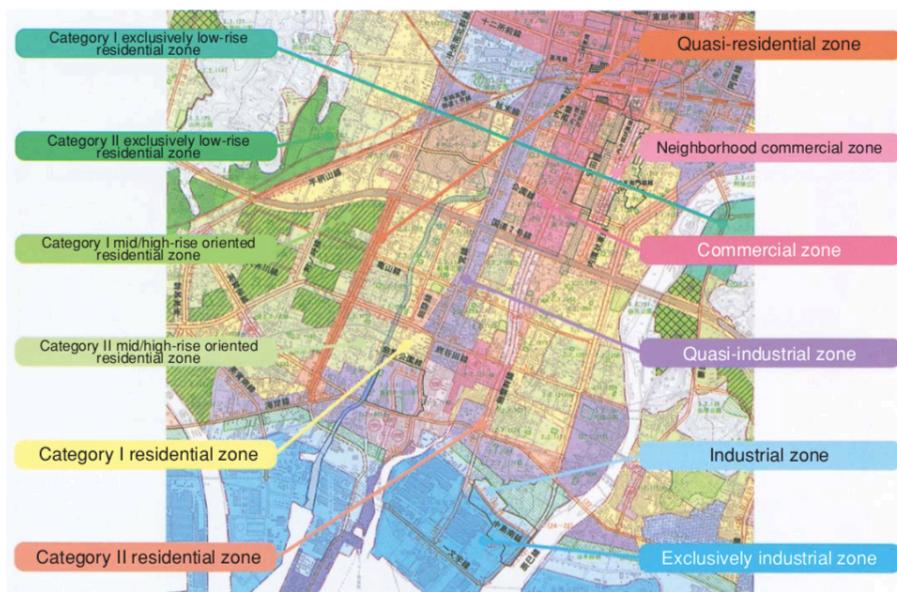


Figure 14 Classification of land use (Source: City & Regional development Bureau, MLIT, 2003)

According to the City Planning Law, Article 29, a person who is planning to use the land for development action should get permission from the prefectural governor. The target size of each development action is

different between the Urbanization Promoting Area, the Undivided City Planning Area and outside of the City Planning Area and development action is required to meet technical standards. Additionally, in the Urbanization-restricted Area, there are strict locational criteria and few development actions which meet the criteria can be constructed (Tominaga, 2011).

The use districts and group rule of buildings

There are 12 kinds of use districts - 7 kinds of residential districts, 2 kinds of commercial districts and 3 kinds of industrial districts - prepared in the City planning law and these districts can be specified in the Urbanization Promoting Area and the Undivided City Planning Area selectively as mentioned above. Each district controls land use. For example, hotels cannot be developed in Category 1 exclusive low building residential zone. Depends on the objective of each district, it can be possible to decide the building coverage, floor-space ratio, height limitation, floor-space ratio limitation of road, diagonal line limitation for road and adjacent land and shadow area limitation. Japanese building code (rule) is regulated by Building Standard Act and it sets out minimum standard (but it extends to so minute) of the site, facilities, infrastructure, usage and so on of a building. Whole codes can be divided into Single code and Group code. Single code sets out about the safety and health of a building itself. For example, there is the strength code of structure to stand up when the earthquake comes, and all buildings are required to meet this code (Tominaga, 2011). On the other hand, group code more concerns about the relation between a building and city, surrounding environment, not a building itself. It is deeply related to the City Planning Law. For example, it sets out use control which decides the usage of the district.

The master plans

In the Local Autonomy Law, each municipality is required to make a fundamental plan which describes basic ideas and purposes as a text to put into practice their own town management and plans. Different from the fundamental plan there are “City Planning Area Master Plan” and “Municipal Master Plan” as texts including drawn plans. The City Planning Area Master Plan is applied to each City Planning Area and decided by prefectural governments. It describes the objective of city planning and whether to divide the City Planning Area into the Urbanization Promoting Area and the Urbanization-restricted Area or not. It also describes the principle for conducting the land use and city facilities in City Planning Area. The City Planning Area Master Plan is usually a larger scale plan than the Municipal Master Plan and reflects it. On the other hand, the Municipal Master Plan is made in each municipality as a text including drawn plans and its contents must correspond to the fundamental plan and the City Planning Area Master Plan. It describes the grand design of a city, for example, the ideal images of the road ahead and problems that should be overcome. It also describes the regional designs which are plans and strategy of a smaller part of the city. Both City Planning Area Master Plan and Municipal Master Plan are not mandatory regulations but just plans which describe the direction of developments in each area and municipality. However, these are as important as the basic plans (Tominaga, 2011).

The district planning

In 1980, the district planning system was set up in the City Planning Law using examples from German B-Plan. The system is the first city planning system anchored by municipalities and citizens. Recently, a more bottom-up

approach to city planning is gathering strength in Japan. This system is a tool to make more micro plan and it is also a comprehensive plan in a certain district. The contents and implementation tools of the system are flexible, and citizens can participate in the process of making the plan. The target districts of this system are in the use districts or the outside of the use districts (the Urbanization-restricted Area or the Undivided City Planning Area) which meet some requirements. The objective of the target district and the plan is to adjust the district is planned with this system (Tominaga, 2011). Details of regulations and planning practices are specified in separate legislation. For instance, the Building Standard Act regulates building activities in accordance with the zoning plan, and the Land Consolidation Act provides legal procedures for land consolidation projects on sites specified in the authorized city plans (JICA,2007).

The City Planning Act of 1968 forms the basis for city planning in Japan. The main features of this Act include:

Effective land-use control:

Areas within a city were designated as 'urbanization promotion areas' and 'urbanization control areas' depending on the degree of urbanization. *The development permission system was also introduced to provide a sufficient level of infrastructure in the development of building land.*

Functional city planning areas:

With rapid economic development, improved motorways and other factors, 'functional city planning areas' were designated integrating multiple municipalities into single planning units. This formed a common basis within

which a prefectural governor makes plans involving more than one municipality (Srinivas H., Japan Overview of Planning, 2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

Delegation of power to local governments:

Power to affect city planning was initially vested with the Minister of Construction (under the 1919 Act). This was delegated to the Prefectural Governors under the 1968 Act. City plans involving more than one municipality are made by the Governor, while other plans are made by the municipalities. City plans are decided principally by local authorities of cities, towns, and villages, and by the Prefecture Governor for plans that require integrated planning on the prefectural basis. An exception is cases that stretch over more than two prefectures, where city plans are to be decided by the Minister of Construction. Local City Planning Councils are established in prefectures, cities towns or villages for this purpose. An original draft plan is prepared and explained to the public. The Draft Plan is then opened for public opinions and concerned municipalities. This results in a Proposed City Plan. Public notice is issued, and submission of written opinions is invited from the public for two weeks. The Local Planning Council is constituted for implementation. Approval from the Minister of Construction is sought in coordination with concerned Ministries. The Final City Plan is then implemented. The regulation of land development is ensured through various acts, including the Nature Conservation Act, the Agricultural Land Act, Forest Act, etc. Within urban areas, there are primarily to types of regulations - a development permission system which regulates the location and form of development, and the building confirmation system which regulates the use and structural safety of building (Srinivas H., Japan Overview of Planning,

2019, <http://www.gdrc.org/uem/observatory/jp-overview.html>).

In conclusion, we can see that in each level of land and spatial planning Japan Government added policies and good practices in order to reduce and block the urban sprawl growth as summarized in the table below.

	Measure/Policy	Level	Goal
1	<i>"Promote measures concerning the utilization, improvement, and conservation of national land"</i>	National/NLSP	Reduce land consumption
2	<i>"In cities where the land utilization density has declined due to the population decline, urban centers must be made more compact to prevent any further density fall resulting from suburban development"</i>	National/NLSP	Densification of the urban fabric
3	<i>"emphasis from the physical restriction of growth to that of promoting planned urban development"</i>	Regional/NCR	Densification of the urban fabric
4	<i>"promoting the "renovation of the metropolitan area"</i> <i>"reorganize and develop the urban spaces by enhancing advanced urban functions and reinforcing residential functions in central Tokyo"</i>	Regional/NCRDP	Densification of the urban fabric
5	<i>"The purpose of specifying the City Planning Area is to make public investments more efficient and promote the land use reasonably and soundly"</i>	Local/CPA	Densification of urban fabric/ efficient urban land use
6	<i>"Urbanization Promoting Area is defined as an area which already forms urban area and should be urbanized preferentially and systematically during about 10 years"</i>	Local/UPA	Densification of urban fabric/ efficient urban land use

7	<p><i>“Development permission system was also introduced to provide a sufficient level of infrastructure in the development of building land”</i></p>	Local/District plan	<p>Densification of urban fabric/ efficient urban land use</p>
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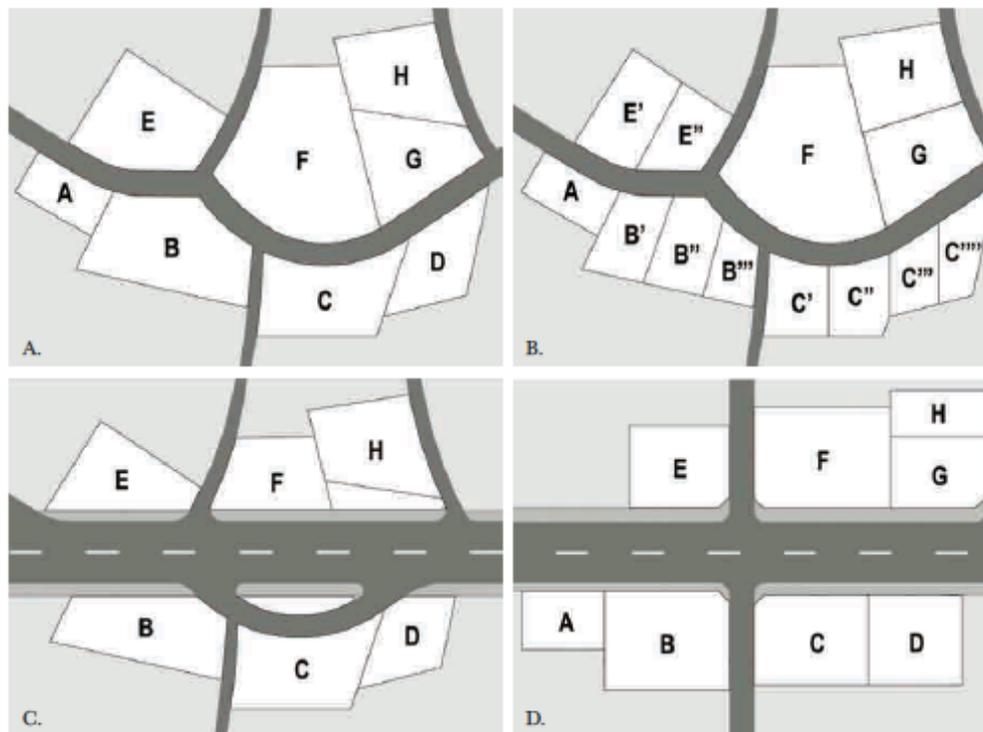
Table 12 Summary table, regulations, and policies to tackle urban sprawl (Source: author elaboration)

5.4.3.1 Land Readjustment

In Japan, land readjustment has been to the present one of the most used urban planning method, usually is called “The Mother of City Planning”. It has been particularly important in Japan where one-third of all urban areas have been developed with LR (Sorensen 1999). This method involve a group of land-owners that join their forces to redevelop or develop land. This process allow land-owners to redevelop irregular plots of agricultural land into urban plots with roads and infrastructures.

