Vulnerability and Resistance of Urban Spaces against Crimes Focusing on Human-Environmental Relationship

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Focusing on Human-Environmental Relationship

人間－環境に着目した都市空間における犯罪に対する脆弱性と抵抗性に関する研究

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Abstract (English)

Although it is a safer country compared to other nations, Japan has a unique issue of "safety and security," the fear of crimes amongst citizens is high even though they rarely face actual crimes in their daily life. Now, people in Japan are interested in crime prevention and it is becoming a problem to be considered on a daily basis. Meanwhile, the research that is intended for the prevention of crimes which occur in the cities where a lot of people live (hereinafter, urban crime prevention research) can be seen as the research that is going to be needed increasingly more in the future in order to make possible the urban environments where people can live safely and affluently.

Looking back at the history of urban crime prevention research in Japan, there have been numerous findings; from relations between space-time and crimes, to researches on fear of crimes, and researches on crime prevention through environmental designs and development of crime prevention communities. On the other hand, there has not been much effort to theorize and systematize the knowledge acquired from this research of crime prevention in Japan, instead relying heavily on the studies done overseas. In addition, in Japan where crime rates are low by nature compared to other developed countries, there is a limit to how much can be studied solely by researching the data on crimes in Japan and it has become apparent that it is difficult to verify the effectiveness of theories of crime preventions and the development of crime prevention communities from such limited findings.

Yet on the other hand, it can be said that Japanese cities still keep a certain “defensibility” --enough to not have the same amount of crime occurrence as other western countries even though they seem to be just as westernized. Under this unique circumstance, it seems possible to make a breakthrough in the study field of place-based crime prevention in Japan by describing the relationship between a crime-intended person and their environment in order to approach directly a quality of crime activities in certain places, namely, a sense of “uneasiness”. Consequently, focusing on the “uneasiness” and the its causative factors, “resistance” embedded in urban spaces, this research aims to describe and examine the comprehensive “defensibility” which can lead to proactive crime prevention against two specific opportunity crimes (arson and bicycle theft) by clarifying both the “vulnerability” and the “resistance” of places in two targeted districts.

All in all, toward the realization of a human-environmental crime prevention study, this research unites consecutive research nexus` of the following two vectors of research: 1) Field work researches on the “uneasy” experience which happens in the human-environmental transaction when trying to commit each crime mentioned above in certain urban places, and 2) Quantitative study on the spatial factors related to the “uneasiness” in order to propose a comprehensive “defensibility” focusing on both “vulnerability” and ”resistance.”

Toward the end of this paper, some future issues are discussed, and the future possibility of applying human-environmental crime prevention study findings to practical urban crime prevention is projected. This thesis consists of 6 chapters with the following contents:

Chapter 1 introduces the research background, objectives and general composition of the study. The entire research layout, significance and limitations of the research are stated in this

chapter. In addition, the previous theories and concepts in the previous scientific studies about crime and crime prevention in Japan are reviewed in order to clarify the purpose and significance of this thesis.

Then, throughout Chapter 2, the history of criminology and crime-related studies focusing on spatial issues is reviewed to clarify what has been focused on and what has been ignored when discussing crime and crime prevention. Then, the objectives of this thesis are again highlighted and the alternative approach to crime prevention and its challenges are clarified.

Chapter 3 is an attempt to handle and clarify the "uneasiness" as a kind of experience which can be identified in the transaction between an individual and environment. This chapter first discusses the relationship between a behavior-intended person and environment in order to approach directly to the quality of "uneasiness" in human activities in certain places by describing the examples of "uneasy" experiences. Then, it is attempted to understand "uneasiness" theoretically. At the end of this chapter, application of the concept of "uneasiness" to crime prevention study is discussed.

In Chapter 4, arson, one of the crucial opportunity crimes whose targets are generally buildings and places, is picked up to handle to analyze both vulnerability and resistance to arson in Fukuoka and more specifically in Haruyoshi district, through consecutive researches from both urban planning and environmental psychological viewpoints. Primarily, it is aimed at describing temporal and spatial vulnerabilities against arson in Fukuoka and Haruyoshi, revealing some roadside objects and spatial designs related to resistance against arson by analyzing the text data about "uneasy" places for committing arson. As resistances, human traffic, observability and lack of anonymity are shown to be key. Then, this is followed by a discussion of the arson vulnerability index for a checklist which can categorize the evaluation into 5 aspects, and is based on the categorization; the importance of "DCO-CPTED" (District Characteristic-oriented Crime Prevention through Environmental Design) in relation to efficient crime prevention in a specific area is discussed.

The first part of Chapter 5 consists of a detailed analysis of the implicit reasons why bicycle thefts are not committed in particular places which are physically and socially embedded in the urban context. This has been done by analyzing field notes about where bicycles are regularly parked in the Kego elementary school district in Fukuoka city through the application of the integrated methods of contextual inquiry and text mining. Also, utilizing the results, a set of indicators were prepared to conduct on-the-spot surveys on bicycle parking places in the target district. Through logistic regression analyses, the equations for both vulnerability and resistance were obtained. Also, a scatter diagram clarifies the antagonism between vulnerability and resistance, and is able to detect the potential vulnerable spots. In the end, appropriate improvements on some types of vulnerable bicycle parking places as categorized based on the balance of two factors are suggested.

Chapter 6, as a conclusion for this research, contains an overall detailed conclusion for the entire study. Focusing on the discussed issues in each chapter, this chapter specifies the necessity of studies about human-environmental transactions in order to obtain knowledge about why people do not commit a crime in a certain place. This chapter also discusses the method used in Chapter 4 and 5, considering it as one of the alternative directions of clinical crime prevention study in Japan.

Abstract (Japanese)

国際的に見ると安全な国でありながら、国民の犯罪に対する不安は高いという「安全・安心」に関して特有の課題を持つ日本において、近年、防犯は一般市民によっても関心が高く、日常的に考慮される対象となりつつあり、人々が暮らす都市で発生する犯罪の未然防止を意図した研究（以下、都市防犯研究）は、住民が安全に、かつ豊かに暮らす都市環境の実現を目指すために今後ますます必要とされていくと予測される。日本における都市防犯研究の歴史を振り返ると、先駆する海外の理論をベースにしながら、犯罪発生との関連性から空間・時間の犯罪に対する「脆弱性」を明らかにする研究や、犯罪不安に関する研究、防犯環境設計や防犯まちづくりに関する研究など、多くの知見が積み重ねられてきた。しかし、他の先進国に比べると元来犯罪発生率が低い日本において、犯罪発生に関するデータのみから防犯に関する研究を行うことの限界や、得られた知見をもとに実践された犯罪対策や防犯まちづくりの方法論の効果を検証することの難しさも同時に明らかとなってきている。ところで、日本における都市の西洋化・多様化は、必ずしも西洋と日本の都市における犯罪発生傾向をも同じにはしておらず、これまでにも低い水準を保っていることから、日本の都市は未だに犯罪に対する「抵抗性」を有していると考えることも出来る。そこで本研究では、日本の都市空間が持つ犯罪を「しづらい」と感じさせ得る「抵抗性」に質的なアプローチで迫り、実際の犯罪二種に関する実証的研究において空間の「脆弱性」に留まらず「抵抗性」をも考慮に入れ、総合的な「防犯力」を量的なアプローチによって明らかにした。

第 1 章では、本研究全体の背景と目的、論文全体の構成を述べると共に、これまで日本にて行われてきている都市防犯研究をレビューし、本論文の目的と意義を述べた。レビューの結果として、日本における既往研究の多くは、都市防犯研究としながらも、実質は「犯罪発生」に関する研究を行い、その犯罪発生傾向から逆説的に防犯を考えるという研究が殆どであることを浮き彫りにした。

次に第 2 章では犯罪学及び防犯に関わる諸学問における研究の歴史的変遷をレビューした。結果として、既往研究の多くでは、これまでに空間が持つ犯罪に対する「脆弱性」のみが着目されており、かつ空間の「抵抗性」を論じるに至っていないことを明らかとした。また、そのような歴史から生じた日本の防犯研究が抱える問題点を指摘し、その解決策となり得る「しづらさ」を取り上げるという研究のオルタナティブを指摘した。

第 3 章では、次章以降で「しづらさ」を取り上げるために、「しづらい」と感じられる空間とはどういったものなのか、そしてどのように感じられるのかを、環境心理学・生態学的心理学からの観点から、4 つのエピソード分析をもとに考察し、最終的に「しづらさ」を扱い得る人間と環境のトランザクションを統合モデルとして表現した。

第 4 章では、人間が環境に関わる具体的な機会犯罪として放火を取り上げ、放火を「しづらい」と感じる空間についてのフィールドノートを基に GTA (Grounded Theory Approach)を用いて放火に対する「抵抗性」に繋がる路上の空間特性を明らかにした後に、従来の研究から得られていた

「脆弱性」に関する項目を含めた空間評価指標を作成し、放火発生の顕著な地区を対象に空間的特徴の評価を行った。結果から、防犯カメラ等の積極的な防犯関連設置物以上に、自動販売機や収集待ちのゴミ袋等の住民の日常生活に関わる物に対して、「人通り」、「被視可能性」、「非匿名感」の大きく 3 つに分類される「抵抗性」が見出された。また、各地区が持つ放火に対する「脆弱性」の特色を、5 つの側面（「非制限感」、「接近可能性」、「非被視可能性」、「荒廃感」、「実行可能性」）から評価し、それぞれの地区が必要とする改善点を評価の数値パターンに応じて明らかにした後に、上記「抵抗性」を生み出す住民の生活関連路上設置物の配置を含めた、地区単位における「脆弱性」と「抵抗性」の両面からの防犯環境設計を提案した。

第 5 章では、日本において発生件数が多い機会犯罪である自転車盗難を、人間-環境を見るべきもう一つの具体的な犯罪として取り上げた。対象校区内におけるフォーマル・インフォーマル問わず駐輪が行われている全てのポイントから、自転車盗難を「しづらい」と感じるポイントについての記述を収集し、それらテキストデータに対してテキストマイニングを行うことで、記述の中から自転車盗難の「しづらさ」に関連する視認物や状況を抽出した。その後、抽出した「しづらさ」に関わる「抵抗性」の指標と、既往研究で明らかとなっていた「脆弱性」の指標を合わせ、全駐輪ポイントを定量的に評価し、その結果と実際の自転車盗難発生に関するデータとの相関性を明らかにすることによって、自転車駐輪空間の「防犯力」を「脆弱性」と「抵抗性」の二つの関係性により説明出来ることを明らかにした。また、最終的な結果から、「防犯力」の高い駐輪場を整備するためには、駐輪場と駐輪した後に所有者が向かう目的地の関係性を明確にし、また自転車の数が極度に集中しないように小さい駐輪場を数多く配備する工夫が必要であるという示唆を得た。

最後に第 6 章では、前章までに得られた知見をもとに、日本におけるプロアクティブな都市防犯に関する研究の方向性として、路上空間が持つ犯罪に対する「脆弱性」のみならず「抵抗性」を考慮する手法により、相反する二つの性質の拮抗を考慮した上で総合的な「防犯力」を求めることの有用性を議論し、本研究全体における手法論を基にした日本における今後の防犯研究に対する展望に言及した。

Preface

"I'm interested in crime."

I often said it 8 years ago when I started studying criminology, and it surprised other people each time. Looking back at what I was doing then, I think it was the truth, but somehow, it did not fit what I wanted to do. For the last 8 years, I have been trying to fit the things I was doing to what I wanted, and went back to the origin of my research question many times. Apparently, I have several origins of my research question.

The first one is the experience that I had my watch stolen when I was in a junior high school. In the summer of 1998 when I was in the 1st grade of my junior high school, I went to a citizens' pool with my friends, and I had my watch stole since I forgot to lock my booth of a coin-operated locker. I almost cried and came back home, and told my mother the whole story. I hoped for some words of comfort from her when I was talking my experience to her, but she disappointed me saying, "You also made the crime." She neither blamed me nor who stole my watch, but I could not understand what she meant at that time.

Another is that I experienced when I was a university student. Since I needed to earn money for living, I did many part-time jobs. One night, after I finished working at a crape stand, I was walking on a street with few streetlights to my apartment, and I encountered a pair of hooligans. They tried to mug me for money with me saying I had been staring them. They didn't have any guns or knives, but they surrounded me and I had no ways to run away. However, after 5-minute quarrel standing in front of a vending machine, they gave up mugging me and left there. I did not know why they left me without getting any money, but felt relieved and went back home at that night.

Considering those two significant crime-related experiences in my life, the first one is asking me why I could not prevent it and the second one is asking me why I was saved. Both of them are related to my major research question: Why people do not commit a crime in specific situations?

My research question should be differed from the one with interests of the reasons why people commit a crime in specific situations. My primary interest has always been crime prevention but not crime occurrence. I hope I can answer those questions I mentioned above throughout writing up this thesis, but for now, there is one thing I was realized reviewing the origins of my research question and I am sure of:

"I'm interested in crime prevention."

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Chapter I Introduction

1. Introduction

1.1 Background of Research

1.1.1 Current Matters Related to Crime and Crime Prevention in Japan

Japan is said to have lost its myth and reputation for being one of the safest economically advanced countries. That is because the recorded crime rate has been increasing constantly until 2002 since WWII in police statistics (Fig. 1-1) according to the statistics in the Japanese White Paper of crime [1]. It appears that the Japanese society has lost confidence in its safety. In addition, it has been observed in the statistics that recently there has been a decreasing trend in the clear up rates. There is also a discussion about the real number of crimes which has been hidden under the tip of iceberg. In other words, the number of the recognized cases does not show the actual number of crime in Japan because there are some crimes which were not recognized by the Police or other people. This means that it is safe to assume that a greater number of crimes have been committed besides the numbers reported by the Police.

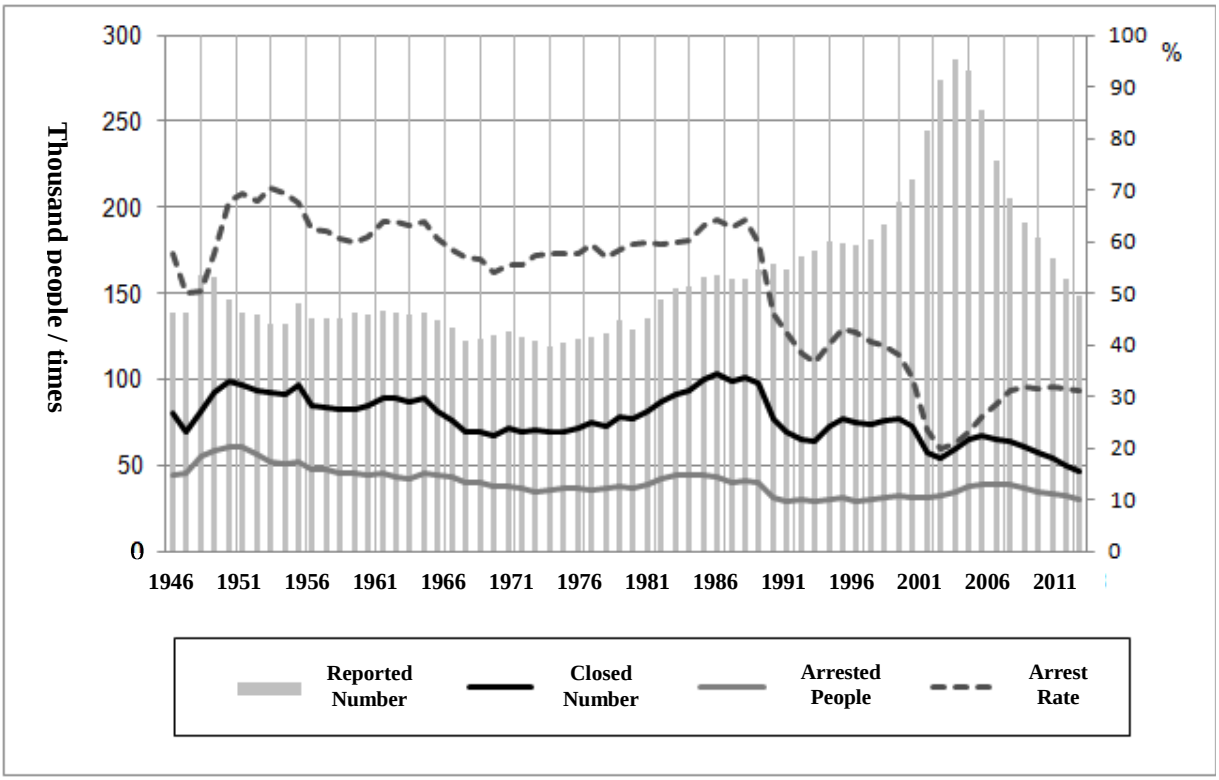

Fig. 1-1 Statistical Trend of Reported Crime and Arrested Criminals[1]

As shown in the statistics (Fig.1-1), one of the supporting points, that Japan has become dangerous, is the crime rate going up more and more recently. However, the reason why the number of recognized cases keeps rising might be caused by the technological innovation, for example, cell-phones made it extremely easy to contact others including the Police. Also, in terms of crime statistics, in the late 1990s, there was a series of police scandals in Japan that fundamentally changed the way the press reported policing issues. Such changes provoked key policy changes toward the reporting and recording of crime. This, in turn, resulted in a sudden increase in the number of crimes recorded, and a sudden decrease in the clear up rates (Hamai, 2004)[2]. In addition, Japan has been proud of the low rate of crime and comparatively safer environment than other countries. In fact, the occurrence rate of heinous crimes (murder, rape, robbery, and assault) in Japan was the lowest in rank amongst the OECD countries in the international comparison conducted by the United Nations [3].

Contrary to the fact of the actual condition about crime occurrence in Japan, a Cabinet Office survey of public attitudes showed that the proportion of those who thought the situation of crime in Japan was getting worse had increased from 18.8% in 1998 to 39.5% in 2004. Internationally speaking, these trends of national fear of crime are shown in a research through international comparisons. The research indicates that 86% of questionnaire-participants answered that they feel Japan has become less safe in comparison with ten years ago. The percentage is significantly higher than that of North America (54%) or Western Europe (58%) [4]. Also, an investigation about victimization, shows that only 1.2% of people in Japan has experienced being victims of burglary, but 34% of them are affraid of being victims of burglary within 1 month, and the number makes Japan to be categorized as a country that has the highest level of fear[5].

This trend in public fear of crime can be thought to be the result of citizen's immoderate exposure to the media reporting news about serious crimes which can threaten our society, especially since 1995 when the Sarin attack took place on the Tokyo subway. Also, this trend is being spurred on due to the technological development. In fact, a number of news organizations report the same news via numerous kinds of media including newspaper, TV programs, and internet, and agitate people's curiosity and fear of crime. Therefore, according to Hamai (2004) [2], the belief of a collapsing safe society can be blamed on the press coverage of crime statistics who created it. The disparity between press coverage of crimes and the actual numbers has become one of the factors to deal with when thinking about the fear of crime of Japanese people.

As a result, it is safe to say that Japan is a country in which there are fewer crimes compared to other economically developed countries. However, many of people hold the fear of crime, and consequently, it would seem that the belief of a safe society collapsed in a strange way. This strange twist of disparity between the actual situation and people's

perception of crime is a unique problem in Japan these days. It greatly boosted up people's interest in crime prevention in everyday life.

Against this social background, the report of the Science Council of Japan indicates that the disparity is a sign that there are current necessities for achieving a higher level of safety and security for people. This can be achieved by realizing a good connection between safety and security in a healthy social system construction [6]. Accordingly, an urban crime prevention study- the research about crime prevention and spatial/community design to create a city in which people can live safely- is now required to be conducted in order to address the issues mentioned above and to improve our habitat and living environment.

1.1.2 History of Crime Prevention in Japan

After the World War II, through the life in school, students learned to cooperate with others rather than to have a personality by being in a 'squad' in a class and competing with other classes (Komiya, 2005)[7], and when they became adults, they were well-trained to be a member of a group. It was completely natural for Japanese people to belong to a city or a village community, and there was one good example of community crime prevention in Japan which was community night patrol. People in a community or a group took turns to patrol the community where they lived. In the criminology science, there is an interesting theory explaining the reason why the consciousness of being in a group can prevent people from committing crimes. The theory is called "social bonding theory," also called "social control theory," which was mainly presented by Travis Hirschi. The theory states that the following four types of control encourage people not to commit a crime nor to break the rules: people's commitment to conventional lines of action, attachment to parents, peers or school, involvement in conventional activities, and beliefs in a common value (Hirschi, 1969) [8]. He emphasized that people who reject such social relationships, called social bonds by Hirschi, are more likely to lack commitment to conventional goals and commit a crime. On the other hand, people who are highly committed to conventional acts and beliefs are more likely to be involved in conventional activities (Siegel, 2005) [9]. The Japanese society was a good environment to grow such social bonds and real environment in which social bonds worked well.

The Japanese society was also a good environment in which the Police could maintain and exercise their authority. This is owed to the following two reasons. The first one is that there was the concept that the emperor, Japanese administration, and government official workers were in a higher position than the regular citizens, even though the system was abolished after World War II. It was related to the "IE" system, which was abolished in 1947. It was the smallest unit in the Japanese society under the Japanese family law in the Meiji

period. There was no longer the "IE" system legally in Japan; however, the principles of the old family system are still alive in the modern Japanese society. A model of samurai families and societies, which was influenced by the Confucian principles, forms the basis of both hidden Japanese systems, and they kept being informally followed by many Japanese people. Because of those hidden system, it was very ordinary for Japanese people to obey people who were in a higher position, such as government office worker including police officers. Therefore, police officer could make citizens follow their orders and keep the order.

The second reason is that there were fewer technologically developed objects, such as cars, PCs, and cell-phones which made people confined in their own space. But currently, Cars made people break through the limited physical area; Computers, internet and cell-phones gave people the ability to know many things and helped people expand their communication area. Any new movement in a society always creates new phenomena's, and their effects are not always positive but they might affect our society negatively in some cases. (Tanioka, 2004) [10]. Those technological developments increased the opportunities of people to commit crime and also the possibility of being a victim of one. For those reasons, it was considerably easier for police officers to maintain order in the past.

The practical dismissal of the previously mentioned Japanese old systems has been happening since the 20th century caused by in the dramatic change of the Japanese society. The number of farmers decreased, and the number of salaried workers increased. Meanwhile, the society and community has changed, which means that it became more and more difficult to protect a community by means of its own residents. People started having a car per a family and transportation has developed drastically, therefore, people's radius of action has expanded. Computers and cell-phones enabled people to contact each other regardless of the distance separating, and also increased the chances to meet people who are not direct acquaintances. Due to those changes in the Japanese society, even though deeply held values die hard, they have been modified to fit into the current society. Finally, Japan is now westernized, and individualism is widespread (Komiya, 2005) [7]. Japan is not anymore country in which people can protect their communities by themselves by means of the old fashioned was of crime prevention. However, the Japanese police do not seem to shift the way crime prevention is handled in way which can fit the current Japanese society.

People, including the police and Japanese media, persist in trying to clarify the cause of this unfortunate endeavor. Unfortunately, we can occasionally hear that some commentators and anchors mentioning that the cause of crime, especially bizarre and unusual murders, is the darkness of the criminal's mind, and they usually refer the problems and criminals to psychiatrists, which, most of the time, does not lead to an effective and practical solution for crime prevention. We need something that can work practically and directly linked with crime prevention.

Considering the resistance of roadsides, streets and cities against crime, Japanese cities were well-developed due to their co-ownership. The concept of concurrent ownership of streets or cities was the one our ancestors had developed as a crime preventive technology. With modernization and urbanization, the co-ownership concept collapsed because of the installation of the public concept in Japanese society. Both concepts, concurrent ownership and publicness, are considered similar to each other. But they're different in the point that the former stresses residents' ownership of streets while the latter excludes residents out of the streets. What we need now is to clarify how similar crime prevention factors can be embedded in roadsides.

Also, the crime prevention tactics which proved to work well in western country will work in Japan too, because Japan has been westernized after the World War II. However, Japan seems to have a westernized culture on the surface but still maintains the Japanese conservative system deep inside. Therefore, we need to develop our own crime prevention systems, and in the process, it is necessary to refer to the crime prevention literature which succeeded in western country.

1.2 Categorical Review of Previous Studies about Crime and Crime Prevention in Japan

Looking back on the studies conducted in the field related to place-based crime prevention in Japan, it is clear that the followings studies are the major ones so far: studies about 1) fear of crime, 2) community design, 3) crime occurrence analyzed by computing big data, and 4) others.

1.2.1 Studies about Fear of Crime

Since the beginning of the history of Japanese environmental criminology, studies about fear of crime, which refer to the fear of being a victim of crime as opposed to the actual probability of being a victim of crime, have been one of the main stream studies (e.g., Kobayashi and Suzuki (1981)[11]; Hino (2009)[12]). Fear of crime prompts people to think about self-protection, while making the area stressful and people avoid approaching it (Hale, 1996) [13].According to Hanyu (2008) [14], such fear of crime has several aspects: 1) evaluation of risk 2) self-evaluation of the ability to manage crisis, and it is divided in general fear of crime, such as the fear of whole idea of crime, and circumstance-depended fear of crime, such as the fear of crime in a particular place. The former tends to depend on affairs in a society, and the latter tends to depend on the physical environment. One of the most significant examples examining fear of crime is Saito's [15] study. Saito statistically analyzed spatial factors

influencing the fear of crime and crime occurrence in a residential district occupied primarily with tenement houses (Saito, 1991) [15]. Also, Osonoi et al. carried out a questionnaire survey of residents' fear of crime at parks, connections among other community members, and actual methods they practice for crime prevention. In addition to that, Amemiya conducted a survey on the evaluation of safety and the factors of fear of crime at parks, and demonstrated that the actual conditions of fear of crime occur especially in parks and wild roads with high bushes coverage (Amemiya, 2003) [16]. Interestingly, all of these studies clarified that the places where people feel the fear of crime differ from the actual places where crimes take place.

1.2.2 Studies about Community Design

One of the good examples of community crime prevention in Japan was the community night patrols. However, due to the drastic change of Japanese society, the concept of community has been weakening. Under the circumstances, the guideline of the promotion of safe community design was published in 2000 [17]. Since then, many researches about community design or building have been conducted with consideration for improving residents' quality of life. The concept of community design often tends to be related to a concrete method for defending children. For instance, Awashima et al. examined a case of security diagnosis of parks around a university and indicated the efficiency of university-participated safe community building projects for improvement of outdoor environmental conditions around the university (Awashima et al., 2012) [18]. Moreover, linking community design with neighborhood safety maps which is historically regarded as just a method to improve children's crisis management skills, Hino et al. carried out a participant based observation in the process of a park improvement project, and identified some key points to make effective use of neighborhood safety maps not only for education but also environmental improvement.

1.2.3 Studies about Crime Occurrence

Even if Japan obtained its position as the safest country among other economically developed countries, there is a certain amount of crimes enough to be used for statistics especially in urban areas. Therefore, supported by the recent development of technology, the tendency of crime occurrence is now being analyzed utilizing the big data of crime occurrence. Starting with the study conducted by Omata (1998) [19], analyzing the relationship between the occurrence of crimes and environmental and psychological aspects, the trend of this type of research began, and following researches have been conducted in order to clarify the relationship between crimes and the characteristics of cities and districts by utilizing big data of crime occurrence. For example, one of the studies analyzed the relationship between the

occurrence of situational crimes and spatial design, Ito et al. evaluated the spatial aspects and examined the occurrence of arson in a city (Ito, Oue, et al., 1999) [20]. Arima et al. also conducted a study on the spatial characteristics of urban crime focusing on the districts in which more arson has occurred (Arima et al., 2004) [21]. In addition, Amemiya identified the relationship between time series variations of residential burglary rates and the social and physical environments of local districts in Tokyo's 23 wards using latent growth curve modeling. They found that the variables associated with criminological theories are significant predictors of the shape of the latent growth curve (Amemiya, 2013) [22].

1.2.4 Other Studies Related to Crime and Crime Prevention

Criminals tend to recognize the physical features related to crime occurrence when they try to commit a crime. Therefore, there is a need to handle more variables to reach to more accurate defensibility. As one of the attempts to examine criminals' recognition of environment, some researches, based on the Koffka's research (Koffka, 1935) [23] about behavioral environment, examined criminals' cognitive maps (Iriya, 1974) [24]. These researches can contribute for understanding the criminal's acquaintance of places and ways to escape after they commit a crime, or, it can help clarifying the mechanism of choosing crime spots (Brantingham & Brantingham, 1981) [25]. These studies supported the development of geographical profiling. As for the study of environmental awareness, the review of security conditions, in terms of environmental evaluation, has been considered as a possibility. Shaw and Gifford had offenders participate in their experiments and had them measure the ease of breaking in by showing them pictures of homes; the result was that there was a correlation between the residence's "tendency to become victimized," and the existence of symbolic barriers and poor monitoring by the residents (Shaw & Gifford, 1994) [26].

In the experiments that Shaw and Gifford conducted, there is room for discussion as to whether the public would have a similar view to those of the offenders. This is not about whether criminals have innate tendencies; rather, the general public seeing themselves as" the person of the general public, unrelated to either the crime or the person on the victim's side"; therefore, their evaluation would be different from the one of the offender and it would be considered closer to the evaluation of the "fear of crimes." However, in the study of the fear of crimes, the differences with the actual crime sites have been often reported (Sugimura &Arima, 2008) [27].

1.3 Research Aims and Objectives

As shown in the research background, the major aim of this research is crime prevention. Even if it is not decidable whether Japan is safe country or not, reducing the amount of crime is inherently needed before crimes in Japan become uncontrollable.

