International Review for Spatial Planning and Sustainable Development

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For investigation regarding the impact of planning policy on spatial planning implementation, International Community of Spatial Planning and Sustainable Development (SPSD) seeks to learn from researchers in an integrated multidisciplinary platform that reflects a variety of perspectives—such as economic development, social equality, and ecological protection—with a view to achieving a sustainable urban form.

This international journal attempts to provide insights into the achievement of a sustainable urban form, through spatial planning and implementation; here, we focus on planning experiences at the levels of local cities and some metropolitan areas in the world, particularly in Asian countries. Submissions are expected from multidisciplinary viewpoints encompassing land-use patterns, housing development, transportation, green design, and agricultural and ecological systems.

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Content

Main Section: Urban-Rural Regeneration and Cultural Sustainability

Section A: Planning Strategies and Design Concepts

Editorial Introduction

Urban-Rural Regeneration and Cultural Sustainability

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In the current rapid urbanization view in most countries of the world, it is important to pay attention to legislation and policy development, the improvement of adequate infrastructure and basic services, urban planning and design. This will create an inclusive, tough, prosperous economic environment and maximize the benefits of agglomeration. Sustainable urban-rural development remains one of the most pressing global challenges of the twenty-first century. Central and local governments and their partners should pay greater attention and work together to build on a more harmonious, fair, inclusive and environmentally in urban-rural scale. According to UN-HABITAT Global Activity Report 2015, the world has experienced rapid urbanization. In 2008, the urban population exceeded the rural population. By 2050, it is expected that two thirds of the world's population will live in urban areas. With more than half of humanity living in cities, it is estimated that urban areas account for 70% of the world's gross domestic product and therefore have led to economic growth and prosperity (UN-HABITAT, 2015).

Understanding of sustainable regeneration on urban-rural sustainability frameworks or sustainable urban-rural development is an aggregate of four basic aspects: economic, environmental, social and institutional. They constitute an overall framework of workflows in urban-rural sustainability; then the sustainability of the urban environment considers the relationship with the social, institutional and economic aspects (Czischke et al., 2015). Urban development should also consider the balance between natural needs in a city plan, such as the development of a green zone within the city. Wikantiyoso & Suhartono (2018) studied about local governments involve the private sector through the Corporate Social Responsibility (CSR) program in the provision of green open spaces in Malang city, Indonesia. This study examined the potential and problems of private sector involvement in urban development processes, especially the provision of urban open spaces. The descriptive analysis study was used to describe the phenomenon of CSR implementation for urban open space revitalization program. This study emphasizes the position and role of CSR in the city's green open space revitalization program to formulate a model of private sector involvement policy in the provision of green space. That needs a process of negotiation, planning, implementation and open maintenance, and this is necessary for private sector financial involvement process and the approval of detail engineering design (DED).

According to Tutuko and Shen (2016), urban-urban development causes changes in natural resources in rural areas, so it is necessary to preserve the characteristics of land in each region. It requires an economic model and urban development planning and an established expansion with more holistic ideas and approaches. One solution that fits all needs such as a regionalism or localism approach that incorporates multi-scale and sectoral perspectives within the framework of governance that achieve social and economic well-being through maintenance and improved ecosystem and service functions (Hashim et al., 2015; Scott et al., 2013; Silva et al., 2017).

One that keeps urban-rural regeneration and cultural sustainability is cultural heritage and artistic resources, which is a basic element of identity, continuity and development. Cultural protection is a sustainability-related target that must be achieved also by the management of a balanced tourist attraction, architecture, heritage, and cultural value (Florentina-Cristina et al., 2014; Granata and Scavone, 2016; Moldoveanu and Franc, 2014; Rashid, 2015). Related to that, in this issue, Kim and Son (2018) studied about the process of discovering new sightseeing places by tourists through self-wedding photographs. Thus study also identified the characteristics of the photogenic spots and recorded the changes in places caused by these tourists. This study challenges the understanding of existing tourism resources by asserting that self-wedding photographs and places in Jeju island, South Korea. Moreover, Dursun (2018) studied on the film industry is used as a paradigmatic example demonstrating the degree of global integration for Istanbul. Clustering and local-global interactions are the main points of analysis contributing the integration of film clusters into global film markets. Author concluded that Istanbul film industry cluster is in the tendency of disintegration in spatial sense and has weak external linkages. For sustainable development and being resilient against the crises, local-global interactions and external linkages should be integrated into the existing cluster dynamics.

Shao and Liu (2018) tried to develop a methodology to help find and evaluate the potential of unused space in urban areas from the local level and practice it. Based on the case in Yantai, China, the unused conceptual framework of urban space with physical and functional aspects crossed through natural and acquired formations-subsequently confirmed, developed and improved. More importantly, this study aims to not only develop ways of identifying potential space and unused potential within the practice space, but also to provide the ability to assess the quality and uniqueness of the space.

Sari, Harani and Wibowo (2018) conducted community approach in support of the preservation of a city. This research tried to manage preservation of Old Town area through development of humanistic conservation concept that is "GeMaSPeKoLa" as social community that concern to Preservation of Old Town. This kind of social forum will strengthen local communities to participate in conservation activities and bring the Old City as a World Heritage in Semarang City, Indonesia as one of the most famous tourist attraction in Central Java.

Subadyo, Tutuko and Cahyani (2018) faced the issue about the role of public space that needs to be considered for its use for the citizens. Nowadays, many public spaces are inclusive, with the aim of being urban lungs, social, responsive, democratic, and meaningful in the context of urban development. Changes in inclusive public spaces can lead to historical degradation that can trigger to deterioration of physical conditions (spatial, sociological and ecological aspects). They conclude that assessments of

inclusive historical public spaces need to be done to keep the value of conservation. In every urban development practice it is desirable that policies be taken to consider the history and image of a region, this will help urban regeneration in accordance with the needs and aspirations of the city.

Dash and Gim (2018) conducted a study on Nationally Determined Contribution (NDC) submitted by a country that contributes to climate change (including quantitative targets for greenhouse gas reduction). The study was conducted in Argentina, Gambia, and other developing countries on the motivation of NDC creation. They have the ability to suggest mitigation measures or to contribute data. International factors are proving to be the most important drivers for increasing mitigation target ambitions and can improve the national image of a country in obtaining a higher level of international assistance.

All studies in this issue will contribute significantly to the growing knowledge to create urban-rural regeneration and cultural sustainability. They show that various spatial analyses in urban-rural can be used to analyse and evaluate regeneration in urban-rural and sustainable cultures. Their study shows various effective planning methods for preventive maintenance of the urban environment.

Finally, as a guest editor, I would like to extend my gratitude to the authors and reviewers for good review of this particular issue. This entire article will help the spatial planning community to continue its efforts to provide theoretical and best practice for sustainable urban-rural development and will help create a more comfortable environment in our cities.

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The Role of CSR in the Revitalization of Urban Open Space for Better Sustainable Urban Development

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Abstract: Provision of green open spaces by 30% of urban areas as outlined in Law 26 of 2007 on Spatial Planning, is the responsibility of local governments. Malang City Government is currently in the process of realizing open space according to the provisions of the law. Due to funding constraints, local governments involve the private sector through the Corporate Social Responsibility (CSR) program in the provision of green open spaces. This study examines the potential and problems of private sector involvement in urban development processes, especially the provision of urban open spaces. The purpose of this study is to develop a model of private sector involvement policy. This study was conducted by using descriptive analysis to describe the phenomenon of CSR implementation for urban open space revitalization program. This study uses qualitative analysis of implementation data of Green Open Space (GOS) revitalization through CSR program. This study emphasizes the position and role of CSR in the city's GOS revitalization program to formulate a model of private sector involvement policy in the provision of green space. The model consists of a process of negotiation, planning, implementation and open maintenance. The result of this research is the scheme of private sector financial involvement process and the approval of detail engineering design (DED).

1.   INTRODUCTION

Sustainable urban development is one of the global commitments as set forth in the objectives of the 11 Sustainable Development Goals (SDG's). The growth of urban population and urbanization problem in Indonesia is a serious challenge in realizing sustainable urban development. Sustainable urban growth aims to create a city environment that ensures better quality of city life. The purpose of urban development through sustainable growth in the planning and design effort is to minimize the negative impact of urban development. The demand for the fulfilment of the needs of urban facilities as well as the limited land in urban areas, causing the use of urban space experienced a dilemma in its control (Wikantiyoso, R., 2007).

The concept of sustainability initiated by environmentalists begins with concerns about the long-term consequences of natural support system pressure. The purpose of development is to support the improvement of economic activities that ensure the sustainability of natural resources and the

environment (Tutuko & Shen, 2014; Wikantiyoso, Respati & Tutuko, 2013). Sustainable development is defined as development is that meet the needs of the present without compromising the ability of future generations to meet their own needs (Rasoolimanesh, Badarulzaman, & Jaafar, 2011). Sustainable urban development is essential to improving the quality of life of communities and reducing negative impacts on natural resources in future urban contexts (Mahmoud & El-Sayed, 2011). There are three key concepts that need attention that are development; needs; and future generations. According to Blowers (1993) the goal of sustainable development is to protect natural resources; developing the built environment, maintaining environmental quality, avoiding social justice, and increasing participation (Blowers, 1993). The concept of sustainable urban development becomes important as emphasized in the 11th objective of the MDG's. At the operational level, the concept of sustainable urban development requires alignment in planning, design, and its implementation.

Urban green spaces provide environmental benefits through their effects on negating urban heat, offsetting greenhouse gas emissions, and attenuating stormwater (Lee, Jordan, & Horsley, 2015). The rapid increase in human activity in the city centre has contributed significantly to the increase of carbon gas emissions (Liu, Liu, & Gao, 2014; Rasoolimanesh, Badarulzaman, & Jaafar, 2011). Negative impacts of inadequate quantity and quality of green open space, among others;

1. Decrease in urban environmental comfort; Occurs due to the decrease in capacity and environmental carrying capacity due to the occurrence of pollution, decrease in groundwater, and increase in environmental temperature;
2. Decrease in visual quality of the city; decrease in natural beauty, reduction in flora and fauna varieties, loss of natural artefact;
3. Increased air pollution that drives the greenhouse effect due to increase of carbon gas emissions.
4. Decreased level of community welfare; occurs due to the public health decline, energy consumption increases etc.

The provision of green open space for urban areas as mandated by Law 26 of 2007 on Spatial Planning requires 30% of the total area of the city. This Spatial Planning Law is the highest regulation that must be adhered to in planning, designing, providing and utilizing green open spaces in Indonesia. The requirement for the provision of green open space of at least 30% of urban space is aimed at ensuring a more humanist urban environment, and enhancing the ecological carrying capacity of the city. The provision of 30% of green open spaces (divided 20% public space and 10% private spaces) is a minimum requirement to ensure the balance of urban ecosystems, both hydrological and microclimate system balance, as well as other ecological systems. Provision of public open spaces of at least 20% should be provided by the government. This effort to ensure the achievement of the minimum proportion of public open space that is used by the entire community of the city (Wikantiyoso, Respati & Tutuko, 2013).

The green open space revitalization program is an effort to create green space and active open space as a public space to realize a safe and comfortable city life. The green open space revitalization program on an urban scale can improve the quality of city life (Littke, 2015). Local governments have an important role in ensuring the provision and improvement of the quality of public open spaces. The city government of Malang develops several strategies for the provision of open spaces through the preparation of green city development program, that are Local

Regulation on Green Open Space Master Plan 2012-2032; Improvement of Local Regulation on Spatial Area of Malang City 2010-2030; and the implementation plan of green open space development program of Malang city.

Implementation of green open space revitalization program indirectly resulted in the reduction of green open space. Reducing of the green open space due to a revitalization program if not controlled in an integrated manner can result in a negative impact on the reduced of open space area. So it is necessary to need a control mechanism in the design of green open space revitalization program that will be implemented. On the other hand financing aspects through CSR should be able to limit the compensation earned by the company in the form of advertising media of CSR product providers. Thus, the model of corporate engagement and the process of design negotiation is an important part of integrated planning and designing in sustainable green open space revitalization.

The green open space revitalization aims is not only to improve the ecological function of open space, but also improve the social function of open space as a public space. The public spaces as a social space that have been reduce green open space. The use of public surface space material will reduce the width of the green open space replacement. The use of paving blocks in harsh spaces and pedestrians as a part of public space will be reducing the average surface runoff rate by 40% and up to 67%, which is also influenced by the paving pattern and paving arrangement pattern (Sedyowati et al., 2017). Thus the change of green space into public space have to be considered the use of public space material covers that still allows the absorption of water into the soil.

The Housing and Settlements Office (DKP) becomes the pre-eminent sector of municipal government that have to responsible to maintain and control the quality and quantity of green open space provision due to the GOS revitalization programs. The role of DKP is to strengthen the function of providers and guarantors in urban development in accordance to the direction of Malang green open space master plan 2012-2032 and its implementation.

According to Law 26/2007 on Spatial Planning, the provision of green open spaces is the responsibility of local governments. Due to limited government funding, the green open space providing efforts are carried out by local governments in cooperation with the private sector through CSR programs. Thus, the study of private sector involvement in the urban development process especially in the green open space revitalization program through CSR becomes important. This study investigated the potential and problems of private sector involvement in development process of the city, especially the provision of the city green open space

The objective of this study was to develop a model policy of private sector involvement in green open space provision through CSR. The models consist of negotiation process, planning and design, and implementation of green open space revitalization. There are two purposes in this study:

1. To investigate the potential and problems of private sector involvement in development process of the city, especially in the green open spaces revitalization.

2. To develop a policy model of private sector involvement in green open space revitalization through CSR, that are consists of negotiation process planning and design, and implementation of green open space revitalization.