This innovative urban-land-assembly approach may bring two significant benefits when compared with the eminent domain one, as argued by Andre Sorensen (2009).

The first benefit relies on the preservation of social, cultural and economic networks that are closely tied to a physical location, and the routines and interactions of everyday life in that place, through original community maintenance.



▲ Figure 1.1 (A-D). Comparison between land intervention processes

- A. Medieval, agricultural or unplanned pattern of growth: Owners A, B, C, D, E, F, G and H have property ownership of lands without basic infrastructure and/or without adequate public facilities;
- B. Individual private subdivision and development, plot-by-plot: Owners A and F remain inert to any transformation; Owners B and E subdivide their plots into smaller ones and privately build up basic infrastructure; Owner C acquired owner D's land and subdivided it into smaller plots; Owners G and H mutually agreed to exchange part of their adjacent plots of land (amalgamation);
- C. Development process through expropriation: Owners A and G are expropriated; Owners B, D, E, and in greater proportions F, receive compensation for the loss of part of their plots through eminent domain; also, they still benefit from the newly built infrastructure and consequently obtain asset appreciation of their remaining plot portion; Owners C and H remain intact and they fully benefit from their proximity to the newly built infrastructure; and
- D. Development process through land readjustment: all landowners remain after project implementation; the plots of land now have adequate basic public infrastructure, even though smaller in size after the project implementation.

Figure 15 Comparison between land intervention process (Source: JICA, 2018)

The second benefit relies on the equitable distribution of costs and benefits in the urbanization process: “by requiring that all property owners contribute with a share of their property for public spaces, and for land to sell to pay back improved infrastructures, land readjustment projects can go a considerable distance towards a more equitable distribution of both costs and benefits of urbanization” (Sorensen, 2009). In other words, **through land**

readjustment projects, the main contribution is in the form of land that will simultaneously improve the public realm – roads, parks, sidewalks, sites for public schools and hospital sites – and, consequently, increase private land values. Landowners' property rights, in this sense, still prevail, with a smaller land size and a possible higher total asset value but aiming for a fair distribution of costs and benefits in urban development (JICA, 2018).

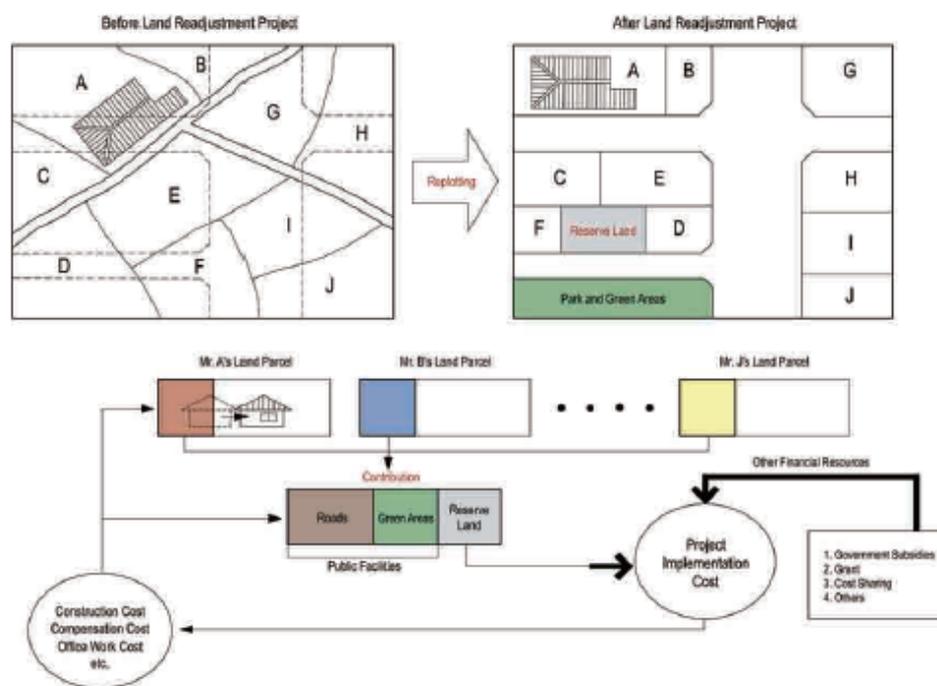


Figure 16 Land Readjustment process (Source: JICA, 2018)

Land readjustment (土地区画整理 this kukaku seiri) is a public-private partnership instrument, in which governments and landowners bear the urban development costs and benefits in places where existing land use patterns are inadequate and inefficient; earning, in principle, for property title maintenance after project completion. The primary mechanism for project implementation is known as “replotting” (換地 Kanchi). Replotting means the change of location, format, and area of several plots of land to achieve a

project's final scene. Transformation processes using replotting are performed by land readjustment implementation agencies – local, prefectural, national government agencies, and private corporations – after attempts at “consensus and agreements” among the land rights holders, complying with the guidelines and conditions predetermined by the Land Readjustment Law. Land readjustment is performed on a voluntary or on a compulsory basis. The management of the transformation process of various land units is exclusively performed by implementation agencies. This refers to the administrative organization of the public sector (local, prefectural, national government, public corporations, and so on), or the private sector (JICA, 2018).

In Japan, the usage of land readjustment is broad in scope and purpose, and can be divided into five categories:

- a. **Control of urban sprawl in suburban/peripheral areas.** This type of land readjustment is implemented with the purpose of providing necessary urban infrastructure in peripheral areas, or in transitional areas between rural and urban, guiding growth and implementing residential areas with urban services;
- b. Development of new towns in suburban/peripheral areas;
- c. Urban rehabilitation. Land readjustment is used to reorganize areas that are highly populated, already have basic infrastructure, but need to regenerate their urban functions, change use patterns, and/or promote commercial zones or improvements in infrastructure;
- d. Development of urban infrastructures;
- e. Disaster reconstruction.



Figure 17 Land Readjustment process in Tokoyama (1994-2000), Aichi Prefecture (Source: JICA, 2018)

**6. FACING URBAN SPRAWL IN PRACTICE:
EVIDENCE FROM THE TOKYO
METROPOLITAN AREA**

6.1 Introduction

Urban sprawl has increased in Japan over the last few decades and has unintentional consequences, including city center decline, increased reliance on the use of the private car. A growing trend of smart growth in the suburbs brought the idea for a new type of urbanism fighting sprawl such as efficient transit, and town center redevelopments. The term smart growth can also be defined as a way to build up a more compact urban development, combined with good transit infrastructures as an alternative to driving in the antithesis of classical sprawling development. This chapter has as a goal to measure the urban sprawl rate in the last decades in order to understand if the policies implemented along the last decades were successful or less fruitfully.

The recent literature tends to support the notion of sprawl, coupled with a series of measurable indicators such as density gradients and sprawl indices which have been used in previous studies (Ewing 1994; Sudhira, 2004; as cited in Sim, Mesev, 2011). Our research explores a set of quantitative variables to characterize urban forms at the metropolitan level and, in particular, to distinguish compactness from sprawl using GIS tools.

6.2 Selection of case studies

The study was conducted in three main suburban areas immediately north of Tokyo (Ageo, Omiya, Urawa), located in Saitama Prefecture, one of the main suburban prefectures in TMA. This prefecture during the post-war period absorbed most of the new residents of the Tokyo Metropolitan Area with Kanagawa and Chiba. The total population tripled (from 1950 to 1995) with an increase from 2.15 million to 6.76 million (Japan Population Census, 1995) and show a steady growth rate, reach 7.33 million inhabitants in 2018

(Japan Population Census, 2018) even more evidently was the expansion of Densely Inhabited Districts (DID). The case study area, particularly Urawa and Omiya City, which are located in the core of Saitama prefecture it's really indicated to lead the research and can be considered a good model and a reasonable representative of other fast-growing metropolitan regions around Tokyo.

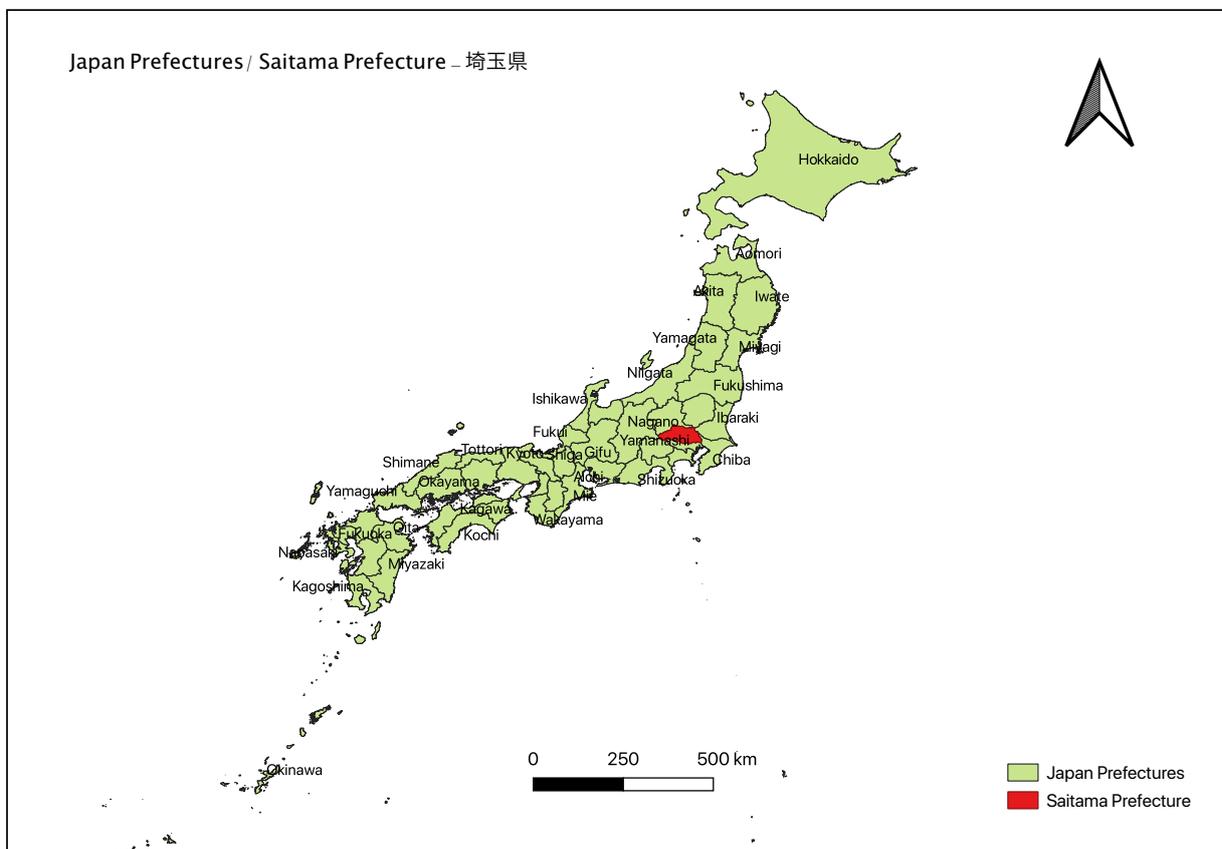


Figure 18 Location of Saitama Prefecture within Japan (Source: author elaboration)