Generally speaking, there are two approaches to pursue crime prevention. The first and the major one is to clarify why and how crimes happen in order to reduce the inductive factors in space. Since crime occurrences can be objectively observed, this approach is considered as the major and “only” way to go. However, the same way there is a study field of preventive medicine, it is possible and necessary to clarify why and how crimes can be prevented from happening considering the resistive factors against crimes of roadsides, streets, and cities. In the related fields of urban planning in this country, there is no research that directly examines the "characteristics that lead to crime prevention." The environmental criminal studies are crucial in finding elements of vulnerability in urban spaces to specific types of crimes; however, such approaches focus on eliminating elements of the city space where vulnerabilities are found, thus in turn, often end up reducing the attractiveness of the city. On the contrary, if we can examine the "characteristics that lead to crime prevention," we can adjust the elements that lead to such characteristics and propose alternative methods of crime prevention, and it can be the qualitative approach, that is, the difficulty of crime activities in certain spaces; unlike the conventional researches that focus on the opposite effects after revealing the easiness, as it is a more direct approach. It can be said that there is a possibility that this approach could provide the knowledge that leads to more effective crime prevention.

Consequently, the aim of the sequence of several researches shown in this thesis is to describe and analyze the process and reason of hesitation when an crime-intended person tries to commit a crime on roadsides, while distinguishing the causative spatial factors and their spatial placement, in order to reach to a spatial or a community design that revolves around effective crime prevention methods for further urban development.

1.4 Construction of the Thesis

This thesis is divided into 6 chapters (Fig. 1-2). Chapter 1 introduces the research background, objectives and a general description of the study. Also, the research layout, significance and limitation are stated in this chapter.

Throughout Chapter 2, the history of criminology and crime-related studies focusing on spatial issues is reviewed to clarify what has been focused on and what has been ignored when discussing crime and crime prevention. After which the objectives of this thesis are again explained and the alternative approach to crime prevention and its challenge are clarified.

Chapter 3 is concerned with the theoretical framework which backs up the entire discussion derived from this thesis. This chapter focuses on detailed insights about the theories that guide the thesis discussion in order to understand the "uneasiness" and "resistance" of urban space to crime. It is an attempt to handle and clarify the "uneasiness" as a quality which can be identified in the transaction between an individual and its environment. This chapter first discusses the relationship between a behavior-intended person and environment in order to approach directly the quality, that is, "uneasiness" of human activities in certain places by describing the experience of feeling "uneasy." Then, we try to explain the "uneasiness" feeling theoretically. At the end of this chapter, the application of the "uneasiness" approach to crime prevention study is discussed.

In Chapter 4, arson, one of the most crucial crimes, is chosen to be handled. The purpose is to reveal the vulnerability and resilience against arson in Fukuoka and more specifically in Haruyoshi district, through consecutive researches from both urban planning and environmental psychological viewpoints. Then, a description of the impact of microscopic objects and spatial design related to both vulnerability and resilience in the crime site for crime prevention is conducted by analyzing the spatial characteristics of the sites in which arsons have been carried out. This is followed by a discussion of the arson vulnerable index for a checklist which can categorize the evaluation aspects into 5 distinct categories, and based on this categorization; the importance of "DCO-CPTED (District Characteristic-oriented Crime Prevention through Environmental Design)" in relationship to efficient crime prevention in a specific area is discussed.

Chapter 5 consists of a detailed analysis of the implicit reasons why bicycle thefts are not committed in particular places physically and socially embedded in the urban context. This has been done by analyzing field notes about where bicycles are regularly parked through the application of the integrated methods of contextual inquiry and text mining. Also, utilizing the results, a set of indicators are prepared to conduct on-spot surveys on bicycle parking places in Kego elementary school district in Fukuoka city. Through logistic regression analysis, the equations of both vulnerability and resistance were obtained. Also, a scatter diagram clarifies the antagonism between vulnerability and resistance, and is able to detect the latent vulnerable spots. In the end, suggestions on appropriate improvements on some types of vulnerable bicycle parking places categorized based on the balance of two factors are proposed.

Chapter 6, as a conclusion for this research, contains an overall detailed conclusion for the entire study. Focusing on the prevailing issues of each chapter, this chapter discusses the necessity of human-environmental transactions in order to obtain knowledge about why people do not commit a crime in a certain place. This chapter also discusses that the method used in Chapter 3 and 4 should be explored as an alternate direction of crime prevention study in Japan.

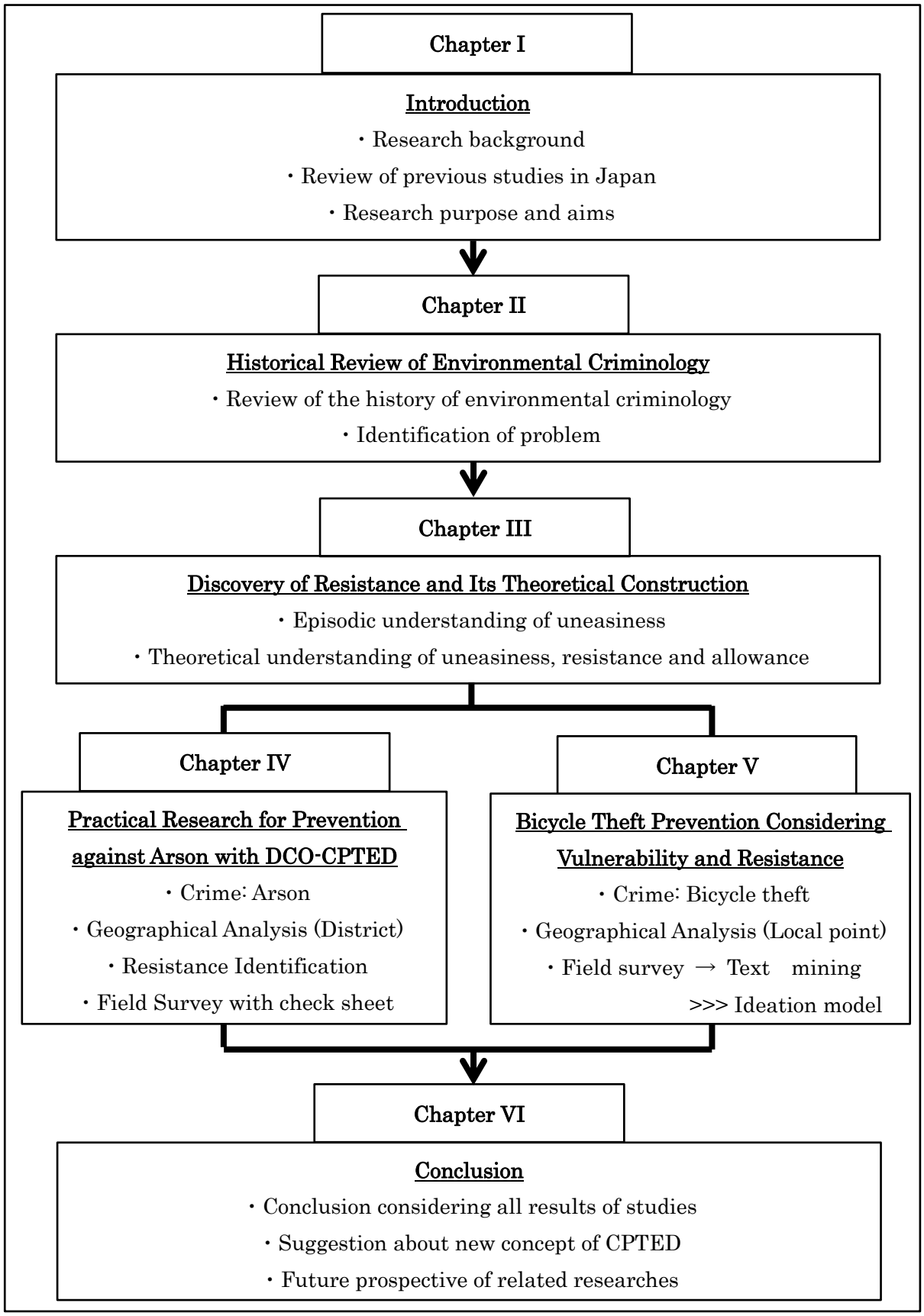

Fig. 1-2 Research Flow

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Chapter II Historical Review of Studies about Crime and Crime Prevention

2. Historical Review of Studies about Crime and Crime Prevention

2.1 Introduction

Besides the discussions about high efficiency and city functions, the discussion about urban safety has recently been centralized in the study field of city planning and community design. That is because it is considered that a city should be with residents' life in it, and residents have a right to live with safety. Therefore, it is impossible to conduct a city planning without regarding the safety of residents. In addition, safety can be one of the good qualities a city or country can have, and it will be an important factor to attract people to live in a city.

In our country, although the role of urban planning for residents' safety in a city has been considered important, conventionally, the focus has been put on the protections against natural disasters and traffic accidents. Consequently, crime prevention has not been fully acknowledged. However, due to the changes in social situations associated with westernization, as well as the decline in sense of security, since the 1990s, the "Crime Prevention through Environmental Designs" which approaches to urban planning as crime prevention has been discussed extensively, and crime prevention has become a topic to be considered regularly. For instance, in addition to institutions such as stores, multiple-unit housing, and parks, there is a hardware side of measures that covers installations of street lights, security cameras, and blue security lights, as well as the introduction of construction of residence that offers crime prevention such as gated communities and home security systems; and a software side of measures that involves phones with GPS and security alert systems, neighborhood watch, crime prevention classes offered by police officers.

Under these circumstances, the theories and methods from environmental criminology have attracted attention with a focus on CPTED (Crime Prevention through Environmental Design). Environmental criminology is a study field within the criminology discipline. In essence, it applies the scientific method to examine the relationship of the individual environments in which crimes occur and analyzes the impacts of these external variables on people's cognitive behavior. Many of researches in the field indicate criminal patterns within particular built environments in urban areas and describe how they influence or contribute to criminal activity and behavior.

In the following, the beginning and development of environmental criminology, which has brought up the ideas to prevent crimes through environmental design which can control the crime inductive factors embedded in buildings, districts or regions, was reviewed with details of each theories derived from it or related fields such as criminology, criminal sociology and environmental psychology.

2.2 Criminal Atavism, the Origin of Criminology

In the history of criminology, Cesare Lombroso, a member of the Positive School of crime prevention and who tried to identify the difference between criminals and other people, was the pioneer in inducement of scientific methods of criminology. His ideas and researches, mainly about criminal atavism which is basically about some biological traits of born criminals, had gained wide attention and also criticized both in Europe and in America in those days [1].

However, as criticism of their work mounted, biological explanations of crime gradually fell out of favor and were abandoned in the early twentieth century. The criticisms on the concept of criminal atavism were given mainly from criminological sociologists who believe the environmental determinism. As the main opponent to Lombroso, Alexandre Lacassagne, a French criminologist and the founder of the Lacassagne School of criminology in the University of Lyon, placed the main emphasis on environmental influence and the importance of improving social environment to prevent crimes, although the environmental determinism did not exclude hereditary matters or physical anomalies [1].

Lacassagne's criticism was a minority opinion in the criminal anthropology association of those days, but it has become increasingly popular, and Lombroso and his work are sometimes even ridiculed today. However, it can be said that Lombroso's work on the born criminal was a direct offshoot of applying the scientific method to the study of crime, and surely he and his work had an important influence upon methods and attempts to shed light on criminal phenomena by utilizing statistics.

2.3 Sociological Criminology

2.3.1 Social Positivism

One of famous Greek philosophers, Aristotle, said that human beings are a political animal; in other words, human being should be in a society to live, and in our daily life, we are contacting and facing each other in a society. On the other hand, it can be said that crime does not happen if there is no contact among people. That is because, simply speaking, crime is an event that causes advantage unfairly for one person and disadvantage for another. Therefore, if there is a society, there are surely some crimes in it.

On such foundation Aristotle laid, a group of positivists developed the field of sociology to scientifically study the major social changes, and the foundations of sociological criminology was conducted by the works of pioneering sociologists L. A. J. Quetelet (1796-1874) and Emile Durkheim (1858-1917), a French sociologist, developed an innovative

idea about crime with considering a society as an organization [2]. According to Durkheim's vision of social positivism, crime is "bound up with the fundamental conditions of all social life," and crimes and delinquencies are natural events in a society (Durkheim, 1895) [3]. He also mentioned that it is virtually impossible to imagine a society in which criminal behavior is totally absent [4]. In addition to that, he believed that crime should be functional, and all behavior can be categorized as crime if the behavior goes over a particular line or level designated by each society. For example, it is morally unacceptable but not a crime to spit chewing gums away on the road in Japan, but people will be arrested if they spit a chewing gum in Singapore. In Singapore, spitting chewing gum is considered as a crime. Since our society has offenders, we needed to create laws which are a kind of security. According to our laws, there is an area in which people can do everything as long as they do not go over the borderline and break the law. If someone passes the borderline, we call the person a deviant or an offender. His idea implies that all of people in a society have chances to commit a crime and become a criminal.

2.3.2 Chicago School

While in Chicago of the United States, due to the development of commerce and industry and urbanization following the increase in immigration population since the 19th century, crimes had become the major social issue. Moreover, crimes of gangland under the prohibition were attracting people's attentions in the society. From this kind of circumstance, the Chicago School, a group of urban sociologists who studied the relationship between environmental conditions and crime, was emerging during the 1920s and 1930s specializing in urban sociology by using the methods of Ecology. The Chicago School is the primacy of sociological positivism, and was laid its foundation by researches begun by Robert Ezra Park (1864-1944), Ernest W. Burgess (1866-1966), Louis Wirth (1897-1952), and their colleagues in the sociology department at the University of Chicago [1].

These urban sociologists examined how neighborhood conditions, such as poverty levels, influenced crime rates. They found that social forces operating in urban areas created a crime-promoting environment; some neighborhoods were "natural areas" for crime. In urban neighborhoods with high levels of poverty, the fabric of critical social institutions, such as the school and the family, became ruined. Their traditional ability to control behavior was undermined, and its outcome was a high crime rate.

Chicago School sociologists argued that crime was not a function of personal traits or characteristics but rather a reaction to an environment that was inadequate for proper human relations and development. Thus, they challenged the widely held belief that criminals were biologically or psychologically impaired or morally inferior. Instead, crime was a social

phenomenon and could be eradicated by improving social and economic conditions.

By pointing out the significance of the environmental factors and the effects, such researches of the Chicago school contributed greatly to the American society at that time when eugenics was the mainstream trend of thoughts.

As a result, the Chicago school laid the foundation of criminal sociology in the United States while becoming the mainstream of the environmental criminology in the following ages. However, after receiving numerous criticisms on the theories and research methods of social ecology which are the basis of its propositions, it has lost its advocates significantly once in 1940s.

2.4 Crime Opportunity Theories

Since the beginning of criminology, it had been mainly focused on criminals and why they are criminals, testing theories regarding the origins such as education, upbringing, or biological factors. These theories tended to ignore not only victims and environments but also the opportunities required for a crime event to occur. However, the fact that personal and social factors are beyond the reach of actual police practice had been often pointed out. Therefore, based on theories that suggest that offenders make rational choices and thus choose targets that offer a high reward with little effort and risk, crime opportunities got the spotlight in the study field in order to directly handle crime, not criminality (Clarke, 1997) [4], and crime opportunity theories were generated.

Crime opportunity theories insist that crimes happen depending on two things: the presence of at least one motivated offender who is willing to engage in a crime, and the conditions of the environment in which that offender is situated, simply speaking, opportunities for crime. Importantly, this theory indicates that all crimes require opportunity but not every opportunity is followed by crime, while a motivated offender is necessary for the commission of a crime but not sufficient.

With the crime opportunity theories, the Chicago School had again come under the spotlight since when it lost its momentum in about 1940s due to criticism of its application of socio-ecological theories and research methods. The major theories have a common feature that all of them can be applied directly to crime prevention, and current actual methods, such as CPTED (crime prevention through environmental design) and situational crime prevention, are featured for their practical, natural, and simple ways at low social and economic costs. In here, representative three pillars of crime opportunity theories are introduced [5].

2.4.1 Crime Pattern Theory

Considering the fact that many of crimes are planned or opportunistic, crime can be thought to happen when the space of victims or targets intersects with the space of offenders. A person has his or her own activity space consists of familiar locations like their houses, working places, schools, or shopping areas.

Crime Pattern Theory postulates that a crime involving an offender and a victim or target can only occur when the activity spaces of both cross paths. Simply put crime will occur if an area provides opportunity for crime and it exists within an offender's awareness space. Consequently an area that provides shopping, recreation and restaurants such as a shopping mall naturally has a higher rate of crime. This is largely due to the high amount of potential victims and offenders visiting the area and the various targets in the area.

Crime Pattern Theory considers how people and things involved in space and time in which crime happens, and explains why crimes are committed in certain areas. Crime pattern theorists have shown that the design and management of town and city can produce major changes in crime rates. For example, it is possible to reduce crime by calming traffic and orienting windows so that people can better supervise their own streets. This theory helps predict where certain crimes may occur, and aids law enforcement in figuring out why crime exists in certain areas.

2.4.2 Rational Choice Perspective

In the 1960s, criminal behavior was primarily believed as the result of inherited criminal predispositions and long-standing criminal predispositions that caused individuals to offend. In those days, research efforts were therefore heavily invested in programs to prevent the development of criminality, which was observed as in a complex of attitudes, personality traits, and dispositions to offend.

During the 1970s, as a general shift of focus in criminology, rational choice theories which focus on the cognitive aspects of offending came into the study field of crime in the Great Britain (Clarke and Cornish, 1997) [4]. In marked contrast to the determinist theories of crime, which presuppose offenders are passively driven to commit offences, the rational choice theory is the view that crime is a function and outcome of a decision-making process in which the potential offenders weigh the potential costs, consequences and benefits of an illegal act, and it focuses offence patterns, where, when, and how crime takes place (Cornish & Clarke, 1986) [6].

The rational choice theory can be seen as an information processing approach, which assumes that offenders make rational decisions about the benefits of criminal behavior after or

while collecting and evaluating all the relevant information. Therefore, in other words, its perspective tries to understand crime from the perspective of the offenders, how they evaluate criminal opportunities, why they decide to do one thing rather than another, and why they choose to obtain their ends by criminal and not legal means. This perspective has helped to explain why displacement does not always occur and has helped develop different ways to reduce opportunities for crime (Barnes, 1995) [7].

According to Ronald V. Clarke, people consider the following 4 points at least when they commit a crime such as robbery, selling drugs, or attacking a rival: 1) Possibility of success, 2) Possibility of failure, 3) Rewards of committing a crime, and 4) Scale of legal punishment [8]. It is impossible to objectively digitize the impacts of these items for each specific crime and situation. Therefore, they should be considered general or average level as an ordinary person can recognize.

Specifically, it is said that law-violating behavior occurs after offenders weigh information on their personal needs and the situational factors involved in the cost and difficulty, reward or personal gain such as tasting the feeling of thrill, and risk of committing a crime. Especially, it has been pointed out that a person who intends to commit a burglary or other crimes of opportunity tend to make a decision to engage in criminal behavior after weighing the consequences and benefits of their actions.

2.4.3 Routine Activity Approach

The concept of environmental criminology assumes that criminals choose when to commit a crime based on environmental opportunities and situational constraints. Cohen and Felson (1979) [9] analyzed patterns of property crime in the 1960s in America and found they reflected changes in society. For example, the increasing number of married women who worked meant that houses were empty during the day, and thus there was an increase in daytime burglary. Similarly, there has been a lot of interest in opportunist crime' - crimes committed without planning. An example of this might be when keys are left in the ignition of a parked car.

According to Felson and Cohen, crime is a series of phenomena which can be examined systematically, and he strongly insisted the necessity to hold objective point of view to get the effective idea about crime prevention with their major concept; Routine Activity Theory or Approach (Felson, 1998) [10]. Routine Activity Approach or Theory is about the interaction between the fluctuation of crime and the macro environmental (ecological) factors (Tanioka, 2004) [11], and excels at focusing the objective standards of criminology.

As the origin of their ideas, Cohen and Felson (1979) [9] examined the relationship between changing routine activities and crime rates in the United States between 1947 and

1974. Beyond their work, they theorized that the following changes contributed significantly to the increase of crime occurrence: 1) an increasing number of population in the juvenile segment, 2) proliferation of valuable but lightweight household items, 3) an increasing percentage of U.S. households consisting of two working adults and weakening of traditional social solidarity.

Additionally, in 1997, they developed the routine activity perspective linking the ecological viewpoints of the Chicago School to crime prevention, and articulated the Routine Activity Theory which is simply about that crimes happen when the following factors converge; 1) an intended criminal, such as many teenagers who belong to a gang group 2) the availability of a suitable target, such as a vacant house which accommodate valuable goods, and 3) the lack of a capable guardian, such as police [10]. Felson and Cohen believe that every society will always have some people who are willing to break the law for some reasons or motives, so both the motivation to commit crime and the supply of offenders are constant, and it is suggested that victimization risk can be reduced by increasing guardianship and/or reducing target vulnerability (Siegel, 2005) [1]. In short, they considered that crime and delinquency happen in our routine activities in everyday life, and the change in life style can influence to the occurrence of crimes.

One of Japanese environmental criminologist, Ichiro Tanioka, did a really notable experiment based on the Routine Activity Theory [12]. By integrating the Routine Activity Theory and Hirschi's social bond theory, Tanioka developed the theory of the "web of informal crime control," which is originally advocated by Marcus Felson. The theory is basically about that intended criminals' behaviors are influenced by not only suitable targets and capable guardians but also intimate guardians who are connected by Hirschi's social bonds. He focused on the school uniforms as a reinforcer of the "web of informal crime control." According to him, high school uniform can significantly reduce the number of high school students who commit delinquencies and crimes (Tanioka, 2004) [11]. In addition to that, Tanioka discovered that more prominent school uniform students wear in a school, less students in the school commit a delinquencies and crimes.

2.5 Environmental Criminology

Despite the obvious multi-faceted nature of crime, scholars and practitioners often attempt to study them separately. For instance, lawyers and political scientists focus on the legal dimension; sociologists, psychologists and civil rights groups generally look to the offenders and victims, while geographers concentrate upon the location of the event.

Environmental criminologists, originally from the Positivist School or that is Chicago School, focuses on criminal patterns within particular built environments and analyzes the

impacts of these external variables on people's cognitive behavior [13]. Environmental criminology is the study of crime, criminality, and victimization as they relate, first, to particular places, and secondly, to the way that individuals and organizations shape their activities spatially, and in so doing are in turn influenced by place-based or spatial factors. In detail, the environmental criminology is used as a kind of way to avert the will of criminals from the good situation to commit a crime by profiling the place, space, and environment. It centers on patterns of criminal behavior and victimization in specific environments, places, and how the interaction of people and the environments spatially forms particular human being's activities.

The origin of the realm of environmental criminology, an interdisciplinary academic field, is not clearly decided (Tanioka, 2004) [11]. Some say that the environmental criminology approach was developed in the 1980s by Paul and Patricia Brantingham, putting a spotlight on geographical and environmental factors that can influence criminal activity. The major research aim of environmental criminology in the beginning was to analyze geographical distribution of crime by ecological methods in order to improve the factors which facilitate crime occurrence and prevent crimes. The factors which were mentioned by Mr. and Mrs. Brantingham are not only criminals, victims, and laws, but also environment such as time and space (Brantingham & Brantingham, 1991) [14]. Early environmental criminologists examine when and where crimes often happen. They are interested in land usage, traffic patterns and street design, and the daily activities and movements of victims and offenders. Environmental criminologists often use maps to look for crime patterns (Verma & Lodha, 2002) [15].

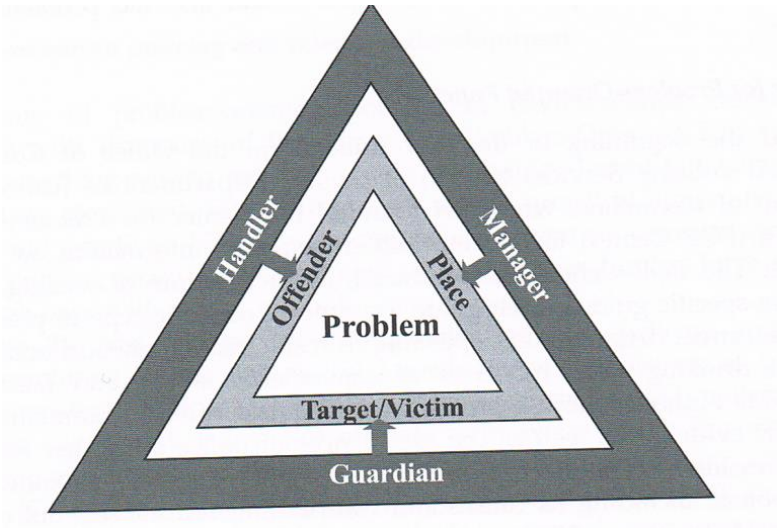

Fig. 2-1 Solution Triangle for Crime-Related Problems Considering Environment

2.5.1 Defensible Space

The concepts of "Defensible Space" were mainly derived from Jane Jacobs, who wrote *The Death and Life of Great American Cities* [16] in 1961, and Oscar Newman, who wrote *Defensible Space* [17] in 1972. It was a pioneer of the approach toward environmental design whose purpose is to reduce the opportunities for people become able to commit particular crimes.

In 1961, Jane Jacobs published her book about a research on Greenwich village in New York. She pointed out that the high-rise apartments, which had built in a number of regions in a high pace in those days, allowed many crimes happened there, and proposed the following basic principles for crime prevention: For crime prevention, it is needed 1) to differentiate public space and private space clearly, 2) to preserve residents' eyes on the streets by changing directions of buildings' faces, and 3) to make the streets used by pedestrians attract people to be on the streets.

Then, the term "Defensible Space" was invented and first used in Oscar Newman's book in the early 1970s, and it was popularized in the United States (Siegel, 2005) [1]. Newman's defensible space is that crime can be prevented through the use of infrastructural and architectural designs that reduce criminal opportunity. For example, houses or apartments that insist the places are private can repulse strangers (Tanioka, 2004) [11]. Observing Newman's idea, the areas in which crimes often happen are known as crime "hot spots," and they may have situational factors that help explain why the particular places have problems. For example, Newman pointed out that high-rise public apartments built from 1950s to 1960s had become a "hot spot" of crime in his book [17].

2.5.2 Geographic Profiling

Geography is also considered in law enforcement, through use of large pinned maps to show where crime incidents occurred. Mapping and analysis of crime, called geographic profiling, is now entering a new phase with the use of computerized crime mapping systems by the police and researchers, with the theories in environmental criminology playing an important part in understanding crime patterns. Geographic profiling (sometimes known as geo-forensics, but to be distinguished from geo-forensics that involves geological profiling) is now regarded as a practical and investigative methodology that uses the locations of a connected series of crimes to determine the most probable area that an offender lives in [1]. The methodology, rooted in the work of Brantingham and Brantingham (1975) [18], is based on a model that describes the hunting behavior of the offender.

Recently, some practical applications of environmental criminology theory include

geographic profiling, which is premised on the idea that criminals take into account geographic factors in deciding where to commit crimes (Bartol & Bartol, 2006) [19].

By incorporating both qualitative and quantitative methods, geographic profiling assists in understanding spatial behavior of an offender and focusing the investigation to a smaller area of the community. Although it is generally applied in serial murder, rape, arson, robbery, and bombing cases, geographic profiling also can be used in single crimes that involve multiple scenes or other significant geographic characteristics.

In addition to determining the offender's most likely area of residence, an understanding of the spatial pattern of a crime series and the characteristics of the crime sites can indicate other useful information, such as whether the crime was opportunistic and the degree of offender familiarity with the crime location. This is based on the connection between an offender's criminal behavior and his or her non-criminal life.

2.5.3 Situational Crime Prevention

According to Ray Jeffery, a criminologist, crime results partly from the opportunities presented by physical environment, therefore it is possible to alter the physical environment so that crime is less likely to occur. He argues that sociologists overstated the social causes of crime, and neglected both biological and environmental determinants (Jeffery, 1977) [20]. His major idea, Situational Crime Prevention, introduces discrete managerial and environmental changes to reduce the opportunity for crimes to occur. It is focused on the settings for crime and seeks to predict the occurrence of crime. Also, it suggests that much offending can appropriately be viewed not simply as the product of deep social, economic, and psychological causes but also as the result of deliberate choices by individuals. Therefore by making criminal action less attractive to offenders, criminal behavior can be suppressed.

From the middle of the 1970s, British criminologists Ronald Clark and Patricia Mayhew developed their "Situational Crime Prevention" approach: reducing opportunity to offend by improving design and management of the environment. Clarke is well-known for his development of the theory and application of situational crime prevention, although he also played a major part in the establishment of the British Crime Survey, in discussions of evaluation methodology, and in improving the knowledge base and tools for problem-oriented policing. He has consistently emphasized the necessity for crime-studies to be practical and well as academically rigorous.

The central concepts of the Situational Crime Prevention theory are deeply rooted in and influenced by other theories, including the rational choice theory, the routine activity theory, and the crime pattern theory (Clarke and Felson, 1993; Felson, 1994) [12] [21]. Naturally, Situational Crime Prevention has become an interdisciplinary, microscopic, and concrete

crime prevention method with the following basic principles (Clarke, 1997) [4]: 1) To reduce the opportunities for criminals to commit crime. 2) To change criminals' ideas about whether they can get away with a particular crime. 3) To make it seem harder, riskier, and less rewarding to commit crime.

More specifically, Ronald Clark published *Situational Crime Prevention - Case study -* including a core list of twelve techniques aimed at reducing a variety of offences in 1992 [22]. Then, as he conducted more research, the list grew from 12 to 16 techniques now. These techniques are categorized into the following 4 groups: ①Increasing perceived effort, ② Increasing perceived risks, ③Reducing anticipated rewards, and ④Removing excuses. Table 2-1 shows the detailed Clark's 16 opportunity-reducing techniques.