2.　　　RESEARCH METHODOLOGY

This study was conducted by using descriptive analysis of qualitative and quantitative data to describe the phenomenon of CSR implementation for urban open space revitalization program. The emphasis of the study was conducted through an analysis of green open space revitalization policy through CSR scheme. The analysis of this study emphasizes the aspect of CSR's role in the city's green open space revitalization program to formulate a model of private sector involvement policy in the provision of green urban spaces. The policy model includes the process of negotiation, planning and design process, and implementation of green open space revitalization. Figure 1 show that the green open space providing divided into two schema that are public open space providing and private open space providing. The two main analyses carried out in this research are analysing potential GOS area reduction problems, as well as analysing the execution process of planning and designing the implementation of GOS revitalization through CSR. Both of these analyses were conducted to obtain an optimal model in private sector involvement in the provision of green open space, especially the revitalization policy of GOS through CSR program.
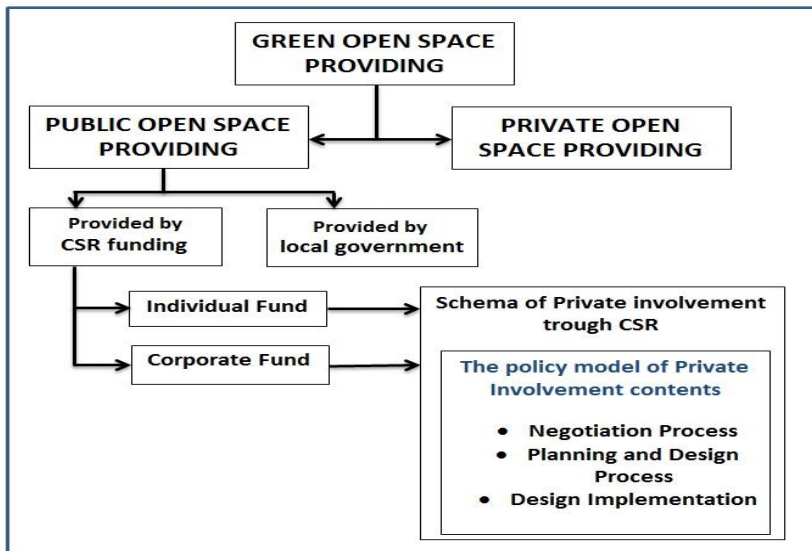
Figure 1. Framework Analysis of green open space provision model through CSR

Primary quantitative data collection is done by measuring the green open space on the project site and the graphic measurement of the revitalized design image data to obtain valid data. The measurement results are matched (compared) with the quantitative data in the open space master plan as the benchmarking data used to make GOS revitalization policy review. The review of planning policies is described descriptively with reference to applicable laws and regulations. The qualitative data obtained through observation, focus group discussions and in-depth interviews with relevant parties (DKP) and its technical team on the negotiation process, the process of planning and design, and implementation design. Both data are used to construct a framework and scheme of private sector involvement implementation models in the provision of open space through CSR.

3.   MALANG GREEN OPEN SPACE DEVELOPMENT PLAN

3.1   Green Open Space Development Problems

The sustainability of urban development has a very wide dimension, namely environmental, economic, and socio-cultural. The emergence of joint initiatives on sustainable development is a response to the impact of urbanization, improvement of economic development and degradation of urban environments that cause climate change (Trip, 2007). Urban development effort in the spatial dimension in rapid urban development faces a very complex challenge in the provision of space. According to Wikantiyoso, Respati and Tutuko (2013) the challenges of urban development in today's global era include several issues, namely; (1) urbanization; cities should be able to anticipate an increase in the rate of urbanization, (2) spatial planning of the city; the municipal product plan must ensure a sustainable development process, (3) municipal infrastructure and facilities; green infrastructure and environmentally friendly transportation facilities, (4) decreasing environmental carrying capacity; urban development should be able to increase environmental carrying capacity, (5) environmental quality reduction and disaster mitigation; ensure the provision of green open spaces of the city to maintain environmental quality and disaster mitigation, (6) city governance; encourage the implementation of good city governance.

Green city development efforts require a lot of financing. According to Liu, Liu, and Gao (2014), the central and local governments should provide sufficient funds to assist in the development of low-carbon buildings, city greenery, and public transport. Limitations of local government financing are solved through increased private participation through CSR fundraising. The conception of community participation in urban development places the urban community as the subject of development process. The process of urban development includes the stages of planning, policy-making implementation of development policies and evaluation of the success of urban development.

Figure 2. Division of Malang Development Area   *Figure 3*. Land Used Plan

Malang City is the second largest city in East Java, which has strategic potential with an area of 11,097.11 Ha. Figure 2 illustrated the division of urban development area divided into six development areas; east Malang, southeast Malang, central Malang, west Malang, northeast Malang and north
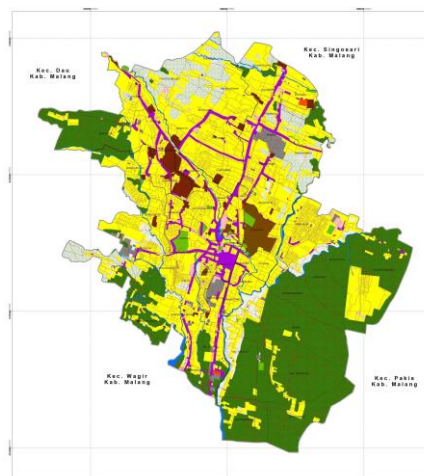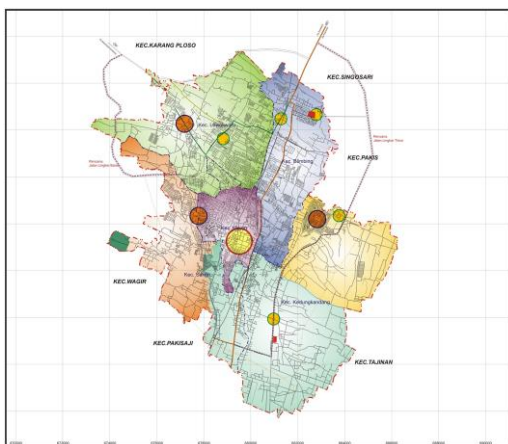
Malang development area.   Figure3 illustrate that the disproportionate distribution of green open spaces in each of the developing area. The provision of GOS at each development center becomes important for the balance of the open space projection distribution. The establishment of a central of development area is based on the suitability of functions and roles of each region as the center of urban growth service activities.

The Malang city vision is to realize the city of Malang as an educated city, cultured, environmental awareness for the prosperous society. This vision becomes the direction and framework of sustainable city development by creating prosperous society with good education quality, cultured and environmentally friendly. The development of Malang city through the development of green city concept is one of the efforts to realize sustainable city development. Utilization of space for physical development should prioritize efforts to maintain and improve environmental carrying capacity through the provision of green open spaces. Providing efforts of green open space can be divided into two categories, namely; open spaces providing, and open space quality improving through a revitalization program.

The provision of urban open space conceptually has been carried out through technical regulations, but substantially still can't function yet as a guidance and direction of the provision of green open spaces. This causes the implementation of the development plan to experience technical obstacles due to the lack of operational regulations.

Table 1. Green open space in Malang City based on 2012

Type of Green Open Space	Areas (Ha)	Percentage
Urban Forest	33.56	0.35 %
City Park	175.49	1.82 %
Field	59.19	0.61 %
Cemetery	94.73	0.98 %
Green Line road (median road, boulevard),	218.64	2.26 %
Riverbank boundary	1102.43	11.41 %
Railway line boundary	43.11	0.45 %
Extra High Voltage Connection boundary	25	0.26 %
Total	**1752.15**	**18.14 %**

Table 1 show that the implementation of public green open space today is equal to 18.14% of Malang city area. There is a difference in the fact of green open space between planning and conditions in the field. This difference can occur because the preparation of spatial plans and master plan has not been referring to geospatial digital data as required by Law no. 4 of 2011, which is done in an integrated manner. This difference can occur because the preparation of spatial plans and master plan has not been referring to geospatial digital data that required by Law no. 4 of 2011, which is done in an integrated manner. The use of Geographic Information System (GIS) data will minimize the spatial data gap (Mahmoud & El-Sayed, 2011). This problem can be solved by using GIS in urban planning and design.

This field fact shows that existing spatial regulatory products are less able to be used as guidance in guiding spatial planning. The Town Planning Board should undertake city planning reforms through the use of an integrated spatial information system in the planning, implementation and evaluation of urban planning and design. The different plan data contained in the master plan can occur because the master plan has not yet used the map data standards of the Geospatial Information Agency as required in Government Regulation no. 8 of 2013 on Accuracy of Spatial Map. The one-map policy as mandated in Law No. 4 of 2011 on Geospatial Information,

which requires the use of geospatial data in spatial planning is the basic policy in spatial reform in Malang ([Wikantiyoso, R., 2017](#)).

Referring to the Master Plan of green open space improving the quality and provision of green open spaces is done through the following efforts:

1. Improving open space quantity of private and public buildings, as well as at the top of the building (rooftop garden);
2. Improving the open space function into green open space and the provision of street green lines, and median roads;
3. Open space quality improvement along the main road, the border area of the city according to its classification;
4. Revitalizing and restoring the green open space functions and securing natural greenways, through development of green open space as a safety zone on railway lines; Green open space along the riverfront; Extra high voltage boundary, and the green line of industrial estate buffer;
5. Establishing a conservation area according to the characteristics of the region as a city icon;
6. Increasing community participation in the management of green space through the application of incentives and disincentives.

Table 1 illustrated that the total green open space was 1752.15 Ha or just 18.14% of city. These indicated that the green open space of Malang city is quantitatively it is less about 11.86% or about 1316.12 Ha. Referring to Figure 2 and 3, it can be seen that along the banks of the river that pass through the city of Malang is a reserve of green open space development, which is 63% of the total potential of open space of Malang city or an area of 1139.9 Ha.

Table 2. CSR funding provider of GOS revitalization program

No	CSR Provider	Year	Location	Area (m2)	Amount (million IDR)
1	Bank JATIM	2011	Ken Dedes Park	5002	100
2	Bank BRI	2013	Alun-alun Design Competition	-	30
3	Bentoel Group	2014	Trunojoyo Park	9145	2,000
4	Nivea	2014	Merbabu Family Park	4181	600
5	Permata Jingga	2014	Suhat Park	254	666
6	BRI Bank	2014	Design implementation	23970	5,600
7	Nikko Steel Industry	2015	Outdoor Gym		1,200
8	Otsuka	2015	Malabar Urban forest	16812	2,500
9	Bentoel Group	2015	Kunang-kunang Park	14777	1,500
10	Bentoel Group	2016	Slamet Park	4919	1,000
11	Henry Soetio (individual)	2016	Idjen Street Pedestrian	450	2,600
12	WOW Corp.	2016	Sawojajar Green Corridor	672	300
13	Bentoel Group	2017	Taman Dieng Pedestrian	3498	1,500
14	YPTM	2017	Unmer Park	1954	1,000
15	WOW Corp.	2017	Sawojajar Green Corridor	500	200
16	Telkomsel	2017	Merjosari Park Loop Arena	500	800
17	Henry Soetio (Individual)	2017	Dempo Park	2475	500

Table 2 shows that the CSR provider consists of corporates and individuals (grants). That also illustrates the increasing number of development projects with CSR funds in the last 5 years. This indicates that there is an increasing the level of trusts from grantor to the city government. The development financing pattern through CSR is very strategic to overcome the limitation of development financing through the city government budget fund. This development financing pattern through CSR should be followed by a clearer set of rules relating to the rights and

responsibilities of each party. The agreement of cooperation between parties should be done through the negotiation process at the planning stage, the determination of detail design engineering, project implementation, delivery and maintenance phase.

Space Area Composition of Malang City
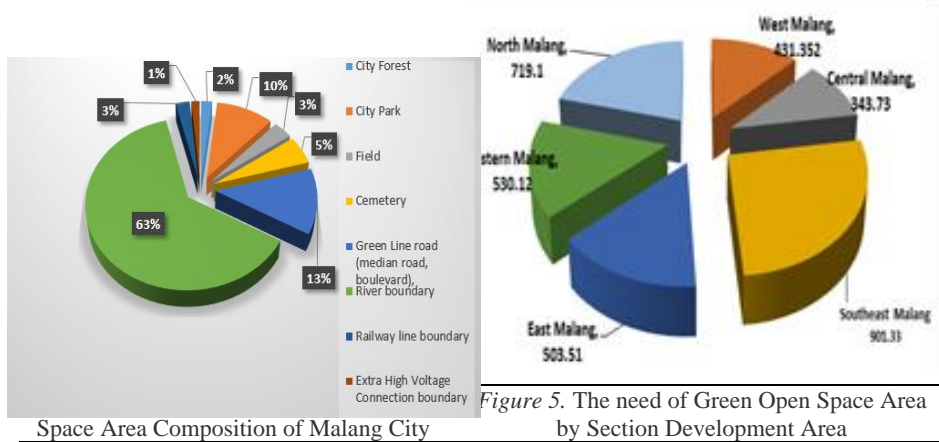
Figure 5. The need of Green Open Space Area by Section Development Area

From the review of policies on the development and provision of GOS found there are several problems, namely:
1. There is a fact that the GOS in Malang city has not been properly validated from the area and its location.
2. Spatial planning products after the enactment of Government Regulation No. 8 of 2013 has not been reviewed and adjusted, so the planning map accuracy has not met the planning standards.
3. There is a gap between the needs of GOS planning and its implementation following the adoption of GOS revitalization policy through CSR.

3.2 Malang City Green Open Space Revitalization

The city's green open spaces have ecological, aesthetic, social, and economic functions. In accordance with the function of open space has a role in the provision of space for social activities, recreation, city parks, environmental sustainability, and other values in accordance with its utilization (Brander & Koetse, 2011; Shen, Sun, & Che, 2017). A good ecological function of the space will ensure the sustainability of an urban area. Other spatial functions (social, economic, architectural) is a function of support and improvement of environmental quality and culture of the city. According to Wolch, Byrne, and Newell (2014) green space also promotes physical activity, psychological well-being (Bertram & Rehdanz, 2015), and general public health of the city (Shen, Sun, & Che, 2017). City green open spaces have a very strategic function in an effort to create a conducive city environment to place the interaction between the human life (Shen, Sun, & Che, 2017) order with the natural environment harmoniously and sustainably (Wolch, Byrne, & Newell, 2014). The question is how to manage the GOS that naturally exists to be a natural environment comfort for a harmonious and integrated urban human activity.