According to paper “Land Readjustment, Urban Planning and Urban Sprawl in the Tokyo Metropolitan Area” (Sorensen, 1999) these areas were investigated due to their specific location and relationships of the different actors involved in the building process. The case study selected is suitable to

compare data about sprawl along a middle-long period of time, from Sorensen's paper to the present and try to understand if the LR policy was successful or not in order to reduce the urban sprawl phenomena.



Figure 19 Location of case study between Saitama Prefecture (Source: author elaboration)

6.3 Methodology and process

The methodological approach used for thesis development was divided into the following phases:

- A phase of data retrieval (aerial photographs, thematic maps, shapefiles, and regional technical maps) for the construction of a georeferenced database relating to the variation in land use/coverage of Ageo, Omiya and Urawa Municipality from 1995 to 2015. The materials used are made up of aerial photographs and ancillary data used to supplement the information contained in aerial photographs. Thematic maps, shapefiles, and aerial photos were provided by the National Land Numerical Information Download Service (http://nlftp.mlit.go.jp/ksj-e/gml/gml_datalist.html).

- Construction of 12 land use/coverage maps (years 1995, 2005 and 2015) classified according to the hierarchical legend based on the CORINE Land Cover project in the GIS environment.

To run the analysis by GIS software and calculate the indexes were used mainly three shapefiles about DID, agricultural areas and forest area as described in the description's boxes below:

Forest Areas Shapefile

Feature information	Feature name	Explanation	
	Forest Areas	The forest areas in the data are land that should be used for forests and require efforts to promote forestry or maintain the functions pertaining to forests, and have been designated as national forest zones under Article 2-3 of the Forest Act or as private forests subject to regional forest management plan under Article 5-1 of that Act.	
Attribute information	Attribute name	Explanation	Value Type
	Scope	Area designated as Forest Area	GM_Surface
	Prefecture code	Attached number for uniquely identifying Prefecture	Code list [Prefecture code]
	Subprefecture area code	Attached number for uniquely identifying Subprefecture	Code list [Subprefecture area class code]
	Forest Areas type Code	Attached number for uniquely identifying Forest Areas	Code list [Forest Areas type code]

Table 13 Attributes table – forest area shapefile (Source: MLIT)

DID Shapefile

Feature information	Feature name	Explanation	
	DID	Density Inhabited District. Regions within municipal boundaries with high population densities defined as basic unit blocks in National Census	
Attribute information	Attribute name	Explanation	Value Type
	DIDid	Region code (5 digits) + Density Inhabited District symbol (1 digit)	Integer
	DID scope	DID boundary	GM_Surface
	Prefecture code	Region code of Prefecture containing DID	Code list [Prefecture code]
	Municipal code	Region code of Municipality containing DID	Integer
	Municipality name	Name of Municipality containing DID	CharacterString
	Density Inhabited District symbol	Symbol attached according to larger population when 2 or more Density Inhabited Districts are set in the same municipality.	Integer **1" for only one DID within same municipality
	Population	Population of corresponding DID	Integer
	Surface area	Surface area of Population of corresponding DID (km2)	Real
	Previous population	Population of corresponding DID from previous National Census	Integer types **"NULL" when no previous value
	Previous surface area	Surface area of corresponding DID from previous National Census. Units [km2]	Real types **"NULL" when no previous value
	Population percentage of Density Inhabited District among whole region	Result of DID population subtracted from municipality population. Units [%]	Real
	Surface area percentage of Density Inhabited District among whole region	Result of DID surface area subtracted from municipality surface area Units [%]	Real
	Year of National Census	National Census	TM_Instance
Other information	The data(1995, 2000, 2005, 2010, 2015) is approved for commercial use without application under the following conditions: Acceptance and acknowledgment of [About National Land Numerical Information download service] The source of the data [digital national land information] and name of the parties processing the data is indicated.		

Table 14 Attributes table – DID area shapefile (Source: MLIT)

Agricultural Areas Shapefile

Feature information	Feature name	Explanation	
	Agricultural area	Agricultural Areas are lands that should be used as agricultural land and need comprehensive agricultural land promotion, and designations as Agricultural Promotion Regions under the Act on Establishment of Agricultural Promotion Regions Article 6 are for corresponding regions. The following are applicable. · Agricultural area designated under the National Land Use Planning Act · Agricultural areas according to Article 8, paragraph 2, section 1 of Act on Establishment of Agricultural Promotion Regions	
Attribute information	Attribute name	Explanation	Value Type
	Scope	Region designated as Agricultural area	GM_Surface
	Prefecture code	Attached number for uniquely identifying Prefecture	Code list [Prefecture code]
	Branch area class code	Attached number for uniquely identifying Branch area	Code list [Branch area class code]
Agricultural area class code	Attached number for uniquely identifying Agricultural area	Code list [Agricultural area class code]	
Other information	Metadata for each data item is attached to the file to be downloaded. Subdivision ((Farmland district)) included within the data is treated as referential information within the Land Use Master Plan, and accuracy of the indication cannot be assured.		

Table 15 Attributes table – agricultural area shapefile (Source: MLIT)

6.3.1 Developing a Measurable Definition of Sprawl and Compactness

Despite a rigorous definition of the idea of sprawl, the term is usually defined by scholars by four main land-use characteristics: low density, scattered development, commercial strip development, and leapfrog development (Tsai et al, 2005 as cited in Sim, Mesev, 2011).

The last three characteristics are based on the spatial arrangement of the urban area and define the sprawl phenomena by contrast. Compactness can be defined as more energy-efficient and less polluting. Ewing (1997) defined compactness as some concentration of employment and housing as well as a mixture of land uses. Galster et al (2001) defined compactness as a certain degree of clustered developments and measured it by the amount of land developed in each square mile. Tsai (2005) described compactness as often involving the concentration of development as opposed to sprawling development. Hanson et al (2001) employ metrics to describe land development along six geographical dimensions: density; continuity; concentration; centrality; Nuclearity; and diversity. Tsai (2005) used a set of four dimensions of metropolitan form - metropolitan size, density, degree of equal distribution and degree of clustering and utilized Moran, Geary, Gini, and Entropy indicators to measure those four dimensions for both population and employment distribution (Sim, Mesev, 2011). With this researches in mind, three dimensions of sprawl indicators were selected to develop our study.

Size: the urban land area has often used as a simple index of sprawl. The idea of using urban land size rises from the idea that sprawl causes more land consumption than compact development. Because sprawl is generally characterized by an increase in the built-up area along the urban and rural fringe, this attribute gives valuable information to understand the behavior of

sprawl. Larger urban size values often indicate a greater degree of sprawl (Sim, Mesev, 2011).

Density: this indicator is measured by the population per unit of developed land. There are numerous density-based measurements that use population and employment data. Hasse (2004) suggested that the density of new urbanization should be used as a measure of land consumption for new urban growth, Schneider et al (2009) used the density of built-up land by measuring the ratio of the amount of urban land to all land by percentage. This index provided information about the new land development's density rate (Sim, Mesev, 2011). The higher ratio of low-density development to total development indicates sprawl whereas lower ratios indicate more compact or smarter growth patterns. In this research, the density indicator has been provided a measure of land consumption for new urban growth per capita. Population increment was calculated by comparing the difference between years from the following, 1993 and 2003. The amount of new urban growth in 1993 and 2003 were extracted from FWC land use and land cover maps and was then generated by intersecting urban areas in the earlier year. The new urban density indicator was calculated by normalizing the amount of new growth by the concurrent increase in population. Larger per capita new growth density values indicate a greater degree of sprawl.

Loss of open space under urban development: loss of open space is a measure of a decrease in important land lost due to urban growth. Sprawling development consumes open space across the landscaped surroundings. The indicator was developed by first creating maps of wetland and forest from FWC land use and land cover maps in 1993 and 2005. The wetland and forest maps then intersected with the new urban growth maps in 1993 and 2003 extracted from FWC land use and land cover maps. The open space loss

indicator was generated by the tabulating area of all open land (wetland and forest) categories in the earlier year that became urbanized by the later year for the metropolitan level. The per capita open space loss indicator was generated by normalizing the amount of open space loss by the concurrent increase in population. Larger per capita open space loss values indicate a greater degree of sprawl (Sim, Mesev, 2011).

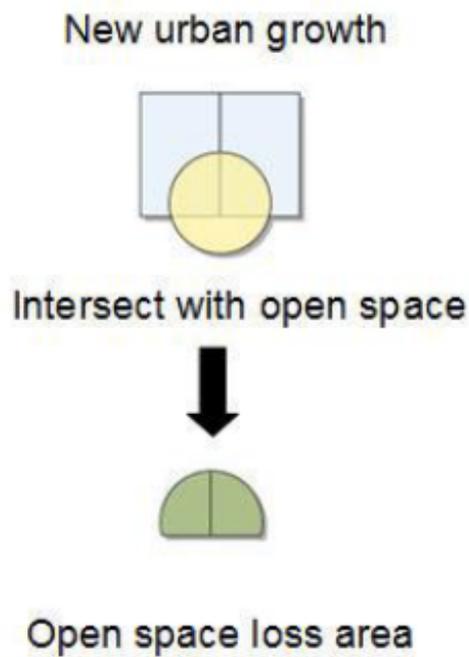


Figure 20 Explanatory diagram referring to the calculation of open loss area (Source: Sim, Mesev, 2011)

6.4 Case studies analysis

The research follows was conducted through the case study analysis developed by the use of GIS tools in order to calculate the three indexes of sprawl mentioned before. At the end of the process, cartographic maps were elaborated by GIS software tools to explain better the urbanization and density trends and understand the urban sprawl phenomena in the selected cases. Will be also providing further information about the land numerical data and used shapefiles. The first case study will be Ageo-Shi following by the case of Omiya and Urawa City which were analyzed at the same time due to their location within the same administrative zone.