Now, Situational Crime Prevention is gaining recognition, and is already playing a part in Great Britain's and the Netherlands' government crime policy (Clarke, 1997) [4]. However, the techniques of Situational Crime Prevention shown in the Table 2-1 aiming to reduce opportunities have limitations. As new technologies arise and time changes, new and more efficient techniques will be developed, and will most likely replace some of the ones mentioned previously. Furthermore, not all techniques are tailored to be effective with respect to every category of crime. Some are more or less fitted to prevent specific crime, as for instance reducing provocations will work best for closed environments but may not necessarily affect thieves. Removal of excuses is aimed at lesser offenders, who engage in petty crimes in daily life, but will not affect hardened offenders. The techniques also overlap each other, as for instance increasing effort may lead to an increase in risks.

Society as a whole needs to take measures toward reducing opportunities for crime. According to the situational crime prevention theory, society plays a role in inadvertently creating crime, through the manufacturing of "criminogenic goods" (cars with no alarm systems, unprotected software, poor security devices, etc.), through leaky systems, and poor management/design of facilities (such as unsecured parking lots, overcrowded pubs and clubs, etc.). Society thus needs to come up with new ideas, with lesser economic and social costs. Another similar set of precautions against crime comes from the traditional "crime prevention through environmental design" (CPTED) which involves constructing and locating buildings in ways that "harden" crime targets, providing more "defensible space" and making it less attractive to offenders (Newman, 1972; Jeffery, 1977) [17] [20].

Table 2-1 Clarke's 16 Opportunity-reducing Techniques

Increasing Perceived Effort	Increasing Perceived Risks	Reducing Anticipated Rewards	Removing Excuses
1. Target hardening	*5. Entry/exit screening*	*9. Target removal*	*13. Rule setting*
Slug rejecter device	Automatic ticket gates	Removable car radio	Customs declaration
Steering locks	Baggage screening	Women's refuges	Harassment codes
Bandit screens	Merchandise tags	Phonecard	Hotel registration
2. Access control	*6. Formal surveillance*	*10. Identifying property*	*14. Stimulating conscience*
Parking lot barriers	Red light cameras	Property marking	Roadside speedometers
Fenced yards	Burglar alarms	Vehicle licensing	"Shoplifting is stealing"
Entry phones	Security guards	Cattle branding	"Idiots drink and drive"
3. Deflecting offenders	*7. Surveillance by employees*	*11. Reducing temptation*	*15. Controlling disinhibitors*
Bus stop placement	Pay phone location	Gender-neutral listings	Drinking-age laws
Tavern location	Park attendants	Off-street parking	Ignition interlock
Street closures	CCTV systems	Rapid repair	V-chip
4. Controlling facilitators	*8. Natural surveillance*	*12. Denying benefits*	*16. Facilitating compliance*
Credit card photo	Defensible space	Ink merchandise tags	Easy library checkout
Gun controls	Street lighting	PIN for car radios	Public lavatories
Caller-ID	Cab driver I.D.	Graffiti cleaning	Trash bins

Source: Adapted from Clarke and Homel (1997)

2.5.4 Crime Prevention through Environmental Design

As one of the ideas which have had huge impact in the study field of environmental criminology, it is impossible to miss the concept of 'Crime Prevention through Environmental Design (CPTED). CPTED is advocated by Jane Jacobs, Ray Jefferey, and Oscar Newman, and its major goal is to prevent people from committing a crime by physical characteristic of the place or environmental design ultimately (Hanyu, 2008) [23]. CPTED is a practical application, based on the idea that situational factors such as the environment (poor lighting) can make crime more or less likely to occur at a particular time and place, and it measures to reduce the likelihood can include adding lighting, or making the place less contributive for crime (Jeffery, 1971) [24].

The idea that the design of built environments and the incidence of crime are in some way related began to appear in research and policy work as early as 1961 when Jane Jacobs published her book *The Death and Life of Great American Cities*. Jacobs argued that a mix of land uses, consistent building setbacks, short block lengths and other characteristics resulted in twenty-four hour activity and “eyes on the street” can contribute to safer environments.

Then, Ray Jeffrey’s *Crime Prevention through Environmental Design* in 1971 introduced a new era in criminological thought centered on the environment surrounding a crime rather than the criminal. Jeffrey, a criminologist, was supported by Oscar Newman, an architect, in 1972 with his *Defensible Space*: *Crime Prevention through Urban Design* in which he highlighted the physical design ingredients of territoriality and surveillance as contributing to a secure environment, both internally and externally [24].

Nowadays, more citizens are involved in crime prevention and more crime prevention equipment is in use, and CPTED is often cited in these circumstances. In short, CPTED states that the physical layout or design of an environment can “eventually” prevent or deter crime in that environment. There is a reason why the word “eventually” is emphasized. A physical environment can directly deter crime in certain ways; e.g., a strong lock. The layout and design of an environment can also alter the awareness and behavior of residents and users. This altered awareness and behavior can eventually act as a crime deterrent. Using psychological mechanisms to deter crime is an extremely important part of CPTED.

In detail, CPTED is based on the four principles of maintaining surveillance, reinforcing territoriality, controlling access, and fortifying property. The following introduces the detailed concepts of four principles.

【Target Hardening】

Target Hardening is the traditional approach to crime prevention and security and often mentioned in connection with CPTED. This simply means making a building more difficult to

forcibly enter. People can target harden homes, sheds, and even vehicles. A few common ways to target harden a home include adding security strike plates with three-inch screws to all exterior doors and secondary locks to all windows and sliders. Secondary window locks could be inexpensive wooden dowels or window pins designed to create added security around the windows. Security film can be installed on windows making it more difficult and time consuming to break in. When considering how to target harden an area, remember that most criminals prey on opportunity. Removing opportunity (such as an open window) can significantly reduce chances of being victimized. Burglars many times use rocks and other large objects they find in the landscaping and around the property to break windows out.

【Access Control】

Natural access control is another design concept directed primarily at decreasing crime opportunity by denying access to crime targets and creating a perception of risk for offenders. People are physically guided through a space by the strategic design of streets, sidewalks, building entrances, landscaping, and neighborhood gateways. Design elements are very useful tools to clearly indicate public routes and discourage access to private areas and structural elements.

Criminals like to feel that they are in control. However, this sense of control can be denied by clearly marking the approaches to buildings and properties and channeling visitors into a defined area. As a few tips for creating natural access control, these are suggested: 1) Use maze entrances in public lobbies. The goal is to cut off straight-line access to a potential target, such as a bank teller or cashier. Even tension barriers that have to be jumped or navigated around can discourage the bad guys. 2) Use curbing and landscaping to direct automobile and foot traffic into a controlled, visible area.

【Natural Surveillance】

Criminals do not like to be seen or recognized, so they will choose situations where they can hide and easily escape. Consequently, the placement of physical features, activities, and people in a way that maximizes visibility is one concept directed toward keeping intruders easily observable, and therefore less likely to commit criminal acts. Features that maximize the visibility of people, parking areas, and building entrances are: unobstructed doors and windows, pedestrian-friendly sidewalks and streets, front porches, and appropriate nighttime lighting.

Here are some ways to incorporate natural surveillance into a business environment. 1) Keep areas well lit. In particular, building entrances should be bright at all times and provide a clear line of sight from both inside and outside. 2) Eliminate hiding spots. Cut down hedges and remove trees, bushes, fences, dumpsters, etc. that create blind spots or hiding places. 3)

Low, thorny hedges work well around windows, because they don't obstruct the view in or out, and they don't provide a comfortable place to hide. 4) Use Closed Circuit Television (CCTV) to view areas without natural sight lines. Put up monitors in public areas so that visitors know they are being watched. The last thing a criminal wants to see when they enter a building is their own face on a security monitor.

【Territorial Reinforcement】

Physical design can also create or extend a sphere of influence. Users are encouraged to develop a sense of territorial control while potential offenders, perceiving this control, are discouraged. This concept includes features that define property lines and distinguish private spaces from public spaces using landscape plantings, pavement designs, gateway treatments, signage, and open fences.

The purpose of this principle is to create a clear distinction between public and private property. This is important for two reasons: Legitimate occupants have a sense of ownership and will notice, and even challenge, people who don't belong; intruders, on the other hand, have a harder time blending in. Here are some ways to implement territorial reinforcement: 1) Make sure receptionists have clear sightlines to all entrances, as well as the ability to quickly and discreetly call for help. A panic button that calls a central station or signals for help via an alarm light in a separate section of the building works well. 2) Make sure security signage is clearly visible at all entrances. 3) Implement a visitor badging system, and make sure that all visitors are properly escorted.

The four principles can be categorized into 2. First, fortifying property and regulating access are the two methods of physically preventing crime. Fortifying property can involve fitting strong locks, building high fences, and employing security guards. Access regulation can mean establishing a “no trespassing” area, limiting entry and exit to ID card holders, or installing a reception desk with security staff. Access control directly keeps potential criminals out and makes it difficult for them to plan criminal activity in advance.

Also, Natural surveillance maintenance and protection of territoriality are methods that use psychological mechanisms. Natural surveillance dictates that crime is deterred in places where the eyes of residents, users, and passersby naturally drift (in other words, where people can see). This principle was invoked during the development of the place-based crime theory, which was started by scholars like Jacobs (1961) [16]. In particular, it emphasizes the role of the natural surveillance. In addition, similar to symbolic barriers referred by Oscar Newman, physical design can also create or extend a sphere of influence through psychological mechanism. Residents are encouraged to develop a sense of territorial control while potential offenders, perceiving this control, are discouraged.

2.6 Environmental Psychology

Environmental Psychologists have also examined and developed the effects of devices on situations, environment, and spaces in order to approach to crime prevention (Tanioka, 2004) [11]. Environmental psychology is a direct study of the relationship and interactions between an environment and human beings by examining human minds as a medium. The problems this interdisciplinary study field handle can be anything from the psychological effects of urban crowding to the architectural design of public schools and extend from the public arena into the individual household (Proshansky, 1987) [25].

In the range of this study field, images of cities, cognitive distance, environmental cognition, residential place selection, personal space, or discussion of territory have been handled. Among the other, major scholars at the roots of environmental psychology were Jakob von Uexküll, Kurt Lewin, Egon Brunswik, and later Gerhard Kaminski and Carl Friedrich Graumann (Allesch, 2003) [26]. As one of the distinguishable works related to crime prevention in this study field, Ittelson and Stokols developed hypothesis and theories about the effective devices in city planning in order to derive criminals from committing crime (Tanioka, 2004) [11].

Studies conducted in a laboratory setting were considered not suitable for the topics or themes handled in this practical study field since they caused some doubt as to their validity in the real world (Gifford, 2007) [27]. Consequently, environmental psychologists now often conduct studies outside of the laboratory, enabling the field to continue to progress. Today, environmental psychology is being applied to many different areas such as architecture and design, advertisements, and crime prevention.

2.7 Conclusion of Historical Review and Identification of Problems

The history of scientific studies about crime and crime prevention started by Cesare Lombroso had its huge turning point when situation and environment were carried in consideration of concepts and theories. Thanks to a number of researches after the Routine Activity Theory was articulated, crime-related factors of places have been clarified and evaluated while only one variable, how related physical environmental features are with crime occurrence, has been exclusively focused to discuss how defensible a place is, and now the knowledge is summarized and utilized for urban planning (Schneider and Kitchen, 2001) [28].

However, on the middle way of focusing on environment and making impersonal criminal portraits to handle them in scientific way like statistics, it has been fogged out the fact that not everyone will commit a crime to become a criminal but everyone can intend to commit a crime. Felson and Cohen pulled criminal activities back into one kind of routine

activities, and put them on a "cutting board" to examine, but ironically criminals have been put somewhere in a "jail", since the phantom, impersonal criminal portrait, was appropriate to be used for statistics. This can be thought as a curse of Lombroso who believed that criminals should be different from non-criminals. Of course, it is obviously easy and fitted to handle the phantom for statistics, yet criminologist can never see real figure of criminals if they keep handling it. Also, if effective crime prevention is considered, the relationship between crime-intending people and environment, such as crime-intending people's cognition, should primarily examined, but very few researches (e.g. Shaw and Gifford, 1994) [29] have been conducted since the real figure of criminals put away in a "jail," a different world from where non-criminals live. If criminologists notice that the real figure of so-called criminals are ourselves, unlike handling impersonal and generalized criminal portrait, it is possible to see the relationship between a crime-intending person as a subject and the surroundings.

In addition, while criminals and environment have been focused individually in the history of criminology, the relationship between a crime-intended person (not criminal) and environment has not been paid attention. However, if crime prevention is to be out ultimate goal, it is necessary to be aware of what happens between a criminal and environment when the criminal tries to commit a crime. Besides investigating the personalities of criminals (or those who would be labeled so) from psychological viewpoint, examining residents' fear of crime, and studying the characteristics of criminal hot spots with urban planning in mind, the question that needs to be asked is why people *do not* commit crimes in certain places. Answering this question is very different to answering questions about the criminals' personalities and the characteristics of crime scenes or hot spots.

Since Japan has the low crime rate, there is a limit for these researches to be progressed in Japan as long as the relationship between crime occurrence and physical environment, yet on the other hand, it can be said that Japanese cities still keep certain "defensibility" enough not to have as same amount of crime occurrence as other western countries even though they seem to be westernized. Under this unique circumstance, it seems possible to make a breakthrough in the study field of place-based crime prevention in Japan by describing the relationship between a crime-intended person (not criminal) and their environment in order to approach directly a quality of crime activities in certain places, namely, a sense of "uneasiness." From the next chapter, the sense of "uneasiness," as a key experience to reach to an alternative approach of crime prevention, will be discussed.

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Chapter III Discovery of Resistance and Its Theoretical Construction

3. Discovery of resistance utilizing uneasiness and its theoretical construction

3.1 Introduction

3.1.1 Research Background

Cities, where many people carry on their daily lives, have given us a lot of convenience as they develop, such as efficient labor and comfortable living environments. On the other hand, in response to changes in living environments, it is a fact that they have also created obstacles such as new urban crimes. Since early on in Europe and the United States, urban planning itself, necessary in the ongoing development of the cities, is considered one of the powerful means to prevent crimes and there have been numerous researches concerning this. Recently, even in Japan, urban crimes are regarded as one of the problems, and it has become requisite for the study field of urban planning to manage them.

3.1.2 Previous Studies

Many studies have been conducted in Japan to better understand the relationship between crimes and environments in order for urban planning, which can intervene directly and indirectly in urban road networks, land uses, and population distribution of the city, to contribute effectively to preventing crimes; such as how the variables in target cities of the urban planning can affect the numbers and distribution of crimes in those cities. For example, Omata (1998) [1] analyzed the relationship between the occurrence of crimes and environmental/psychological aspects. Also, Amemiya (2013) [2] identified a relationship between time series variations in residential burglary rates and the social and physical environments of local districts in Tokyo's 23 wards using latent growth curve modeling, and clarified that the variables associated with criminological theories are significant predictors of the shape of the latent growth curve.

Attempting criminals do not only recognize the physical features related to a crime event when they try to commit a crime. Therefore, there is a need to handle more variables to attain a more robust defensibility. As one of the attempts to examine criminals' recognition of environment, some researches, based on Koffka's research (Koffka, 1935) [3] about behavioral environment, examined criminals' cognitive maps. These researches can contribute to understanding a criminal's acquaintance with places and ways to escape after they commit a crime, or clarifying the mechanism of choosing crime spots (Brantingham & Brantingham, 1991) [4], and they have supported the development of geographical profiling. As for the study of environmental awareness, the review of security conditions, in terms of environmental

evaluation, has been considered as a possibility. Shaw and Gifford had offenders participate in their experiments and had them measure the ease of breaking in by showing them pictures of homes; the result was that there was a negative correlation between the residence's "tendency to become victimized," and the non-existence of symbolic barriers and poor monitoring by the residents (Shaw & Gifford, 1994) [5]. Moreover, in the experiments that Shaw and Gifford conducted, there remains room for discussion as to whether the public would have a similar view to those of the offenders. This is not about whether criminals have innate tendencies; rather, whether the general public see themselves as “a member of the general public”, unrelated to crimes, or the “person on the victim's side"; therefore, their evaluation would be different from those of the offender`s and it would be considered closer to the evaluation of the "fear of crimes," rather than a criminal`s “tendency to commit a crime.” It may be noted that in the study of the fear of crimes, the differences between the actual crime sites have been often reported (Sugimura & Arima, 2008) [6].

3.1.3 Purpose of Research

In the history of scientific studies about crime and crime prevention in Japan, criminals or environments have been focused on as variables separately, but never two these two variables at the same time. In other words, the relationship between criminals and environment has not been focused on in the study field. However, if crime prevention is to be our ultimate goal, it is necessary to investigate the reason why people *do not* commit crimes in certain places, besides studying the characteristics of criminal hot spots with respect to urban planning.

Therefore, it is necessary to discuss about the relationship between a crime-intended person (not criminal) and the environment in order to approach directly to the quality, of “uneasiness” in crime activities (or routine activities) in certain places. However, in the related fields of urban planning in this country, there is no research that directly examines the “characteristics” that lead to crime prevention, taking criminal behaviors as transactions between the human and the environments, and focuses on such dynamism. The studies introduced above can be generally called environmental criminal studies and they are crucial in finding vulnerabilities in elements of urban spaces relative to specific types of crimes; however, such approaches focus on eliminating elements of the city space where vulnerabilities are found, thus in turn, often end up reducing the attractiveness of the city. On the contrary, if we can examine the "characteristics that lead to crime prevention," we can adjust the elements that lead to such characteristics and propose alternatives as methods of crime prevention.

Crime prevention refers to the general planned efforts aiming mainly at reducing the numbers of crimes. In order to gain knowledge that leads to such efforts, for example in the

fields of criminal sociology or environmental criminology, by visualizing and quantifying spatial and temporal distributions of criminal activities utilizing the GIS, the "ease" of crimes in a specific space is successfully described based on the data of occurrences of crimes, in accordance with the scientific methods; and it has advanced by leaps and bounds in recent years. Along with the advances in computer technologies such as the GIS, crime-related studies have been established as science; and it is evident that such studies have offered great practical benefit by applying their findings to crime preventions. However, there is another approach in terms of perceiving crime prevention as the ultimate goal. It is the one that approaches the quality, that is, the difficulty of crime activities in certain spaces; unlike the conventional researches that focus on the opposite effects after revealing the "ease." As it is a more direct approach, it can be said that there is a possibility that it can provide the knowledge that leads to crime prevention more effectively.

Consequently, this chapter first discusses the relationship between a behavior-intended person and environment in order to approach directly to the quality, that is, “uneasiness” of human activities in certain places by describing the experience of feeling “uneasiness.” Then, it is attempted to understand “uneasiness” theoretically. At the end of this chapter, application of the approach to “uneasiness” to crime prevention study is discussed.

3.1.4 Methodology

Crime prevention studies should be about theoretical and empirical researches on the subject of reducing opportunities for crime. Until recently, this topic was of relatively minor importance in criminology or some study fields handling crimes and crime prevention because opportunity was thought to determine, not whether crime occurred, but only the time and place of its occurrence. It followed that manipulating opportunities would result not in reduced crime, but in the temporal or geographical displacement of offending, or perhaps in the commission of different and possibly worse forms of crime. If crime was to be reduced, what needed to be changed was the underlying motivation for crime, deriving from strong biological, psychological or social forces.

Now, there are two major questions here; what the “characteristics” that lead to suppression of motivation for crime are, and how they can be grasped. The works to answer these questions should be conducted in the upcoming crime preventive studies in the future for each kind of crime, but, here, taking criminal activities as “routine activities,” this paper aims to understand the dynamism of the relationships, that is, the feeling of “uneasiness” that can be observed when a person tries to do something in an environment.

First, the phenomenon of transactions between the environments and the humans who feel the “uneasiness” of actions is introduced from the next section. Basing on my own

experience, I have attempted to describe “uneasiness” with three episodes, pictures and a description I wrote when I experienced it. After the “uneasiness” I encountered in my daily life, in order to introduce what is the central matter of concern: an attempt to understand the “uneasiness” theoretically for application of the approach to “uneasiness” to crime prevention.

3.2 Episodic Understanding of Uneasiness

3.2.1 Episode I <A Sink with Fur and an Operation Manual > (October, 2009)

Fig. 3-1 A Laboratory’s Sink

Caption : There is a document covered by plastic bag in a sink. It looks like an operation manual. Because of fur on the bottom of the sink, it seems that nobody has used this sink for a long time. I need to wash my hand after moving some boxes with dust, and I could use this sink but I go out to a bathroom to wash my hands.

Description: This laboratory had just started using as a room for professors belonging to a newly established department. Therefore, there are few things brought in this room and only tables and chairs have been furnished. Even a telephone was laid on a floor. Looking at the condition of the room, I understood that this room had not been used for a long time. As with other things in this room, the fur I can see on the bottom in the sink explained to me that this sink was once used before but had not been used for a while. Also, there was a document which looked like an operation manual of something. The professor who had started using this room went to a bathroom to wash his hands after lunch. Later, I asked him the reason why he went to the bathroom to wash his hands, and he mentioned that he had not realized that there was a sink before I mentioned it. After that, he asked me to help him to move some boxes and my hands got dirty because the boxes had dust on them. I went in front of the sink and tried to wash my hands there, but somehow I hesitated to use the facet and went out of the room up to the bathroom the same as the professor did.

3.2.2 Episode II <A Bag in the Corner> (October, 2009)

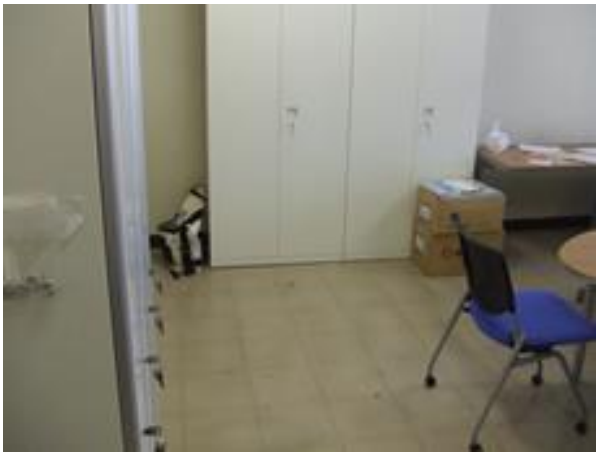

Fig. 3-2 A Bag Put in a Corner of a Laboratory

Caption : There is a suitable corner to put my bag. The floor does not look dirty, so it is no problem for me to put it there. I think the bag will not disturb other people's actions in this room. The bag often makes loud noise, so I left it open not to disturb conversation others have.

Description: I was invited by the professor who used this room. When I entered to this room for the first time, I wanted to put my bag down somewhere because I put my old laptop in it and it was heavy to keep carrying on my shoulder. However, I was a stranger in this place and familiar with nothing. Of course, this room is for professors, and I did not want to be rude. I could not find any appropriate table or chair to put my bag since there are some documents on the main table. Also, I could not find out which table was occupied. In the end, I decided to put my bag on the floor in a corner. That was because I thought that the bag would not disturb others` work in this room, or impede entering and going out of this room. Fortunately, the floor seemed not so dirty, so I did not hesitate and put my bag down there. Additionally, I did not want to inconvenience or be rude to anyone by making loud noises which the bag often makes when I close it. So, I left it open before placing it down on the floor.

3.2.3 Episode III <A Chair at a Cafe> (February, 2010)

Fig. 3-3 A Roughly Placed Chair at a Cafe

Caption: My favorite place of a café located in front of a station. This seat is surrounded by partitions and located in the middle and appropriately far from the entrance. There is no one around this chair but it is roughly placed. I want to have a seat here, but I cannot.

Description: There is a café near the station I use every day. I often go to this café to have a rest, study or work. There are some favorite seats and this place is one of them. This seat is on the wall in the middle and far from the entrance, and so even when some people enter or leave this shop from the entrance, cold wind will not reach up to this seat. One day, I went to this café and I first ordered a cup of coffee with milk, and tried to have a seat in the middle of the shop. When I went at this seat, it was not placed neatly. I looked around the seat, and no one was around this chair. I first tried to have a seat here, but suddenly I felt that maybe another person had used this place and he or she was just off the seat temporary. There was nothing on the table, but I saw the way the chair was placed as the sign of temporal leave of someone. After about one minute thought, I decided not to use this chair and went to another seat to have a rest.

3.2.4 Episode IV <A Gate in a Residential District in China> (March, 2012)

Fig. 3-4 A Gate in a Residential District in China

Caption: There is a gate between residential districts. To cross the road facing to this gate, I need to go through it, but I feel uneasy to take this way. There is no other way to go out of this enclosed place, so I need to go through here even I feel uncomfortable.

Description: When I went to Tianjin in March in 2012, I was really surprised how gated the residential districts in China are. When I took a walk around some residential districts, there were many small residential districts linked with this kind of gate. It is not a bad thing to use this gate and many other people used it to go out of this district. There is no sign to prohibit people from passing through this place. However, at first I hesitated to go through there, and tried to find another way to go over there. Since each small unit of residential area, in which are several high-rise apartments, is surrounded by fences or walls, there are gates to link each unit to another. After I walked around this gate to find another way, I finally went through the gate since I needed to go back to the hotel where I stayed for breakfast.

3.2.5 Discussion of Episodes

In the description of the first episode, there was a kind of “hesitation” or “feeling of uneasiness” which resulted in doing another action or behavior. If there was an observer to examine my behavior, what happened there can be observed as that I went to a bathroom to wash my hands similar to what I observed of the professor’s behavior. Many researches on observable behaviors of people using a public or semi-public space together with others have been conducted. The concept of “personal space”, coined by Edward T, Hall, is a range that has a certain psychological boundary around an individual (Robert Sommer, 1969) [7], and the idea was originated by Heini Hediger’s work observing behaviors of animals in a zoo. However, Hall (1966) [8] referred in his book, *The Hidden Dimension*, that a person can process a sequence of actions in the hidden dimension and sometimes the process is not noticed by others or the individual him/herself. The feeling of uneasiness to wash my hands at the sink in the first episode is one of the examples processed in the hidden dimension. Importantly, I could wash my hands at the sink, but in the end, I might not do it, and in fact I did not do it. The “uneasiness” can be thought of as one of the reasons why an individual *does not* do a certain action in a certain place. Even though it cannot be observed by other people around the individual, surely that kind of feeling sometimes exists, and it appears when an individual tries to do something in environment.

Also, the description of episode II also suggests there was “hesitation.” The above description suggests there was a kind of "hesitation" which resulted in "non-action." Actually, there was only one more person who was using the room, and that person was using the desk located in the right back side in this photo. However, in this context, there was a subtle impression that there may have been other people who were using other desks and chairs in the room. It should be pointed out that although there were no other people in the room, "hesitation" was felt based on the locations of the objects in the room. After some degree of facts are known, this "hesitation" dissipated and the author started placing the bag on the desk recognizing that the desk was not used by anyone else. Interestingly, it was observed in the description of episode II that the feeling of “uneasiness” tends not to be focused while the feeling of “possibility” or “allowance” often gain attention especially when an action related to them is conducted. In the hidden process of decision making in the episode II, the actual actions and related “allowance” were focused on, and “uneasiness” was under cover of the observable factors.

From the episode III, it was revealed that the feeling of “uneasiness” will be shaped when there is an individual’s will to make an action and influence the environment. If I did not care which chair to sit on, the chair was just a chair roughly left by a previous user. In the episode, since the place was my favorite place to have and I wanted to have a seat there, the

“uneasiness” appeared to me. In addition, the “uneasiness” can appear differently depending on an individual and his or her intention. It is possible for some people to see the chair as welcoming. Plus, whenever the “uneasiness” appears, there is a certain range of physical or psychological extension. In the episode, my thought was not limited to only the chair, but extended to the person somewhere away from the chair. Of course, the extension is not unlimited, but there should be a certain range in its extension as long as the individual and environment can transact with each other.

Finally, the episode IV indicates the experience of doing one action in the end while feeling the “uneasiness.” Which means feeling “uneasiness” is just a supportive condition that applies a psychological force on an individual to give up doing an action. Therefore, even though an individual feels “uneasiness” when he or she tries to do something, depending on his/her will or demands, the action can be completed ignoring the “uneasiness.” Also, reviewing this experience, it is implied that the will or intent of the person who made the fence was not important, and the “uneasiness” was then and there between me and the environment including the gates and fences.

3.3 Understanding of Resistance

Throughout, the several episodes mentioned above described what “uneasiness” is and in which situation an individual can experience it. In the following discussion, some previous theories and concepts will be brought in to help the theoretical understanding of the experience of feeling “uneasiness.” Also, the characteristics or quality was defined in order to apply the concept to crime prevention studies.

Now, there are two major questions here: what the "characteristics that lead to crime prevention" are in urban spaces and how they should be understood and managed. This paper tries to answer the questions above by understanding the dynamism of the relationships that are seen as transactions between human beings and the environments.

3.3.1 Affordance Explored by James J. Gibson

The concept of “affordance” is worldwide famous as a latent quality or information of perceived environment (or an object) which will give individuals the possibility of doing an action. J. J. Gibson (1977) [9], one of the famous perceptual psychologists, articulated the concept of affordance, and he defined affordances as possibilities embedded in environment and existing regardless of its pros and cons.

It seems the concept of “uneasiness” is similar to the concept of affordances; both of them are informational qualities when an individual faces in an environment but don`t refer to

environmental characteristics that generate motivation to cause actions. However, Gibson's affordance will not change its appearance responding to the psychological condition of the one who perceived the environment. However, as it was mentioned above, "uneasiness" is subject to change depending on what individuals want in that environment. Therefore, comparing to the concept of affordance, "uneasiness" can be defined as "resistance" which is a kind of quality that can be actualized in the transaction of an individual and environment in a certain place. Also, it is possible to think of the opposite concept, "allowance."

This difference between "affordance" and "uneasiness" or "allowance" can be overlapped with the concept of "Langue" and "parole," notable ideas of Ferdinand de Saussure. According to him (1986) [10], "Langue" involves the principles of language, without which no meaningful utterance of "parole" would be possible. "Parole" refers to the concrete instances of the use of langue. This is the individual, personal phenomenon of language as a series of speech acts made by a linguistic subject. For instance, piled-up books afford people to put their head on to sleep or use as a step, and these features exist with the physical aspect of piled-up books. However, even if you know that it is possible to use books as a pillow, you would not take that action maybe because of you feel something wrong to use them in that way. The latter example is not "affordance" but "uneasiness."