Malang City is located in the highlands that crossed by 5 rivers, typologically has great potential for the provision of green open spaces. Table 1 indicate that the GOS of Malang city is dominated by river bank boundary open spaces, 11.41 % of total city area or 59.61 % of total open space area. This area has enormous potential as an urban open space

development area. Riverside open space can be developed into a reserve area of open space provision through the normalization program of the riverside.

Revitalization of green open spaces conducted by the government through CSR program has impacted the reduction of green open space as much as 23.62 percent. Table 3 illustrated that of the 13 revitalization projects on an area of 88.159 m2 have been reduce about 20,821.26 m2. Ecologically has not had a significant impact because most of hard spaces are uses a porous material. According to Erik, head of DKP Malang, this condition can still be tolerated. Due to the use of porous material of this phenomenon the overall theoretical calculation is still less than 20 percent or below the maximum threshold. However, in detail referring to Table 3, with reference to each project, stricter control measures are required through the revitalization design negotiation process.

Table 3. The calculation of the reduction of green open space on the revitalization program

No	Location	Area of Green Space (m2)	Decreasing green space (m2)	Decreasing Green space (%)
1	Ken Dedes Park	5,002	250.10	5
2	Trunojoyo Park	9,145	1,271.75	15
3	Merbabu Family Park	4,181	1,045.25	25
4	Suhat Park	254	26.67	10.5
5	Design implementation of Alun Alun Park	23,970	8,749.05	36.5
6	Malabar Urban forest	16,812	2,101.50	12.5
7	Kunang-kunang Park	14,777	2,881.52	19.5
8	Slamet Park	4,919	1,475.70	30
9	Sawojajar Green Space Corridor	672	151.20	22.5
10	Taman Dieng Pedestrian	3,498	1,749.00	45
11	Unmer Park	1,954	450.19	23.5
12	Sawojajar Green Corridor	500	62.5	12.5
13	Dempo Park	2,475	606.38	24.5
	SUM	88,159	20,821.26	23.62

According to the Minister of Home Affairs Regulation No. 1 of 2007, urban green open space planning requires an ideal area at least 30% of urban area (Article 9 paragraph 1). The area consists of public and private green space (Article 9 paragraph 2). The extent of public space provision is the responsibility of the city government which is done in stages in accordance with the financial capability of each region (Article 9 paragraph 3), public open space can't be converted. The private green space provision is the responsibility of private parties / institutions, individuals and communities controlled through the use of space permit by the local authority (Article 9 paragraph 4).

The policy of green space provision and utilization is done to maintain the sustainability and balance of urban ecosystem. This policy is undertaken to improve, maintain a microclimate, aesthetic value, groundwater absorb, creating balance and harmony of the physical environment of the city. The local government should be supervising and controlling of the change of urban open spaces. The management of urban space provision must be done starting from planning process, appointment, development, comprehensive and integrated care. The existence of Green Open Space is very important in controlling and maintaining the integrity and quality of the environment (de la Barrera, Reyes-Paecke, & Banzhaf, 2016). Controlling the implementation of urban development should be done proportionally and balanced between economic interests, social and environmental sustainability.

There are several important issues that to be considered in relation to the issues of the green open space revitalization within the framework of sustainable development, namely;

1. Reduction of green open space due to revitalization efforts must be minimized, in accordance with the predetermined threshold, in accordance with the provisions of existing regulations.
2. The reduction control measures, carried out in the process of planning and revitalizing green open space design process.
3. The CSR provider's involvement in the design process is carried out to optimize the design in accordance with the financing provided and guarding changes to existing green open spaces.
4. The process of revitalizing green open space through CSR requires a policy model that includes the process of negotiation, planning and design processes, and its implementation.

Figures 6 - 11 showed the concept of the use of riverfront space as the green space of the city. Typology of watershed form that extends along the river form can be developed as a substitution of green open space of the city. Open areas along the river have been transformed into residential areas that are illegally harnessed by communities without city government permits. The potential of this extraordinary space should be a serious concern to realize the obligation to provide green open space by 30%. The existence of riverfront space can be used as a substitution space for the reduction of open space due to changes in ecological functions to the public space. Figure 6-11 also give illustrated the city's green open space development plan in the six development areas. The development of open spaces of river banks became the dominant pattern in the effort to provide green open spaces of the city. Substantially it is possible because the open space in waterfront area dominates the open space of Malang city, which is about 63% of the total open space of Malang city.
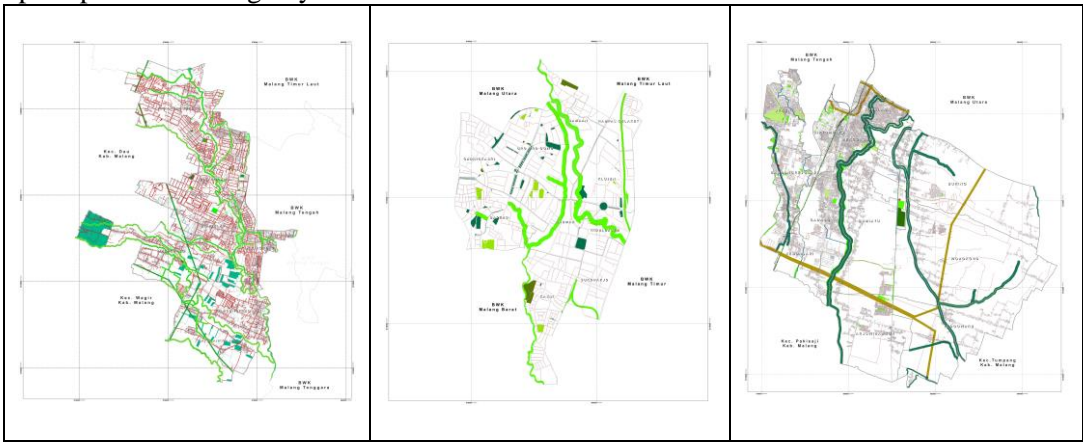
Figure 6. Development Plan of GOS West of Malang	*Figure 7.* Development Plan of GOS Center of Malang	*Figure 8.* Development Plan of GOS Southeast of Malang
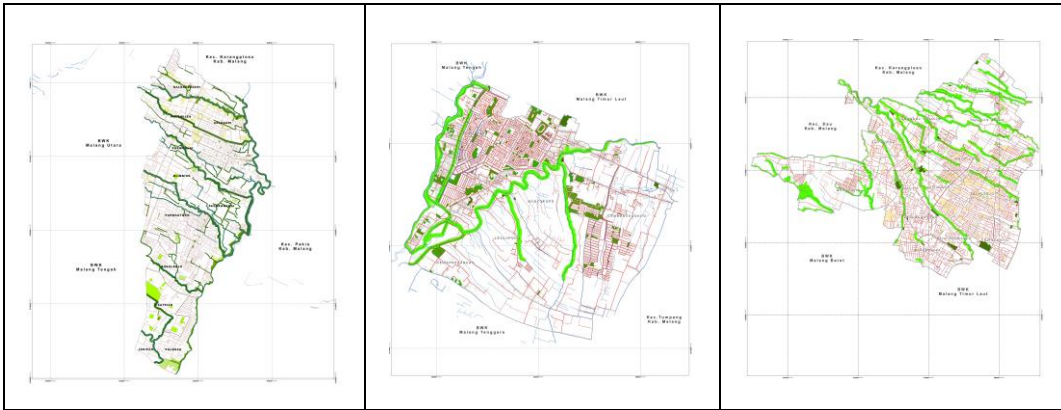
| Figure 9. Development Plan of GOS Northeast of Malang | Figure 10. Development Plan of GOS East of Malang | Figure 11. Development Plan of GOS North of Malang |

4. THE ROLE OF CSR DUE TO GOS REVITALIZATION POLICY

The term of social responsibility came into widespread use in the early 1970s. Attention to social responsibility in the past has focused primarily on business. The Company will set aside its benefits for the benefit of the surrounding community, as a form of compensation which is packaged in the form of CSR. The initial idea of social responsibility is oriented towards philanthropic activities such as charitable giving. Today the form of implementation of CSR is increasingly shifting and diverse in accordance with community development needs. According to Julia, Rahayu, and Yudi (2010), CSR is the theoretical basis of the need for a company to build a harmonious relationship with the surrounding community. Corporate social responsibility can be defined as a company's moral responsibility to its stakeholder strategy, especially for communities around the work area. The parameters of a company's success in the perspective of CSR is to promote moral and ethical principles, namely to achieve the best results without harming the community. One of the principles of morality in running a company is to do business by promoting moral and ethical principles will give the greatest benefit to society and company.

Objects of corporate social responsibility also change from the object of social community to become the object of a wider scope to the national development problems such as human rights, environmental sustainability, consumer protection and avoidance of fraud and corruption and so on (Jamali, 2014). This shift has caused the term of CSR to become more familiar to most people than to social responsibility. At this level a view of social responsibility applies to all organizations that also have a responsibility to contribute to society towards sustainable development programs in a broader sense.

The CSR concept involves partnership responsibilities between government, community resource agencies, as well as local communities that are not passive and static and are a shared responsibility socially between stakeholders. The concept of corporate philanthropy (social phenomena) in social responsibility is no longer sufficient, since the concept does not involve a socially responsible partnership with other stakeholders. The complexity of social problems in the last decade and the implementation of decentralization have placed CSR as a concept that is expected to provide a

new breakthrough in empowering communities around the company. Strategic CSR planning will enable the program to become a social investment to empower communities, in order to be able to fully support economic and social life independently and sustainably.

The CSR activity in developing countries is therefore portrayed as ongoing and extensive, although it tends to be less formalized, more sunken, and more philanthropic and nature (Visser, 2008). It also draws on deeply engrained cultural/religious values and is primarily oriented toward local communities (Jamali, 2014; Visser, 2008). From several definitions of CSR, it can be concluded that CSR is a corporate or business commitment to contribute resources in sustainable development as a form of corporate social responsibility by emphasizing on the continuity of attention to economic, social and environmental aspects.

Post-MDG's by the end of 2015, an agreement on the Sustainable Development Agenda to be achieved by 2030, hereinafter referred to as Sustainable Development Goals (SDGs). SDG's is a new development agreement that encourages shifting changes toward sustainable development based on human rights and equality to promote social, economic and environmental development (Haughton, 1997). SDGs are enforced with the principles of universality, integration and inclusion to ensure that "No one is Left Behind." This understanding means that social responsibility is closely linked to sustainable development.

Corporate social responsibility in sustainable development focuses and concerns about the role of the company in assuming the organization's responsibility to society and the environment in addition to business interests (Burke & Logsdon, 1996). The company through its business advantages has a role and responsibility in the development of the surrounding environment. The role of CSR will be more real if CSR funding opportunities can be well organized by the local government. According to Stele (2010), the granting of CSR by the company should be based on its actions on standards, guidelines or regulations in accordance with applicable principles or norms. In applying these standards it is recommended that organizations take into account the diversity of society, environment, law, culture, politics and organization, as well as differences in economic conditions, by maintaining the consistency of international norms. There are 7 principles that have to be consider in the implementation of CSR in the International Standards ISO 26000 (Stele, 2010) that are:

1. Accountability; an organization should be accountable for its impacts on society, the economy and the environment.
2. Transparency; an organization should be transparent in its decisions and activities that impact on society and the environment.
3. Ethical behaviour; an organization should behave ethically. An organization's behaviour should be based on the values of honesty, equity and integrity. These values imply a concern for people, animals and the environment and a commitment to address the impact of its activities and decisions on stakeholders' interests
4. Respect for stakeholder interest; an organization should respect, consider and respond to the interests of its stakeholders. Although an organization's objectives may be limited to the interests of its owners, members, customers or constituents, other individuals or groups may also have rights, claims or specific interests that should be taken into account.
5. Respect for the rule of law; an organization should accept that respect for the rule of law is mandatory, in the context of social responsibility,

respect for the rule of law means that an organization complies with all applicable laws and regulations.

6. Respect for international norms of behaviour; an organization should respect international norms of behaviour; while adhering to the principle of respect for the rule of law

7. Respect for human right; an organization should respect human rights and recognize both their importance and their universality

The Green Open Space development program through CSR is an effort to improve the function of urban open space not only as an ecological function, but also for socio-cultural functions for public activities, that funding by CSR providers. This condition brings consequences for the reduction of green open spaces. The results of the 13 GOS revitalization project (Table 3) shows that the reduction or change of soft space to hard space has a wide range of percentages. There is no pattern or relationship between the open spaces of origin with the proportion of open space reduction. The percentage of change is more due to the design decisions and functions of the public space to be provided. Designing is done through consultation mechanism between CSR provider, designated planner, Housing and Settlements Office (DKP) technical team, and resource persons from various parties appointed by DKP.

The reduction in green open space ranges from 5 % to 45 % of the revitalized space area, with a reduction rate of 23.62% (see table 3). According to Erik the head of DKP, the reduction of green space due to the revitalization program is still tolerated up to 20 %. This means that excess tolerance limits should bring consequences for the necessity of providing substitution land. However, this provision still does not exist in the regional regulations on the Malang city Green Open Space Master Plan. Thus, a new regulation on substitution of green open spaces should be drafted due to the increase and / or changes in the function of some green open spaces for public spaces.

The city government's has to be gives more attention by making the control mechanism policy through the provision of at least 30% of cities for green open spaces. Implementation of this provision is applied to the design or process of Detail Engineering Design (DED) or consultation process of program design of open space revitalization implementation through CSR. The role of the Design Consultation Team of the Housing and Settlement Office becomes very strategic in maintaining and negotiating the consequences of reducing the open area of the city.