6.4.1 Ageo-Shi - 上尾市

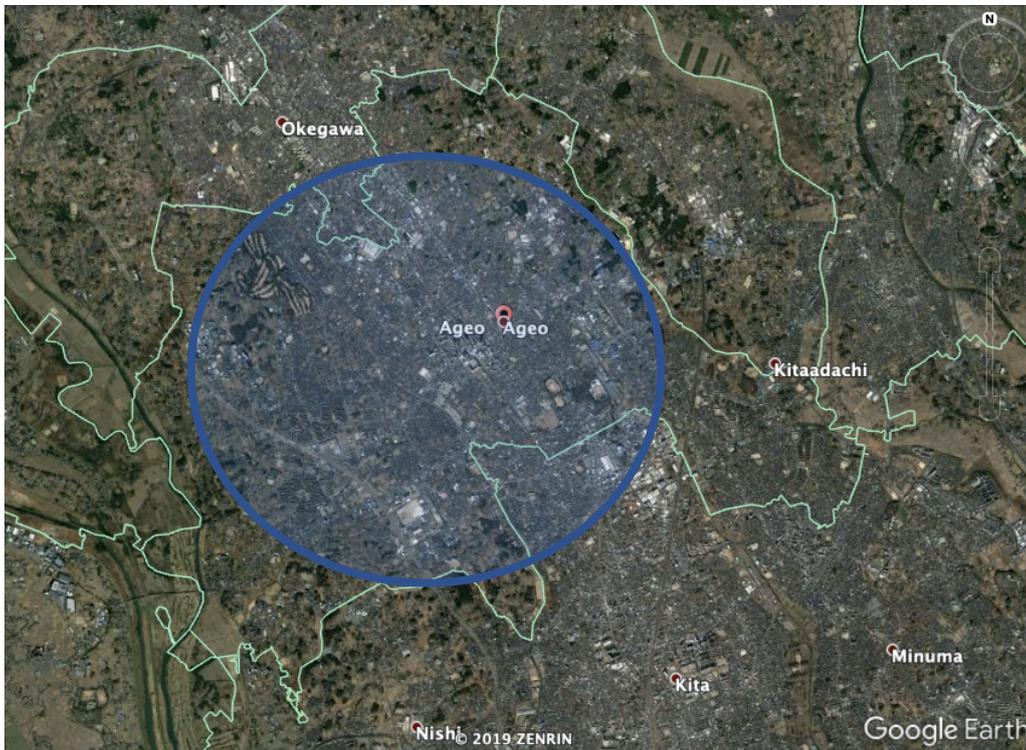


Figure 21 Aerial view of Ageo-Shi, Saitama Prefecture (Source: Google Earth)

Table 16.1 Size Index Ageo-Shi 1990-1995

<i>Description</i>	<i>Year</i>	<i>Units km²</i>	<i>Ratio %</i>
Urban land area (DID)	1990	22.90	
Urban land area (DID)	1995	24.10	
Urban land area ratio	90-95		+ 5,2

Table 16.2 Size Index Ageo-Shi 1995-2005

<i>Description</i>	<i>Year</i>	<i>Units km²</i>	<i>Ratio %</i>
Urban land area (DID)	1995	24.10	
Urban land area (DID)	2005	24.89	
Urban land area ratio	95-05		+ 3,3

Table 16.3 Size Index Ageo-Shi 2005-2015

<i>Description</i>	<i>Year</i>	<i>Units km²</i>	<i>Ratio %</i>
Urban land area (DID)	2005	24.89	
Urban land area (DID)	2015	25.44	
Urban land area ratio	05-15		+ 2,2

The first analysis was conducted on the case of the City of Ageo (上尾市) about the size index (DID surface increase trend), referred to a period of time long twenty years, from 1995 to 2015 (latest data census available at the time of research development). As is possible to see in the first table (16.1) the size index increased of + 5,2% in the previous five years, + 3,3% from 1995 to 2005 (tab. 16.2) and 2,2 % from 2005 to 2015 (tab. 16.3). The map elaborated by GIS reported in figure 22 shows, in fact, a little increase of DID not clearly visible mainly because located within the area already urbanized or close to the urban fringe. What is meaningful is the lower increase ratio in the DID surface despite the population increase.

The tables from 17.1 to 17.3 reveal a trend in the densification of the DID surface in the case of Ageo-Shi from 7.474,93 inhabitants per square kilometers in 1995 to 7.825,75 and 7.973,58 in 2015 with an increase respectively of +7,5%, +8,1%, and 4,1%. The density ratio is one of the most important indexes, that reveals a phenomenon of sprawl where density decrease generally is possible to observe a sprawl phenomenon increase; in our case, the steady increase in density describes a city where the sprawl slowdown in a period of time of twenty years.

The last calculated index was about the open space loss area (tab. 18.1 and 18.2). The data available provided by Japan Agency just from 2006 to 2015 gave us the surfaces used for agricultural purposes and covered by forest. The index shows a decrease of -53,7% related to the forest area and -47,9% for agricultural areas. This trend besides the increase in density of DID and a lower ratio of increase of urbanized surface it's a clear proof of the effectiveness of land consumption policies as Land Readjustment in the case of Ageo-Shima City.

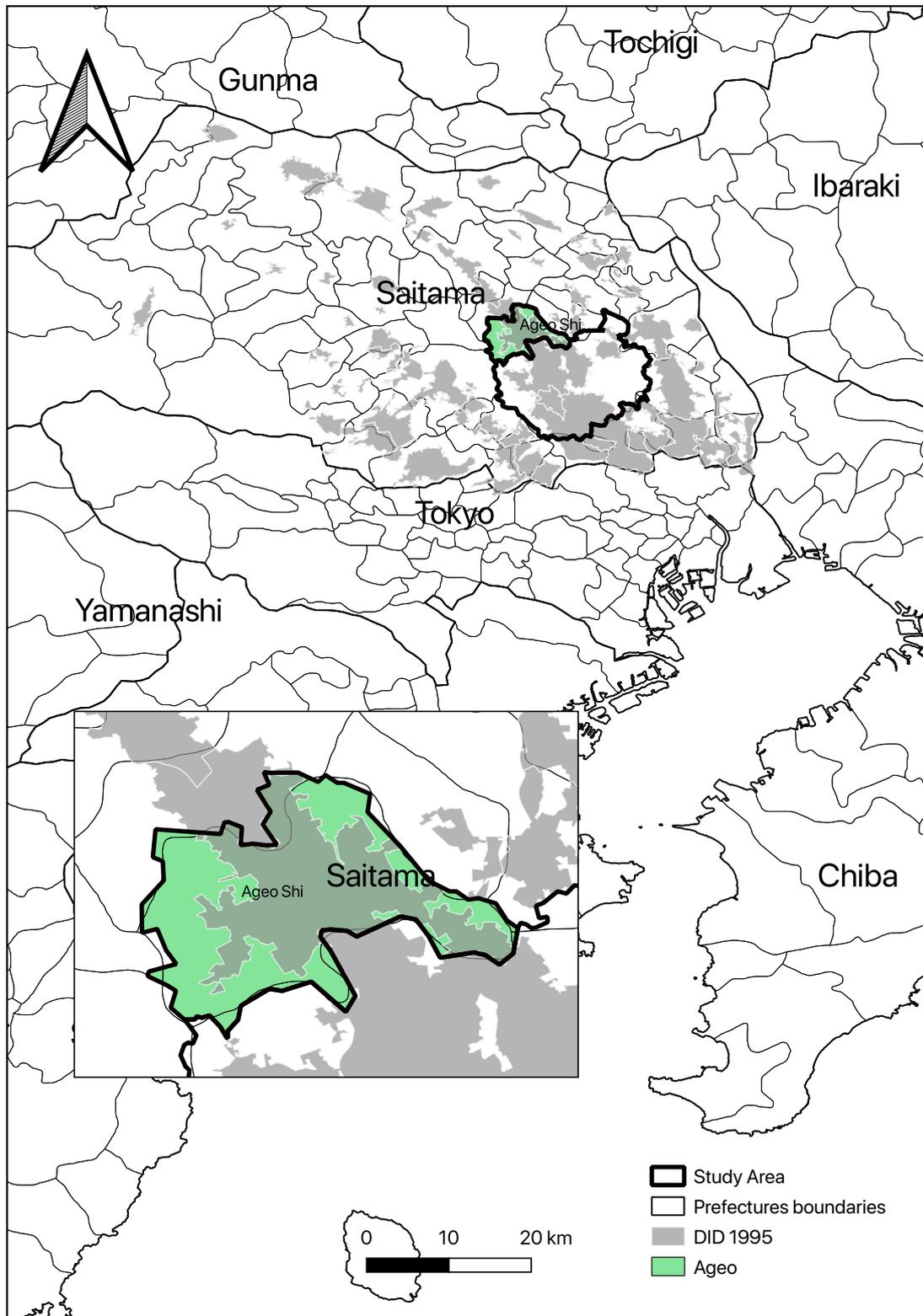


Figure 22 DID cartography Ageo-Shi 1995 (Source: author elaboration)