3.3.2 Allowance and Resistance

As it was discussed above, "resistance" is something actualized in the transaction of a person and his or her environment. Therefore it is not always actualized when human beings take an action. So, what is actualized when people do not feel "uneasiness?" The answer can be "allowance," the opposite concept of "resistance." "Allowance" is afforded possibility and generally its actualization is not noticed because the appearance of action itself covers it up. This can be explained with the famous visual effect, "Rubin's Vase" (Fig. 3-5). This picture provides an intuitive demonstration of the figure-ground distinction. If human faces are seen as the figure, a vase becomes the background, and if a vase is seen as the figure, human faces become the background. Equally, when a person sees "resistance" in the transaction of him/her and environment, "allowance" cannot be found in the transaction, and vice versa.

Fig. 3-5 Rubin's Vase

In our daily life, generally this "allowance" is seen as a figure and people take actions while "resistance" is not much focused on. However, if a person tries to do something not allowed, illegal, socially tabooed, or personally avoided, the person can see "resistance" in the transaction with the environment since it is necessary to intentionally focus on it in order to see if there is a risk. One important notion here is that there should be a certain frame to limit the range of (back)ground. Fig. 3-6 shows a silhouette of comma-shaped bead. Around the bead, there is infinity ground surrounding it. However, once a circle (= limit) is delimited, it is possible to distinguish the negative space. Sometimes, like the Rubin's Vase, people are able to recognize the negative space created by a figure, but in the bead case, people cannot easily notice the ground if there is no limit of ground. Therefore, if a person tries to see "resistance," a frame or limit of transaction is required.

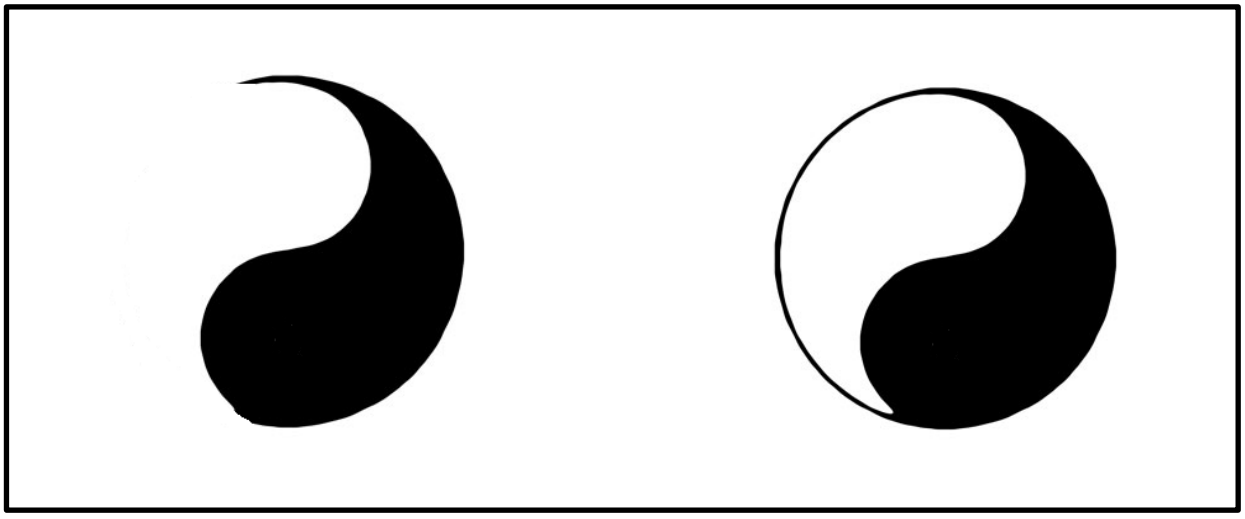

Fig. 3-6 Silhouette of Comma-shaped Bead (left) and Framed One (right)

3.3.3 Umwelt and Comprehensive Idea of Human-Environmental Transaction

Finally, this section explains the frame or range of transaction between a person and environment. Based on the discussion of the episode III, it is supposed to be limited in a certain range. Also, the discussion about the figure-ground relationship of “resistance” and “allowance” also indicates necessity of the frame. According to Lewin (1951) [11] and his theory about life space or field, the “field” is a Gestalt psychological environment existing in an individual's mind at a certain point in time. The question is how the range can be defined.

Looking back to the academic history of Lewin and Gibson, the key ideas of Jakob von Uexküll may be the origin of their ideas (Minami, 2006) [12]. Uexküll is known for his studies on how living organisms “subjectively” perceive and interpret their environments. The key notion of his theory is “Umwelt” which is usually translated as subjective universe, although in German it simply means 'environment'. Uexküll thought that organisms may have different “Umwelts” even if they live in the same place. Also, he mentioned that each “Umwelt” has each range defined by the organism’s design of their structure and on the work of their functional cycles which consist of “Merkwelt” and “Wirkwelt” (perceptual world and operational world) (Uexküll, 1933) [13].

Regarding Uexküll’s “Umwelt” as the range of transaction, Fig. 3-7 was proposed to explain the comprehensive ideas of “resistance,” “allowance,” “affordance,” “Umwelt,” “Merkwelt,” and ”Wirkwelt,” supported by the concepts and ideas created by Gibson and Uexküll. In this figure, the ground is shown as environment to shape others. Also, the environment is filled with affordances. The range of “Umwelt,” which is the range of transaction between a subject and environment, is drawn as the overlapped part of “Merkwelt” and “Wirkwelt.” Both of them have their limitation range, so there is a reachable sphere as a maximum limitation to reach. Of course, the subject is an organism, so it can move to shift the sphere.

Environment is like a soup in which affordances are melted. On the other hand, “Umwelt” is a film that is formed in the rim of the overlapped part of “Wirkwelt” and “Merkwelt,” and flows by the shift of “Wirkwelt” and “Merkwelt.” By the intent of the subject, the entrapped affordances are picked-up if necessary. The mobility of “Unwelt” to take affordance in it is like the way that a whale takes plankton with sea water at the same time in. Then, depending on the tone of the subject, “allowance” and “resistance” will stand out, and result in actions.

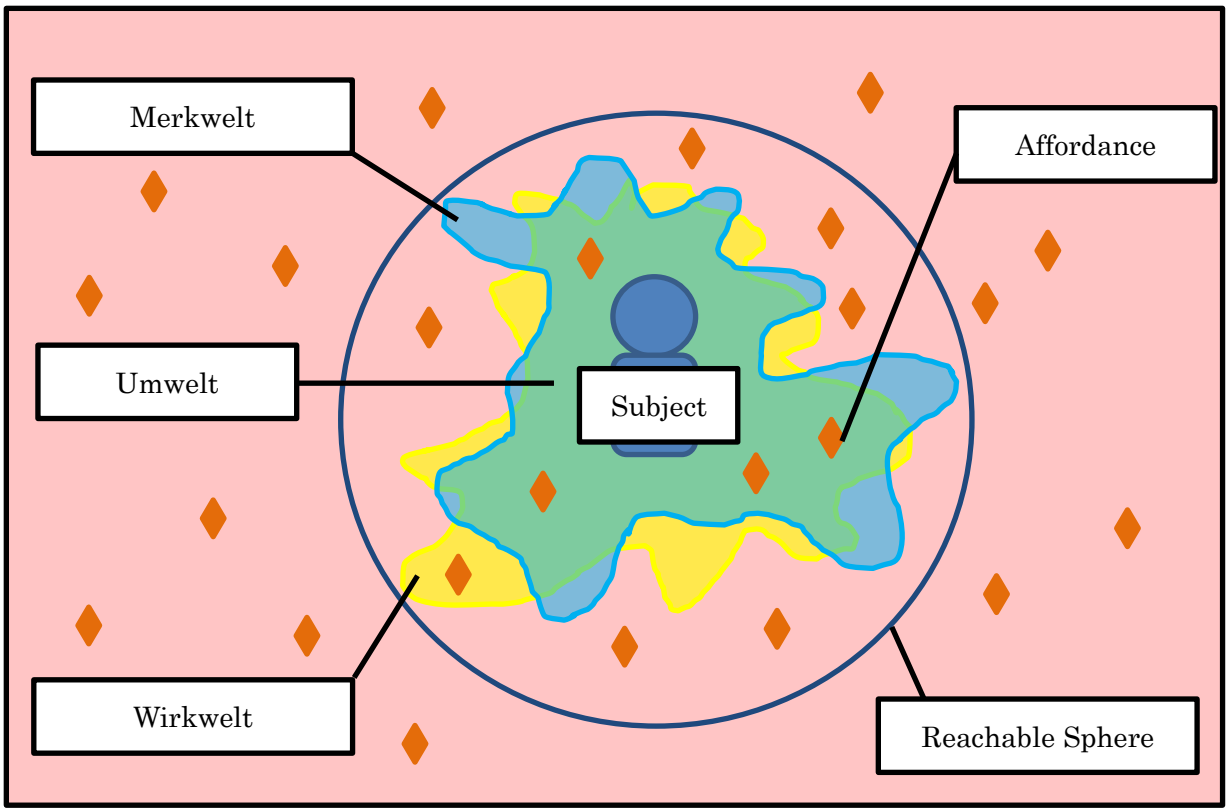

Fig. 3-7 Comprehensive Idea of Human-Environmental Transaction

3.3.4 Temporal Range of Human-Environmental Transaction

In Fig. 3-7 indicated in the previous section is one of the ideas of transaction from the physical or spatial viewpoint. According to Gibson, affordances can be objectively examined since they permanently exist in environment. On the other hand, resistance and allowance can be modified by the intention of the person who has a will to conduct an action in an environment. That is because they are only found in the idea of time. Fig. 3-8 shows the temporal range of human-environmental transaction with an example of a person who is "writing" on a notebook. When this person is writing, he is also referring what he has "written" and thinking of what he has "to write." He is making both operating action and perceptual action for the past and the future at the same time. In this moment, resistance and allowance can appear for him.

This notion has important meaning for the research methods to handle "resistance." Simply speaking, researchers need to be in an environment and try to do something with the concept of time and space which are limited appropriately. To fulfill this challenge, researchers are advised to conduct clinically sound methods for designing or choosing a physical environment if they want to discuss the "resistance" against roadside crimes.

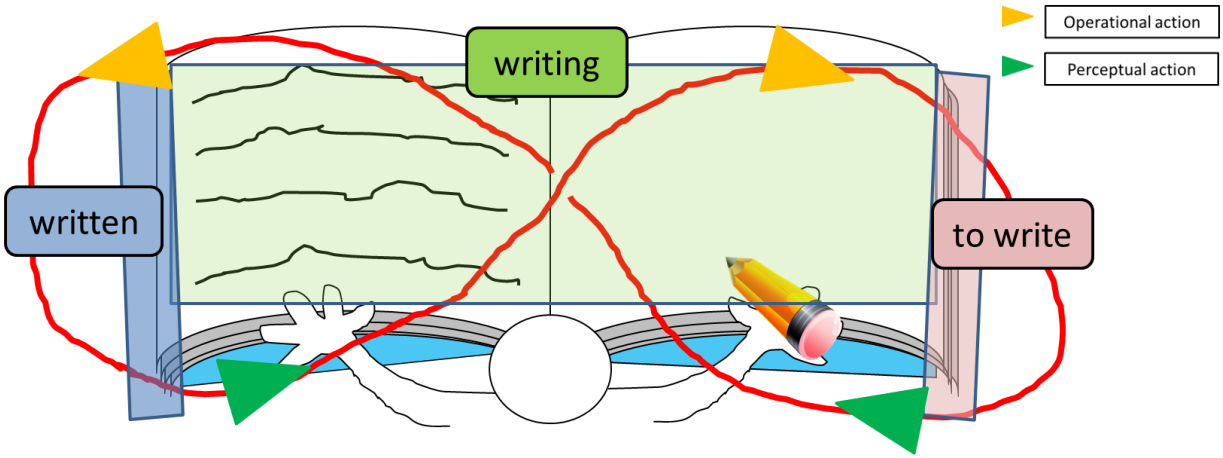

Fig. 3-8 Temporal Range of Human-Environmental Transaction

3.4 Discussion and Prospective Directions

By reviewing the history of studies about crime and crime prevention, it was clarified that once criminals were the central matter of concern, and now environment is. However, only each side of criminals or environment has been focused at one time but the relationship between criminals and environment has not been focused on. If crime prevention is to be our ultimate goal, it is necessary to investigate the reason why people *do not* commit crimes in certain places, in addition to studying the characteristics of criminal hot spots with respect to urban designing.

Accordingly, this chapter attempts to first describe the episodes related to the feeling of "uneasiness" which seemed related to preventing certain people's actions. After the discussion of the contents of the episodes, some traits of "uneasiness" was clarified and "uneasiness" was defined as "resistance" with the counter concept, "allowance," seen in a human-environmental transaction. Then, through the theoretical understanding of both "resistance" and "allowance," the comprehensive understanding of concepts, "Umwelt," "affordance," and "transaction" was led.

Based on the results, it seems possible to utilize "resistance" since it can be clearly actualized in a transaction if people confront environment and an action with a thought that the action is not allowed. Crimes are one of the behaviors which we are not allowed to commit in a society, and so the method is compatible with the nature of crimes and crime prevention.

If researchers use the concept of "resistance," they need to be the subject in Fig. 3-7, since "resistance" is the quality that appears only in the middle of human-environmental transaction. Because of the social consensus that crimes are not desirable behaviors or actions, people do not notice that these behaviors are laid in the reachable sphere. Of course, it is an

ideal situation that people generally regard criminal behaviors as something out of the reachable sphere, but criminologists or other researchers should try to shift their “Wirkwelt” and “Merkwelt” to the rim of the reachable sphere in order to obtain useful knowledge for crime prevention.

Considering the fact that criminals are in our (including researchers) side, not in a “jail,” as a research method to identify and examine the sense of “uneasiness,” the best and direct approach cannot be anything but that researchers stand in roadsides and “try” to commit a certain crime in order to see what he or she sees in between the environment and him or her. “Uneasiness” appears between a person and his or her environment in that place at that time depending on what the person has done, is doing, and will do. It is not a thing we can observe objectively, but a quality which a researcher as a person sees it in the place at the time by doing (including “thinking” as an action) something by referring to what he or she has done and thinking of what he or she may do. As one of the compatible methods to examine the “resistance” (and “allowance”), ethnography can be suggested since it can subjectively describe “parol” which is different from individual to individual, from situation to situation, in a city structure (= langue).

This proposed research method is an attempt to shift and move the “Umwelt” intentionally by trying to commit a crime in urban area. Not limited to researchers, everyone can try this method to see the human-environmental transaction. From the next chapter, some trials of this method were conducted to see “resistance” for realization of crime prevention which can approach both “resistance” and “vulnerability” which has been clarified by studies about crime-occurrence. This is the way to estimate the real figure of criminals out of a jail, and approach the “Umwelt” in which crime-intended people stand, and try to find pro-active crime prevention for the future of crime prevention study in Japan.

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Chapter IV Practical Research for Prevention against Arson with DCO-CPTED

4.1 Introduction

4.1.1 Research Background

With the advance of urbanization, many urban problems have increased in our everyday life. For example, the number of urban crimes is increasing. Of course, comparing to other economically developed countries, Japan currently has a small number of urban crimes, but it is important to achieve the preventive attitude in order to stop the increasing trend for the future. In addition, not only actual victimization but also hearing or watching the news about urban crimes can increase the general fear of crime, and therefore, the consequent concern of citizens towards crime is considered an important issue that must be solved immediately. Given this issue, urban planning aiming at crime prevention is increasingly called for in Japan. Among major crimes in Japan, arson is famous for its cruelty and harmfulness, yet we can't live without buildings that are common targets for arsonists. It is necessary therefore to aim towards the realization of cities where people can live comfortably without the fear of arson.

4.1.2 Previous Studies

Since when "Defensible Space (Newman, 1996) [1]," "CPTED (Crime Prevention through Environmental Design) (Jeffery, 1971) [2]" and "Situational Crime Prevention (Clarke, 1997) [3]" were imported into the research field of crime and crime prevention in Japan, it had led to the participation of many other study fields, such as architecture and urban planning, and many studies have focused on the relationship between the occurrence of crimes and external and spatial factors. In Japan, besides the studies about fear of crime which can improve the residents' quality of life and is important to take into account (Hale, 1996) [4], CPTED is especially considered as one way to reach to methods of crime prevention, as it prevents criminals from committing crimes through the design of buildings and/or places.

For example, as one of an old study focusing on arson, Yamaoka clarified some characteristics of arson, and compares some factors of one-time arson and those of consecutive arson (Yamaoka, 1978) [5]. Also, Omata conducted a study analyzing the relationship between the occurrence of crimes and environmental/psychological aspects (Omata, 1998) [6]. Then, in order to focus on the physical environment for human beings, the relationship between crimes and the characteristics of cities and districts has been clarified in many papers. Kashiwara et al. focus on the spatial factors of a city in order to examine whether they are related to the occurrence of crimes in convenience stores (Kashiwara, Ito, et al. (1996) [7]). Also, as one of the studies analyzing the relationship between the occurrence of situational crimes and spatial designs, Ito et al. evaluated the spatial aspects and examined the occurrence of arson in a city

(Ito, Oue, et al. (1999) [8]). Arima et al. also conducted a study on the spatial characteristics of urban crime focusing on the districts in which more arson has occurred (Arima et al. (2004) [9]).

The previous studies could clarify some crime-related factors which are usually macroscopic, but on the other hand, microscopic factors of the crime spots have not been clarified and evaluated enough. In the history of the studies related to crime and crime prevention accumulated, only one variable, vulnerability, has been used to find how defensible a place is, and now the knowledge is summarized and utilized for urban planning (Schneider and Kitchen, 2001) [10]. However, crime attempters recognize not only vulnerability but also resistance when they try to commit a crime. Therefore, there is a need to handle these two variables to reach to more accurate defensibility.

4.1.3 Research Purpose

Up to date, CPTED has attracted attention as an essential concept aiming at preventing roadside crimes leading to the promotion of safer cities in Japan. But in many cases, it may not be effective since city structures of Japan and those in western countries are different. Also, as it was mentioned in the previous section, previous studies above clarified some crime-related factors which can help researchers to find vulnerable spots against specific crimes. On the other hand, the factors which can indicate the resistance of spots against crimes have not been clarified.

Therefore, it is of critical importance to develop ways in which CPTED targets specific kinds of crime, in a limited district, or country, and time zone with considering the resistance against target crimes. In particular, advancing methods to evaluate the vulnerability and resistance at the same time is the first step to an effective design and implementation of CPTED so that not only sites which need to be improved but also concrete methods of improvement can be clarified. In order to promote the next generation of CPTED, it is surely needed to conduct a consecutive research from a quantitative research for vulnerability to a qualitative research for resistance of the places which need the practice of crime prevention. Consequently, this chapter's major purpose was set to reveal the vulnerability and resistance against one specific crime, arson, in Fukuoka and provide an investigation into possible spatial design and factors for encouraging people not to commit arson in a particular place with some conditions.

4.1.4 Methodology

The purpose of this study is, in other words, to produce knowledge which can contribute

to the promotion of the next generation of CPTED based on both vulnerability and resistance of the targeted place. To fulfill this purpose, in this study, Fukuoka City (Fig.4-1), Fukuoka Prefecture, JAPAN, is macroscopically taken as the target of study, and arson is chosen as the target crime.

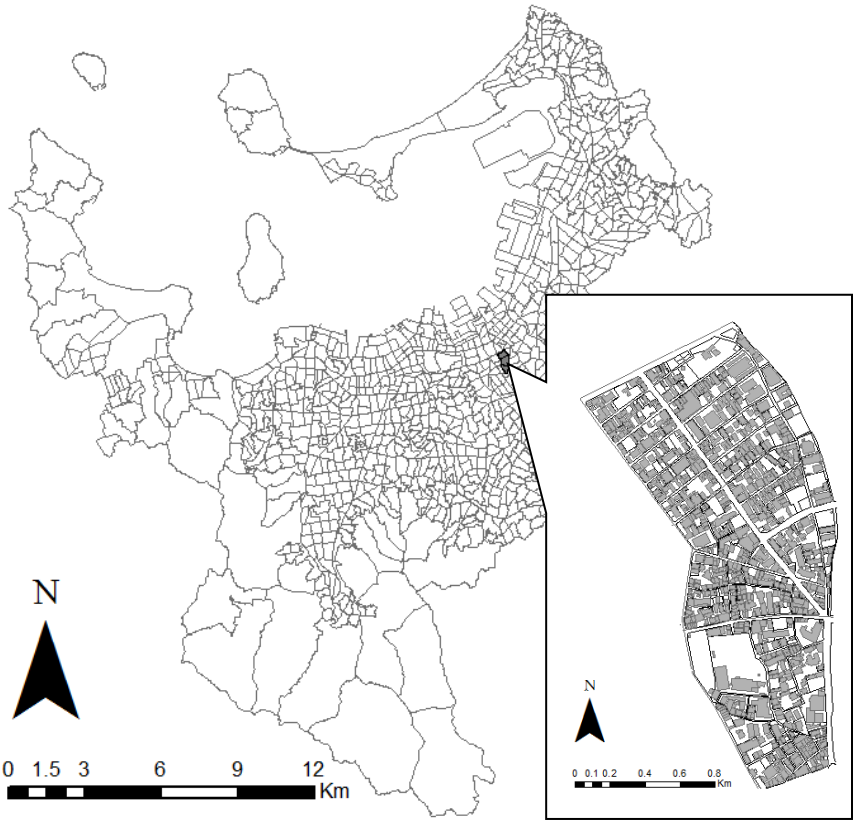


Fig. 4-1 Map of Fukuoka City and Haruyoshi District

The analyzed data was provided by the Fire and Disaster Management Bureau of Fukuoka city; it includes detailed address of the arson spots, date and time, classification, and ignited materials.

We start, in section 2, by clarifying the actual condition of arson occurrence in Fukuoka by visualizing and analyzing the data for specific places in which arsons have occurred. After that, the hot spots of arson are identified on the map. Among the districts which have a concentration of arson spots, Haruyoshi (Fig.4-1) was chosen as the target for microscopic analysis on spatial designs of hot spots. Next, in section 3, the relationship between the occurrence of arson and the spatial design and temporal situation of Haruyoshi has been analyzed in order to verify the vulnerability of the district against arson. Additionally, in section 4, and based on the on-the-site fieldwork survey conducted in the district, the spots evaluated as “difficult” to commit arson in are selected. The objects and the contexts they are embedded in are clarified as the environmental factors which can strengthen the resistance of

the district through an analysis based on M-GTA (modified grounded theory approach), one of the qualitative analysis method. At the end of this chapter, based on the target place's vulnerability and resistance, the ideas and implementation of the next generation of CPTED matching with the nature and characteristics of Haruyoshi are proposed.

Then, in order to analyze the arson-related characteristics of spatial design, the spatial design of "arson points" and "non-arson points" are compared by using the data from an on-the-spot survey conducted on 102 "arson points" and randomly chosen 102 "non-arson points" in the districts that possess a concentration of arson points. After that, based on the result of the comparison, 13 check items are selected as those related to the occurrence of arson. Next, the relationships among the 13 items are clarified by examining the result of 13 items for "arson points" in HAYASHI's Quantification Method Type III, a statistical method used in multivariate analysis and for quantifying qualitative categories and samples simultaneously. Through this process, the selected check items to inspect the spatial features of a site are determined. In addition, districts containing many points in which arson has carried out are targeted in order to classify and analyze the vulnerability indicated by the check items.

4.2 Macroscopic Statistics

4.2.1 Summary of Arson Data in Fukuoka City

At first, in order to understand the actual conditions of arson in Fukuoka, the data about arson provided by the Fire and Disaster Management Bureau of Fukuoka City is summarized. Fig. 4-2 shows the number of arson in each year divided by target.

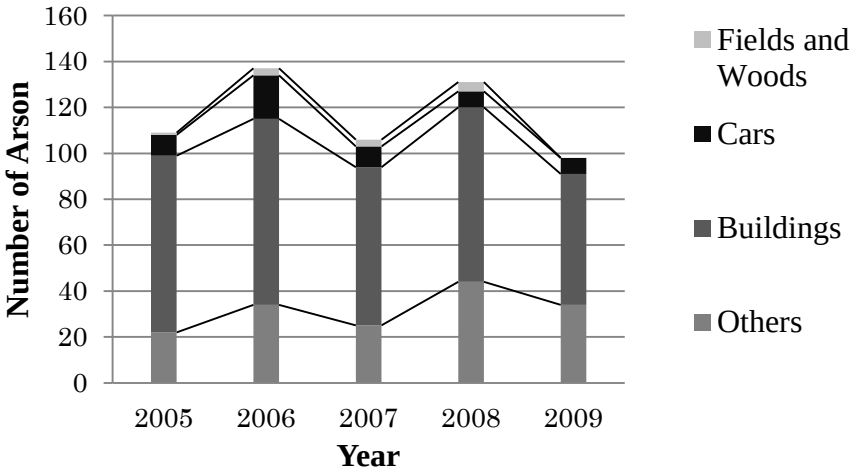


Fig. 4-2 Number of arson in each year divided by target

The summarized data above indicates that Fukuoka City generally has about 120 arsons in each year, and has suffered about 600 arsons from the beginning of 2005 to the end of 2009. Compared to other cities in Japan, the number is statistically significant, and there is a clear need to consider preventive urban planning against arson. We can also see that most of the targets are buildings. Accordingly, to counter arsons in Fukuoka, it can be said that crime prevention methods targeting building is majorly effective and must be taken in consideration.

4.2.2 Temporal Analysis

In Fig. 4-3, it is indicated that there is a specific time range (from 9 pm to 4 am) in which most arsons have been committed. Generally speaking, arsons are easy to commit after sunset because there will be more dead angles. Also, from the viewpoints of human activities, the result is understandable since arson is well-known as a crime majorly committed by people who live in a society and chronically feel stressed by something like work in Japan. Since these arsonists are engaged in working in daytime, it is thought that there is the specific time range in Fig. 4-3, and so it is needed to consider crime prevention which can work at night.

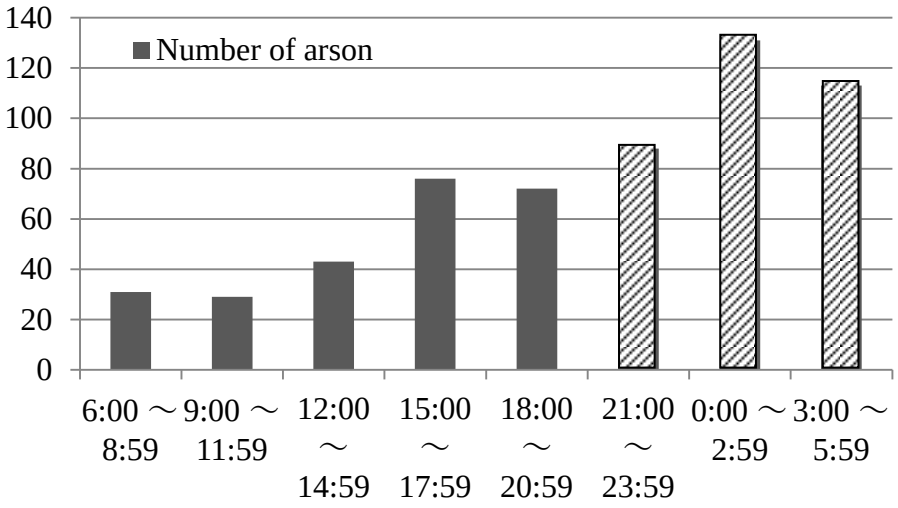


Fig. 4-3 Time Zones of Arson in Fukuoka City

Also, Fig.4-4 shows the statistic data of arson occurrence sorted by month. Accordingly, it seems that there are some of the months (May and December) when arson happened many times. Related to the viewpoint of stressors, people tend to feel stressed more compared to other months in Japanese society since there are many stressors. In May, as we have a specific term “May sick” to describe a depression people tend to have in May after April which is a

busy month since Japanese financial and academic year starts. Also, in December, people are very busy to finish up working for the year and prepare for the next year.

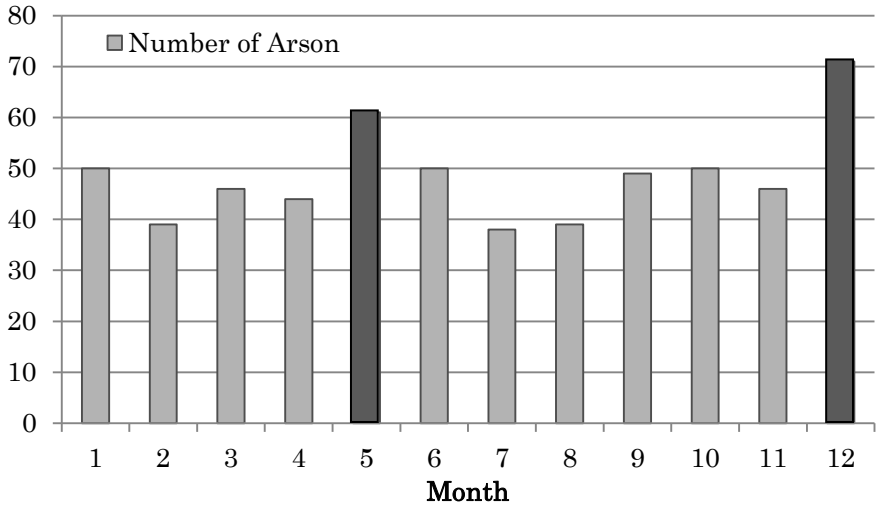


Fig. 4-4 Month and Arson Occurrence

In order to discuss the actual conditions of arson occurrence in the past five years from the geographical point of view, the data of all arson in Fukuoka City is plotted on the map of Fukuoka in GIS by using the Address Matching Service. To visualize the density of the spots in which arsons have been carried out, Kernel density estimation method is utilized. The result is shown in Fig.4-5, and the hot spots of arson are clearly identified in the map.