Community participation through CSR programs and grants if managed well will increase community confidence in urban development management. Accountability and transparency of CSR funds and grants is the key to success to encourage CRS and provide funding as an alternative to city development funding, especially the provision of green open spaces. Stakeholder engagement in urban development is a long and ongoing process that requires accountability, transparency and commitment of the city government (MacKillop, 2012) to ensure that the GOS revitalization program is in the interests of the urban community. The openness of the GOS development program to every part of the city will provide a great opportunity for the community to participate in the implementation of the city plan (Ballard et al., 2007). The municipal government through the Housing and Settlements Office shall prepare all the rules and regulations regarding the terms of conditions and guidelines for the implementation of CSR in the GOS revitalization policy.

5.   CONCLUSION

The green open space revitalization program through CSR is currently one of the models of community involvement in realizing sustainable urban development. Transparent public fund management by the city government can increase community participation in urban development. Accountability and transparency of CSR funds and grants are key to success to encourage CRS and grant funds as an alternative to city development funding, especially the provision of green open spaces. The funding of the open space provision effort through CSR program from private sector were considerable close to 81% of all green open space revitalization program.   From discussion and result related to the question of the potential and problems of private sector involvement in the provision of urban open spaces, it can be concluded that:

1. The involvement of the private sector in the provision of open spaces of the city has enormous potential. Involvement of the private sector is a form of participation of the urban community through the planning and design process, the implementation of design and even financing through the provision of CSR funds;
2. Participation of the financing of the provision of green open spaces of the city can be done through CSR;
3. The level of trust of private parties (both personal and corporate) to the government in managing CSR funds in the provision of green open spaces of the city, is the key to success in the management of development donation funds, especially CSR programs.
4. The municipality should immediately make a new regulation on the substitution of green open spaces of the city due to the increase and / or changes in the function of some of the green open spaces for public spaces.

Based on the findings and results of the discussion of research issues, needs to be given recommendations to the city government, in particular the Housing and Settlement Office (DKP) in order to manage the revitalization of GOS through CSR. Some of the things that can be recommended are:

1. The municipality shall immediately review and adjust the product of the urban spatial plan using standard geospatial data in accordance with applicable legislation, to ensure that the achievement of the green open space provision of the city on which its obligations are more measurable and valid;
2. The green open space revitalization program should be integrated with efforts to provide urban open spaces, as there is potential for a large GOS reduction problem in the GOS revitalization program;
3. Corporate social responsibility program is a potential to be developed as a policy of private sector involvement in urban development, as well as increasing community participation in realizing sustainable urban development;
4. Revitalization of GOS through CSR as a municipal policy should formulate mechanisms through an approach model that guarantees control functions according to sustainable development schemes.
5. The framework of the role of private involvement in the provision of green open space through CSR as outlined above can be illustrated in Figure 12. The provision of green open space through CSR programs can be a model of community engagement in sustainable urban development. This model consists of negotiation process, planning,

implementation and maintenance of green open space, especially in CSR implementation process.
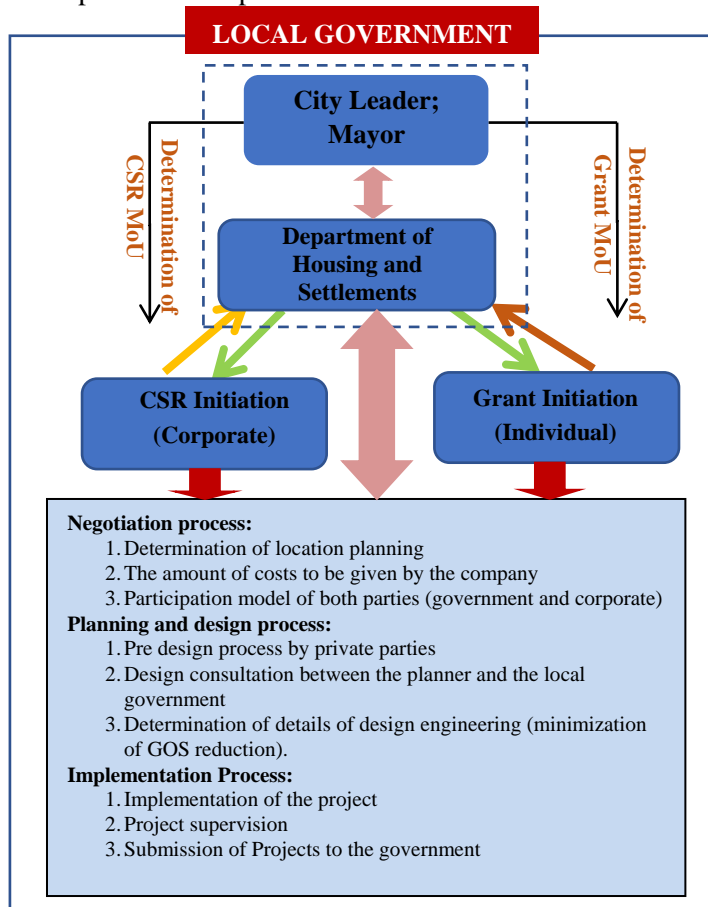
Figure 12. The initiation process of giving CSR / Grant to the city government

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Local Identity Regeneration of Unused Urban Spaces

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Abstract: This study attempts to develop a methodology to help discover and evaluate the potential of unused urban spaces at the local level, and put it into practice. Through the application of the method, the conceptual framework of unused urban spaces with physical and functional aspects, across natural and acquired origins of formation, is further confirmed, developed and improved. More importantly, this study aims not only to develop a method of identifying the local unused space and its development potential in practice, but also to provide the capability of assessing the quality and uniqueness of such space.

1.   INTRODUCTION

Due to modernisation and globalisation, more and more unused urban spaces, such as bridges, are created as city planners try to meet the functional requirements of the city. There is a large danger of repetitiveness and sameness across our cities. Therefore, understanding and promoting local identity is necessary for successfully recognising the reasons for the character of any place, what our role in it might be, and how we can sustain or change it, especially for unused urban spaces. Researchers have started to pay more attention to local identity, such as the genius of the place (Pope, 1731), the image of the city (Lynch, 1960), city forms (Lynch, 1981), life between buildings (Gehl, 1987), sense of place (Measham, 2006), experiential landscape (Thwaites & Simkins, 2007), and place making and keeping (Markusen & Nicodemus, 2014). A recurring theme in the research is that each place has its own unique qualities; some emphasise physical makeup, others social activities. But how is local identity promoted? And what about the unused spaces? It ought to be the responsibility of the architect or landscape-designer to be sensitive to those unique spaces and their qualities, to enhance them rather than to destroy them.

Despite the growing importance of local identity to the improvement of the quality of human life, the term is rather ambiguously defined, which has caused difficulties in the field of landscape study, where practitioners have not realised the impact of local identity during their working processes. Together with globalisation, this has resulted in the disappearance of a vast amount of local identities over the last decade. The unused urban space shares the same problems: no formal definition and not much attention from practitioners.

The aim of this paper is to respond to these problems by investigating unused urban space and local identity in the context of contemporary Chinese urban development, and develop from this a conceptual framework for application in practice. This is significant because it can help to underpin an understanding of the importance of unused urban places' local identities in modern urban design processes, resulting in the formation of a better urban environment.

The objectives of this paper are to:
1) Undertake a literature review of unused urban spaces and local identity.
2) Develop a conceptual framework from it to help practitioners gain better knowledge of the term.
3) Carry out interviews in Yantai to investigate implications for the applicability of the conceptual framework and use this to assess the local identity of unused space in Yantai.

The overall aim of the paper is to:
1) Introduce a better understanding of the definitions of unused space and local identity, and their conceptual framework as it relates to urban development.
2) Explain the practicality of the paper's findings in relation to the local identity of unused urban spaces.

Through this case study, the importance of understanding the local identity of unused urban space is discussed. The resulting conceptual framework has the potential, when further developed, to provide insight into the local identity of unused urban spaces to help urban designers better understand and evaluate them to inform better decision-making practices.

2.   UNDERSTAND UNUSED URBAN SPACES

There are two main aspects of the impact of unused urban space on urban planning. On one hand, unused urban space has led to the discussion of density, compactness, expansion and urban structure in the process of urbanisation. It plays a central role in the process of urban expansion and the process of intensive and existing urbanisation.

Ebner (1999) suggested that the use of regional percentages to discourage regional vacancy is often inaccurate because such definitions do not have a clear idea of what the "vacancy" is, and because that definition will change according to the purpose of the study, so it would be inaccurate to suggest that the term has a static definition (Ebner, 1999). One of the purposes of this study is, therefore, to redefine unused urban space as a broader concept.

The definitions are usually concerned with the origins of disuse. Where spaces are categorised based on this origin, they are divided into two types: one is because the area has always been left out throughout the city's development process, and the other is it was previously used but later fell into disuse for unforeseeable reasons. This distinction is important when introducing the terminology; for example, regarding landscape planning issues, the term "unused" usually refers to abandoned landscape terrain and space that has never been developed in any form.

Some of the definitions of unused urban space emphasise the terrain's emptiness compared to the surrounding built environment, which is neither occupied nor unoccupied by architecture and infrastructure. However, practitioners stress that unused spaces in urban planning are normally spaces that have been abandoned or have no urban activities, such as urban

wasteland, brownfield, desert land, degraded land or buildings. All of these definitions do point to the enormous potential of development of such terrain or architecture.

Going by the most basic concept, the unused urban space is still "land". Ebner (1999) proved that, in fact, the city's unused space is also part of the landscape environment, where it is forced into an idle state by its surrounding building space and urban activities reflected in the space (Ebner, 1999). Although urban wasteland is a product of organic development, it is still a part of the urban spatial formation process. Based on this view, vacancy is a bi-product of urban development.

In addition, the development around unused urban space is concerned with both space and time. Only by examining the historical trajectory of city development can we understand the causes of the formation of unused space. The history of a place reveals the reason why it was vacant or abandoned, and explains why there is no human activity and social production. The origin of a place can be found in the urban planning model, which is based on the use of land in the urban growth model, real estate speculation or industrial demand specifying the use of a specific urban space model.

In addition, the time dimension follows trends in formation and transformation of unused urban space. The 1950s and 1960s brought the growth of abandoned historic centres to achieve urban development. In the next decade, to meet the demand for productivity growth, a lot of urban blank areas were developed in large numbers. In the eighties, the political programs and trends of public and private cooperation turned industrial areas into residential and office spaces. After that, the city's development focused on the strategic return of the city centre, which has continued. The process of revitalisation, re-identification and reconstruction of the city is almost always focused on the development of unused urban spaces and buildings.

In general, this lack of space for human activities does not cause many problems or affect a particular interest. However, when we see them as part of history, such unused space seems to be particularly important. To this end, scholars and practitioners believe that the protection and re-development of unused urban space and the transformation of the city's future development has played a particularly important role.

It can be seen from the above literature that unused space can be defined as undeveloped areas and areas that are missing functional capabilities. One important fact to note is that this definition is concerned with the surrounding environment, and this relationship changes over time. Regarding the time dimension, these two aspects can then be further divided into 'natural' and 'acquired' as reasons for formation. At the same time, the physical and functional level of unused space are co-related (Figure1).

As shown above, at the spatial level, when the physical unused space is fully developed, it may lead to a reduction of function within the area, resulting in unused space at the functional level. On the contrary, when a space is left unused to meet more functional requirements, it will face the danger of producing unused space at the physical level. Across time, the two types of unused space become interconnected and often affect each other.
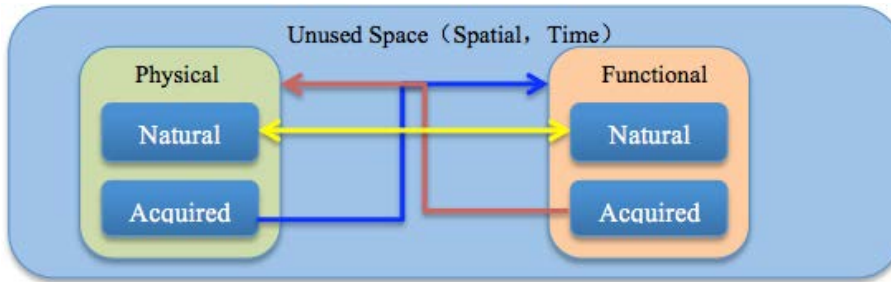
Figure 1. Unused Urban Space Framework

3.   LOCAL IDENTITY

The major obstacles when trying to define local identity are the confusion between different levels of identities and other related terms. Therefore it is important to understand the difference between different identities and to clarify the common features between related terms of local identity.

3.1   Different levels of identity

At different physical scales the concept of identity in landscape has been categorised into national, regional, and urban identity, together with ideas of local identity (Dredge & Jenkins, 2003). Christmann (2003) suggested that the different levels of such identities are not only caused by their physical scales, but also by cultural differences. Others have mentioned smaller places that are incorporated within larger scales (Tuan, 1974; Relph, 1976; Low & Altman, 1992).

A country or a nation is commonly recognised as a form of national identity (Lewicka, 2011). Monuments and ceremonies, for example, all contribute meaning to the national identity (Vale, 2008); whereas regional identity focuses more on the interaction between people and their surrounding environment at a smaller scale (Raagmaa, 2002) where narrative and the historical perspective emphasise how the place is represented in people's minds and memories (Paasi, 2003). Urban identity narrows the scale to a specific city level, such as the city of London: its emphasis is on how local people form their own identity through interaction, which then forms the regional identity (Oktay, Derya, 2002). Finally, local identity acts as a basic principle for all three former identities: it focuses on the interactions between people and the local environment at a very narrative scale, such as at the level of a city street.

3.2   Related Definition of Local Identity

At a local level, certain terms are used that focus on fundamental issues like physical interaction and social experiences, namely Place Identity and Place Attachment (Proshansky, Fabian, & Kaminoff, 1983; Jorgensen & Stedman, 2001). These terms refer to aspects that influence personal identity, which concerns people's feelings about local space that can be affected by both sensory and memory experience (Williams, 1973).