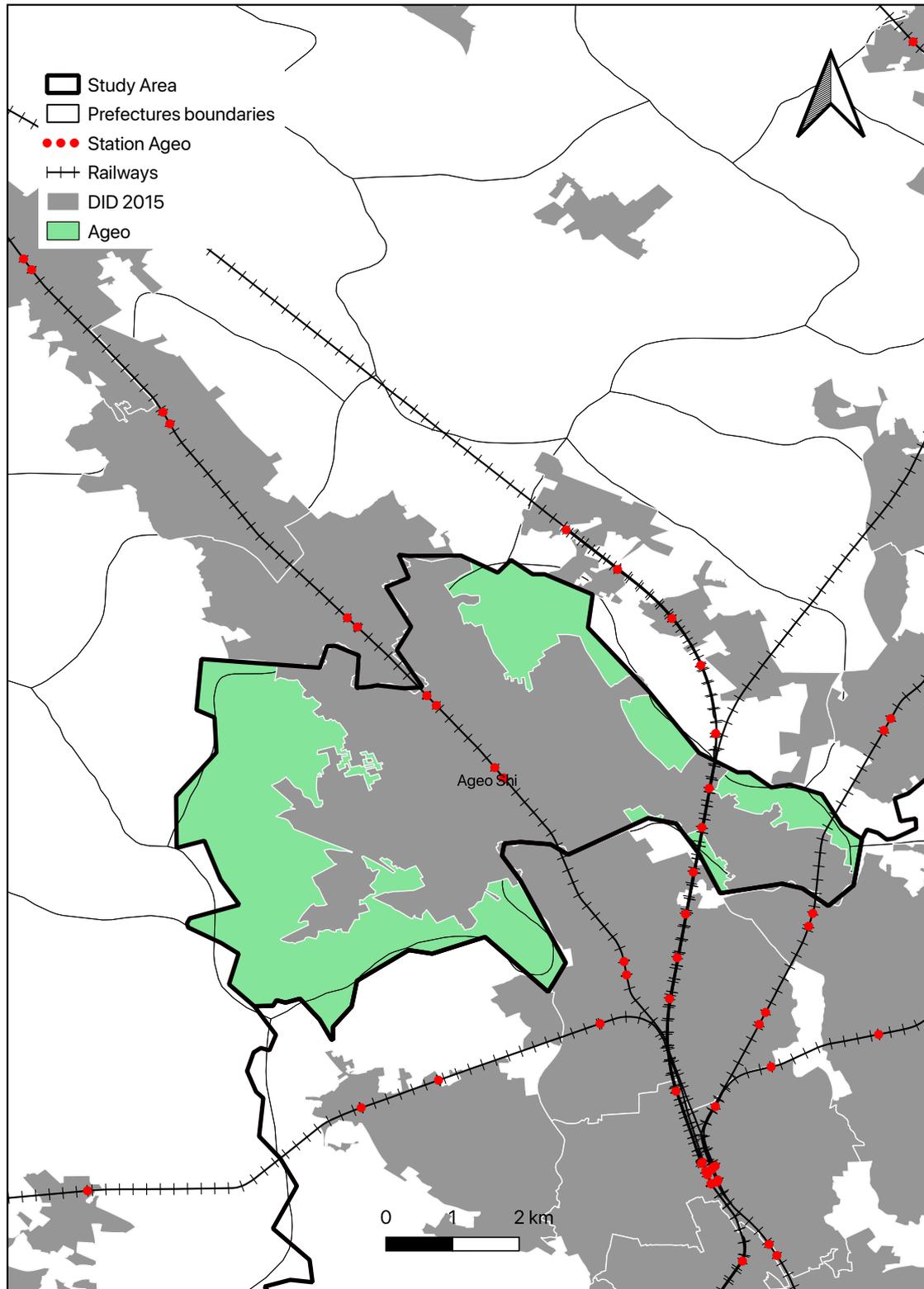


Figure 23 DID cartography Ageo-Shi 2015 (Source: author elaboration)

Table 17.1 Density Ageo-Shi 1990-1995

<i>Description</i>	<i>Year</i>	<i>Units</i>	<i>Density</i>	<i>Ratio %</i>
Population	1990	167.537		
Population	1995	180.146		
Population Ratio	90-95			+ 7,5
Population Density	1990		7316,02	
Population Density	1995		7474,93	

Table 17.2 Density Ageo-Shi 1995-2005

<i>Description</i>	<i>Year</i>	<i>Units</i>	<i>Density</i>	<i>Ratio %</i>
Population	1995	180.146		
Population	2005	194.783		
Population Ratio	95-05			+ 8,1
Population Density	1995		7474,93	
Population Density	2005		7825,75	

Table 17.3 Density Ageo-Shi 2005-2015

<i>Description</i>	<i>Year</i>	<i>Units</i>	<i>Density</i>	<i>Ratio %</i>
Population	2005	194.783		
Population	2015	202.848		
Population Ratio	05-15			+ 4,1
Population Density	2005		7825,75	
Population Density	2015		7973,58	

Table 18.1 Open Spaces Loss Ageo-Shi 2006-2010

<i>Description</i>	<i>Year</i>	<i>Units m²</i>	<i>Ratio %</i>
Forest Area Loss	06-10	253.028	
Agricultural Area Loss	06-10	1.436.925	

Table 18.2 Open Spaces Loss Ageo-Shi 2011-2015

<i>Description</i>	<i>Year</i>	<i>Units m²</i>	<i>Ratio %</i>
Forest Area Loss	11-15	117.045	
Agricultural Area Loss	11-15	748.545	
Forest Area Loss ratio	11-15		- 53,7
Agricultural Area Loss ratio	11-15		- 47,9

6.4.2 Omiya-Ku/Urawa-Shi - 大宮区/浦和市

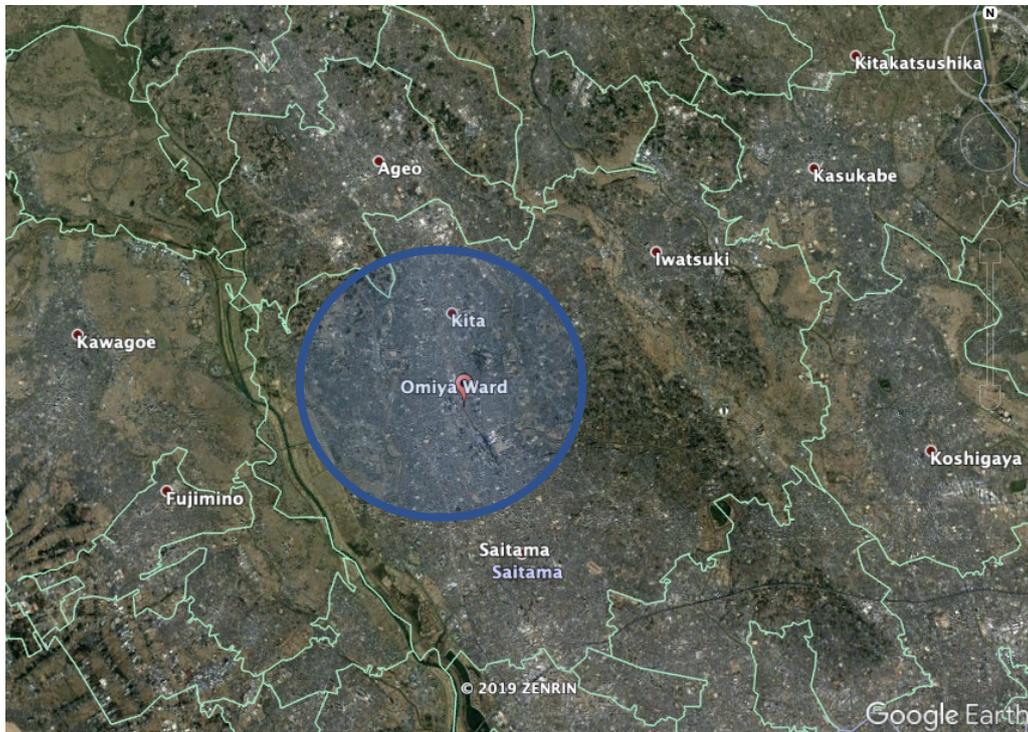


Figure 24 Aerial view of Omiya-Ku, Saitama Prefecture (Source: Google Earth)

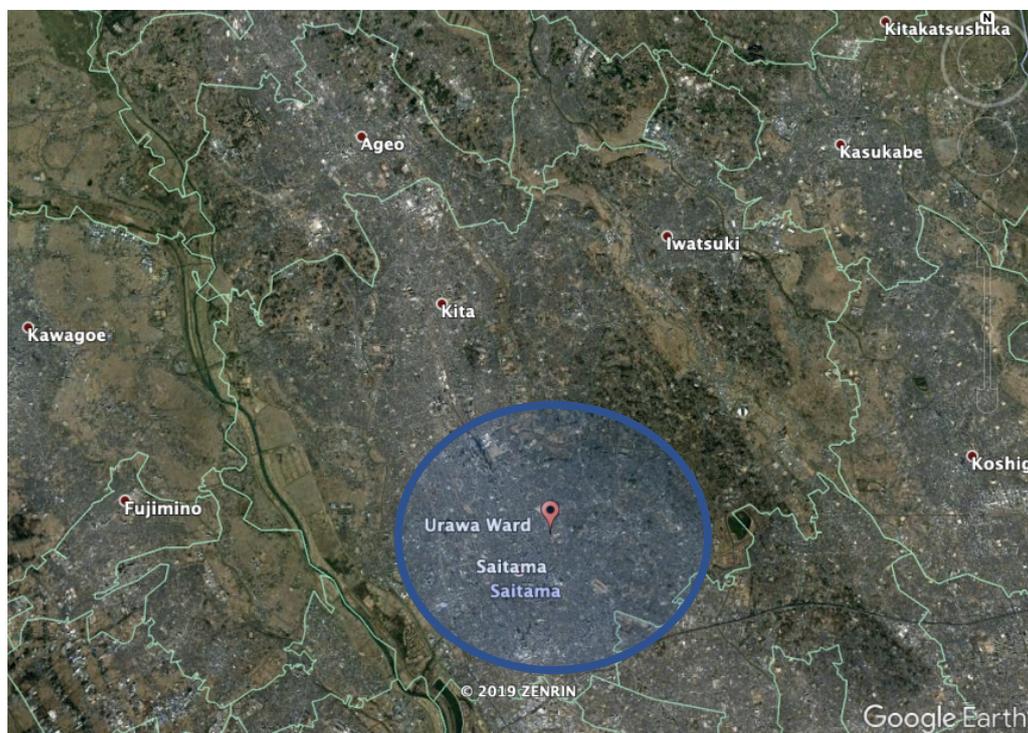


Figure 25 Aerial view of Urawa-Shi, Saitama Prefecture (Source: Google Earth)

Table 19.1 Size Index Omiya-Ku/Urawa-Shi 1990-1995

<i>Description</i>	<i>Year</i>	<i>Units km²</i>	<i>Ratio %</i>
Urban land area (DID)	1990	99.20	
Urban land area (DID)	1995	102.90	
Urban land area ratio	90-95		+ 3,7

Table 19.2 Size Index Omiya-ku/Urawa-Shi 1995-2005

<i>Description</i>	<i>Year</i>	<i>Units km²</i>	<i>Ratio %</i>
Urban land area (DID)	1995	102.90	
Urban land area (DID)	2005	104.72	
Urban land area ratio	95-05		+ 1,8

Table 19.3 Size Index Omiya-ku/Urawa-Shi 2005-2015

<i>Description</i>	<i>Year</i>	<i>Units km²</i>	<i>Ratio %</i>
Urban land area (DID)	2005	104.72	
Urban land area (DID)	2015	105.82	
Urban land area ratio	05-15		+ 1,1

The last two case studies analyzed are the Omiya-Ku and Urawa-Shi City both located in the Saitama prefecture and in the same administrative zone. This location was necessary to lead the analysis together. As in the case of Ageo-Shi, the first index calculated was related to size. Table 19.1 to 19.3 reported a continuous decrease in the urbanized area ratio from +3,7% (1995) to just +1,1% (2015) which clearly shows us a substantial-stop in the growth of the urbanized area. Besides this slowdown, we can assist as for the Ageo-Shi case a densification trend from +8,4% (1995) to +13,6% (2015) with 10.250,19 inhabitants per square kilometers against the 8.797,92 inhabitants per square kilometers calculated in 1995.