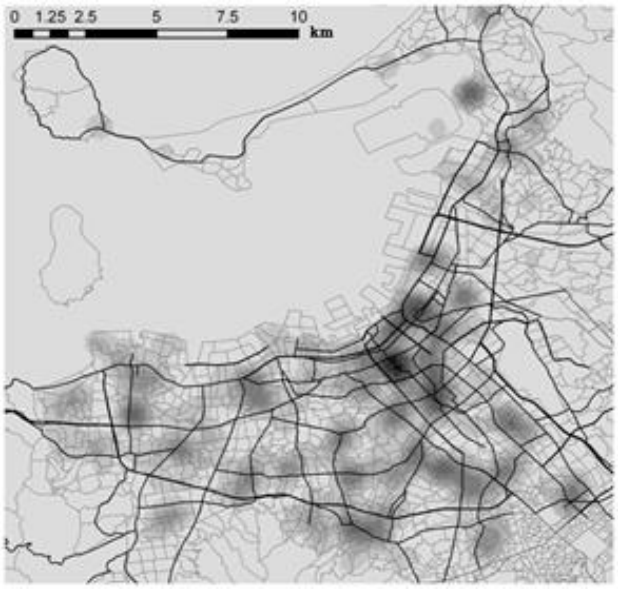


Fig. 4-5 Density of Arson Spots in Fukuoka City

Interestingly, the hot spots are do not appear in the locations of Tenjin and Hakata, the core areas of Fukuoka, but Haruyoshi, Yoshizuka, and Hibaru, the districts located in the rim of the core areas of Fukuoka.

Also, as a macroscopic analysis, the relationship between the number of arson occurrences and the distance from arson spots to major arterial roads is summarized in Fig.4-6. The figure indicates that the majority of arson crimes were committed in the area within 50m to 150m away from major arterial roads.

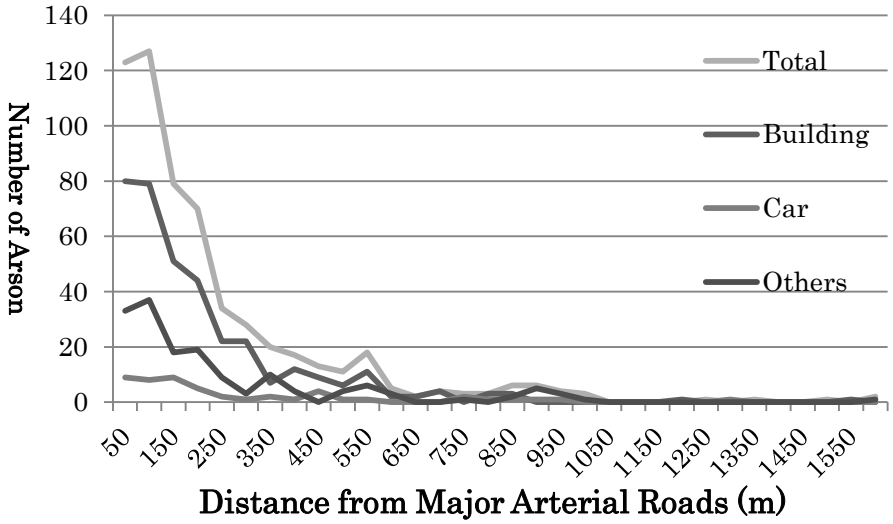


Fig. 4-6 Number of Arson Spots and Their Distance from Major Arterial Roads

4.2.3 Fukuoka's General Vulnerability against Arson

Taking into account all the results provided in this section, it is clear that there are definite trends that rule the temporal and geographical vulnerabilities against arson in Fukuoka, and they are distinguishable.

Consequently, it is suggested that in general, prevention methods must focus on arson targeting buildings at night in Fukuoka City. Also, the temporal tendency focusing on days of arson occurrence differ from each district. So, it is suggested that residents need to leverage the day and month when many arsons have been committed in the district when they want to strengthen the patrols around their districts.

Moreover, from the geographical analysis of arson spots, the districts located in the rim of the core areas of Fukuoka should be considered as those where serious improvement in crime preventive planning against arson is needed, focusing on the areas which are within 50m to 150m from major arterial roads.

4.3 Microscopic Analysis in a Hot District of Arson in Fukuoka

4.3.1 Selection of Target District

To conduct a microscopic analysis in a hot district of arson in Fukuoka, Table.1 is provided to see the districts that possess a concentration of arson points based on the data of all arson in Fukuoka City. Since some arson crimes have been carried out in the same spots, the number of arson spots does not exactly match with the result of density, but the district that has the greatest number of arson spots is Haruyoshi (Fig.4-7). In the figure, there are 10 arson spots, and some spots have had several arsons at the same spot. The number of arson crimes is the same as the one seen in the analysis of density. Consequently, Haruyoshi is a suitable district to examine the actual condition of arson from microscopic point of view.

Haruyoshi still has old city structures in many areas, but we can also find new apartment blocks and houses. There are a lot of individual houses which have walls and gates as the old Japanese style houses, while many apartments have pillars that lift them above ground to create parking spaces for cars and bicycles of residents. Besides, there are many alleys and backstreets with a width that is less than 4m.

Table 4-1 Districts with Concentration of Arson

District Number	Districts		Number of Arsons
1	Haruyoshi	Chuo-ku	14
2	Hibaru	Minamia-ku	11
3	Nanakuma	Jounan-ku	10
4	Hakozaki	Higashi-ku	10
5	Yoshizuka	Hakata-ku	10
6	Chiyo	Hakata-ku	10
7	Kashiwabaru	Minami-ku	9
8	Fukushige-danchi	Nishi-ku	8
9	Ozasa	Chuo-ku	8
10	Ijiri	Minami-ku	8

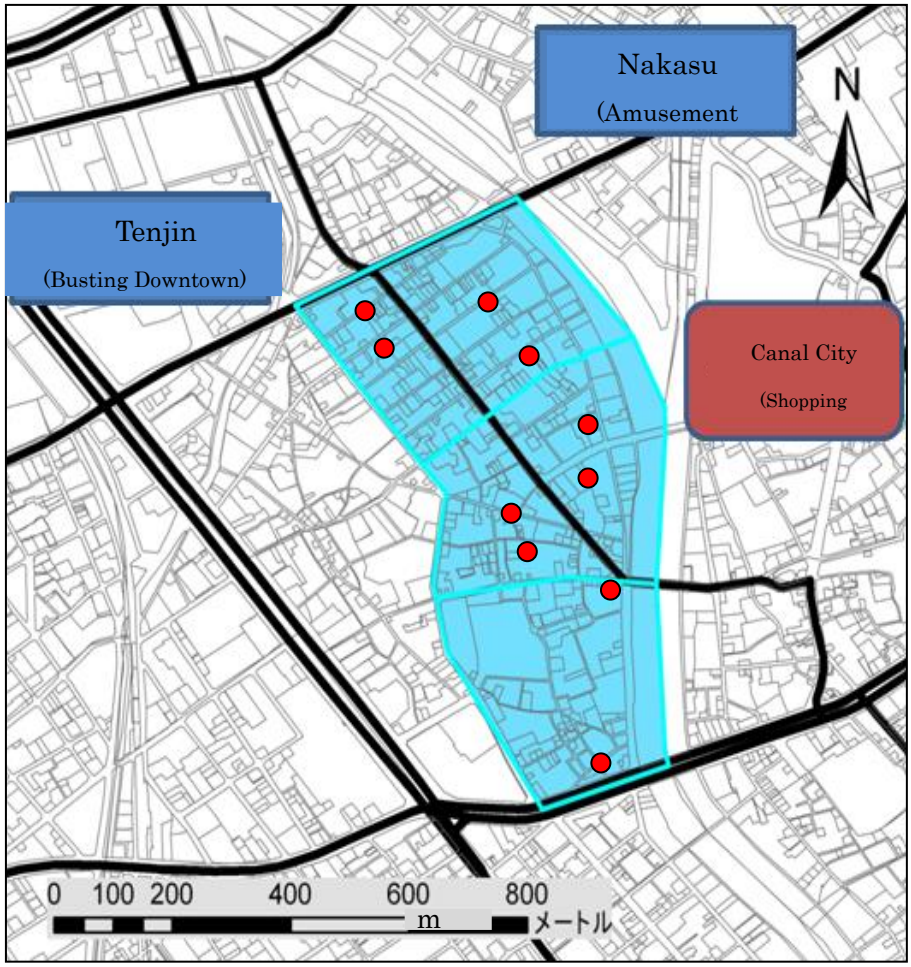


Fig. 4-7 Haruyoshi and Its Surrounding

4.3.2 Microscopic Analysis

For further understanding of microscopic spatial characteristics of the arson spots in Haruyoshi, on-the-site surveys were conducted. The approximate (not exact) locations of arson are plotted in Fig.4-7. Some of the arsons in Haruyoshi were committed at the same location, so 10 points were chosen for the on-the-site survey.

Table.2 shows the result of the survey. Interestingly, all of the spots are located in the places which are 100m or less away from major arterial roads. Also, at least 2 or 3 usages of land are observed (Fig. 4-8). Furthermore, most of the roads in which the arson spots are on have less than 5m of width. Void spaces in which people can pass are also often to be observed in the arson spots or in adjacent sites (Fig. 4-9).

Fig. 4-8 Multiple Land Usage and Permeable Space in Haruyoshi

Fig. 4-9 Permeable Space in Haruyoshi

Table 4-2 Spatial Characteristics of Arson Spots in Haruyoshi

No.	Distance from major arterial roads(m)	Variety of adjacent buildings	Width of the road where the building is located (m)	Void・Permeable Space (◎: very permeable, ○: permeable, △: not so permeable)	
1	5.1	Detached house, Commercial Building	3.4	○	In the adjacent sites
2	28.9	Detached house, Apartment, Commercial Building	14.1	◎	In the site where the building is located
3	32.8	Detached house, Apartment, Commercial Building	4.2	◎	In the site where the building is located
4	64.8	Detached house, Apartment, Commercial Building	2.6	○	In the adjacent sites
5	32.8	Detached house, Apartment, Commercial Building	4.3	◎	In the site where the building is located
6	73.3	Detached house, Apartment, Commercial Building	13.3	◎	In the site where the building is located
7	91.7	Detached house, Apartment, Commercial Building	4.5	◎	In the site where the building is located
8	75.8	Apartment, Commercial Building	4.7	○	In the adjacent sites
9	54.5	Apartment, Commercial Building	4.2	△	In the block where the building is located
10	53.2	Apartment	4.2	○	In the adjacent sites

4.3.3 Haruyoshi's Vulnerability against Arson

Up to here, the spatial characteristics of the arson spots in Haruyoshi have been discussed. To summarize, the specific points to leverage for prevention against arson are: 1) the spots located appropriately away from major arterial roads, 2) the spots surrounded by a variety of buildings used for many purposes, and 3) the spots with void spaces through which people can go and come.

In contrast, in the next section, more specific environmental and psychological analysis is provided to clarify the resistance the district has.

4.4 Fieldwork and Environmental Psychological Analysis

4.4.1 General Information of Fieldwork

In the previous sections, with quantitative approaches, the trends and characteristics of arson in Fukuoka and Haruyoshi are analyzed to see the vulnerability against arson. Through this analysis, we discovered where the need to leverage for preventive actions against arson, but specific methods is still essential and is to be even furthermore explored.

Therefore, this section is aimed at exploring various factors which can prevent people from committing arson in Haruyoshi from a qualitative viewpoint. Specifically, at first, an on-the-site survey was conducted to obtain the places in which it is evaluated as "difficult" to commit arson. This survey was conducted all over the district at night in the period going from 2010 July to 2011 January intermittently. Each place in which author felt it was "difficult" to commit arson, pictures and field notes (the texted data of ideation which emerged when the author tried to commit arson at those places) were taken. After the survey, the author added captions on all the pictures taken from the field, and the pictures, their captions, and field notes were holistically analyzed by M-GTA.

Field Notes:
There is a lot of garbage to be collected tonight. This place is very bright not because of any roadside lights but because there is a vending machine. The residents might come here to throw garbage out, and it is really easy for them to find me standing around here.

Caption: Place for garbage next to a vending machine.

Fig. 4-10 Sample of the Data for M-GTA

4.4.2 Methodology of Analysis

Grounded Theory Approach (GTA) is generally used for developing a theory inductively from a corpus of text data (Glaser and Strauss (1967) [11]). The basic idea of the GTA is to read a textual database, such as field notes repeatedly, and "discover" or label variables, called categories, concepts and properties, and their interrelationships. The ability to perceive variables and relationships is termed "theoretical sensitivity" and is affected by a number of things including one's reading of the literature and one's use of techniques designed to enhance sensitivity. Of course, the data does not have to be literally textual, and it could be observations of behavior, such as interactions and events in a specific place.

One of its merits is the open-ended nature of its interaction which makes it possible to reveal and arrange implicit knowledge about a person's own thoughts. Of course, GTA has been criticized for its process which is impossible to free oneself from preconceptions in the collection and analysis of the data, but its constant comparative method is still worthy among other qualitative method (Thomas and James (2006) [12]).

Therefore in this study, GTA is considered as a qualitative inquiry method, not a quantitative approach like the developers, Glaser and Strauss, have intended it to be. As a constant comparative method of clinical data of urban spots, GTA is suitable to use for this study since it can reveal the implicit knowledge which cannot be revealed by directive questionnaires and predefined criteria.

The general process of GTA is; 1) take text data like field notes, 2) conduct constant comparison for clustering, 3) review the data based on the result of clustering, 4) repeat 2) and 3) until all the data is settled down in categories or a theory that can be explained by the categories. The original version of GTA requires researchers to segment down text data as small as possible, but the process might destroy the contexts of the data. So, M-GTA brought by Kinoshita (2007) [13] is utilized for this study. With M-GTA, key words and sentences are directly extracted from text data, and they are compared to each other as a small concept to generate bigger categories and concepts. In the next section, the result of M-GTA on the data for this study is explained.

4.4.3 Result of Analysis

4.4.3.1 Visually Recognized Objects

In this study, visually recognized objects which appeared in the corpus of text data are focused on as one of the key aspects to analyze the resistance of Haruyoshi district against arson. There are many objects observed in the field and they can be categorized into 2

categories: Objects which are proactive in crime prevention, such as surveillance cameras and security lights, and objects derived from residents' life, such as parked bicycles and garbage. Table 4-3 shows the summary of the recognized objects in 2 categories.

Table 4-3 List of Visually Recognized Objects

Category	Objects
Objects which are proactive in crime prevention	Surveillance Camera
	Security Light
	Gate
	Fence
	Warning Sticker
	Pebbles
Objects derived from residents' life	Bicycle
	Taxi
	Vending machine
	Parked Car
	Convenience Store
	Bar / Restaurant
	Garbage
	Garbage truck
	Planter

4.4.3.2 Crime Preventive Factors of Visually Recognized Objects

Through M-GTA, visually recognized objects are clustered, and the result of clustering is shown in Table 4-4. According to the results, 9 clusters are defined, and the characteristics of each cluster are introduced and examined below.

Table 4-4 Clusters of Crime Preventive Factors

No.	Clusters
1	Temporal Settings
2	Existence of Other's Behaviour
3	Access Point
4	Unclear Idle Time
5	Surveillance Appeal
6	Openness of Space
7	Recoiling of Action
8	State of Territory
9	Parting

Temporal Settings

This cluster is formed from the sentences and words about objects seemed to be set temporally. For example, a car parked at a coin-operated parking space seems that it is parked there for a short time, and indicates that the owner of the car will come back soon. In addition, bicycles parked informally are in this cluster. Additionally, Fukuoka is famous for its unique system to collect garbage from houses and apartments, and residents usually put garbage bag out at designated places at night on designated day. The garbage can also indicates that someone can come to the garbage collecting place abruptly at night. This cluster is related to the human traffic as in the resistance categories.

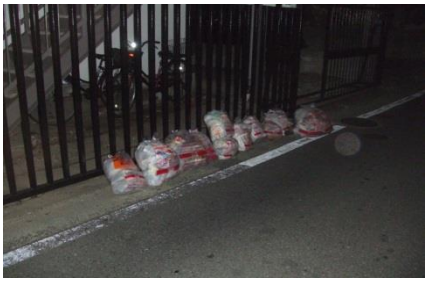


Fig. 4-11 & 4-12 Thrown-out Garbage Bags and a Garbage Wagon Collecting at Night

Existence of Other's Behavior

This cluster consists of the sentences about both visible and invisible existence of people's behaviours, not only pedestrians themselves but also the hotels that rent rooms to couples either overnight or for short times (Fig. 4-13). Haruyoshi is famous for concentration of such hotels, and this cluster is one of the features of Haruyoshi's crime preventive factors. Also, due to the location near to Tenjin, the downtown of Fukuoka, and Nakasu, an amusement centre especially for night activities, Haruyoshi is used as backstreet area to pass by taxies. Therefore, compared to other district, Haruyoshi has a lot of taxies passing through especially at night (Fig. 4-14).

Fig. 4-13 & 4-14 A Casual Motel So-called "Love Hotel" and Traffic of Taxi in Haruyoshi

Access Point

The objects categorized in this cluster have the ability to attract people to do something around there. For example, a vending machine of cigarettes located near to an izakaya, a Japanese-style bar, can bring around not only pedestrians but also the customers of the bar, and the place with the vending machine has become one of the access points where people often come (Fig. 4-15). Needless to say, convenience stores which are open overnight in Japan are able to be access points for residents at night (Fig. 4-16).

Fig. 4-15 & 4-16 A Vending Machine Set by a Bar and a Convenience Store Open at Night

Unclear Idle Time

This cluster is strongly related to the temporal setting cluster, and defines that objects set or parked permanently cannot let people know the exact time of the owner's return. If someone tries to do something illegal, he/she needs to pay attention to others coming to the place. In Haruyoshi, there are some coin-operated parking lots for people to park their cars and go to restaurants near to the parking lot or other adjoined areas such as Tenjin or Nakasu. The important point is that it is really difficult to predict how long the idle time is due to the multi-purpose characteristic and location of the district.

Fig. 4-17 & 4-18 Bicycles Parked at an Unofficial Place and a Coin-operated Parking Lot

Surveillance Appeal

In Haruyoshi, there are some places at which security lights or surveillance cameras were observed. Of course, surveillance cameras and security lights are one way to enhance surveillance. Besides these proactive devices for crime prevention, a garden, yard and planter make people feel the place is arranged and managed by somebody, and so their effort can also be this surveillance appeal.

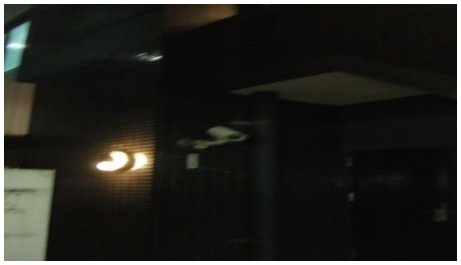



Fig. 4-19 & 4-20 A Security Light and a Surveillance Camera

Openness of Space

The descriptions of spatial characteristics focused on the openness of space in and around the site are grouped in this cluster. This cluster is strongly related to the observability as in the resistance category. If the Pilotis are enlightened enough, people feel this openness strongly (Fig. 4-21). Also, in some places, in order to clarify the border of two different sites, fences are used, and they create more openness than walls do (Fig. 4-22). Of course, it is more difficult to commit arson if there is more observability. Therefore, it is important to make open and observable places against arson.


Fig. 4-21 & 4-22 Fully Lighten Pilotis and a Places Parted by a Fence

Recoiling of Action

There are some devices set to make recoiling of action which can be helpful for the residents and scary to someone who doesn't belong to the place. As an example of the devices set unintentionally, the steps made of iron, pebbles scattered in front of an entrance of a house, and rusty gates which make a creak when people open or close them are observed.


Fig. 4-23 & 4-24 Scattered Pebbles in Front of a House and Steps Made of Iron

State of Territory

This cluster consists of the sentences related to the inanonymity as in the resistance category. Fences and gates are examples of the hard state of territory, but not only that, there are also some soft states such as the settlement of planters and difference of pavement.


Fig. 4-25 & 4-26 Settlement of Planters and Difference of Pavement to State of Territory

Parting

This cluster defines on of most important notions for crime prevention. If there is someone standing in the parted places from roads, the person will be suspected. This is not only about making private spaces, but it will work to make public spaces which can limit the access of people, such as an alcove and parking lots for specific and limited users.


Fig. 4-27 & 4-28 An alcove with Only One Exit and a Parking Lot for Limited Users

4.4.3.3 Resistance against Arson in Haruyoshi

After clustering the observed objects, 9 clusters are grouped into 3, and each of the groups is named. The result is shown in Table 4-5. In here, these 3 groups are considered the resistance against arson in Haruyoshi, and explained below.

Table 4-5 Resistance against Arson in Haruyoshi

Resistance	Clusters
Human Traffic	Temporal Settings
	Existence of Other's Behaviour
	Access Point
	Unclear Idle Time
Observability	Surveillance Appeal
	Openness of Space
	Recoiling of Action
Inanonymity	State of Territory
	Parting

Human Traffic

Human traffic is related to the temporal settings, existence of other's behaviour, access point, and unclear idle time. Human traffic does not have to be the real traffic, but some settings, conditions, and devices which can make people feel that somebody might come can create this resistance. Specifically, the bicycles parked in front of an izakaya have this resistance, unlike those parked in a parking lot attached to an apartment. That is because, the bicycle can indicate that the owner is in the izakaya and he/she might come out from the izakaya soon. Also, there are vending machines selling beverages and cigarettes in front of izakaya, but the latter can create a lot of human traffic.

Field Notes:
There is a vending machine settled aside a wall of izakaya so that people eat and drink in the izakaya conveniently can come to this place to buy cigarettes. Since the izakaya is open till late night, it is possible to make human traffic even at night. If this vending machine is for beverages, the relationship with the izakaya may be different.

Caption: A vending machine set aside an izakaya

Fig. 4-29 Representative Picture and Script for Human Traffic

Observability

This resistance is related to the surveillance appeal, openness of space, and recoiling of action, and is about the risk and/or feeling of being observed by other people. This resistance will appear not only when a criminal stands on a road with some other pedestrians, but also when a criminal feels the appeal of surveillance or the possibility of being observed even though there is no one around the site. For example, in Haruyoshi, there are some low-level old apartments with stairs made of iron which make sounds when people use them and generate observability and prevent non-residents from using them.

Field Notes:
This place is located in a site of an apartment but easy to come into. However, if people try to go up these stairs made of iron, big sound will be made, and it is possible to let people around here know that here is a person weirdly. So, it is difficult to go up these stairs at night.

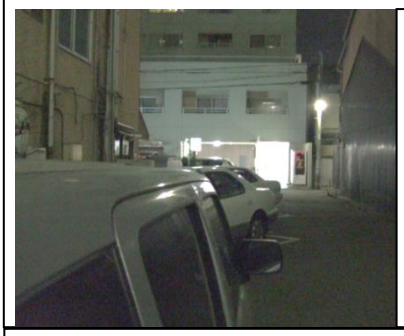
Caption: Iron stairs found in a site of an apartment

Fig. 4-30 Representative Picture and Script for Observability

Inanonymity

Inanonymity consists of the state of territory and parting. Because of this, potential criminals will feel that they can be identified and give up trying to commit a crime in the site. If there is a state of territory, there is a great risk of being observed by the owner of the site or

those who know who is the owner or user of the site. Also, there are some roads with dead ends all along in Haruyoshi, and it is difficult to commit arson at the deep side of the road since there is a risk that someone identifies the weirdness of the criminal being there.



Field Notes:
This parking lot was surrounded by many buildings in which people are not at night. Therefore, the secluded part of this place is very dark. Also, the secluded part is parted from the road confronted with this parking lot. It is very strange if an non-owner of the parked car stands here.

Caption: A parking lot parted from the facing road

Fig. 4-31 Representative Picture and Script for Inanonymity

4.4.4 Haruyoshi's Resistance

Through the fieldwork in Haruyoshi and analysis of the qualitative data by M-GTA, some resistance against arson in Haruyoshi, and related factors and objects is revealed. By parsing the crime preventive factors, the resistance is summarized into 3 main clusters: 1) Human traffic, 2) Observability, and 3) inanonymity. As an interesting result throughout the analysis, it is implied that the resistance does not rely on the observed objects' usage, but the environmental compatibility; in other words, specific settings of the objects and surroundings are of a great matter. This point should be considered when planning urban reforms regarding crime prevention.

4.5 Examination of Arson-related Spatial Characteristics

4.5.1 Visualization of the Density of Arson Spot and Selection of Target Districts

In order to know the districts that possess a concentration of arson points, the data of all arson in Fukuoka City is plotted on the map of Fukuoka in GIS by using the Address Matching Service. To visualize the density of the spots in which arsons have carried out, Kernel density estimation method is utilized. The result is shown in Fig.4-32, and the hot spots of arson are clearly identified in the map. Interestingly, the hot spots are not shown in the locations of Tenjin and Hakata, the core areas of Fukuoka, but the following 14 districts: Haruyoshi, Yoshizuka, Naka, Hakozaki, Ozasa, Minoshima, Hibaru, Nanakuma, Odo, Meinohama, Hakata-ekimae, Chiyo, Kashihara, Nishijin.

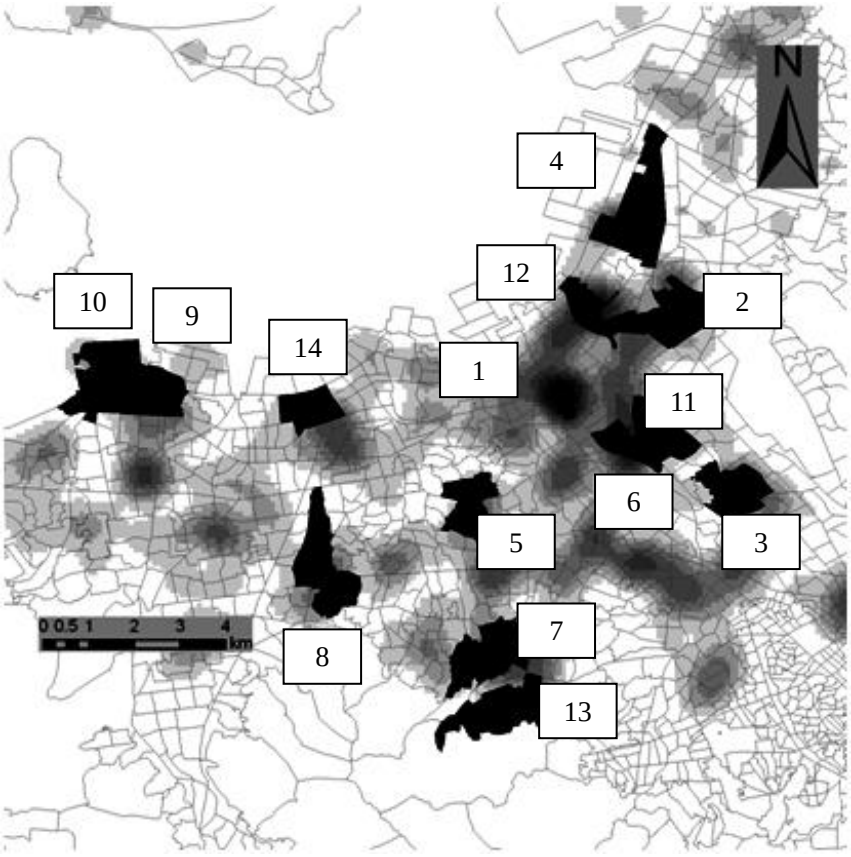


Fig. 4-32 Density of Arson and Districts with High Rates of Arson

Table.4-6 shows the districts in which much arson has taken place. Since some arsons have been carried out in the same spots, the number of arson spots does not show the exact density, but the districts that have a smaller number of arson spots, such as Naka, have the arsons which have been carried out in the same spot.

Table 4-6 Selected Districts and the Number of Arson Spots

District Number	Selected Districts		Number of Arson Spots
1	Haruyoshi	Chuo-ku	12
2	Yoshizuka	Hakata-ku	9
3	Naka	Hakata-ku	3
4	Hakozaki	Higashi-ku	7
5	Ozasa	Chuo-ku	7
6	Minoshima	Hakata-ku	4
7	Hibaru	Minami-ku	10
8	Nanakuma	Jyonan-ku	7
9	Odo	Nishi-ku	5
10	Meinohama	Nishi-ku	6
11	Eki-minami	Hakata-ku	7
12	Chiyo	Hakata-ku	10
13	Kashihara	Minami-ku	8
14	Nishijin	Sawara-ku	7

4.5.2 On-the-spot Survey

According to the results of visualization and selection of target districts, an on-the-spot survey was conducted in order to analyze the arson-related characteristics of spatial design. The spatial characteristics of “arson points” which are identified from the data of arson in Fukuoka City and the one of “non-arson points” which are randomly selected in the selected districts are compared by using the data from the on-the-spot survey. The survey was conducted on 102 “arson points” and randomly chosen 102 “non-arson points” in the districts that possess a concentration of arson points. The survey had been conducted from August 12th, 2011 to November 3rd, 2011 including the pilot survey. The survey was basically conducted at night since Fig. 4-32 indicates that a lot of arsons have been committed at night.

Also, since participation of the people living in a targeted district is important to establish DCO-CPTED, the style of checklist for the survey is chosen. The checklist style can make it easier for residents to join the survey, because there is no need to use specific tools for scaling, calculating, and examining the targeted areas. The check items are made and selected from the two key concepts of CPTED: access control, natural surveillance [2], and one concept of Defensible Space: desolation of places [1] (Table.4-7).