Cultural identity focuses on how people's memory is influenced by local historical heritage and is related to the memory aspect of personal identity (Oktay, Derya, 2002; Krause, 2001; Hidalgo & Hernandez, 2001), and thereby relate to forming communities and constructing community identity

([Thompson & Travlou, 2007](#)). The goal of local community identity development is to improve both physical appearance and local memories to better match people's preferences, improving place identity.

In addition, sense of place is concerned with people's level of satisfaction in a certain place, both from the physical and psychological aspects ([Pope, 1731](#)). Similarly, landscape identity is a social and personal construction that differentiates the existential and spatial aspects of spatial uniqueness ([Turner, 2006](#); [Haartsen, Groote, & Huigen, 2000](#)). The physical aspect is the existential identity of a space, whereas the spatial identity concerns human psychology, such as human preferences and historical heritage.

Concerning all of the above identities, the major literature consistently mentions the concept of bi-directional interaction between the physical environment and local people's feelings, specifically that they enhance each other from time to time. This implies that the physical aspect acts as one of the major aspects of local identity. Additionally, the way people distinguish their local places to the outside world through social activities is also the focus of local identity ([Zube, 1991](#); [Lynch, 1960](#); [Hidalgo & Hernandez, 2001](#)). In addition to local identity's capacity to provide a unique place with satisfactory functionalities, it can, importantly, provide sensory psychological comfort. Another major benefit from long-dwelling traditional communities is from their physical and spiritual heritages, which are deeply embedded within human memory ([Oktay, D, 2005](#)).

Based on the above fact and aiming to provide a formal unified meaning of local identity, this paper proposes the below definition.

Local identity provides features that create a recognisable image of small-scale place and enables its residents to differentiate themselves from others through physical, social, sensory and memory-based perspectives. There are special feelings associated with local identity, created by interactions between people and their surrounding environment and understood through these four perspectives; such feelings include both positive and negative emotions.

3.3   Local Identity of Unused Urban Space

After clarifying the definition and theoretical framework of both unused space and local identity, we need to return to the focus of this study, local identity regeneration of unused urban space. This requires that the definition of the two frameworks be combined and their interconnectivity understood.

In the definition of unused urban spaces, the existence of the innate or acquired "vacant" areas, at the physical and functional levels, reflects or strengthens the relationships between local residents and the surrounding environment. Such feelings of the representative image, formed over time during the interaction process, can either be positive or negative.

From the theoretical framework, the unused urban space reflects the local identity in the two dimensions of space and time:

From the spatial point of view, the unused space influences the four aspects of local identity at the physical and functional levels.

1) The physical building structure and blank space effectively affects the physical and sensory aspects of local identity.
2) The gaps in environmental functions affect the social aspect of local identity.
3) As time goes by, the above two points, together, affect the history of the local place, hence influencing the memory aspect of local identity.

It is apparent that the spatial dimension of unused space focuses mainly on the physical and sensory aspects of local identity.

From a temporal perspective, unused spaces have a certain impact on the physical and sensory aspect of local identity, but most importantly, they affect the local culture and historical elements of local identity across time.

Therefore, in the study of the local identity of unused urban space, and specifically in the analysis of the local status of potential local identities, it should first be determined whether the formation of such space was natural or if it was acquired during the development process, following which the unused space should be evaluated with regard to the dimensions of space and time respectively.

At this point, the definition and composition of unused urban space and local identity are effectively combined and summarised. This definition framework will provide guidance for the development of identification and an assessment methodology. In summary, the method aims to identify the unused urban space based on different processes of formation, through two dimensions and four factors of local identity in order to assess the corresponding spatial space.

In the following, this study proceeds to identify and evaluate the local identity of unused urban space.

4.   DATA COLLECTION

The methodology is developed through a case study in Yantai, China. In order to test the validity of the aspects of local identity introduced in the previous sections, the study site must strongly express all of these aspects, and the information must be easily obtainable. Yantai was chosen due to its satisfaction of the above requirements. Yantai is a city located on the southern coast of the Bohai Sea in China's Shandong province, with a population of 7.02 million and area of 13745.95 km².

It has been proven that using 180° horizontal panoramic photographs (A.K.A. PPEI) as a data source for landscape research is an effective and accurate method given the current limitations in other technologies (Shao, Lange, & Thwaites, 2015). Therefore a set of 180° local photos was produced and presented to local participants who were asked to make a selection of unique elements.

The photos were taken around areas within the study area using a Nikon Coolpix P510 Digital Camera. The camera was attached to a tripod at eye-level when taking photos; the zoom range was set between 24mm to 1000mm (35mm equivalent focal length) to try to represent a human focal view. The set of photos was produced and shown to 30 local participants at the study site (with direct observation of the study site). They were asked to pick landscape features that they believed were the unique elements at the study site. During the interview process, questions were asked and the conversations were recorded using a digital recording pen for later interpretation.

For sample size, Sandelowski (1995) pointed out that the size should be neither too small to achieve data saturation, nor too large to undertake a deep, case-oriented analysis required for qualitative research. Various methodologists have suggested that between 12 to 30 participants for each interview group is appropriate for qualitative research (Guest, Bunce, & Johnson, 2006). Therefore this study assumed 30 participants as an appropriate final number to complete the interview.

30 panoramic photos of the local environment comprised the photo set; they were printed in colour on A3 paper. At the study site, the photos were presented to 30 local participants and onsite interviews were completed.

In each interview, participants were asked to use coloured adhesive dots to mark the elements they liked or disliked on the set of 30 A3 panoramic photos. Their opinions throughout the interview process were recorded via a digital recorder and also noted on the photos for real-time use. The meanings of each colour are given:

- Blue Dot --- Physical Aspect
- Green Dot --- Social Aspect
- Yellow Dot --- Sensory Aspect
- Red Dot --- Memory Aspect

Furthermore, both the positive and negative perspectives of local identity are identified as they both form a representation of the local site. Each participant marked their selections using "+" and "-" to represent positive and negative feelings correspondingly, with a blank space optional for no specific feeling.

In addition, during the onsite PPEI process, participants were asked to point out the "unused" spaces that they thought could be developed or re-developed. As expressed in the last section, because unused spaces are distinguished by their formation processes, participants are encouraged to not only choose the spaces that are physically unused, but also missing functionality. See Figure 2 for a demonstration of the data analysis process.
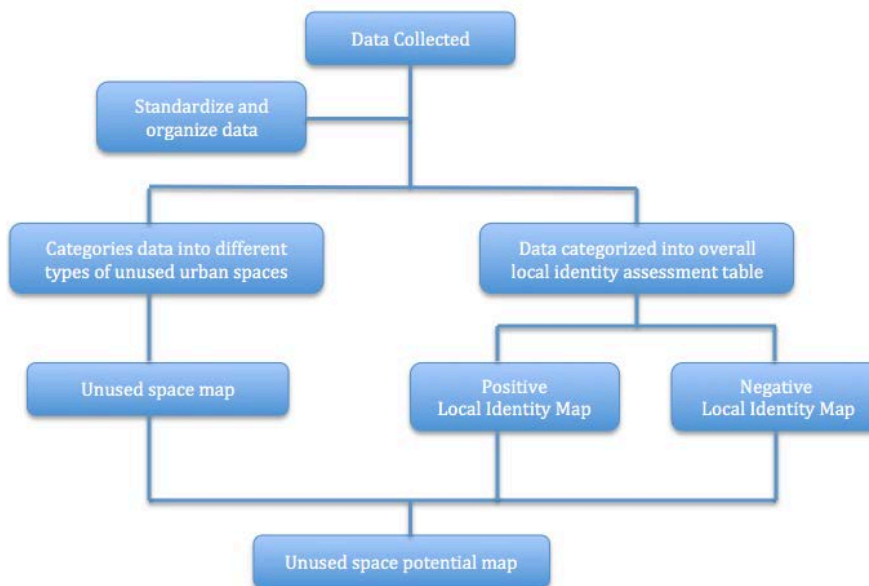
Figure 2. Data analysis process

5.   DATA ANALYSIS

Based on the elements selected and the reason for their selection, all participants' opinions are standardised and organised into two assessment tables for interpolation, one for Unused Space Identification and the other for Local Identity Identification and Assessment.

The Unused Space Identification table simply records the spaces that participants think are "unused" and can be further enhanced. The table organises different spaces into four sections based on the reason for their selection. Each of them represents a type of unused space. For example, the

dysfunctional areas are because participants think they can be further developed to better meet their functionality requirement, and the poor landscape quality areas are missing good physical environmental qualities. These spaces are then mapped on to a local map for easy interpretation:
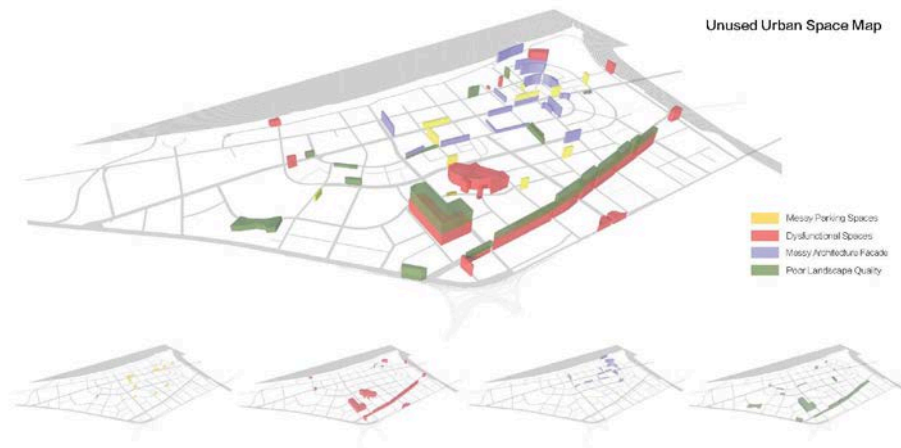
Figure 3. Unused Urban Space Map

For the local identity assessment table, the middle four table columns represent the four aspects of local identity accordingly. Based on the reason for their selection, elements are categorised into corresponding cells in each local identity aspect table. One important fact to note is that one physical element might have existed in multiple aspect columns due to the reason for its selection. As an example, it can be seen that "Binhai Square Ancient Architectural Building Complex" has been selected across all participant groups (No. 1 in Figure 4). In this way, the table provides a comprehensive view across the different preferences that all participants gave on the elements they have selected.

The table's first two columns are given as pie charts of positive and negative levels. Each pie chart visualises the level of quality of all four aspects of local identity at one location. The colours in the pie chart represent different aspects:

- Blue: Physical Aspect
- Green: Social Aspect
- Yellow: Sensory Aspect
- Red: Memory Aspect

The size of the pie chart is decided by the number of overall selections of the elements at each location, and the proportion of each colour in the pie chart is determined by the number of corresponding preference selections for each aspect. The preferences are cast into 'like' and 'dislike' options, with 'like' meaning the participant prefers the selection and sees it as an important local element, and 'dislike' meaning the element has a negative impact on the participants' feelings and wants it to be either removed or reduced. For example, at the far left side of the overall assessment table, there are 15 likes on "Tiandi Square" (No. 1 Physical) in its physical appearance; 34 likes on "dancing" carried out at the square (No. 1 Social); 13 likes on "night lighting" (No. 1 Social); and 7 likes for "representing the development of the zone" (No. 1 Memory) that are all related to the museum. The count combined forms the overall size of the positive pie chart and corresponding proportion of the colours; the bigger the size or

proportion, the more important it is. The same principle follows for the generation of the negative pie charts.

Qualitative Assessment		Aspect in the Same Location				Rank
Positive Pie	Negative Pie	Physical Aspect	Social Aspect	Sensory Aspect	Memory Aspect	
		Tiandi Square	Daily walk, Running exercise, Take a walk, Friends to take pictures, Dancing, Write with a large brush pen, Taichi, Performance	Night lighting effects	Represents the development of the zone	1
		Cai Yun City	Shopping, Watch movies, dance	Lively, Summer shade	Underground parking rebuilt, supermarket rebuilt, Typical early abusiness	2
		Golden Beach Park	Daily walk, Walking, Taichi, Children playing, Swimming, Dancing, Running, Watch events	Lack of facilities	Deserted beach renovation	3
		Jiahe Park	Fishing, BBQ		Landscape pond into a fish pond	4
		Desheng	Shopping, Watch movie, Dinner	Noisy, Poor operation	The vegetable market from Caiyun City moved to Desheng	5
		Tianma Bridge	Play, Put the hole light	Scenery is good, Less people	Built for many years	6
		Coastal Forest		See the fox, Sophorae floral, Bird	Spontaneous planting, destroyed the original black pine forest	7
		Huanghe Road	Walking	Spring forsythia, crape myrtle, peach blossom, More Korean, Sea breeze	Rebuilt	8
		Sailing Square			Surface transformation and beautification, Represents the development of the zone, First sculpture 2	9
		Library complex	Art show, Children dance classes, music classes, Mountaineering	Art show, Children dance classes, music classes, Mountaineering	Beacon is a provincial-level cultural protection unit	10
		Planning Exhibition Square		Clean and tidy, Staircase design is gentle		11
		Nianci villa		Dirty and messy	Old, Reconstruction two years ago	12
		Fulai Shan Park	Daily walk, Play, Dancing, Singing, Walk the child			13
		Binhai Road		Sea breeze	Street lamp is a patented design	14
		Starting area plant	Shopping		Transformed into sports venues, hotels, offices	15
		Tianma Hotel		Good Impact	Building renovation in 2014	16
		Planning Bureau	Popular Science Education, Cool summer	Sound of the waves		17
		Wanda	Shopping	Construction		18
		Oushang Market	Shopping, Children Activities, Shopping supermarket	Construction		19
		Zhongxin Building		Construction		20
		Tianma Square	Walking, running, Square dance, Hold an event		Modern high-level building representatives	21
		East Palace			Old stories, Traditional building	22
		Xing Yi Square	Food	Good view		23
		Hualu Power		Dust, Mechanical sound		24
		Kevlar		Stinky		25
		Aihua International School				26
		Changjiang Road			Old Sunup Sculpture	27
		Cishan Park	Tourism	Good view	Old temple	28
		Liuzi River	Playing	Lack of green spaces		29
		Taishan Road	Food, Shopping	Poor paving	Oldest road	30
		Hua An Hotel				31
		Hengda market	Shopping			32
		Yongwang	Shopping			33
		Xinhe Weidamei		Stinky		34
		Dahua Towel Factory			Represents the development of the zone	35 / 36
		Zhenghai building				37
		Spandex		Stinky		38
		Western Power		Exhaust sound in winter night, Stinky		39
		No.7 Residential Area	No activities	Lack of green spaces	No market	40

Figure 4. Overall Assessment Table

Based on the above table, two corresponding local identity maps were generated, one for positive elements, the other for negative elements.