The last index (open space loss area), also, in this case, shown a clear slowdown in the consumption of open space as reported in tables 21.1 and 21.2. The data calculated confirmed the general trend with a ratio decrease of -47,8% about forest area and a less decrease – but also important - for the agricultural area with -15,0%.

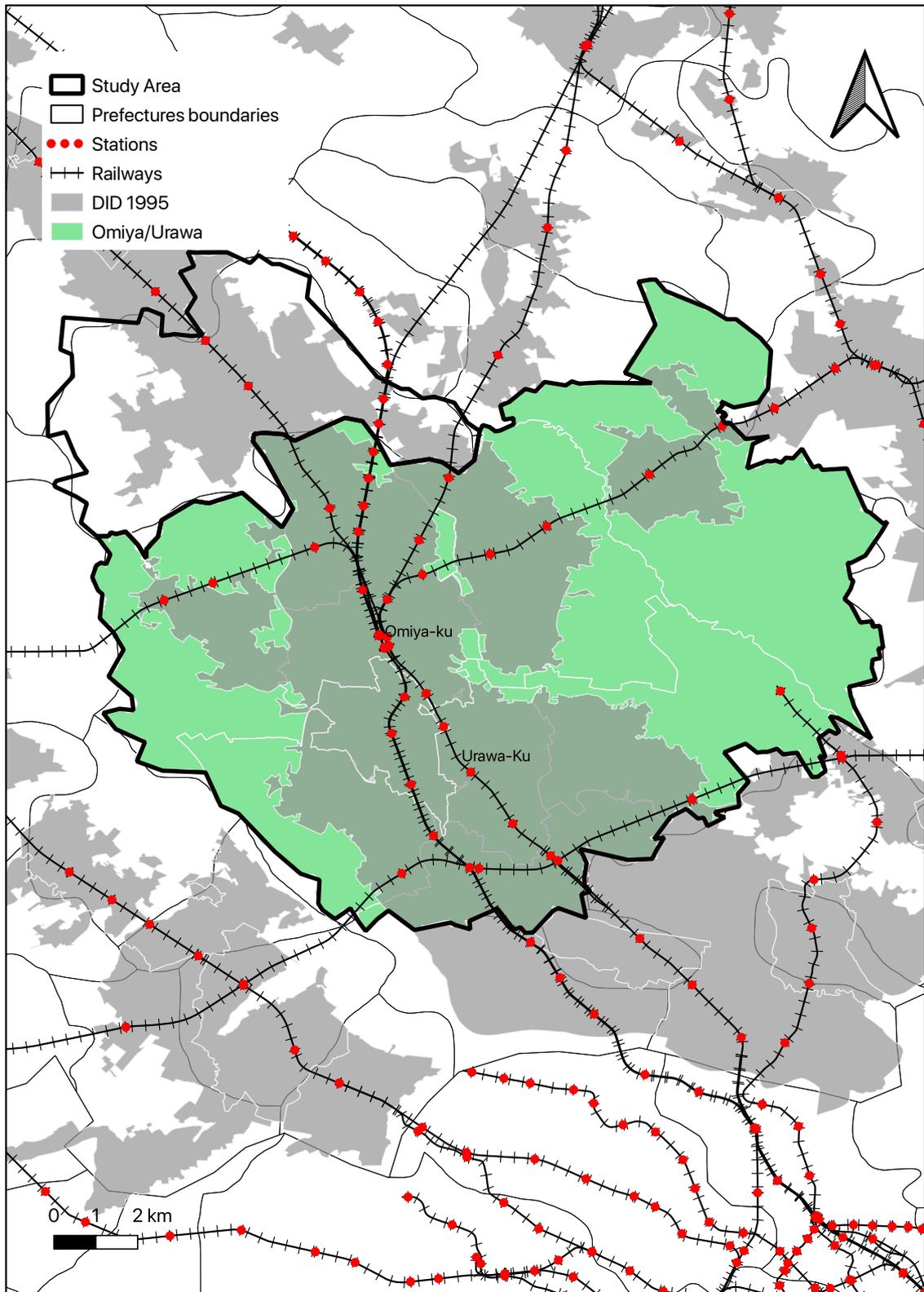


Figure 26 DID cartography Omiya-Ku and Urawa-Shi 1995 (Source: author elaboration)

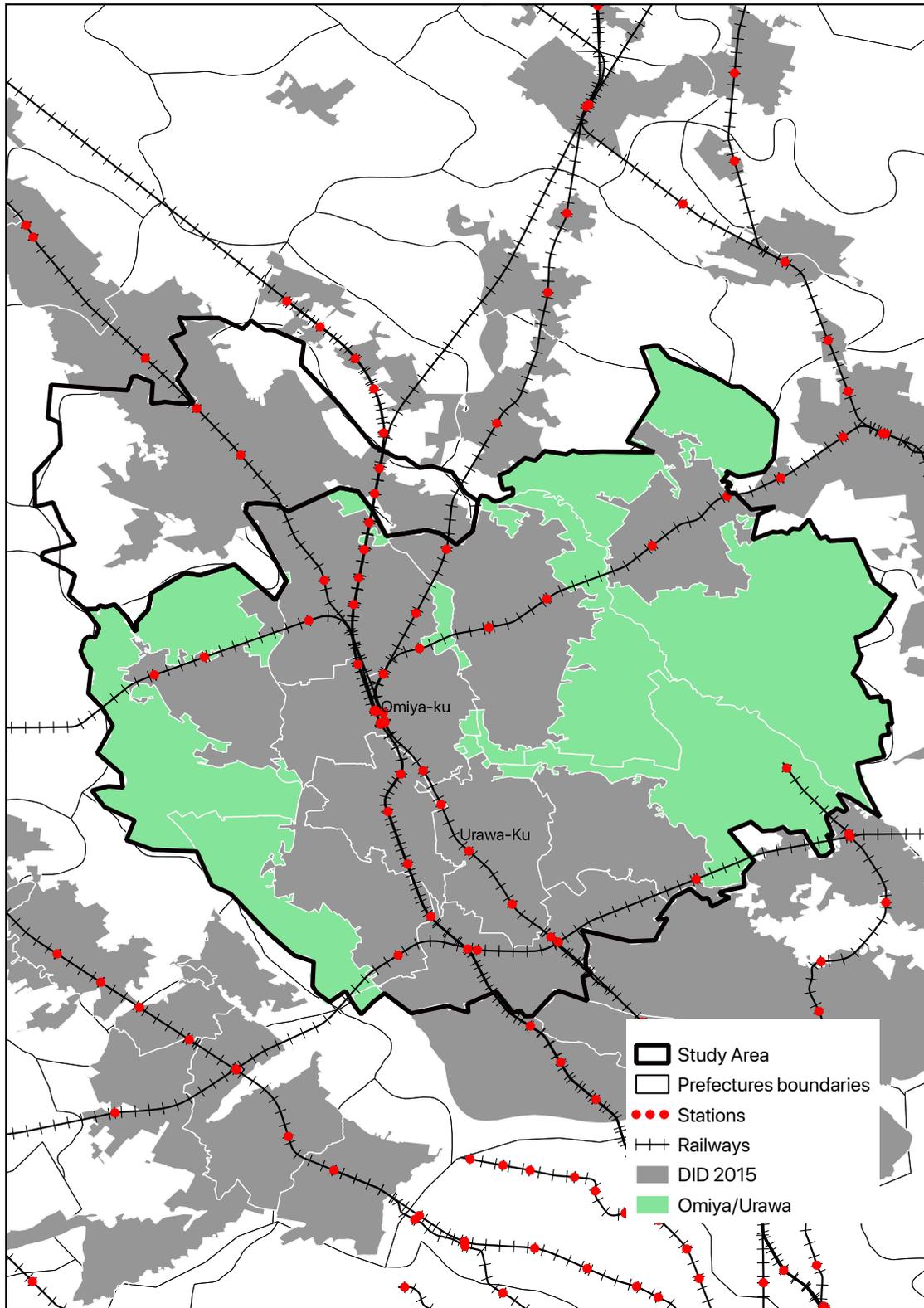


Figure 27 DID cartography Omiya-Ku and Urawa-Shi 2015 (Source: author elaboration)

Table 20.1 Density Omiya-Ku/Urawa-Shi 1990-1995

<i>Description</i>	<i>Year</i>	<i>Units</i>	<i>Density</i>	<i>Ratio %</i>
Population	1990	835.388		
Population	1995	905.306		
Population Ratio	90-95			+ 8,4
Population Density	1990		8.421,25	
Population Density	1995		8.797,92	

Table 20.2 Density Omiya-Ku/Urawa-Shi 1995-2005

<i>Description</i>	<i>Year</i>	<i>Units</i>	<i>Density</i>	<i>Ratio %</i>
Population	1995	905.306		
Population	2005	954.871		
Population Ratio	95-05			+ 5,5
Population Density	1995		8.797,92	
Population Density	2005		9.118,32	

Table 20.3 Density Omiya-Ku/Urawa-Shi 2005-2015

<i>Description</i>	<i>Year</i>	<i>Units</i>	<i>Density</i>	<i>Ratio %</i>
Population	2005	954.871		
Population	2015	1.084.676		
Population Ratio	05-15			+ 13,6
Population Density	2005		9.118,32	
Population Density	2015		10.250,19	

Table 21.1 Open Spaces Loss Omiya-Ku/Urawa-Shi 2006-2010

<i>Description</i>	<i>Year</i>	<i>Units m²</i>	<i>Ratio %</i>
Forest Area Loss	06-10	139.918	
Agricultural Area Loss	06-10	4.794.235	

Table 21.2 Open Spaces Loss Omiya-Ku/Urawa-Shi 2011-2015

<i>Description</i>	<i>Year</i>	<i>Units m²</i>	<i>Ratio %</i>
Forest Area Loss	11-15	117.045	
Agricultural Area Loss	11-15	748.545	
Forest Area Loss ratio	11-15	72.830	- 47,8
Agricultural Area Loss ratio	11-15	4.074.433	- 15,0

The next sub-chapter (6.5) will describe better the results obtained and reported in the previous tables which will be given a further explanation with the use of charts. These graphs will help us to understand the trends related to the index previously calculated.