Table 4-7 List of Check Items

Item	Description	Theories' concept
A	The site is not gated	Access control
B	The access point is widely open	Access control
C	The site has two access points or more than that	Access control
D	The site is surrounded by a vacant building or house	Natural surveillance
E	The site is surrounded by the building which is vacant at night	Natural surveillance
F	The site is not surrounded by shops or restaurants open at night	Natural surveillance
G	The site is surrounded by an open public space	Natural surveillance
H	The site is not on the road which has only one traffic lane	Natural surveillance
I	The site has something obstructing against the road	Natural surveillance
J	The site has something obstructing against the surrounding sites	Natural surveillance
K	The site doesn't have different pavement treatment from that of roads	Access control
L	A broken equipment is found in the site	Desolation
M	An illegal graffiti is found in the site	Desolation
N	A litter is found in the site	Desolation
O	A surveillance camera is not found in the site	Natural surveillance
P	A sensor light is not found in the site	Natural surveillance
Q	A sound making spot is not found in the site	Natural surveillance
R	There is a very dark spot (less than 1 lx) in the site	Natural surveillance
S	There is a screened spot in the site	Natural surveillance

4.5.3 Result of On-the-spot Survey and the Arson Vulnerability Index

In order to see the difference of responses toward each item in arson points and non-arson points, the total numbers of responses are examined by Chi-square test, with Table.4-8 showing the result of this. There are statistically significant differences for many of items. However, the statistic difference between the responses to arson points and those to non-arson points are not observed for Item F, H, I, K, O, and Q. The result suggests that the existence of shops or restaurants which are open at night, roads which have two traffic lanes or more, walls against roads, pavement treatment, surveillance cameras and sound making spots are not related to the occurrence of arson.

Table 4-8 Result of Chi-square Test

Item	arson point		non-arson point		Chi-square test
	checked	not checked	checked	not checked	+p<.10 *p<.05 **p<.01
A	62	40	52	50	+
B	61	41	35	67	**
C	70	32	34	68	**
D	86	16	4	98	**
E	66	36	54	48	+
F	85	17	91	11	ns
G	75	27	62	40	+
H	71	31	63	39	ns
I	36	66	35	67	ns
J	83	19	63	39	**
K	19	83	13	89	ns
L	38	64	10	92	**
M	25	77	11	91	*
N	54	48	20	82	**
O	62	40	66	36	ns
P	73	29	52	50	**
Q	87	15	82	15	ns
R	83	19	45	57	**
S	91	11	48	54	**

4.6 Establishment of the Arson Vulnerable Index

4.6.1 Selection of Items for the Arson Vulnerable Index

Based on the result of the previous sections, the items for the arson vulnerable index are selected. In this study, the items that do not show the statistical difference between the responses toward arson points and non-arson points are excluded. Table.4 shows the selected 13 items for the arson vulnerability index.

Table 4-9 Selected 13 Check Items

Item	Description
A	The site is not gated
B	The access point is widely open
C	The site has two access points or more than that
D	The site is surrounded by a vacant building or house
E	The site is surrounded by the building which is vacant at night
F	The site is surrounded by an open public space
G	The site has something obstructing against the surrounding sites
H	A broken equipment is found in the site
I	An illegal graffiti is found in the site
J	A litter is found in the site
K	A sensor light is not found in the site
L	There is a very dark spot (less than 1 lx) in the site
M	There is a screened spot in the site

4.6.2 Hayashi's Quantification Method Type III

In order to categorize the 13 selected items, Hayashi's Quantification Method Type III is utilized. Hayashi's Quantification Method Type III is generally used for quantifying qualitative categories and samples simultaneously. The distinctive feature of the method is that it can classify or quantify both categories and samples merely by looking at qualitative dichotomy response patterns, i.e., whether each sample reacts positively or negatively to several categories. Given a data matrix the size of which is the number of samples by the number of categories, the basic principle is to rearrange the rows and the columns so that the positive responses can converge around the diagonal. The categories close to one another, and the samples close to one another, are considered to be qualitatively similar; those distant from one

another are said to be qualitatively different. Since the results of the items of the survey consist of normal scales, Hayashi's Quantification Method Type III is chosen as the best way to categorize the items.

4.6.3 Categorization of Items

In Table 4-10, the result of Hayashi's Quantification Method Type III is shown. The ranges of category scores are sorted to indicate the 5 categories suggested by the method. To suit the items in each category, the name of categories are given.

Table 4-10 Range of Category Scores

		Description	1	2	3	4	5
Unrestrictedness	1-1	There is a very dark spot (less than 1 lx) in the site	4.53	1.23	1.05	1.41	1.67
	1-2	A litter is found in the site	3.14	1.40	1.47	0.81	0.71
Accessibility	2-1	The site has two access points or more than that	2.04	3.94	1.08	0.04	1.43
	2-2	The access point is widely open	2.29	3.25	1.54	0.72	1.55
Unobservability	3-1	There is a screened spot in the site	3.13	2.37	4.86	1.82	0.57
	3-2	A sensor light is not found in the site	1.68	0.60	4.19	1.23	1.42
	3-3	The site has something obstructing against the surrounding sites	2.00	2.39	3.55	3.40	2.57
	3-4	The site is surrounded by an open public space	0.95	1.03	3.17	0.40	2.45
Desolateness	4-1	An illegal graffiti is found in the site	0.66	0.55	1.42	5.52	1.66
	4-2	A broken equipment is found in the site	2.34	1.90	0.91	3.32	0.67
Performability	5-1	The site is surrounded by a vacant building or house	0.88	3.86	0.27	0.92	4.49
	5-2	The site is surrounded by the building which is vacant at night	0.75	2.77	0.43	2.66	4.12
	5-3	The site is not gated	2.42	0.60	2.19	0.48	2.65

- Unrestrictedness

In this category, the darkness and existence of litter in the site are figured. It is considered that people tend to feel unrestricted in a dark spot, and the litter can be the actual evidence of people's unrestricted behavior.

- Accessibility

In this category, the width and number of access points to the site are figured. Wide access points make it easier for people to access the site, and two access points or more allow perpetrators to run away from the site.

- Unobservability

The existence of screened spots, obstructions between surrounding sites, and open public space surrounding the targeted site are figured in this category. They can make specific spots in the site screened, and even if a person is in the spot, it is difficult to be observed from the surroundings. Also, the lack of sensor lights is figured in this category. Needless to say, sensor lights can make the unobservable spots observable from the surroundings.

- Desolateness

Illegal graffiti and broken equipment in the site are figured in this category. People tend to feel an area is desolate because of these factors, making people guess that no one else will come to the spot.

- Performability

In this category, the existence of buildings or houses that are vacant or become vacant at night is taken into account, while the lack of gate in the site is also considered. Vacant surroundings and the lack of gate allow people to easily perform what they want.

4.7 Comparison of Selected Districts

4.7.1 Obtaining Vulnerable Points for Each Category

In order to conduct a cluster analysis to classify and compare the selected districts in which a lot of arson has been carried out, the districts' vulnerable points for each category are calculated. Firstly, only arson spots are selected for each district, and the numbers of checked categories are summed up. They are then averaged out into each category. Finally, each averaged point is divided by the number of arson points of the districts and times 100 to obtain a vulnerability ratio for each category. Table 4-11 shows the results of this calculation.

Table 4-11 Range of Category Scores

District Name		1	2	3	4	5
		Unrestrictedness	Accessibility	Unobservability	Desolateness	Perfomability
1	Haruyoshi	75.00	54.17	72.92	54.17	58.33
2	Yoshizuka	83.33	55.56	80.56	61.11	48.15
3	Naka	83.33	100.00	91.67	50.00	44.44
4	Hakozaki	78.57	57.14	78.57	14.29	52.38
5	Ozasa	71.43	64.29	85.71	35.71	47.62
6	Minoshima	62.50	75.00	87.50	25.00	41.67
7	Hibaru	60.00	50.00	72.50	5.00	36.67
8	Nanakuma	78.57	85.71	78.57	14.29	52.38
9	Odo	80.00	80.00	80.00	30.00	33.33
10	Meinohama	50.00	66.67	91.67	16.67	33.33
11	Eki-minami	35.71	78.57	82.14	21.43	47.62
12	Chiyo	60.00	65.00	72.50	30.00	60.00
13	Kashihara	87.50	62.50	90.63	31.25	45.83
14	Nishijin	35.71	50.00	60.71	35.71	38.10
	Avarage	67.26	67.47	80.40	30.33	45.70

4.7.2 Classification of Selected Districts

Based on the result of the calculation in the previous section, cluster analysis was applied to classify each district and analyze their characteristics by using SPSS. The average linkage clustering is used to form the clusters, and Euclidean distance is chosen as the type of distance.

The result of cluster analysis is shown in Fig.4-33. According to the result, 5 types of characteristics are defined. The characteristics of each type are discussed below with one representative case.

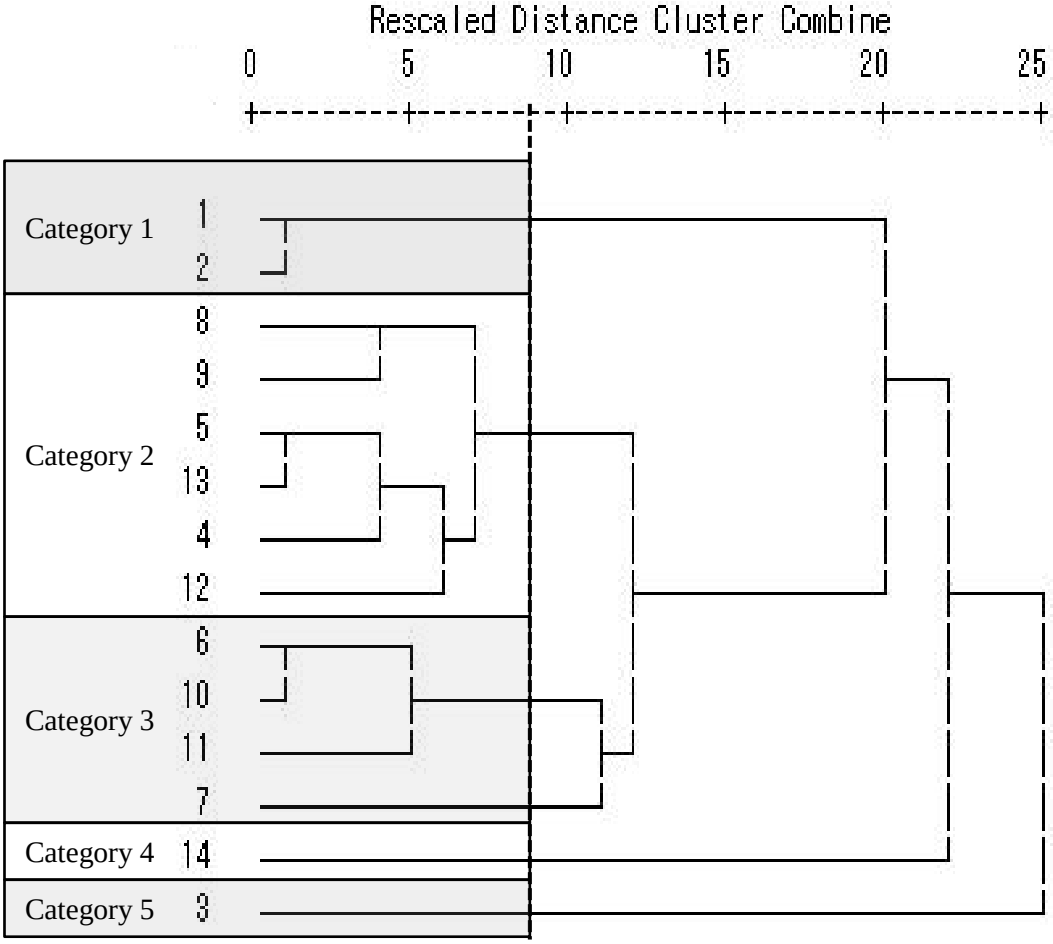


Fig. 4-33 Dendrogram of Cluster Analysis

Category 1) Mixed structure type (Haruyoshi, Yoshizuka)

This type is formed by the districts Haruyoshi and Yoshizuka, which still have old city structures in many areas, but also some of new apartments and houses can be observed on the other hand. The notable characteristics are the high performability, unobservability, and unrestrictedness. However, accessibility is slightly lower than that of other types. That is because there are a lot of individual houses which have walls and gates as the old style of Japanese houses.

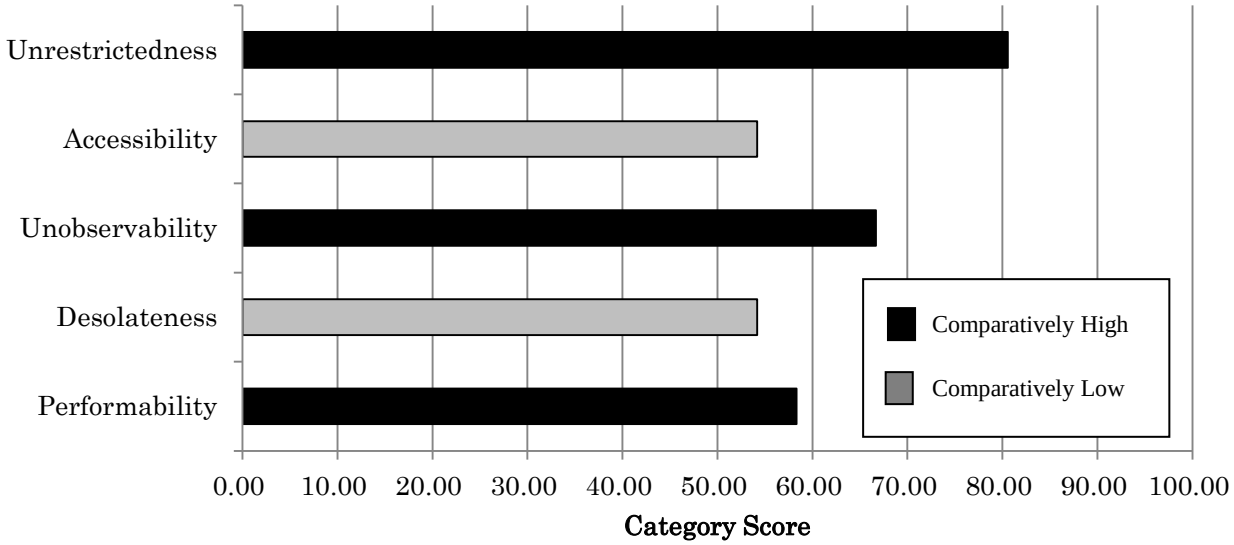


Fig. 4-34 Category Scores of Haruyoshi

Category 2) Unrestricted & Accessible type (Nanakuma, Hakozaki, Kashihara, Chiyo, Ozasa, Odo)

Many districts are defined as this type, and show a high percentage towards unrestrictedness and accessibility. Also, the notable characteristic is the low desolateness. The towns and districts are well-managed and they are not desolate, but they need some actions related to the access control. When considering the CPTED, it is especially suggested to use the checklist for these kinds of districts so that the first priority to improve can be clarified.

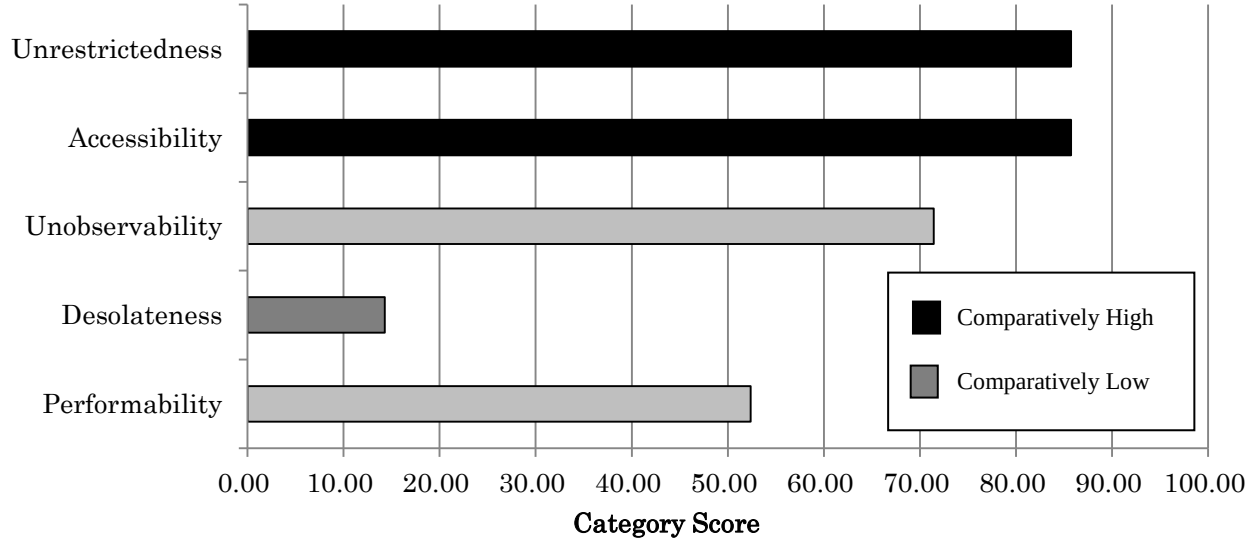


Fig. 4-35 Category Scores of Nanakuma

Category 3) Well-managed and gated type (Mienohama, Hibaru, Eki-minami, Minoshima)

This type is consists of Meinohama, Hibaru, Eki-minami, and Minoshima, areas that are new or becoming new. There are some old city structures and houses observed, but generally these districts have low desolateness and are well-managed. However, there are a lot of places which are gated or walled well. It makes desolateness and performability become low, but increases unobservability at the same time. If the unobservability is improved, this district can become less vulnerable.

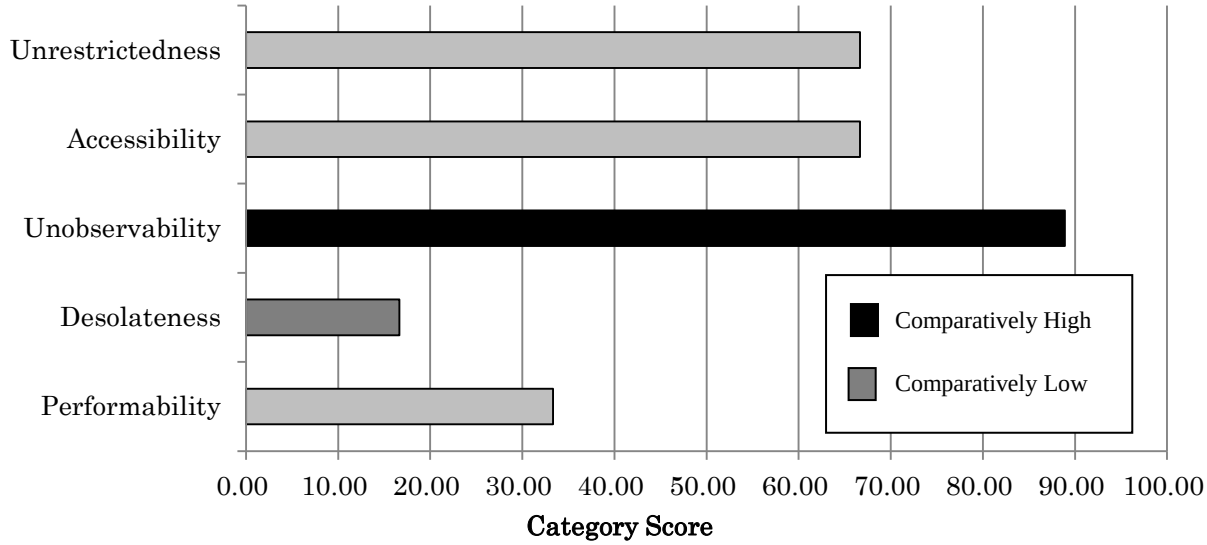


Fig. 4-36 Category Scores of Meinohama

Category 4) Balanced type (Nishijin)

Nishijin is the only area defined as this type. All of categories have less percentage when compared to other districts, especially unrestrictedness and accessibility. The result means that the other factors which are not related to spatial designs. From the viewpoint of spatial design, Nishijin should be safe, but there are some more psychological or anthropological factors which have not been revealed through the checklist utilized in this study. For those factors, further study shall be conducted in the future.

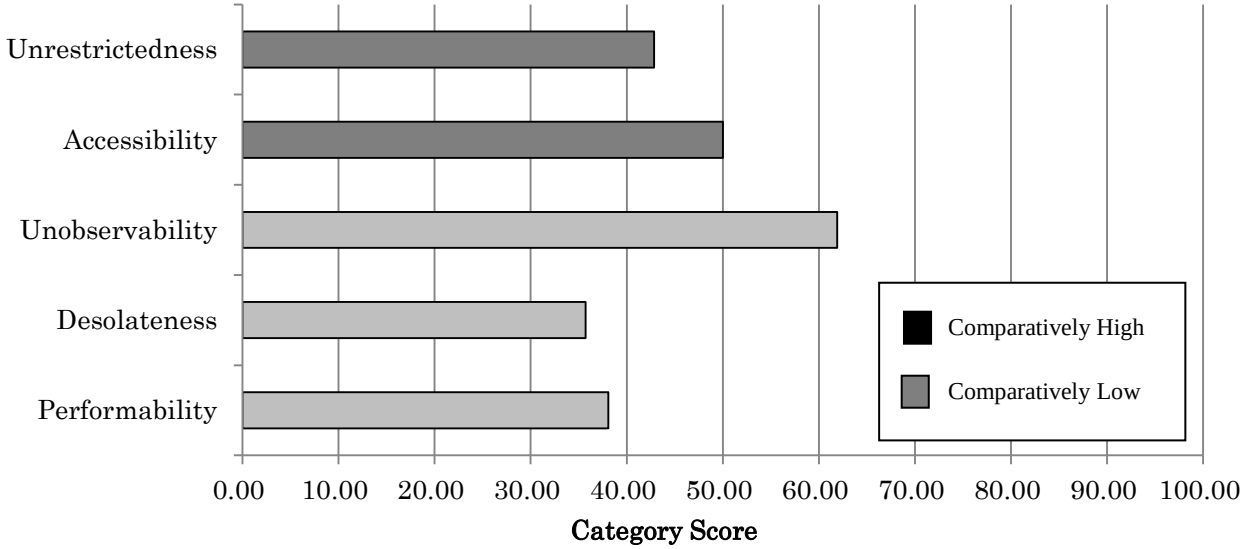


Fig. 4-37 Category Scores of Nishijin

Category 5) Significantly vulnerable type (Naka)

The district, Naka, is defined in this type. It is notable that this district has high levels of unrestrictedness, accessibility, and unobservability compared to other districts. The spots in which arsons have been committed are easily accessed and possess many dark spots. There are a lot of planted trees and bushes which obstruct the sight of people walking around/in the site.

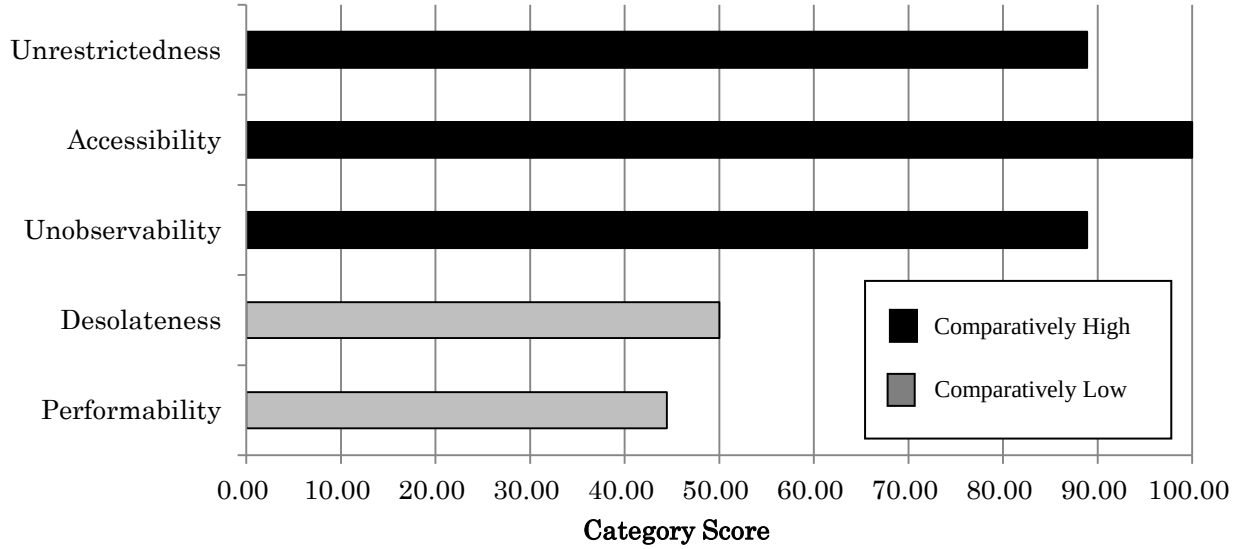


Fig. 4-38 Category Scores of Naka

4.8 Conclusion

In this study, first, the temporal and geographical vulnerabilities against arson in Fukuoka are explained. Then, a more localized district, Haruyoshi, is chosen being on the highest concentration of arson sites and which needs to be improved with specific crime preventive methods. Then, the spatial design of “arson points” and “non-arson points” are compared by using the data from an on-the-spot survey conducted on “arson points” and randomly chosen “non-arson points” in the districts that possess a concentration of arson, in order to analyze the arson-related characteristics of spatial design.

As a result of temporal analysis of Fukuoka, specific months (May and December) and time zones (9 p.m. to 6 a.m.) were clarified to leverage for prevention against arson. In CPTED, there is a concept of formal organized surveillance. Based on the information of vulnerable time zones and months, it may be possible to conduct semi-formal organized surveillance only in the time zones of the months to prevent major arsons. In addition, the result of the geographical and spatial survey and analysis in Fukuoka and Haruyoshi concludes that there are specific points to leverage for prevention against arsons especially targeting buildings: 1) the spots located appropriately away from major arterial roads, 2) the spots

surrounded by a variety of buildings used for many purposes, and 3) the spots with void spaces through which people can go and come. Based on the knowledge of CPTED, it is understandable that these three spots are vulnerable; however, considering the unique characteristic in urban structure of Haruyoshi, it is difficult to conduct hardening access control and improving surveillance unless implementing a readjustment of district itself. In addition, the sequential results of this study strongly suggest that it is needed to clarify the vulnerability of a small range of cities or districts ahead of crime preventive urban planning since their spatial and social characteristics differ from each other. CPTED has offered a vast and general idea of crime prevention related to spatial designs so far, but this study suggests that it is needed to think of each characteristic of the targeted district, town, or city from spatial and temporal viewpoints macroscopically and microscopically. Consequently, the importance of exploring the DCO-CPTED is implied.

Also, given the dilemma mentioned above, indicating where improvements should take place is not enough, but the how can those improvements be implemented is also crucial to improve the resilience of each district, and not only vulnerability but also resilience should be revealed to conduct practical crime preventive urban planning. To add such knowledge to the concept of CPTED, finally, as a result of the qualitative survey and analysis on the places evaluated as “difficult” places to commit arson, focusing on the visually observed objects, Haruyoshi’s resilience, 1) Human traffic, 2) Observability, and 3) inanonymity, are revealed. These preventive factors can be integrated into the previous CPTED method of urban planning, and it is possible to improve the condition more.

Additionally, the result of the survey and analysis concludes that not all spatial designs that are considered as related to crime prevention in the big theories, CPTED and Defensible Space, are actually related to the occurrence of arson. Interestingly, it clarifies that the existence of surveillance cameras or different pavement treatment do not corresponded to arson.

Furthermore, analysis focusing on other kinds of crime and examining the check items for surveys are tasks that could promote DCO-CPTED in the future. On the other hand, examination of the survey to detect the resistance of the city remains an important matter for further consideration. Consequently, the importance of considering those two axes (vulnerability and resilience) at the same time is implied for the next generation of CPTED. For this purpose, the consecutive method about crimes by joint quantitative and qualitative methodologies is called for.

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Chapter V Bicycle Theft Prevention Considering Vulnerability and Resistance

5.1 Introduction

5.1.1 Research Background

Nowadays, a number of urban problems that did not exist previously exist have emerged into our urban life with the advance of urbanization and modernization. For example the number of urban crimes is gradually increasing while the total amount of crimes committed in Japan is actually decreasing. This causes citizens to be more troubled by crime and sometimes disturbs or even threatens the growth of cities. For example, after the peak of motorization, due to the perceived negative environmental impact caused by vehicles, bicycle-oriented city planning has become more relevant days while the number of bicycle theft is increasing correspondingly. Fig. 5-1 shows the transition of the percentage of vehicle thefts in Japan from 2002 to 2011 according to the database of the National Police Agency. While the numbers of motorcycle and car thefts are drastically decreasing, the number of bicycle thefts does not follow the same trend, even though the Police have tried to encourage people to be careful of bicycle theft and many tools to prevent bicycle theft have been produced. Therefore, under the social movement of bicycle use expansion, the bicycle theft prevention ideas are required to be integrated into city planning, in order to improve our habitat, living environment.