Figure 5. Positive Local Identity Map
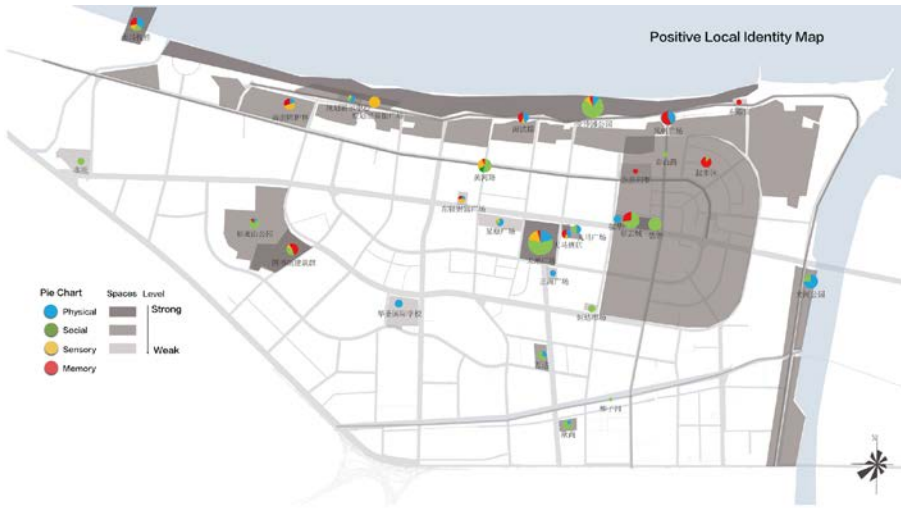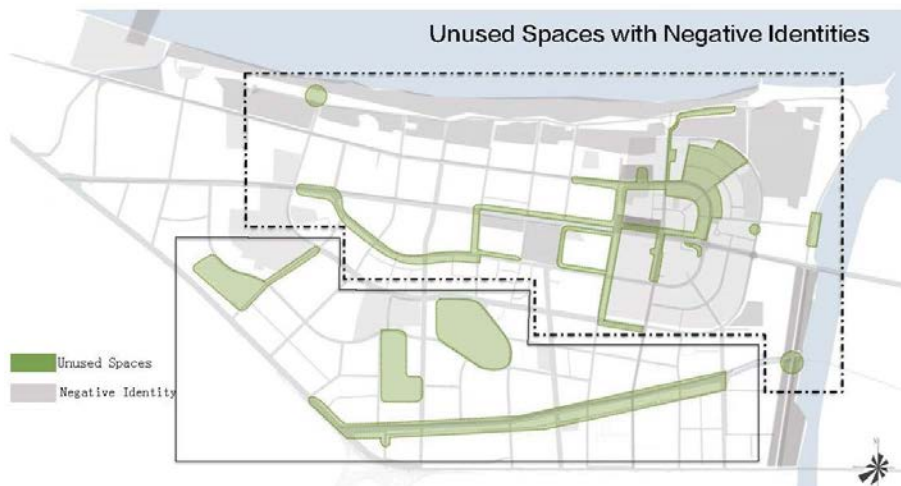

Figure 6. Negative Local Identity Map

Figure 7. Unused Spaces with Negative Identities

Because the goal of this study is to find the potential for unused urban spaces, more attention is given to unused spaces and negative local identities. Hence, the negative local identity map (Figure 6) and the unused space (Figure 7) map are put together to help identify the potential for the

unused spaces. In this map, the grey areas are the areas containing negative local identities and the green areas are the spaces that are identified as "unused" urban spaces, regardless of their reason for selection.

6.   DISCUSSION

Based on the elements selected and the reason for their selection, all participants' opinions were standardised and organised into two assessment tables for interpolation, one for Unused Space Identification and the other for Local Identity Identification and Assessment.

The unused space map not only shows the space identified by local participants, but also shows the reason for their selection. All reasons were successfully categorised into four different reasons across two different aspects:

- Physical level: Messy building façade, lack of landscape quality
- Functional level: Messy parking spaces on the road, dysfunctional spaces

These findings are not only visualisations of the unused spaces with their given formation processes, but also prove the framework that was developed in the literature review section, that unused spaces can be either undeveloped areas or areas that are missing functional capabilities.

The pie chart in the overall assessment table has the power to both identify the local identity and show its corresponding assessment. Their total number of selections ranks the identified local identity elements. The total size of the pie chart shows the importance of local elements; it shows the aspects the local elements' cover at the location, differentiated by colours in the pie chart; the proportion of each colour inside the pie chart represents the importance of each aspect regarding the location. Most importantly, the positive and negative pie charts are mapped to the local map for direct observation of all of the local identity elements and their assessments correspondingly.

The final map, which combines both negative local identity and unused spaces, clearly indicates the areas that either have too many negative identities and unused spaces or the places that only have unused spaces with less negative identities. Therefore, when using this map and the unused space map together, the practitioner would have the ability to identify the unused urban spaces and assess their potential to impact local identity.

As an example, the top half of the final map has quite a few overlapping negative identity areas and unused spaces, which are circled with dotted lines. The bottom half of the map has only a few negative identities with a few large-scale unused spaces, which are circled with solid lines. Additionally, it clearly shows that the bottom half does not have many overlapping areas. By comparing this map with the Unused Space Identification map, more information is revealed.

The top half of the map needs further development as the majority of the unused spaces in this section overlap the negative identities and these spaces tend to be more physically related. In the Unused Space Identification map, the top half shows more physically unused spaces, and the local identity assessment table also expresses more negative opinions regarding the physical aspect. This finding further proves the point of the literature review. Therefore if one would like to do more development in this area, they should consider enhancing the current site's physical appearance and add more elements relevant to other local identity aspects.

The bottom half has more potential to be developed because it rarely has any negative identities or any positive ones, but there are a lot of large-scale unused spaces that are missing both physical and functional capabilities regarding the Unused Space Identification map, especially the long riverside area at the very bottom of the map. Therefore, if one would like to add more to local identity, this part of the city would have great potential. Such a conclusion is made not only because there are no negative identities in this space, but also because the cause of the formation of this space is both physical and functional. Hence, it can be seen that the place has potential for both physical and functional development. The development of such a space has the potential to create new local identity from the physical, social and sensory aspects, and, over time, it will certainly create new culture, history and memory for residents.

In summary, the maps generated in this research have achieved the following results:

1) The Unused Space Identification map clearly shows the location of each "vacant" space and also shows the cause of their formation. The results prove the definition of unused urban spaces.
2) The overall assessment table can be used to interpret the importance of each local identity element, the aspects they represent, and their corresponding positive and negative ranks.
3) The positive and negative local identity maps visualise the location of each of the local identity elements and their importance.
4) The final unused space and negative local identity map has the power to identify unused spaces that have the potential to either enhance current local identity or create new local identities. If used together with the other maps, it provides a flexible combination for different research and practical purposes.

7.   LIMITATION

Despite the positive findings and results from the methodology developed in this research, the method is still subject to a number of limitations.

7.1   Selection of one case study

Because of the time frame and geographical issues, this research only used one case study. Although the study site covered satisfies the required perspectives outlined in the intended scope of the study, it does not necessarily represent a model study site. Hence, the methodology is subject to further tests in other spaces. However, as the study site covers aspects of local identity and the qualitative nature of the methodology, this research argues that the method has potential to become a universal method that can be applied across different places. This approach could be further assessed in future research.

7.2   Combination of unused space map and other maps

Due to the nature of this research, only the unused space map and negative local identity maps were combined to explore the potential for unused space for enhancing current or regenerating new local identities.

However, there are still more possibilities regarding the combination of maps and tables. For example, the overall assessment table and positive local identity maps can be used together to investigate further into each individual aspect of local identity and to point out the most influential elements for each aspect, so that one could focus on the protection of such elements in future development. One could also overlap the unused space map onto the positive local identity map to see which local identity has more potential to be enhanced by revamping the unused spaces surrounding it.

8.   CONCLUSION

Despite the loss of local identity across the globe, limited investigations and valid solutions have been proposed. This research therefore aimed to contribute a solution to the problem of local identity loss and proposes a valid way to investigate deeper into the principle of the problem through a typical example in Yantai, China. To such extent, the research acts as a starting point to understand the knowledge and findings of unused urban spaces and local identity; it fills a gap in the research on local identity of unused urban spaces by proposing a definition and investigation framework for the terminology.

The research also attempts to investigate the distinctive features, strengths and shortfalls of unused urban spaces and local identity by making use of visualisation techniques. The findings may not only contribute to the general solutions of loss of local identities, but also help to enhance the living environment to make people feel more attached to these spaces. Urban practitioners could use the thesis findings and methodology to assess their target location's local identities and unused spaces before they carry out their projects or design, hence improving their work's quality and enhancing the impact to local sites and people by helping to find the spaces that are worth revamping, and the ones that are worth protecting, as well as ultimately improving people's attachment to their local environment.

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Global Creative Economy and Istanbul: A Focus on Film Industry Cluster

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Abstract: The main objective of this paper is to explore the cluster dynamics and external linkages of the Istanbul film industry through a questionnaire-based study with film producers. The paper aims to determine whether the success in the global market is created through the cluster dynamics of the local film industry. The status of Istanbul's integration into the global market can be shown by the activities of the film industry. Clustering and local-global interactions are the main points of analysis as they are the major factors indicating integration of film clusters into global film markets. The findings show that the Istanbul film industry cluster tends towards disintegration spatially and has weak external linkages. For sustainable development and resilience against potential future crises, local-global interactions and external linkages should be integrated into the existing cluster dynamics. Consequently, this study asserts that despite the position of Istanbul on the periphery of the global economic system, through the film sector as a creative industry, its position and degree of global integration can be increased.

1.   INTRODUCTION

The global economy has been in the process of restructuring since the economic crisis of the 1970s. In this period, involvement of states in economic processes and advantageous conditions of mass production have come to an end. The new period means new economic sectors are producing goods with high symbolic meaning, such as in cultural industries. These can be understood as the symbols of the modern cultural economy. In the world economy, it has become accepted that the growing cultural industries offer solutions to the problems of unemployment and are themselves vehicles of export.

In parallel with the growing interest in this issue, there has been increasing academic research from different disciplines, such as sociology and business studies. These different disciplines' studies have evaluated those industries from different perspectives, such as firm characteristics and labour processes (Aksoy & Robins, 1992; Bathelt, 2002, 2004, 2005; Blair, 2001; Hesmondhalgh, 2002, 2007; du Gay & Pryke, 2002; Krätke, 2002; Power & Scott, 2004; Pratt, 1997; Scott, 1997, 2004a, 2004b). The film industry, as the biggest commercial sector of cultural industries and a dynamic industry of world trade (Rosnan, Nazari Ismail, & Mohd Daud, 2010), has attracted the

attention of both policy makers and entrepreneurs, however, it is very difficult to provide sustainable development in those cultural industries because of their dynamicity.

Not only the film industry but all cultural industries have taken a central position in cities' economic policies in order to integrate into the network of world cities. Many cities around the world have changed their industrial profiles towards cultural economies (Scott, 2004a), joining as nodes into the relevant global network. According to Scott (2004a), this happens because the cultural economy is evaluated as a source and enhancer of local economic development and as the source of expansion for output and employment. Urban policies are focused on competition and clustering, two interrelated concepts supporting each other, where clusters are desirable for their positive effects on increasing competition (Eraydin, 2008). The evaluation of the economic performance of cities and regions is realised using assets of competition, such as human capital, creativeness, culture, art and technology; intensive convergence of these assets results in the clustering of cultural industries. Thus, cultural industries comprising different sectors emerge at these merging points. In the world economy, fast growing cities now tend to have developed cultural industry clusters. Therefore, culture and creativity have become established features of the urban policy agenda as the drivers of economic development. Cultural industries are stimulated with the aim of promoting cities at an international level and attracting both investment and the creative class (Bayliss, 2007).

In this study, the economic development of Istanbul is the main concern and the film industry is determined as the indicator of the position of the city in the global economy. The movie industry is analysed in this context due to its direct contribution to the urban economy and its impacts on the promotion of cities and countries in the world market. In this context, cluster dynamics and external linkages of the Istanbul film industry are explored through a questionnaire study with film producers. Istanbul, as the only film cluster in Turkey, was selected as the case study area. The central question was whether the cluster dynamics of the Istanbul film industry can lead to economic success in the global market. Clustering and local-global interactions are the points of analysis in this study. In this regard, clustering dynamics and different global integration models are detailed first in order to explain the general structure of the film industry. Following this, a historical analysis of the Turkish film industry is carried out with regard to the cluster dynamics and integration models. The database and survey process are explored in the third part, and then the cluster analysis is given with the findings. Finally, the findings for the Istanbul film cluster are summarised and discussed together with some suggested policy changes.