6.5 Results

The size index for the historical series examined (1995, 2005, 2015) related to Ageo-Shi shown an increase in the footprint of urban area (DID) through the last two decades (tab.16.1, tab. 16.2, tab. 16.3) but in the same period although the urban area has grown percentages have recorded a continuous slowdown from + 5,2% in 1995 to just + 2,2% in the 2015 year of the last census which indicate a interested trend probably related to the implementation of LR in the area.

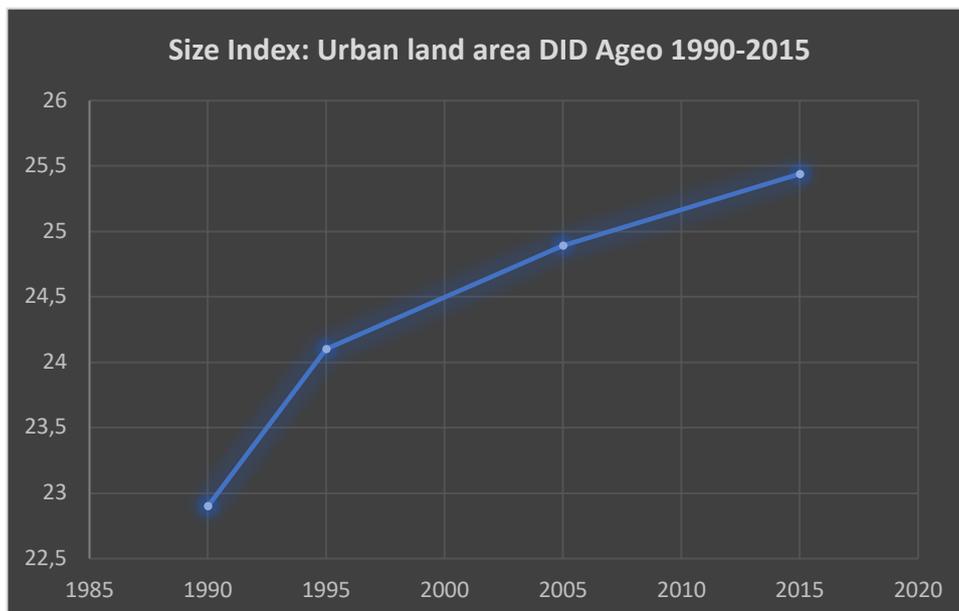


Table 22 Size Index chart referred to Ageo-Shi from 1995-2015 (Source: author elaboration)

The second index calculated is density, it's interesting to observe a steady increase in density from +7,5 % in 1990-1995 to +4,1% in the last decade which suggests us a process of densification in the City of Ageo. The last index is related to the loss of agricultural and forest areas calculated from 2006 to 2015 highlighted a steady decrease in forest and agricultural areas respectively – 53,7% and 47,9 (tab. 18.1, tab. 18.2).

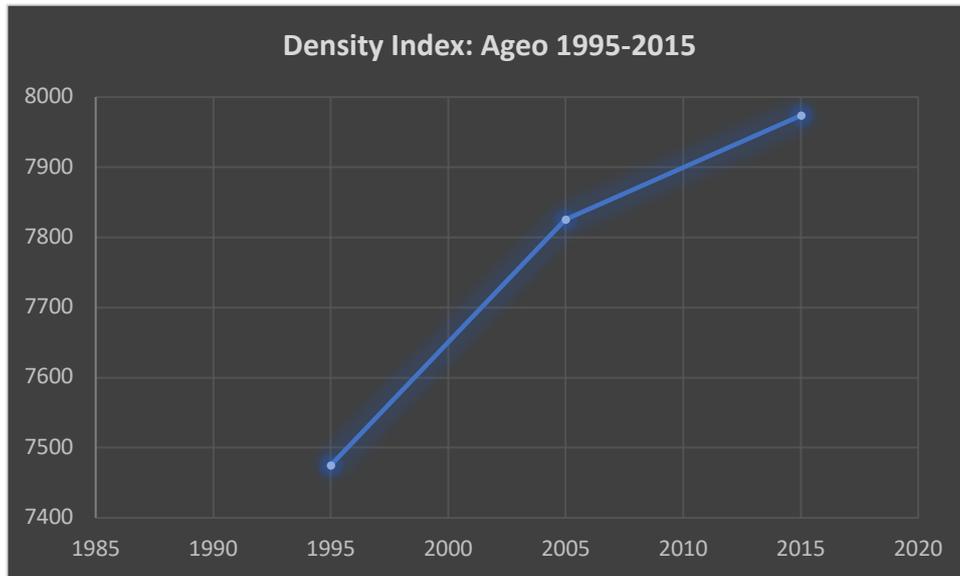


Table 23 Density Index chart referred to Ageo-Shi from 1995-2105 (Source: author elaboration)

Regarding the case of Omiya-Ku and Urawa-Shi was developed the same analysis in order to compare the indexes within the case study. About the size index, we can observe the same trend of a continuous slowdown of the percentage of growth from +3,7% 1995 to + 1,1% in 2015 of urban areas similar to Ageo City.

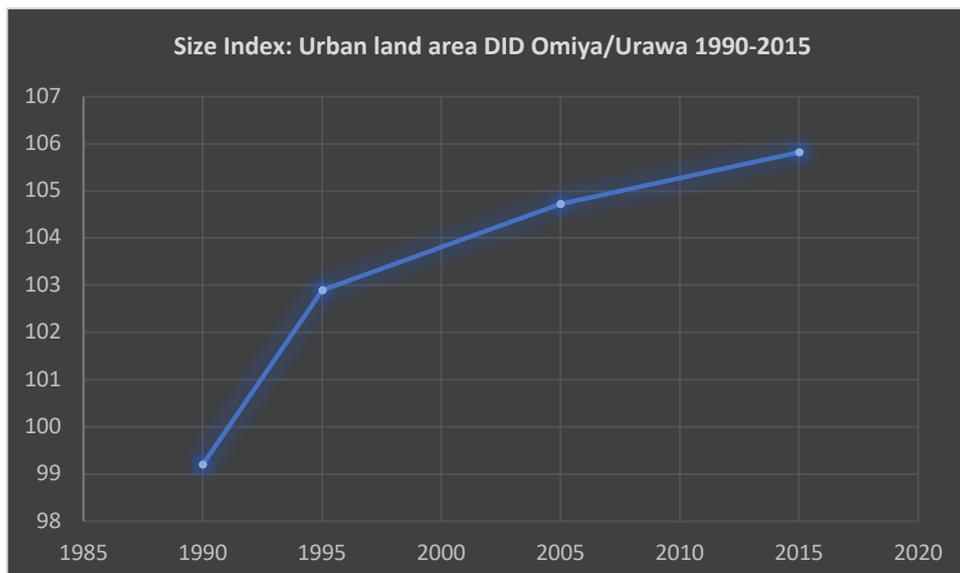


Table 24 Size Index chart referred to Omiya-Ku/Urawa-Shi from 1990-2015 (Source: author elaboration)

The density index also in the case of Omiya-Ku and Urawa-Shi showed a steady increase in density from +8,4 % in 1995 to +13,6% in 2015. Regarding the loss of agricultural and forest areas highlighted a steady decrease in consumption of forest and agricultural areas; respectively – 47,8% and -15,0 (tab. 21.1, tab. 21.2).

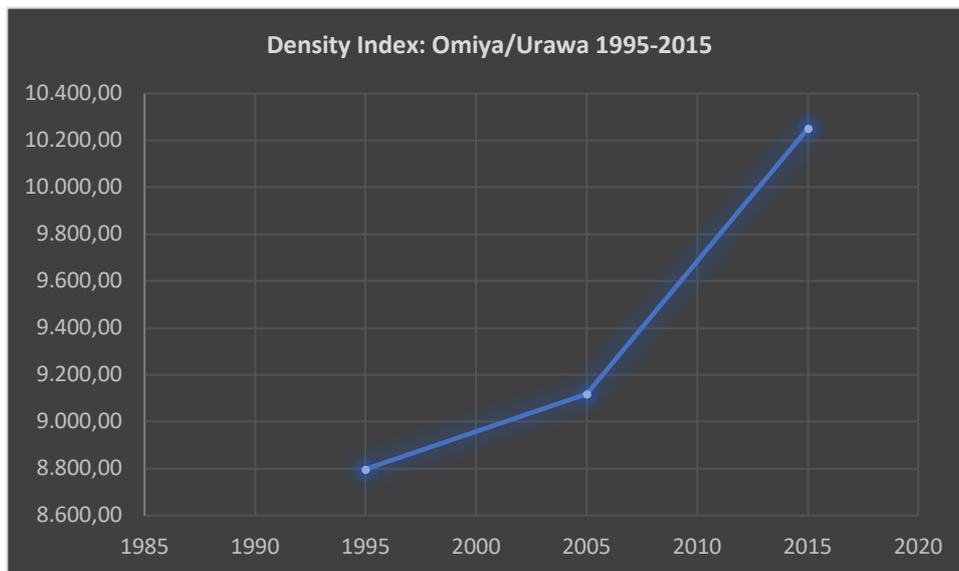


Table 25 Density Index chart referred to Omiya-Ku/Urawa-Shi from 1995-2015 (Source: author elaboration)