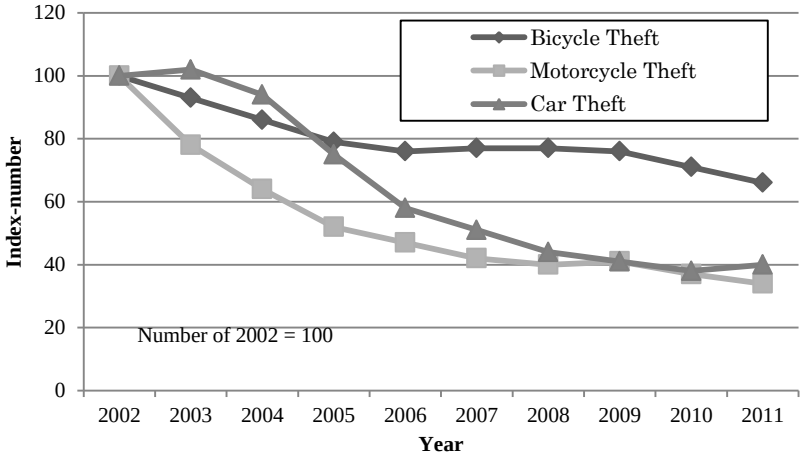

Fig. 5-1 Index-number of Reported Vehicle Thefts[1]

5.1.2 Previous Studies and Purpose of Study

Due to a recent trend of research into crime and crime prevention, many studies focus on the relationship between the occurrence of crimes and external factors such as environment, education, and city. This research was conducted after the concepts of
"Defensible Space" and "CPTED (Crime Prevention through Environmental Design)" were introduced into this field of study. Since when "Defensible Space (Newman, 1996)[1],"

"CPTED (Crime Prevention through Environmental Design) (Jeffery, 1971)[2]" and "Situational Crime Prevention (Clarke, 1983)[3]" were imported into the research field of crime and crime prevention in Japan, it had led to the participation of many other study fields, such as architecture and urban planning, and many studies have focused on the relationship between the occurrence of crimes and external and spatial factors.

More specifically, in order to focus on the physical environment, the relationship between crimes and the characteristics of cities and districts has already been clarified in many papers. For example, Kashiwara et al. focuses on spatial factors within a city in order to examine whether they are related to the occurrence of crimes on convenience stores or not [4]. Also, as an example of the studies focusing on the relationship between the occurrence of situational crimes and environmental design, Ito et al. studied the relationship between various environmental aspects and the occurrence of arson in a city [5]. In addition, Kashibayashi et al. indicates the common and different features of two places where many bicycle thefts had taken place while mentioning the importance of considering the public exposure of parking lots for bicycles as one of environmental factors for that may contribute towards bicycle theft [6]. Moreover, Utsui clarifies in his study that the density of bicycle theft is related to the location of big commercial buildings and stations [7].

The studies mentioned above are generally clarifying various crime-related factors whilst proposing some preventive spatial designs. However, there is no research about the reasons why people do not commit a crime in particular places, and the factors which are directly related to crime prevention have not been clarified and discussed enough. Consequently, the general purpose of this study is to produce specific knowledge which can contribute directly to crime prevention by analyzing positive factors within an urban environment.

5.2 Research Method

5.2.1 Method Flow

Considering the matters discussed above, we intend to focus on bicycle theft, one of most frequent and familiar urban crimes. To fulfill its purpose, this chapter initially aims to explore various crime preventive factors and create an ideation model which can describe why criminals give up trying to commit a crime in a particular place. Accordingly, this research first utilizes the integrated method of contextual inquiry and text mining in order to analyze the field notes about places evaluated as "difficult" places to commit bicycle theft.

Contextual inquiry is a user-centered design ethnographic research method. One its merits is the open-ended nature its interaction which makes it possible to reveal implicit knowledge about a person's own thought process that they themselves are not consciously

aware of. In the study field of urban planning focusing on crime prevention, it has traditionally been very hard for researchers to uncover this implicit knowledge, the reason why people do not commit a crime in a particular place. Therefore, to reveal this knowledge which cannot be revealed by directive questionnaires and predefined criteria, the features of contextual inquiry are suitable to use for this study.

On the other hand, in the same way as contextual inquiry, text mining is useful to analyze open-ended survey questions and tease out underlying information about something from a large variety of texts. Text mining is defined as the analytical method to handle data which is contained in natural literal text. Text mining works by transposing words and phrases in unstructured data into numerical values which can then be linked with structured data in a database and analyzed with quantitative research techniques.

While both of methods have their merits, they can be sometimes challenging. For text mining, since the process usually requires the participants to write their opinion freely, the texts are often inconsistent, ambiguous, and/or contain slang or personal expressions. Also, it is sometimes difficult for researchers to conduct contextual inquiry, due to a stage in the KJ method which requires one to converge the information and cluster a lot of data, and the quality of the result that researchers may obtain is directly related to their skill. Accordingly, this research proposes the integrated the methods of contextual inquiry and text mining in order to reveal the positive impact of urban context for bicycle theft prevention.

Specifically, at first, an on-the-spot survey was conducted to obtain the actual places at which bicycles are parked frequently in an elementary-school district, and the geographical data was analyzed. Also, the places evaluated as “difficult” to commit bicycle theft are selected. Then the texted data of ideation which emerged when the author tried to commit bicycle theft at the places was analyzed by text mining in order to obtain the results from term frequency analysis, co-occurrence analysis, and cluster analysis on the sentences obtained from the survey. These analyses were conducted to create an ideation model.

Then, utilizing the ideation model, a set of indicators were prepared focusing on vulnerability and resistance to conduct on-the-spot surveys on 457 bicycle-parking places in the district.

Based on the result of the on-the-spot survey, some of indicators which have strong relation with the occurrence of bicycle theft are selected. After that, multivariate regression analysis is applied to obtain each regression equation for vulnerability and resistance.

In addition, the equation is utilized to detect potential hot spots and defensible spaces, and clarifies the antagonism between vulnerability and resistance at the same time. Moreover, the antagonism reveals the some kinds of vulnerable spots which have high vulnerability or latently have equilibrium of these two factors.

At last, according to the categorization based on the analysis of the antagonism of the two

factors, appropriate improvements on each type of vulnerable bicycle parking places are discussed, and the further crime preventive urban planning method was suggested.

5.2.2 Study Target

The target area of this study is the Kego elementary-school district (Fig. 5-3) of Fukuoka City, Fukuoka Prefecture, Japan. According to the report (Table 5-1) produced by the Police, Fukuoka was ranked No.8 for bicycle thefts and 498 thefts have been reported between January to July of 2012. Also, the Kego elementary-school district has well-mixed urban functions, such as commercial facilities, offices, schools, residential areas, and public transportation hubs. In addition, 144 bicycles have been stolen in this elementary-school district in 2011, and the ratio of bicycle theft is comparatively higher than other districts surrounding the Tenjin and Hakata areas, the two central areas of Fukuoka City. Consequently, this district is a suitable area to examine the actual condition of bicycle theft, and there is a clear need to consider bicycle theft preventive urban planning.

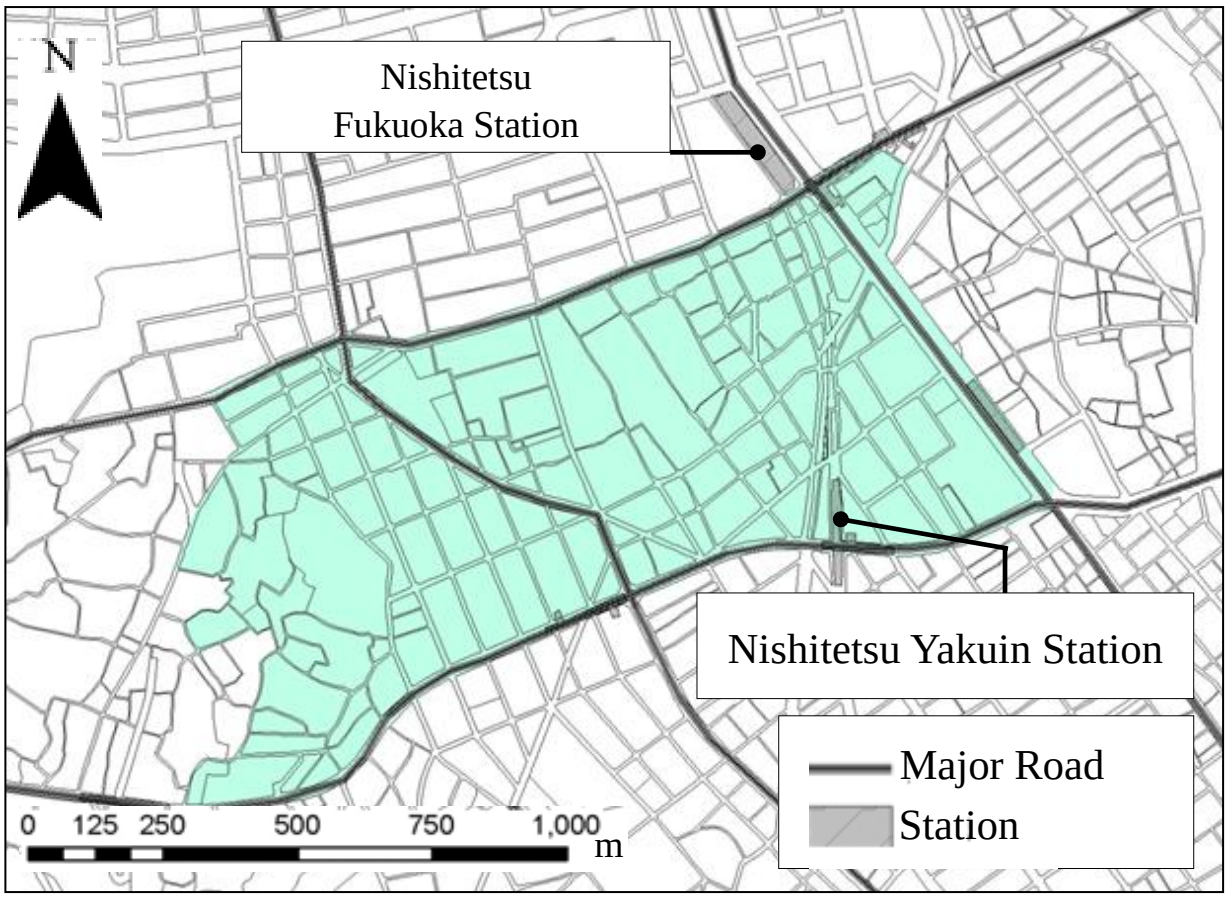

Fig. 5-3 Kego Elementary-School District

Table 5-1 Index-number of Vehicle Thefts

Rank	Jan. to Jul. of 2012	
	Prefecture	Bicycle Theft Reported
1	Aichi	2,154
2	Osaka	1,356
3	Chiba	1,291
4	Ibaragi	1,085
5	Saitama	1,024
6	Kanagawa	818
7	Hyogo	574
8	Fukuoka	498
9	Tochigi	408
10	Tokyo	334
―	National Amount	12,436

5.3 Initial On-the-spot Survey

On-the-spot surveys were conducted in order to understand both the official and unofficial places people park their bicycles. These surveys were conducted all over the district on the schedule shown in Table 5-2 in order to identify the most common parking places for bicycles.

Table 5-2 Schedules of Conducted Surveys

No.	Date	Description
1	2012/06/24	Weekend/Daytime
2	2012/07/02	Weekday/Night
3	2012/07/29	Weekend/Daytime
4	2012/08/01	Weekday/Night

For each survey, the places at which 3 or more bicycles were observed were counted. Field notes were also taken if the place was classified as a “difficult” place to commit a bicycle theft. In order to make it easier to analyze the field notes, contextual inquiry techniques were applied, and the notes were recorded with detailed and generalized ideas focusing on “who,” “what,” “where,” “when,” and “how.” Private sites and the parking places which have locks on the gates are excluded from the data. Finally, the places which had been counted twice or more throughout the four surveys are counted (in total 413) and plotted on a

GIS map (Fig. 5-4).

Also, the data on all the bicycle thefts in the district is plotted on the GIS map by using an Address Matching Service. To visualize the density of the spots in which bicycle theft bicycle thefts were carried out, a Kernel density estimation method was utilized, and the visualized density map is also overlapped on the map in Fig. 5-4.

Interestingly, it is observed from Fig. 5-4 that there are specific hot spots even though the distribution places bicycles parked is not inclined over the map. On the contrary, there are some places which are not overlapped on the density distribution. This fact shows that there are not only "easy" places to commit bicycle theft but also "difficult" places at the same time in this district.

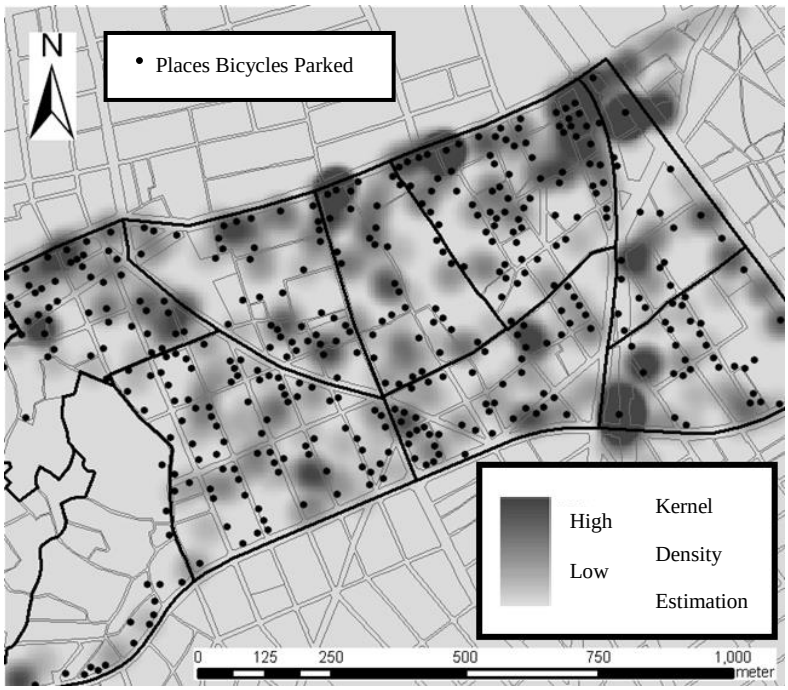

Fig. 5-4 Places Bicycles Parked and Density of Bicycle Theft

5.4 Analysis Focusing on "Uneasy" Places to Commit a Bicycle Theft

5.4.1 Frequency Analysis

In order to obtain the ideas and keywords within the field notes from the on-the-spot survey, a KH Coder[2] has been utilized to analyze the entire text effectively.

At first, the frequency of each term is analyzed, Table 5-3 show these results. Some words such as "bicycle," "theft" and other words are excluded from the table since those words are related strongly to the topic and their frequency is high enough to hide other

frequency of other terms. Also, only nouns (proper nouns are excluded), phrasal nouns, verbs, and adjectives from the terms which are observed 5 times or more are selected to conduct the analysis.

As nouns, “people,” “road,” “building,” “store” and “owner” are within the top 5 most frequent. “Convenience store” and “short time” are found as frequent phrasal nouns by the result. Also, as verbs, “observe,” “use,” “come,” “face” and “guess” are frequently used in these sentences. Finally, concerning adjectives which appeared frequently in the text data, “small,” “pedestrian,” “transparent,” “open” and “certain” were selected.

From a simple observation on the result, when a place was evaluated as “difficult” place to commit bicycle theft, it is clarified that not only environmental factors such as “people,” “road” or “building” but also the “owner” of the bicycles are considered. Also, it seems that to be “observed” is something that bicycle thieves want to avoid because the adjectives such as “small,” “pedestrian,” and “transparent,” which related to how the thieves can be observed by others, are often found in the data.

Table 5-3 Frequently Observed Terms

	Term	Frequency		Term	Frequency
Noun	people	73	**Verb**	observe	34
	road	59		use	27
	building	45		come	24
	store	25		face	18
	owner	22		guess	18
	apartment	18		pass	10
	office	18		walk	10
	restaurant	16		locate	8
	space	16		surround	8
	wall	15		attach	5
	site	13		know	5
	inside	12		predict	5
	cafe	11			
	window	11	**Adjective**	small	19
	person	10		pedestrian	16
	pedestrian	9		transparent	14
	eye	8		open	13
	possibility	8		certain	12
	time	8		wide	11
	company	7		big	9
	floor	7		awkward	5
	janitor	7		narrow	5
	outside	6			
	traffic	6	**Phrasal Noun**	Convenience store	19
	worker	6			
	resident	5		Short time	5
	balcony	5			

5.4.2 Co-Occurrence Network Analysis

For further analysis on the text data, the KH Coder is utilized again in order to obtain the figures for a co-occurrence network, a diagram visualizing the network of frequently observed terms from the text data, based on co-occurrences of terms.

When computing the co-occurrence network analysis, the minimum frequency of terms was set as 5 and the maximum frequency of terms was set as 74, judging by the frequency analysis. Fig. 5-5 shows the visualized result of co-occurrence network analysis. Larger nodes are for higher frequency terms. Combining the comprehension of frequency analysis with the result in Fig. 5-5, the groups of terms are interpreted, focusing on the most frequent keywords.

As a result, some of significant observations are obtained. First, the parking places of “apartments” which have a “small number” of “residents” are difficult places to commit bicycle theft. This is because there is a larger risk of being observed by “residents” who are not the owners of the targeted bicycle but know which bicycle is whose within a small community. Also, the presence of bicycle “owners” who are “guessed” to “come” back to their bicycles in “short time” is strongly considered. Also, even among the “owners” who are not returning to their bicycles soon, it is easy to “guess” that “office workers” are the owners of the bicycles when the bicycles are parked close to offices, and it is “awkward” if the bicycle thieves “come” to the bicycles to “use” them. Additionally, if bicycles are parked at a place attached to a building, the “observation” from the “inside” of the building shall be considered, especially when the “walls” are “transparent” or with “windows.” Furthermore, the parking places which are “attached” to a “parking lot” for cars are defensible against bicycle theft. Of course, “convenience stores” and the places which are “located” on major “road” with a lot of “pedestrians” are not suitable to commit a bicycle theft because there are a lot of “people” “passing” by those places. Also, even though there are not “pedestrians” or people staying around the places, it is hard to commit a bicycle theft if there are some factors which indicate the “possibility” or “predictability” of the presence of people’s eyes.

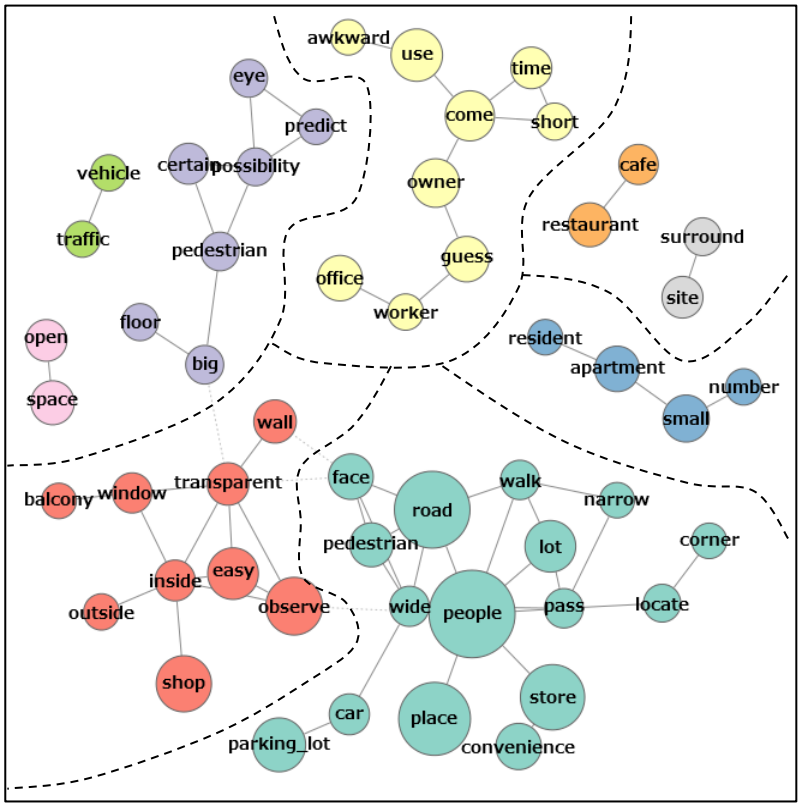

Fig. 5-5 Co-occurrence Network of Frequent Terms

5.4.3 Cluster Analysis

Based on the result of the co-occurrence calculation on the terms that are frequently observed in the text data in the previous section, cluster analysis was applied to classify the sentences, and to compare and examine each feature of the groups classified. The average linkage clustering is used to form the clusters, and Euclidean distance is chosen as the type of distance.

Table 5-4 Cluster Analysis of Sentences

Cluster	Name (Feature of the Cluster)	Number. of Documents
1	Uncritical Observer	58
2	Critical Observer	29
3	Personal Linkage	40
4	Spatial Characteristic of Surrounding	16
5	Nature of Parking Place	13
6	Spatial Linkage	25

The result of cluster analysis is shown in Table 5-4. According to the result, 5 groups of correlated sentences are defined. Since cluster 6 in Table 5-4 is about the evaluation of whether places are difficult or easy to commit bicycle theft, that cluster is not included the number of groups. The characteristics of each cluster are introduced and examined below.

Cluster 1: Uncritical Observer

This cluster is formed from the sentences about uncritical observers such as pedestrians walking or waiting on streets. Even though pedestrians are at or near the certain place, as long as they do not notice a feeling of wrongness, they are uncritical. Naturally, more pedestrians will generate more risks for those who are trying to commit bicycle thefts undetected.

Cluster 2: Critical Observer

This cluster consists of the sentences about critical observers, the owner of a bicycle and/or those who know the owner of the bicycle. Notably, the physical and temporal proximity of the critical observers are assumed by how and where bicycles are parked. For example, it is difficult to try to steal a bicycle parked roughly in front of a convenience store, because it is easy to guess that the owner will come back to the bicycle soon.

Cluster 3: Personal Linkage

In this cluster, the relationships between the one trying to commit a bicycle theft and the targeted bicycle, the parking place, and the surroundings are described. For example, there is a greater risk to be suspected when committing a bicycle theft at the place attached to an office building if the one trying to commit a bicycle theft does not look like an office worker. Therefore, the personal linkages that describe how natural it is to be there are to be considered.

Cluster 4: Spatial Characteristic of Surrounding

The descriptions of spatial characteristics of the surroundings are grouped in this cluster. For example, there is a great risk to be observed from the inside of the building if the building where a parking place is attached has a café, restaurant, or office on the first floor with transparent walls and/or windows. Therefore, it is required to consider the spatial characteristic of surroundings of the parking place.

Cluster 5: Nature of the Parking Place

Few sentences are categorized in this cluster. However, including physical and social characteristics, the nature of parking place is also considered when committing a bicycle theft. If the place is semi-public, it is socially exclusive even the place is not spatially exclusive.

Cluster 6: Spatial Linkage

The sentences categorized in this cluster are about the relationships between the parking place and the surroundings. Since people usually use their bicycles to drive up to the destined buildings, if there are bicycles parked near a building, the owners are likely inside the building and the risk to be observed when committing a bicycle theft there is very high.

5.5 Ideation Model

5.5.1 Creation of the Ideation Model

Considering the cluster analysis on the obtained sentences, the ideation concept model of committing a bicycle theft is created (Fig. 5-6). It explains that the intended thief needs to check the temporal and spatial proximity in order to detect the place of owners and critical observers (those who know the owners of the bicycles), while being careful with the personal compatibility and the amount of uncritical observers with the feeling of wrongness.

Needless to say, it is hard to steal a bicycle when being observed by the owner or critical observer. Therefore, it is required to estimate the place and the absent time of the owners and critical observers found around the parking place. On the other hand, it is not so dangerous to be observed by uncritical observers, such as pedestrians walking or waiting around the parking places, as long as they do not observe what is happening there for a long time or notice a feeling of wrongness, such as one that the thief does not belong in that place.

The ideation concept model indicates how it is complicated to check all of the information which is factorized and shown in the figure. While one of the purposes of this research was to reveal the factors to be considered when committing a bicycle theft, it is absolutely required to note that the final evaluation whether places are difficult or easy to commit a bicycle theft that can be concluded by the holistic view of the situation varies from second to second.

5.5.2 Significance of Generalized Intellectual Process

As the final step of the contextual inquiry, with grasping the ideation model, 3 scenarios describe the process of evaluating a place as difficult to commit a bicycle theft. Here, one of the scenarios is introduced as the generalized intellectual process (Table 5-5).

According to the generalized intellectual process and analyses above, the following are implied for bicycle theft prevention. 1) Ideally, parking places should not be without watchers, but be attached to the each destination with transparent walls. 2) The parking places at big apartments are easy targets for a bicycle thief since there is not enough community resistance

to create critical observers. 3) Also, the parking places that are spatially and socially exclusive are effective to make uncritical observers feel the strangeness of intended thief's presence.

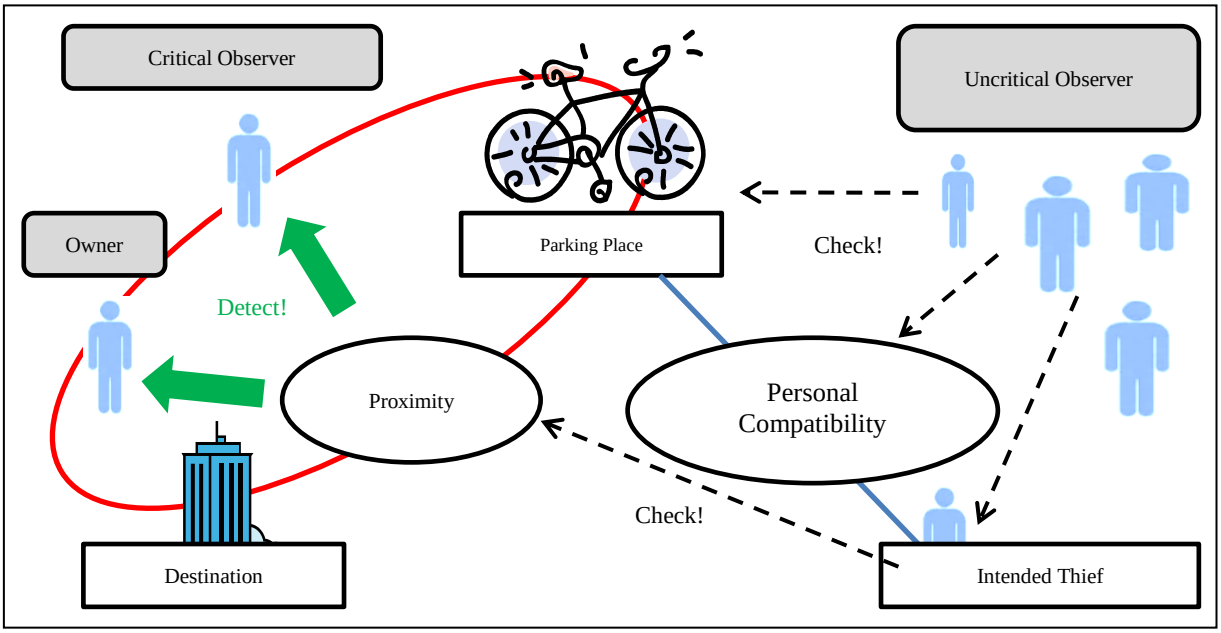

Fig. 5-6 Ideation Model of Committing a Bicycle Theft

Table 5-5 Generalized Intellectual Process

Owner
Where is the destination and how far is it from the parking place?
How is the visibility from the destination on the parking place?
How long may the owner spend at the destination?
How is the visibility from the parking place on to the surroundings?
Critical Observer
Is there a janitor or watcher for the parking place?
Is it possible that the critical observer is in the building near the parking place?
How often may the critical observer come to the parking place?
Uncritical Observer
How many pedestrians are walking or staying around the parking place?
Is it natural to be in or use the parking place?

5.6 Research on Actual Condition of Bicycle Theft in the Target District

5.6.1 Summary of Bicycle Theft Data

Summing up the data of bicycle theft, Fig. 5-7 shows the number of bicycle theft reported within the Kego elementary school district from the beginning of 2004 to the end of 2012. The district has had in total about 1,279 bicycle thefts, and about 142 bicycle thefts in each year.

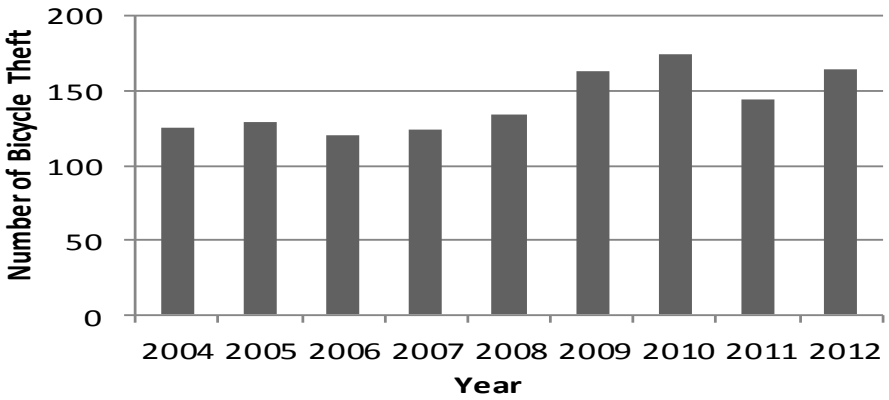

Fig. 5-7 Bicycle Thefts in the Kego Elementary-School District

In Table 5-6 which shows the temporal matrix of bicycle theft, there is a specific time zone in which a lot of bicycle thefts are concentrated. Generally, bicycle theft was conducted in the same day-cycle on both weekdays and weekends. From 8:00 to 24:00, bicycle thefts are constantly conducted because there is concentration of target (bicycle) due to people's daytime activities. Also, the twilight time zone (from 18:00 to 20:00) has significant concentration of bicycle theft, and that is assumed to be caused by increase of blind spots which correspondingly appear by the sun setting. Besides, in that time zone, people tend to move from where they have stayed during the day time to their residences or places for evening recreations. Therefore, the demand for bicycles is comparatively increased, and that can be one of the reasons why there is the temporal convergence of bicycle theft.

Consequently, it is suggested that prevention methods must be integrated with the environment in which people do some activities around, and focus on the specific time zone (from 18:00 to 20:00) which bicycle theft occurrence converged in the target district.