2.   CLUSTERING AND LOCAL-GLOBAL INTEGRATION

The dual theoretical structure for the clusters, used by Vang and Chaminade (2007), provides a conceptual framework for the explanation of success of cultural industry clusters. However, research on the cluster dynamics of a cultural industry that has intensive external relations and global relationships is not much discussed. While different clustering approaches, such as Marshallian and Jacob clustering, provide good frameworks for the investigation of the structures of cultural industries based on globally

intensive relationships, they also admit important deficiencies for the evaluation of external linkages.

2.1 Marshallian Clustering

In the development literature, major success in different places like Third Italy, Baden-Wurttemberg, Silicon Valley and Hollywood has stimulated discussion of the role of clustering on success through an increase in productivity, as happened in these examples. Flexibility and cheap access to the resources required in the production process explain the success of these clusters. Moreover, dynamic externalities, such as localised learning and innovation, which provide advantages to the firms in the cluster, have become the focus of research. Firms that achieve localised knowledge spillover, labour markets and institutional supports via traded and untraded dependencies sustain their innovation-based competitive advantages. Physical proximity in clusters enables face-to-face interaction and facilitates the exchange of tacit and codified knowledge among firms; thus, it enables innovative and competitive development (Vang & Chaminade, 2007).

The Marshallian approach explains the economic success of clusters through the effects of human and social capital; i.e., success is explained by the determining factors for the interactions of the firms and the mutual learning processes among them. Thus, it can be said for the cluster that human and social capital promote competition by providing interactive learning processes. As stated by Vang and Chaminade (2007), human capital is more related to the labour market and shows the ability to reach, read, understand, convert and commercialise the localised knowledge spillovers in the sector, whereas social capital might facilitate businesses characterised by a high degree of uncertainty.

The Marshallian clustering approach is criticised for its ignorance of local-global relationships and for its limited account of foreign direct investments. Local-global interaction analyses made on cultural industries -and especially on film industries - investigate the production strategies of clusters focused on the utilisation of cheap labour, infrastructure, natural beauties and financial supports of foreign countries. Furthermore, according to Vang and Chaminade (2007), no enquiry focuses on the question of how and to what extent global relations and external relations can affect the success and internal organisation of the cultural industry clusters.

2.2 Jacobs Clustering

Studies made on cultural industry clusters are generally developed with the Jacobs approach (Jacobs, 1969), which focuses on the underlying reasons for concentration in metropolitan areas and on such factors as diversified labour markets, openness, tolerance and "buzz". In order to increase the competitive capacity of cultural industries, it is crucial to access unique, valuable and diversified knowledge and recombination of this type of knowledge. Fast recombination, knowledge sharing and the continuous reproduction of knowledge are the essential features of cultural industries organised in the form of a cluster. Cultural industries are project-based, where each project must be different from previous ones and hence must organise quickly, produce innovations and practice them. These types of organisations may solely be in metropolitan areas, accommodating the diversity of human capital; however, a high level of diversity is related to the openness and

tolerance of a society, which presents difficulties for this approach due to the globalisation process and local-global linkages (Vang & Chaminade, 2007).

The evaluation of these two approaches introduces the key role of clustering for the success of cultural industries. The dynamics of the role of clustering in success and competition can be analysed from five dimensions (Bathelt, 2004), namely (1) horizontal dimensions (competition and diversity), (2) vertical dimensions (interactive learning), (3) institutional dimensions (encouragement of inter-enterprise cooperation and collaborative projects), (4) external dimensions (connection to the market and the collection of knowledge in various regional and national settings), and (5) dimensions of power (the process of adaptation to changing rules and markets). It is vital to establish trade-offs among these dimensions of clustering to prevent situations such as lock-in, path dependency, blind confidence and over-embeddedness that may prevent economic success in any cluster.

The film industry is the focus of this study. It inherently produces clusters due to its project-based organisational structure. Connections between all related actors for each different film project require close physical proximity; the increased possibility of socialisation, learning, face to face interaction, creativity and motivation encourages firms to be located in clusters altogether. The case studies on clustering around the different geographies demonstrate that clusters positively affect creativity and productivity and thereby the development of firms, together with the whole economy of the cities and regions in which they are located, which enables the emergence of new firms, new jobs, innovation and competition (Jacobs, 1969). However, clusters may sometimes promote problems in the central and core areas. For instance, the attractiveness of the subcentres may produce a tendency of industrial shift, as can be observed with the Istanbul film industry cluster.

2.3   Restructuring Process in Film Industry

All stages in a film's life-cycle, such as production, distribution, exhibition and financing are undergoing industrial changes. Those changes can be summarised under two headings, internationalisation and globalisation. While internationalisation means intense economic exchange across national boundaries, globalisation is the integration of different nations, firms and organisations into global economic, cultural and political systems (Lorenzen, 2009). The process of internationalisation is the extension of existing activities into other countries and the attainment of economies of scale and scope (Kaiser & Liecke, 2007; Keane, 2006). It is agreements and alliances between nations or nationally based firms (Lorenzen, 2009). Dicken (1998) describes globalisation as "the functional integration of internationally dispersed activities". When the two structural changes are evaluated, it is evident that internationalisation is a quantitative process, while globalisation is more qualitative. Lorenzen (2007, 2009) emphasises that globalisation means connectedness among many countries and leads to their integration into global networks of economy, culture, policy; as such, it is beyond internationalisation. c

Lorenzen (2007, 2008) exposes four aspects of globalisation for the film industry, which are globalisation of (1) involvement in filmmaking, (2) film consumption, (3) film production, and (4) the organisation of filmmaking. The first aspect is related to the increase in the number of film producers outside of the USA. The second feature is about varying consumer preferences emerging with new niches in the global film market. The third aspect of globalisation is related to the production process in which film projects

transcend national borders. The last aspect regards global corporations organising across national boundaries. In this global film market, the tendencies of horizontal and vertical integration of cultural production companies are observed with the aim of increasing competition (such as publishing, music, TV, cinema, etc.) and reaching broader global markets.

In the current world film market, it is necessary that film production clusters integrate into the global film market to promote competition and sustainable growth. The process of integration varies for different countries according to their own production organisation, labour process, and arrangement mechanisms. In this study, six different models of integration into the global film market are defined in the context of the above-mentioned concepts and discussions. These models produce different features according to the different combinations of industrial organisation, labour market, size of home market, regulatory mechanisms, and film content. The first model is based on Hollywood due to its organisational heterogeneity, international filmmaking practices, and powerful distribution and marketing networks. The command function of Hollywood in the global film market is the base of this first integration model. Runaway production is the second integration model; with two sides to the integration process, it both provides an ability to reach the international film market and has the advantage of using local financial and creative sources. The third model is co-production with foreign film companies. Companies increasingly prefer to make movies as co-productions to take advantage of tax incentives and reductions, some procedural advantages, and cheaper labour. The fourth strategy is based on the adaptation and duplication of industrial organisation and filmmaking styles of Hollywood. The fifth model is based on geo-cultural marketing with diasporic movies, which examines the benefits derived from cultural similarities between countries. Finally, the last global integration model is niche marketing, which covers the use of different filmmaking methods, such as the niche animation films of Japan and dogma strategies of Denmark; this integration model includes non-commercial use of films or art-house filmmaking.

Table 1. General Characteristics of Selected National Film Markets, 2009

Country	Command Centre	Co-productions				Adaptation			Geo-cultural Marketing		Runaway Productions			Niche Markets		
	US	France	Germany	Italy	Spain	UK	China	S. Korea	India	*Nigeria	Australia	Canada	Ireland	Japan	Denmark	Turkey
# of films	677	230	220	133	186	116	456	138	819	872	38	75	34	448	30	69
Population (million)	307.4	64.7	81.9	59.8	46.1	61.2	1.33	48.7	1.207	152	21.6	33.6	4.5	127.6	5.5	70.4
GDP per capita ($)	45.55	39.9	37.31	33.3	30.25	32.8	3.62	14.946	982	2.4	34.974	36.589	49.1	39.12	52.815	7.84
Admissions (million)	1.364.0	201	146.3	111	109.5	174	218	156.8	2.900.0		90.7	108	17.7	169.3	13.9	36.9
# of Screens	39028	5522	4734	3208	4083	3696	4723	1996	10120	*4871	1989	2833	442	3396	397	1575
Market shares by national films (percent)	91.8	36.8	27.4	24.4	16	16.5	56.6	48.8	92		5	0.8	0.2	56.9	17.3	50.9
Market shares by US films (percent)	------	*63.2	*72.6	*75.6	84	*83.5	*43.4	*51.2	*8		95	91.8	*99.8	*43.1	*82.7	*49.1
Average Ticket Price ($)	7.18	8.53	9.28	8.46	8.48	8.49	4.16	5.73	0.57		9.29	8.01	9.81	13	13.78	5.37
Gross Box Office Revenues (Million $)	9.629	1.7	1.4	940	929	1.47	906	854	1.86		848	863	173	2.2	192	198

Source: World Film Market Trends, Focus 2010, European Audiovisual Observatory; *Include both US and other countries' films, *Nigeria: UNESCO Institute for Statistics, 2005

Filmmaking countries may simultaneously use a range of models. For example, two global integration strategies are observed in the Turkish film industry cluster, *co-productions* with European countries*,* and *geo-cultural marketing* to the Middle East, Balkan States, and Turkic countries. As stated above, global integration is necessary for sustainable growth and competition in the film industry. Considering this, the Turkish film industry has shown some positive developments in the last two decades, but export growth is still limited. It is a small-scale industry when compared with other filmmaking countries such as France, Japan and the UK. In order to show the size and position of the Turkish film industry in the global market, *Table 1* lists the indicators used, including the number of films, home market size, admissions, market share, number of screens, and box office revenue. The Turkish film industry is in the small-scale film country list with Ireland and Denmark.

3.   TURKISH FILM INDUSTRY

The Turkish film industry has not historically shown continuous growth. Due to the social, economic, and political factors, the characteristics of this growth have changed over the years. When the external relations of the Turkish film industry are analysed as a historical process, there is a clear one-way flow: foreign films have been imported and distributed in the domestic market with no reciprocal export. In the last twenty years, new processes, such as spatial decentralisation and new methods of integration into global markets, have emerged in Turkey. The general historical characteristics of the Turkish film industry, strong clustering dynamics and weak external relations, have become more significant. The industry can be analysed through four major periods in Turkey, in the context of the economic, social and political developments underlying the clustering and global integration.

3.1 First steps: 1896 - 1950

The Turkish film industry was established in the period 1896 -1950. The first public screening in Turkey took place at Sponeck pub on a Pera street in 1896 (Öz & Özkaracalar, 2011). All of the early screenings were made in Pera (Istiklal Street, Beyoglu) because the exhibitors rented cafes on the street to capture its vibrant social life. In the following periods, these cafes were converted into permanent cinemas. As stated by Öz and Özkaracalar (2011), most of the film import and distribution companies were located close to the Galata district towards the end of the 1920s. Over the following decade, all film businesses were clustered in the district of Pera and mainly on and around the Grand Street.

In the first stage of Turkish cinema, global interaction and the US film industry's commanding function began to affect the world film market. In terms of global integration, there were no developments in the Turkish film industry. Subsequent to the world wars, the European cinema sector became the major film exporter to Turkey. Exhibition of foreign films in the Turkish domestic market was the only connection with foreign markets.

3.2 Growing domestic market, popularisation and big decline period: 1950 - 1980

In this period, Turkish cinema underwent significant developments in terms of film production. These golden years of Turkish cinema are called the "Yesilcam" period, referencing a street in Pera district in which all film-related business activities were densely concentrated. It was also the resort area for those working in the Galata district and became the shopping, leisure and entertainment centre of Istanbul. The reason for the film companies' concentration was the "simultaneous presence of a sophisticated local demand and a few successful companies" inviting related activities to the area (Öz & Özkaracalar, 2011).

Eraydin (2002) comments that "Turkish businessmen believe what they see", referring to the pattern of imitation of firms' production dynamics and spatial organisation following business success, which leads to clustering. The founding of film companies in the Pera district led to intensive concentration (Öz & Özkaracalar, 2011) during that period, where linkages with external actors and markets were the most important dynamics. Co-productions with foreign companies and the use of foreign actors in movies were the two types of external linkages. In terms of company structure, there were both big and independent filmmaking companies. There were 26 co-produced feature films with foreign companies between 1950 and 1980 in the Turkish film industry (Yılmazok, 2010). The Leg system was the distribution model of Turkish movies in that period. In that system, distributors decided film genres and casts for their regions. Also, they were providing finance for film production. They had connections with exhibitors who were demanding regionally popular types of movies to fill their weekly programs. Foreign market connections during this period were co-productions and film exports, which both increased during that period. The increasing number of external linkages were important for the film industry's economic development, but it remained small-scale compared with respect to the total number of film productions. In order to increase external connections, such as international co-productions and film exports, both internal and external dynamics are important (Erkılıç, 2003), and the Turkish film industry experienced pressure from both internal and external

dynamics. Externally, the Cyprus operation, Israel and Arab war, and the overturning of the Iranian Shah negatively affected the exportation of Turkish films; internally, the increasing costs, lack of raw film stocks, piracy, TV effects, and terror decreased the number of films and audiences. Those problems caused a huge decline in Turkish Cinema towards the end of the 1970s. The industry came to a halt after the military intervention of 1980.

3.3   Restructuring period: 1980 - 1995

Many film companies were closed in the late 1970s. The surviving ones have continued their small number of film productions for both TV and cinemas in and around the Beyoglu district. Together with the globalisation process in the world economy, the industry was revived through local-global interactions. The Eurimages membership of Turkey and the entrance of foreign distribution companies into the Turkish market in 1989 were the most important developments of this period. Eurimages membership provided financial support to a number of film projects. Movies made with the support of Eurimages were generally low-budget and commercially unsuccessful films, although they were artistically successful B films in both national and international markets. Thus, in this period of restructuring, the Turkish film industry integrated into the global market and especially European markets with artistically successful films. However, the relationships within the distribution stage were led by major distributors of international markets over their local branches, meaning the distribution of US films in the Turkish market but not vice-versa. The reach of these international distributors also affected the exhibition stage, through the increasing number of foreign films exhibited in local cinema theatres.