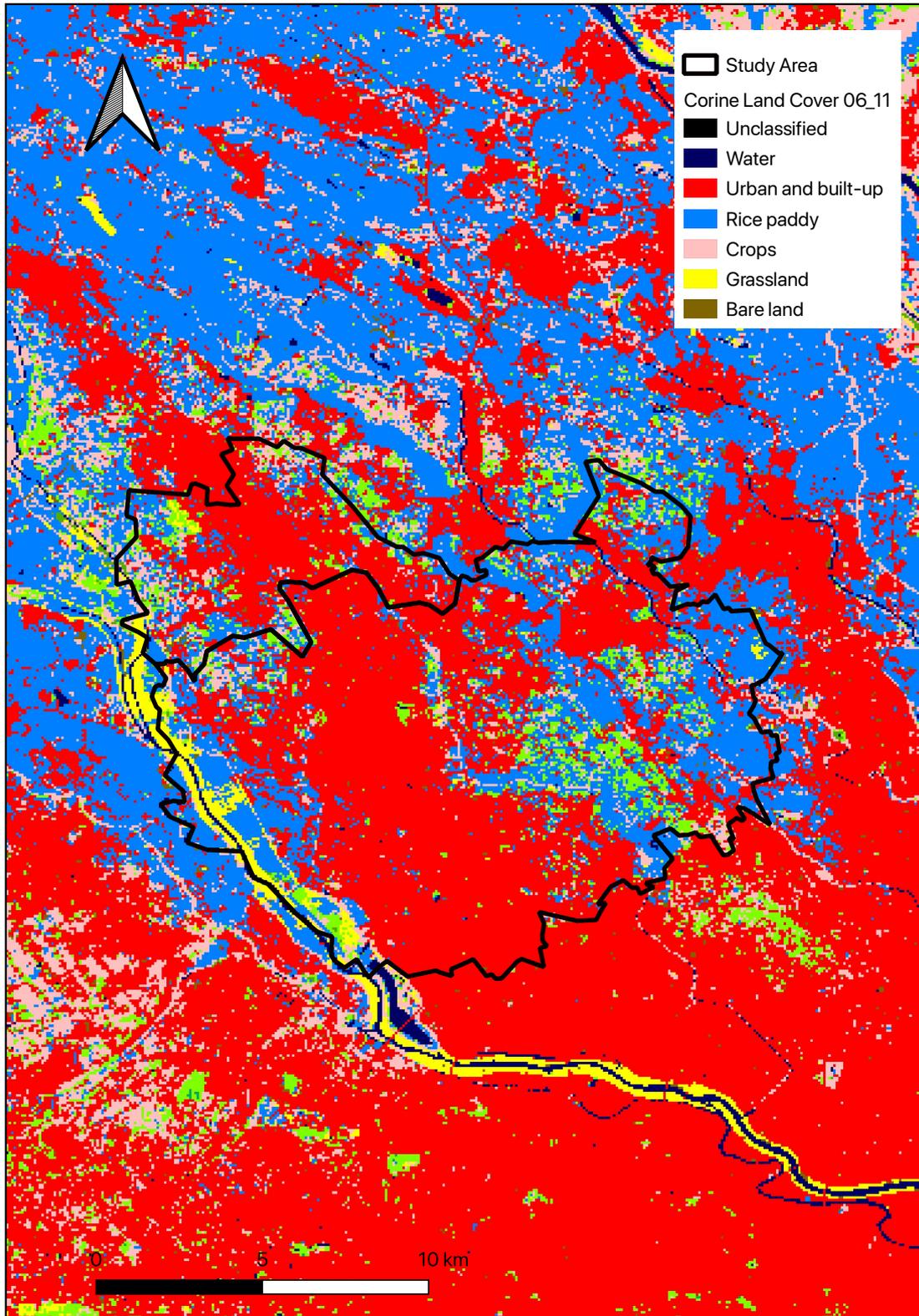


Table 26 Corine Land Cover between 2006-2011 (Source: author elaboration)

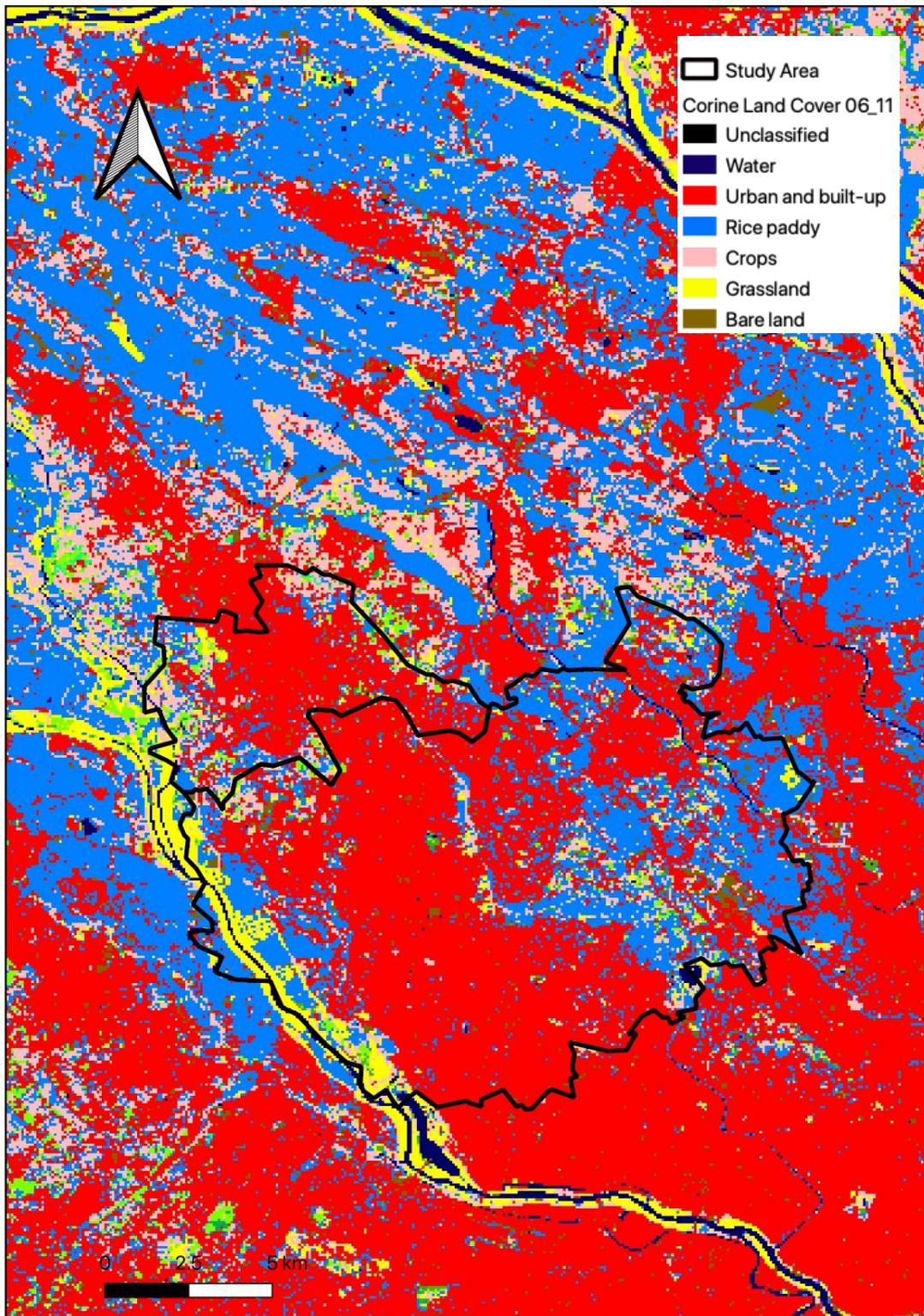


Table 27 Corine Land Cover between 2014-2016 which show substantial densification of urbanized areas (Source: author elaboration)

The two elaborations reported above represented a post elaboration of satellite images which allowed to describe better the land-use variation over two frames which were elaborated for the period 2006-2011 (tab. 26) and 2014-2016 (tab. 27). The Japanese Spatial Agency classified the territory in seven classes:

- unclassified;
- water;
- urban and built-up (red);
- rice paddy;
- crops;
- grassland (yellow);
- bare land.

As is possible to show in the two elaborations (there was not a significant growth in urban surface within the area previously analyzed (Ageo, Omiya, and Urawa) in terms of percentage of land cover classified in the red color as urban and built up patches through the last ten years. Related to this point also crops and grassland patches similarly don't show a visible change in their percentage of coverage; as is proved by the indexes below calculated.

In conclusion, these last elaborations provided further confirmation of the trends obtained by means of the calculation of the indices relating to sprawl which show a substantial decrease and slowdown in the phenomenon of sprawl in the whole Tokyo metropolitan area, especially in the urban fringes.

7. CONCLUSIONS

7.1 Concluding remarks

At the end of this long journey, it is now time to reflect on the experience gained thanks to the research carried out, and on the lessons that can be drawn from it.

Urban sprawl is one of the most impactful phenomena, which generates many environmental, social and economic issues as was discussed in this research's thesis and proved by the scientific literature. The case study selected - located in the metropolitan area of Tokyo – tried to describe the initial situation and the results which come out after the implementation of policies to tackle the urban sprawl phenomena in the Japanese context through the last decades.

In line with the main aim, this research in the third chapter has provided a general review of the urban sprawl with varied definitions of this phenomenon that have been given – by scholars - to find a clear and measurable definition. Besides, the main characteristics of urban sprawl description in chapter four were provided an overall description of the urban sprawl phenomena focused on Japan through the last decades after the Second World War. The chapter five as the main part of this thesis explored the Japanese planning system from the ancient era and the Japanese their power division; the last part of this chapter gave a depth description of the spatial policies at the national, regional and local levels and their contents to tackle the urban sprawl. An important section explained particularly the land readjustment tool as the main measure implemented by the Japanese government to reduce land consumption as explained by professor Sorensen in his previous researches. Chapter 6 is focused on the case study analysis of Ageo, Omiya, and Urawa aiming to explain if the policies – especially LR –

were successful in these contexts. The calculation of three indexes - size, density, and loss of open spaces – allowed the calculation of interesting trends related to the development of sprawl in the Tokyo Metropolitan Area which clearly show an important decrease in the percentage ratio of urbanized surface and loss of forest and agricultural areas and in the meantime the increase in densification of the DID.

In the following section, the limits of the adopted approach and research perspectives and suggestions will be given.

7.2 Limits of adopted approach and research perspective

The research methodology adopted in this thesis has allowed the analysis and evaluation of spatial policies aimed to contain urban sprawl in the Japanese context, particularly in the peripheral area of the Tokyo metropolitan area.

As mentioned before the research was conducted on a limited area located in the Saitama prefecture, so the main limitations of this work are related to the sample's limitation mainly linked to the low percentage of land covered by the study within the whole TMA. Despite the limited portion of the urban area analyzed, it can be said that the case studies analyzed are highly representative of the entire Tokyo metropolitan area; for localization, demographic trends and implementation of policies aimed at containing urban development. Besides this point, it is also important to highlight the several researches developed by Professor Sorensen during the 90s in the same territorial context and cities. The present thesis so aimed to continue - even if only to a limited extent - these researches in order to give feedback to the

assumption about the effectiveness of policies to face sprawl; extending the time horizon of the research until recent times.

In conclusion, the case studies analyzed in this research thesis, through the calculation of the indices, confirmed the effectiveness and impact of the planning tools – especially LR - used by the Japanese government in order to reduce the phenomenon of sprawl.

As mentioned in the first part of the present chapter urban sprawl would have negative effects on the future of cities across the world, so will be really interesting and essential to review and conclude all analysis in order to confirm firstly - without any doubts - the real impacts of Land Readjustment within the entire metropolitan area in order to understand if the trends highlighted in the case study are also present and reconfirmed at general level. This further researches can be focus on the calculation of more indexes in order to evaluate better the physical transformations of the urban environment and describe deeply the evolution of the sprawl and his future horizons.

At the end of this work the hope is that this research could be useful and informative for the scholars, other individuals and planners for the future implementation of new and innovative tools based on this experience not only in Japan but in whatever country and city that need to solve and control the urban sprawl phenomenon.

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