Table 5-6 Temporal Matrix of Bicycle Theft

Day \ Of Clock	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon.	1	3	1	0	1	2	1	1	7	1	3	4	3	2	4	1	3	6	11	5	6	5	7	3	
Tue.	2	1	0	0	0	1	0	1	3	4	4	1	3	3	1	4	4	3	4	3	4	6	3	6	
Wed.	1	0	1	1	2	0	3	1	4	6	4	1	1	5	5	0	2	2	6	7	6	3	2	0	
Thu.	1	1	0	0	1	0	1	3	5	2	2	4	1	5	1	1	5	6	2	10	6	6	4	2	
Fri.	4	1	3	3	0	0	1	2	7	3	6	2	2	2	1	1	2	6	8	9	7	4	7	4	
Sat.	2	1	1	0	2	2	1	1	3	3	3	3	7	4	2	7	3	8	13	3	7	6	1	4	
Sun.	3	1	2	1	1	0	1	0	2	2	1	0	4	8	2	9	5	5	5	6	4	2	5	3	

[Number of Bicycle Theft] = 0 - 2 = 3 - 4 = 5 - 6 = 7 - 8 = 9 or more

5.6.2 On-the-spot Survey

In the target district, there are many official and unofficial bicycle parking places scattered within the district. To know the "habitat" of bicycle parking places in the target district, on-the-spot surveys were first conducted. These surveys were conducted all other the district according to the schedule shown in Table 5-6 in order to identify common parking places for bicycles. For each survey, the places at which 3 or more bicycles were observed were counted. Private sites and the parking places which have locks on the gates are excluded from the data. Finally, the places which had been counted twice or more than that throughout the surveys are counted.

During the surveys, the followings are checked: 1) whether the place is a "difficult" place to commit a bicycle theft, 2) the check items about vulnerability shown in Table 5-7, 3) the check items about resistance shown in Table 5-7. In this research, the vulnerability-related items are extracted from Kashibayashi et al. (2008)[6], and the resistance-related items are extracted from the ideation model indicated in the previous section.

Table 5-7 Vulnerability(V) and Resistance(R)-Related Items

V-A	Number of parked bicycles (Count average number of parked bicycles)
V-B	Accessibility from major arterial roads (Count minimum number of nodes to access to arterial roads)
V-C	Actual distance from major arterial roads (Measure actual distance to the nearest arterial roads)
V-D	Type of management (1. Care-taken, 2. Well-arranged but not care-taken, 3. Roughly parked)
V-E	Blindness from the nearest road (1. Blinded, 2. Not blinded) *1
V-F	Number of blinded directions (Count number of blinded directions) *2
V-G	Pedestrian traffic on the facing road (Survey number of pedestrians in the pictures taken for 4 directions)
R-A	Type of the parking place (1. Public road, 2. Residential bldg.., 3. Commercial / public bldg.., 4. Office building, 5. Designated parking lot)
R-B	Publicness of the place (1. Public, 2. Private)
R-C	Style of being shared (1. Open, 2. Limited, 3. Closed) *3
R-D	Visibility from surroundings on the place (1. Wall without windows, 2. Wall with windows, 3. Fences or plants, 4. Transparent wall, 5. Full-open)
R-E	Presence of critical observers (1. Not identified, 2. Lingering people, 3. Workers / Neighbors / residents, 4. Land / shop proprietor, 5. Custodian)
R-F	Mixedness of estimated destination (1. Single, 2. Multi, 3. Indiscriminate)
R-G	Dominant estimated destination (1. Unspecifiable, 2. Drop-by facilities, 3 Stay-in type facilities, 4. Residence or office, 5. Station) *4
R-H	Distance from the dominant estimated destination (1. In / under the building / place, 2. In front of the building / place, 3. Aside the building / place, 4. Across a road, 5. Around the building / place)

5.6.3 General Results of On-the-spot Surveys

As the result of the surveys, the places which had been counted twice or more throughout all surveys are counted (in total 457) and plotted on a GIS map (Fig.5-4). Also, the data on all the bicycle thefts in the district is plotted on the GIS map by using an Address Matching Service. The density of the spots in which bicycle thefts were carried out was visualized by the Kernel density estimation method, and the visualized density map is overlapped on the map of bicycle parking places.

Interestingly, there are specific hot spots observed even though the distribution of bicycle parking places is not inclined over the map. On the contrary, there are some places which are not overlapped on the density distribution. This fact shows that there are not only "easy" places to commit bicycle theft but also "difficult" places at the same time in this district. In addition, this result implies that there are significant tendencies of bicycle theft convergence, and it is suggested to conduct further spatial analysis in order to see more about microscopic and macroscopic environment factors from psychological and physical point of views.

5.7 Spatial Analysis of Bicycle Parking Places

5.7.1 Logistic Regression Analysis

In order to generate both sets of vulnerability and resistance-related indicators, univariate logistic regression analysis is utilized. The logistic regression analysis is a type of regression analysis used for predicting the outcome of a categorical dependent variable based on one or more predictor variables, and used in many disciplines, including the medical and social science fields. Here in this research, the bicycle parking places which have had two or more bicycle thefts are categorized as "hot spots," and it is used as the dependent variable for vulnerability, while the categorization of "difficult" place to commit a bicycle theft is utilized as the dependent variable for resistance. Also, each of vulnerability and resistance-related items in Table 5-7 is used as an independent variable in the analysis.

Generally, as the result of univariate logistic regression analysis, odds ratio is calculated. Odds ratio is generally defined in the formula shown below. It must be greater than 0, and there is positive correlation if it is greater than 1 while there is negative correlation if it is less than 1.

$$Exp(\beta) = \frac{p_1/(1-p_1)}{p_2/(1-p_2)}$$

$p1$: the probability of one event occurring

$p2$: the probability of another event occurring

5.7.2 Uni / Multi Variate Logistic Regression Analysis

As the result of the univariate logistic regression analysis, the odds ratio and level of significance for each item are shown in Table 5-8 and 5-9.

According to the result in Table 5-8, V-A, V-D1 and V-G have significant positive correlation with hot-spots of bicycle theft, and on the other hand, V-B, V-C, and V-F have significant negative correlation with hot-spots.

Therefore, if there are many bicycles parked and pedestrian traffic around the places, the places are tend to become hot spots. Besides, the distance from major arterial roads has negative correlation with the probability of becoming hot spots. Surprisingly, the condition of being "care-taken" has positive correlation with the probability of becoming hot spots, and this is because the places which are care-taken have usually many bicycles parked for a long time. Moreover, considering the result for the number of blinded directions, it is comparatively difficult to commit a bicycle theft at the parking places which are blinded from many directions.

Also, Table 5-9 shows the result of logistic regression analysis for resistance. According to the results of analysis, R-A3, R-B1, R-C1, R-C2, R-D4, R-D5, R-E2, R-E4, R-E5, R-F2, R-G2, and R-H2 have significant positive correlation with difficulties to commit a bicycle theft, while R-A1, R-B2, R-C3, R-D1, R-E1, R-G4, and R-H1 have significant negative correlation.

The result indicates the conditions which make parking places "difficult" to commit a crime. For example, a parking place attached with commercial or public building, a place which is public and shared openly or limitedly, or a place whose destination is a drop-by facility which is located in front of the place.

Based on the result of both uni-variate logistic regression analyses, the items which have significant correlation with each vulnerability and resistance are selected. Then, utilizing the selected variables, multi-variate logistic regression analyses with stepwise procedure were carried out for the sets of indicators to generate efficient regression models. Table 5-10 and 5-11 show the final selected indicators for vulnerability and resistance respectively.

Table 5-8 Result of Logistic Regression Analysis for Vulnerability

Items		Odds Ratio	Level of Significance	Items		Odds Ratio	Level of Significance
V-A		1.10	***	V-E	1	0.61	NS
V-B		0.66	***		2	1.63	NS
V-C		0.99	***	V-F		0.58	***
V-D	1	4.64	***	V-G		1.18	***
	2	0.75	NS	***: p < .001, **: p < .01, *: p < .05			
	3	0.74	NS				

Table 5-9 Result of Logistic Regression Analysis for Resistance

Items		Odds Ratio	Level of Significance	Items		Odds Ratio	Level of Significance
R-A	1	0.11	***	R-E	1	0.06	***
	2	1.66	NS		2	2.62	*
	3	4.34	***		3	1.06	NS
	4	1.40	NS		4	5.76	***
	5	1.20	NS		5	9.92	***
R-B	1	3.08	***	R-F	1	0.58	NS
	2	0.32	***		2	2.29	**
R-C	1	2.94	***		3	0.81	NS
	2	2.41	**	R-G	1	0.86	NS
	3	0.16	***		2	6.93	**
R-D	1	0.17	***		3	1.31	NS
	2	0.91	NS		4	0.22	***
	3	0.35	NS		5	13.13	NS
	4	6.94	***	R-H	1	0.05	***
	5	2.63	*		2	5.54	***
***: p < .001, **: p < .01, *: p < .05					3	0.79	NS
					4	0.00	NS
					5	1.01	NS

Table 5-10 Vulnerable Indicators and Each Coefficient Values

	Coefficient	Indicators
Intercept	-0.845651	
V-a	-0.061025	Number of parked bicycles (Count average number of parked bicycles)
V-b	0.002874	Actual distance from major arterial roads (Measure actual distance to the nearest arterial roads)
V-c	1.596787	Type of management (Care-taken or not)
V-d	-1.022104	Number of blinded directions (Count number of blinded directions)
V-e	0.085628	Pedestrian traffic on the facing road (Survey number of pedestrians in the pictures taken for 4 directions)

Table 5-11 Resistance Indicators and Each Coefficient Values

	Coefficient	Indicators
Intercept	-2.7003	
R-a	1.2987	Publicness of the place (Public or not)
R-b	1.9135	Visibility from surroundings on the place (Transparent wall or not)
R-c	0.7881	Visibility from surroundings on the place (Full-open or not)
R-d	-2.4776	Presence of critical observers (Not identified or not)
R-e	2.3474	Presence of critical observers (Land / shop proprietor / Custodian or not)
R-f	0.9025	Dominant estimated destination (Drop-by facilities or not)
R-g	1.1806	Dominant estimated destination (Residence or office)
R-h	-2.0499	Distance from the dominant estimated destination (In / under the building / place or not)

5.7.3 Actual Condition of Bicycle Thefts and the Scores of Vulnerability and Resistance

Utilizing the multi-variate logistic regression models, vulnerability scores and resistance scores for each bicycle parking places are calculated. The scores are indicated within the range of 0 to 1 ($0 < \text{score} < 1$).

Then, in order to see the relationship between actual condition of bicycle theft occurrence

and the scores of vulnerability and resistance, a distribution matrix (5 × 5) was produced (Fig. 5-8). The vertical axis and horizontal axis indicate the vulnerability score and resistance score respectively, and each mesh indicates the average number and frequency of bicycle theft occurrence for plotted bicycle parking places within the territory of each.

Accordingly, the following tendencies were implied: 1) there is a huge possibility for bicycle parking places to become a hot spot when they have strong vulnerability and week resistance, 2) the possibility to become a hot spot can be decreased if they have strong resistance even their vulnerability score is strong, 3) the possibility to become a hot spot can be increased if they have equality of both factors, and especially when both of them are moderately strong, and 4) there are many bicycle parking places whose vulnerability and resistance are both low and have held small amount of bicycle thefts.

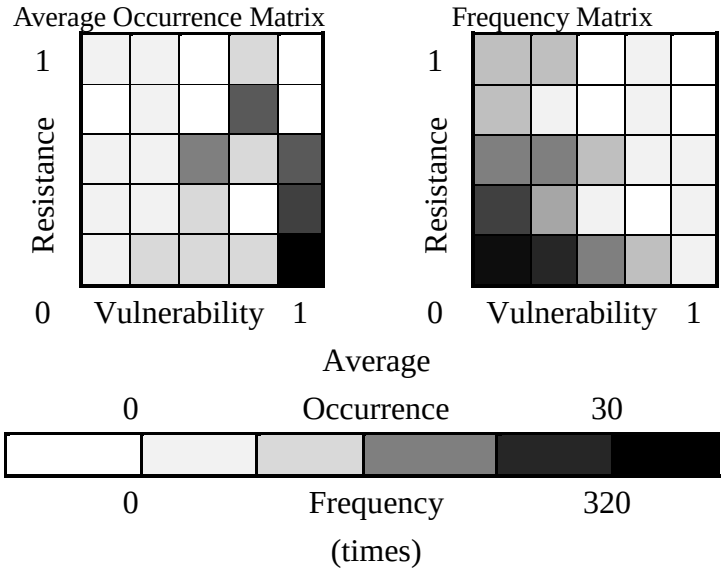

Fig. 5-8 Distributions for Average and Frequency of Bicycle Theft

5.8 Defensibility and Each Possible Improvement

5.8.1 Antagonism Line and Kurtosis Line

Based on the result of the distribution matrix, it was clarified that the trend of bicycle theft occurrence cannot be defined by a simple regression model. Therefore, we turned our attention to the tendencies in the matrix discussed in 4.3, and generated a calculation model for defensibility as focusing on the antagonism line and kurtosis line (Fig. 5-9).

In the matrix, the antagonism line indicates equality of resistance and vulnerability. As one of the criteria, if the plot of resistance and vulnerability for a bicycle parking place is

placed near this line, there is high possibility to become a hotspot.

Also, the kurtosis line indicates how keen the dominant factor (resistance or vulnerability) is. If the calculated scores are plotted near this line, the dominant factor (resistance or vulnerability) is keen. Conversely, if a plot is far from this line, the effect of both resistance and vulnerability will be blurred.

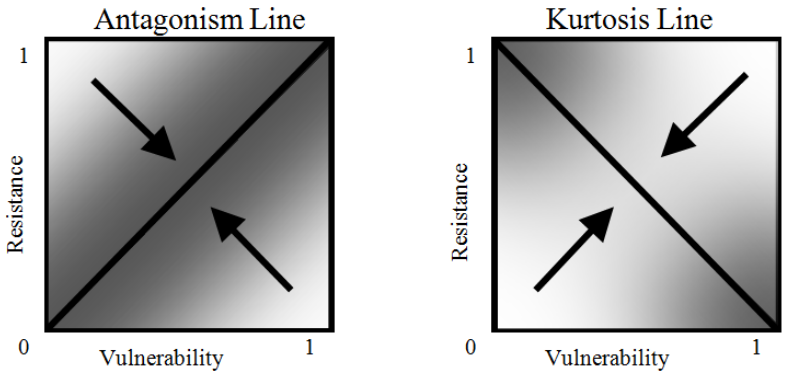

Fig. 5-9 Antagonism Line and Kurtosis Line

5.8.2 Calculation Model for Defensibility

In Fig. 5-9, the antagonism line and kurtosis line can be drawn as equations, y=x and y=-x+1, respectively. Utilizing the antagonism line as a tipping line, the defensibility of a plotted point (x_0, y_0) can be indicated by the equation below:

$$\text{Defensibility} = \frac{y_0 - x_0}{\sqrt{2}}$$

Basically, the parking place is defensible if the defensibility score is positive, and it is vulnerable if the score is negative. However, it is also needed to check the followings utilizing the antagonism line and kurtosis line:

1) Antagonism Check: If the absolute value of defensibility is close to 0 (which means the plot is close to the antagonism line), it is possible for the place to become a hotspot even the defensibility score is positive.

$$\text{Antagonism Value} = \left|\text{Defensibility}\right|$$

2) Kurtosis Check: The kurtosis value can be calculated with the equation below. If the value is close to 0, the defensibility will not be blurred, but the blurredness can increase in response to the kurtosis value.

$$\text{Kurtosis Value} = \frac{\left| y_0 + x_0 - 1 \right|}{\sqrt{2}}$$

5.8.3 Categorization and Appropriate Improvement for Each

According to calculation of each score explained in the previous section, it is possible to detect the latent vulnerable spots even if they have not had any bicycle thefts yet. Fig. 5-10 shows the contour map of average number of bicycle thefts, and bicycle parking places can be categorized into 4:

a) Defensible place: Resistance is dominant, and plots are far from the antagonism line.

b) Vulnerable place: Vulnerability is dominant, and plots are far from the antagonism line.

c1) Unstable place 1: Strong resistance and vulnerability compete with each other, and plots are near to the antagonism line (Frequency = low).

c2) Unstable place 2: Weak resistance and vulnerability compete with each other, and a number of plots are placed near to the antagonism line (Frequency = high).

Table 5-12 shows the examples of bicycle parking places categorized in a), b), c1), and c2) which have high probability to become hot spots but have not had any bicycle thefts yet.

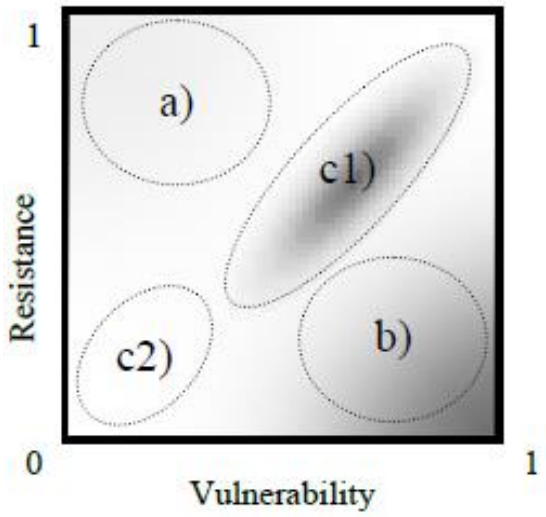

Fig. 5-10 Contour Map and Categorization of Bicycle Parking Places

Table 5-12 Examples of Places Categorized in Each Group

a)		Lot No.	174
		Resistance	0.92
		Vulnerability	0.11
		Defensibility	0.57
		Antagonism Check	0.57 (Strongly stable)
		Kurtosis Check	0.02 (not blurred)
b)		Lot No.	420
		Resistance	0.04
		Vulnerability	0.64
		Defensibility	-0.42
		Antagonism Check	0.42 (Moderately stable)
		Kurtosis Check	0.23 (Moderately blurred)
c1)		Lot No.	126
		Resistance	0.41
		Vulnerability	0.57
		Defensibility	-0.11
		Antagonism Check	0.11 (Strongly Unstable)
		Kurtosis Check	0.01 (not blurred)
c2)		Lot No.	122
		Resistance	0.00
		Vulnerability	0.06
		Defensibility	-0.04
		Antagonism Check	0.04 (Significantly unstable)
		Kurtosis Check	0.66 (Strongly blurred)

The first example has an ideal one-sided plot indicates strong resistance and weak vulnerability. Since the plot was placed away from the antagonism line, this defensible place has small possibility to become a hotspot. Also, according to the result of the kurtosis check, the defensibility is not blurred at all. For this kind of the place, no special improvement is required, but it is needed to check periodically if the surrounding environment has changed or not and attest the defensibility of the place has been kept appropriately.

For the next one-sided plot example indicates strong vulnerability and weak resistance. Therefore, it can be said that the place is a latent vulnerable spot against bicycle theft. To improve the weak resistance, it is better to make some public custodians come around here in order to make the presence of critical observer there.

Also, for the third example, the plot is almost on the antagonism line. It has moderate resistance but vulnerability at the same time. Therefore, the place has not had any bicycle theft but it is possible to have some in the future. Since there is no wall against a road, a fence or transparent wall can make the place look private and increase defensibility.

Finally, the forth example categorized in c2) has both weak vulnerability and resistance. Naturally, the value of defensibility is close to 0, and it is significantly unstable according to the result of the antagonism check. Also, the kurtosis value is very high and the result should be considered strongly blurred. However, that result also means that this kind of places have possibility to become defensible places by improving the factors related to resistance. It is not urgent for urban planners to make environmental improvement for the places categorized in c2), but needed to check places often and catch an indication to become vulnerable places.

5.9 Conclusion

In the first part of this chapter, the implicit process of giving up trying to steal a bicycle is clarified by analyzing the places in which some bicycles are parked regularly through the application of the integrated methods of contextual inquiry and text mining on the field notes about the places. The result of the survey and analysis concludes that not all places at which bicycles are parked can be the target of bicycle theft, but there are some "well-defined" locations for bicycle theft prevention. Also through this study, it is revealed how people give up committing bicycle theft, and that process is explained with the ideation model and generalized intellectual process. The sequential results of this study strongly suggest that the defensibility against bicycle theft is related to if the parking place is "well-defined" or not, and there are specific factors to influence the ideation of potential bicycle thieves. CPTED has offered a vast idea of spatial prevention so far, but this study suggests the necessity of the approach from the viewpoint of the reason why people do not commit a crime in a particular place. To be specific about bicycle theft prevention, not only the physical factors like owners, critical observers, and spatial aspects, but also the context implying the spatial proximity and personal compatibility should be considered.

In the second part, the temporal vulnerabilities against bicycle theft in the targeted district are explained. Then, throughout the on-the-spot survey, both vulnerability-related and resistance-related spatial features were checked, and the factors which have significant impact for each vulnerability and resistance. Additionally, utilizing multi-variant logistic regression analysis, indicators and coefficient values were clarified to calculate scores for each vulnerability and resistance. Finally, the sequential results of this study have discovered "defensibility" of bicycle parking places against bicycle theft with equation models based on vulnerability and resistance. Also, a scatter diagram clarifies the antagonism between

vulnerability and resistance, and is able to detect the vulnerable spots. The models can indicate where and what is needed to be improved in order to reduce the number of bicycle theft. Utilizing the equation, it is possible to find appropriate improvements on specific types of vulnerable bicycle parking places categorized based on the balance of two factors.

In this study, it was succeeded to describe vulnerability and resistance of bicycle parking places and discuss more accurate and practical defensibility. However, the evaluation items and method in this study were developed based on the results of previous studies, and therefore, it is possible for the further studies to evaluate other environmental factors, such as occluded area and occlusion angle of the wall surrounding the parking places, since surveillance should be considered not only horizontally but also vertically in urban areas.

Moreover, microscopic on-the-spot survey on spatial factors was conducted in this study regarding the fact that there are specific hot spots observed even though the distribution of bicycle parking places is not inclined over the map. For the further studies following as an extension of this study, it is suggested to conduct the condition and ambience of bicycle parking places to supplement empirical knowledge for bicycle theft prevention with the results derived from this study.

Finally, since these results are specifically derived for the targeted district based on their current physical condition, and so the versatility of the results can be small, and hence it is needed to conduct another research if the vulnerability and resistance are needed to be clarified for another place. Furthermore, attesting the models in other districts is still a task needed in the future.

Note

*1: This evaluation item is about “blindness,” and so not only walls but also huge obstacles, blinding fences, or corners shaped like “L” are regarded as physical environmental elements possible to create blindness.

*2: This item does not indicate simple walls or fences to make blinded directions, but it is about the directions to which intended bicycle-thieves should not pay attention. If the number of blinded directions is small, intended thieves need to pay attention to many directions and it increases the psychological costs they need to consume.

*3: Bicycle parking places are shared in various ways. For example, public roads are considered open-shared type, and parking lots located in front of restaurants or cafes are considered limited since they are not strictly exclusive. There are some strictly exclusive parking lots such as the one for residents of an apartment located in its ground floor, and these places are considered closed type.

*4: The dominant estimated destination can sometimes be unspecifiable in different two ways. First, especially in an urban center, bicycle parking places are shared with many destinations, and it is hard to identify one specific destination where bicycle owners went. Second, people sometimes park their bicycles on public roads for some reasons, and it is hard to estimate a dominant destination if the places are in the middle of a road and not surrounded by any buildings.

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Chapter VI Conclusion

6. Conclusion

6.1 Review of Each Chapter

In this thesis, focusing on the “uneasiness” and the its causative factors “resistance” embedded in urban spaces, this research aims to describe and examine the comprehensive “defensibility” which can lead to proactive crime prevention against two specific opportunity crimes (arson and bicycle theft) with clarifying both “vulnerability” and “resistance” of places in two targeted district. All in all, toward realization of human-environmental crime prevention study, this research unites consecutive research nexus of the following two vectors of research: 1) Field work researches on “uneasy” experience which happens in the human-environmental transaction when trying to commit each crime mentioned above in certain urban places, and 2) Quantitative study on the spatial factors related to the “uneasiness” in order to propose comprehensive “defensibility” focusing on both “vulnerability” and ”resistance.”

Chapter 2 basically showed the history of environmental criminology. After looking through the historical review, the problem which this thesis needed to challenge before going for actual researches was identified. To make a breakthrough in the study field of place-based crime prevention in Japan, it was proposed to describe the relationship between a crime-intended person (not criminal) and environment in order to approach directly to the quality, that is, “uneasiness” of crime activities (or routine activities) in certain places.

Chapter 3 described the “uneasiness” as a quality which can be identified in the transaction between an individual and environment. This chapter first discusses the relationship between a behavior-intended person and environment in order to approach directly to the quality of “uneasiness” in human activities in certain places by describing the examples of “uneasy” experiences. Then, it is attempted to understand “uneasiness” theoretically. At the end of this chapter, application of the concept of “uneasiness” to crime prevention study is discussed.

In Chapter 4, arson, one of a crucial opportunity crime, is picked up to handle, and it was purposed to analyze both vulnerability and resistance to arson in Fukuoka and more specifically in Haruyoshi district, through consecutive researches from both urban planning and environmental psychological viewpoints. Primarily, it is aimed at describing the impact of microscopic objects and spatial design related to both vulnerability and resistance in the crime site for crime prevention by analyzing the spatial characteristics of the site in which arsons have carried out. As resistances, human traffic, observability and lack of anonymity are shown to be keys. Then, this is followed by a discussion of the arson vulnerability index for a checklist which can categorize the evaluation into 5 aspects, and is based on the categorization; the importance of “DCO-CPTED” (District Characteristic-oriented Crime

Prevention through Environmental Design) in relation to efficient crime prevention in a specific area is discussed.

Chapter 5 analyzed the implicit reasons why bicycle thefts are not committed in particular places which are physically and socially embedded in the urban context. This has been done by analyzing field notes about where bicycles are regularly parked through the application of the integrated methods of contextual inquiry and text mining. Also, utilizing the results, a set of indicators were prepared to conduct on-the-spot surveys on bicycle parking places in Kego elementary school district, Fukuoka city. Through logistic regression analyses, the equations for both vulnerability and resistance were obtained. Also, a scatter diagram clarifies the antagonism between vulnerability and resistance, and is able to detect the potential vulnerable spots. In the end, appropriate improvements on some types of vulnerable bicycle parking places as categorized based on the balance of two factors are suggested.

All in all, the following points were found and indicated throughout this thesis.

1) In the history of place-based crime prevention studies, the existence of criminals in environment and their transaction with environment has not been discussed enough.
2) In order to establish proactive and direct method for crime prevention, it is necessary to handle “uneasy” situation as a result of transaction between a person and environment.
3) In “uneasy” situations, “resistance” and “allowance” can be observed as a quality of transaction between a person and environment.
4) The spatial factors related to “resistance” (against criminal activities) of places are sometimes differently observed compared to the spatial factors related to “vulnerability” (= “allowance” for criminal activities), and both of them need to be handled to discuss the “defensibility” of urban spaces.
5) For arson, it is important to conduct crime prevention based on the characteristics of districts since buildings, the target of arson, are built while being influenced by the regional or district- urban designing. Because of the feature of buildings, immovable, environmental design in district level is required.
6) For bicycle theft, it is essential to identify “defensible” parking places with checking their “resistance” and “vulnerability” against bicycle theft, and try to concentrate bicycles to these “defensible” places from “indefensible” places. Unlike arson, it is easy to change the situation and “defensibility” of places, it is important to conduct periodical checks of bicycle parking places to see their “defensibility” and modify the environmental designs for “indefensible” places.

6.2 Prospective Directions of Further Studies

Japan has a unique issues of "safety and security," the fear of crimes amongst citizens is

high and even the lay people are interested in crime prevention and it is becoming a problem to be considered on a daily basis. Meanwhile, the research that is intended for the prevention of crimes which occurs in the cities where a lot of people live can be seen as the research that is going to be needed increasingly more and more in the future in order to make possible the urban environments where people can live safely and affluently. Based on the results of the sequence studies in this thesis, the followings are concluded:

Looking back at the history of urban crime prevention research in Japan, here has not been much effort to theorize and systematize the knowledge of the crime prevention in Japan relying heavily on the studies done overseas. In addition, in Japan where crime rates are low by nature compared to other developed countries, there is a limit to how much can be studied solely by researching the data on crimes in Japan and it has become apparent that it is difficult to verify the effectiveness of theories of crime preventions and development of crime prevention community from such limited findings. However, if crime prevention is to be our ultimate goal, it is necessary to investigate the reason why people *do not* commit crimes in certain places, besides studying the characteristics of criminal hot spots with urban planning.

In order to avoid ending up reducing the attractiveness of the city due to developments focusing on crime prevention, if we can examine the characteristics that lead to crime prevention, it is going to be possible to adjust the elements that lead to such characteristics and propose alternatives as methods of crime prevention. “Uneasiness” appears between a person and his or her environment in that place at that time depending on what the person has done, is doing, and to do. It is not a thing we can observe objectively, but a quality which a researcher as a person see in the place at the time with doing (including “thinking” as an action) something by referring what he or she has done and thinking of what he or she has to do. As one of the compatible method to exam the “resistance” (and “allowance”), ethnography was utilized in this thesis. As one of the qualitative method, it has a limitation to explain “defensibility” of each place. However, similar to a study field of preventive medicine, it is possible to accumulate clinical studies for certain amount of time and reach to high transferability of appropriately generalized crime preventive method for a limited range, such as a district, city, or country.

As a conclusion for this research, it is underlined that there is a clear necessity of a study of human-environmental transaction in order to obtain knowledge about why people do not commit a crime in a certain place in urban designing study field. For the further studies following as an extension of this study, it is suggested to conduct the condition and ambience of crime points or target points to supplement empirical knowledge for each crime prevention method with the results derived from this study. Finally, since these results are specifically derived for the targeted district based on their current physical condition, and so the versatility of the results can be small, and hence it is needed to conduct more other researches.

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