3.4   Globalisation of the Turkish Film Industry: 1995+

As with the other sectors of the economy, globalisation changed the actors and relationships of the production side of the film industry in Turkey. These changes led to the revival of the Turkish film industry, however, despite the increasing number of films produced in the period, it is not comparable to the success of the Yeşilçam era in either sheer number of films produced or character, as it was during this period that the key players in the Turkish film industry shifted to those of today's globalised film industry. After 1995, the Turkish film industry began dispersing into the European part of Istanbul from Yeşilçam Street and Beyoğlu.

Global integration generally occurs through co-productions and geo-cultural marketing. Moreover, through a stylistic adaptation strategy, some films began to use new techniques for global integration. Globalisation processes especially affected the relationships between the actors of the industry, both national and international, making them more intense and complex. This led to co-productions with some US and European partners in the production stage. Despite being limited in number and unsuccessful at the global scale, these partnerships provided increased diversity of financial resources, including Eurimages funding and, for some film companies, funding from geo-cultural markets and global sponsorships. Moreover, these developments provided the entrance of TV Channels into the sector as sponsors and also increased the role of governmental support. This period also saw the rise of bilateral relations between global and local producer

companies; however, these have been generally limited to the production of auteur films, which struggle for economic success globally.

4. ANALYSIS

This analysis of the Turkish film industry aims to clarify its production structure and external linkages, and to investigate its industrial geography as well as the level of its global integration; however, as there is a lack of statistical data on the representatives of the sector and details regarding the films, such information was collected via questionnaire. This part of the paper is mainly about the preparation of this questionnaire, its structure and the findings. **Structure of the Questionnaire**

The questionnaire is composed of three main parts divided by its main aims, and includes different types of questions, including open-ended and multiple choice questions, and questions using Likert scales.

The first part of the questionnaire gives general information about the company that will be used to analyse the structure of the company. The questions in this part ask about the past and present dynamics of the companies, including their co-productions (national and international), the methods for establishing partnerships, experiences through the production process, and possible multi-sector structures.

The questions of the second part aim to understand the production of the film industry. This part consists of three sub-categories, focused respectively on relationship networks, external linkages and partnerships. The questions on relationship networks aims to analyse the relations of the companies with others over their last projects. They refer to the whole stages of film production including not only pre-production, production and post-production; but also finance and distribution, too. This part of the survey also questions the density and frequency of networking relations as well as the satisfaction from these relations. The tendencies observed in the film industry especially after 1990s, such as national and international co-productions, were also interrogated. It was aimed to understand the reasons and ways producers used these processes regarding the dynamics of competition, clustering and creativity. The other issues questioned are the main strategies used by producer companies to reach foreign markets and release in them.

The last part involves questions regarding financial resources, institutional relations, labour processes and other supportive sectors, and aims to comprehensively detail sectoral relationships, and industrial organisation within a comprehensive perspective.

4.2 Preparing the Database for Questionnaire

The questionnaire was conducted with production companies in the industry, however, it was difficult to reach a full and exact list of film producers in Istanbul. The second step was therefore to acquire a list of producers. The information gathered from the State Institute of Statistics and professional organisations related to the film industry was both inconsistent and incompatible. Thus, the first steps of the field survey aimed to produce a list of active Turkish film producers for a thorough analysis of local and global production networks.

Only four film producer associations were listed and confirmed through the official website of "The Ministry of Culture and Tourism: Directorate General of Copyrights and Cinema", which were SESAM(Professional Union of Film Producers, Importers, Cinema-owners), SEYAP(Film Producers Professional Association), TESİYAP(Professional Association of Television and Cinema Film Producers) and FİYAB(Film Producers' Professional Association). Their member lists were reduced to a single list of production companies, comprising a final total of 182 companies. The last step to prepare the questionnaire was a pilot study to test it, which was made with eight of the companies from the list.

There were also difficulties conducting the questionnaire. It was possible to get in contact with only 75 of the 182 companies, and only 45 companies answered the whole questionnaire, 25% of the total and 60% (45/75) of the companies contacted.

The questionnaire assumed the dual structure of the sector from the first step, however, the common characteristic for these two groups of producers was the absence of systematic records of their previous projects. Because of this problem, the questionnaires had to be conducted with the company owners, as they tended to have more accurate data as the decision makers central to all filmmaking processes. Unfortunately, this further minimised the number of companies that were able to answer the questionnaire.

15 of them were 'one-man firms' with no institutional record on former projects except on agendas or notebooks. These agendas were kept by company owners and included all information about the films regarding their budgets and expenses, as well as the contact information (generally mobile phone numbers) of other film producers in Istanbul. Besides the less professional structure of these 15 companies, the others (30/45) were more organised and institutionalised. This second group of producers, which employed more people, made film projects every year and achieved better box office ratings. Moreover, the institutionalised structure of this group of producers allowed them to act in different areas of the audio-visual industry simultaneously.

4.3   Cluster analysis

Beyoğlu district is the center of Turkish cinema life and is marked by its organic development over time. It is also an important centre for film production. Based on the interview, it was found that 42 of the 45 active companies are located in Beyoğlu district (25), Beşiktaş (11) and Şişli (6) (*Figure 1*). The study focused on the Beyoğlu district, as it was difficult to make an analysis of the geographical concentration of all firms.
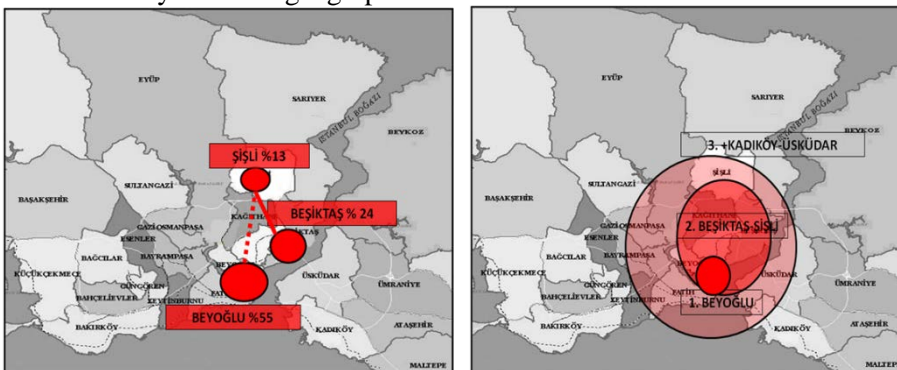

Figure 1. Film production companies in Istanbul (45 producer), Source: Survey Results

This study takes the first 200 most successful films, as per box office ratings, as the basis for the pool of active production companies, representing a total of 118 companies. There were 76 contactable companies, and of those 66 are located in Beyoğlu, Beşiktaş and Şişli. These areas are the first three vertices on the European side of Istanbul based on other reviews made on the address data on the SESAM member list and FİYAP producer association. There were only 13 firms on the Anatolian side, located at Kadıköy, Beykoz and Üsküdar. Compilation of data was only achieved for 45 companies.

The questionnaire asserts that the spatial preferences of the interviewed firms are determined by accessibility, socio-cultural environment and the quality of physical space. Affinity to the public services, related institutions and the firms working together are the other factors affecting the spatial preferences of the sector. However, the intensity of services and cultural facilities in the region do not feature as important factors on preferences.

Representatives of the sector indicated that their main reasons for staying together with other firms were the chance of developing face-to-face relations, ease of working together, working on similar conditions and trusted environments. Beyoğlu, Beşiktaş and Şişli are all localities hosting rich cultural activities, colourful nightlife and commercial and cultural centres. Based on interviews with representatives of companies located in Beyoğlu, the area has many problems with transportation and parking, narrow locations, and security issues; this has led many to move from Beyoğlu to more prestigious areas in the city. Despite this, the firms overwhelmingly preferred to stay in Beyoğlu to develop relations with other firms more easily by staying inside the city. While some of the firms emphasise the historical and cultural identity of the region for their ongoing stay, others point out the existence of supportive sub-sectors in Beyoğlu.

The survey also analysed the mobility of the production companies. 26 of 45 companies were established in Beyoğlu and 13 companies were established in Beşiktaş and Şişli. Furthermore, the number of companies conducting activities in spatial terms is 24 of 45 (53%), and there is a tendency to move through the Ortaköy-Levent and Şişli, besides movement within districts. Centrality, accessibility, affinity to prestigious places and sources of finance are the most important reasons for moving; existing rents, accessibility and spatial sizes were important motives for movement within districts.

In addition to the questionnaire, a geographic concentration analysis for montage studios, firms leasing equipment, film studios, modelling and casting agencies, distribution firms and professional organisations was made. Generally, their location preferences indicate that they are concentrated in the same districts together with film producers (Sayman & Kar, 2007).

The film industry shows an intense process of globalisation. Every day a different country attempts a joint production strategy to get its place on the world market or to increase its market share (Canada, Izland, Ireland, Australia, China and some European countries, such as France, England and Germany). Thus, the survey also questioned the tendency of working with foreign firms in the Turkish Film Industry. The tendency for co-production has become a prominent feature of the Turkish film industry, as 19 of 45 firms (42.2%) are involved in co-production films produced with foreign companies. Additionally, the Cinema Council of the European Union has promoted co-production projects via Eurimages support, which the Turkish film industry has taken annual advantage of every year since 1990.

The questionnaire revealed that international festivals act as facilitators for the establishment of these foreign partnerships, as significant networking opportunities motivating future co-production. The festive atmosphere eases

communication and its effects provide an opportunity for company representatives to meet each other and view each others' productions. Eurimages and international festivals are the most important exogenous factors for the Turkish film industry. Co-production projects provide opportunities for collaboration between powerful global actors in the industry, including producers, directors, and other members of the cast, and provide important competitive advantages. State support is crucial to this process. As this is a very recent development for the Turkish film industry, only a few associations have been established, such as the Film Industry Development Association, the Turk Film Council and Platform for Cinema. They are composed of representatives from the film industry, follow world developments and aim towards integration. As a result, the Turkish film industry cluster remains weak on external linkages but has a system in place to adjust to the global market.

Finally, five other dimensions of clustering (Bathelt, 2004) will be evaluated through the İstanbul film industry cluster. The dimension of *horizontal relations* represents the relations between the firms actively working in the same branch of the industry. Close proximity to rival firms and the resulting interaction with them offers new competitive advantages through production differentiation and innovation. A 70% score in the survey suggests that co-production with local and foreign producers provides a competitive advantage to firms, but this does not represent current practice. The dimension of *vertical relations* refers to commercial and non-commercial dependencies. Results show that vertical relations provide financial support for producing big-budget projects. The firms tend to relate with the firms located in the same region when they are from mutually supportive sectors. According to this analysis, the importance of dependencies on non-commercial factors, such as the interchange of expertise and learning on building partnerships and cooperation, remain at a perceived 50% for the Turkish film industry. The dimension of *externality* is examined through the relationships developed through Eurimages and festivals. The results indicate that there is still no international organisation conducted through the networks made through the big firms' own relationships. The process of coherence and adaptation is the aspect of pace of development, concerning whether the sector can match the developments of the world film sector. Internationalisation and globalisation tendencies of the film sector occur through co-productions, outsourcing (dependent on external sources of funding via taxes and direct financial support) and runaway production, which refers to the realisation of different phases of film production in different foreign countries. Thus, the Turkish film industry lags behind the world film market. Finally, the *international* dimension indicates different perceptions regarding the role of state. While some of the representatives of the sector complain about the lack of state involvement, others (especially larger firms) prefer little or no state intervention in the industry. In this context the *institutional* dimension remains insufficient.

4.4   **Findings of the Questionnaire**

The high number of new firms in Turkey indicates the dynamic structure of the industry. Nearly half of the interviewees (19 of 45 producers) were established after 1995.

The analysis of the production organisation of the film industry indicates that there are two groups of producers actively working in Istanbul. In the first group, there are multi-sector companies that produce big-budget popular

films. They generally operate in different sectors of the audio-visual industry simultaneously in order to benefit from multiple income streams and to mitigate the high risk of film production. However, the second group of producers is comprised of small-scale companies that generally produce auteur films with low budgets.

According to the vertical integration analysis of production companies, only a limited number of companies (5 of 45) are large-scale and dominant, and are actively working on both the distribution and exhibition phases of production at the same time. These companies, with vertically integrated structures, can produce big-budget films with wide-ranging exhibition.

The film industry is based on intensive relationship networks, which allow for the minimisation of production time through the collaboration of various actors. The results of the questionnaire demonstrate this complex network structure in the value chain of the Istanbul film industry. The main phases of film production that gather all related actors together are the finance, production (including three sub-stages), distribution and exhibition phases. The central financial sources for films are generally the producers themselves, TV channels and international organisations such as Eurimages. Nearly 69% of Turkish film production companies (31/45) produce films with budgets of up to two million dollars, which is far less than the typical Hollywood budget.

Small film-production companies are the drivers of competition and creativity in the industry. Nearly 50% of all İstanbul film companies operate with less than 10 full-time employees. However, as the major type of employment in the sector is freelance work, the number of employees tends to increase during the production process. Major production companies in the sector employ more than ten workers.

The analysis also indicates that the number of co-productions are increasing in Turkey following the general trend of the world film industry.

The analysis indicates that 62% of the film producers (28/45) have made co-productions, 68% of which (19/28) are internationally co-produced. The partners of these internationally co-produced films are generally from European countries. These projects generally have limited, state-funded budgets, with some receiving special funds from Eurimages. They generally initiate these partnerships in international film festivals, benefiting from the reputations of directors or from pre-established acquaintances, leveraging existing relationships from previous projects.

For co-productions, technological competence, creativity and quality of labour were given as the basis for evaluating the level of satisfaction from the partner companies through all stages, from production to exhibition. The results show that these companies were generally satisfied across these characteristics at the production stage, however, the level of satisfaction suddenly decreases for post-production stages, including distribution and exhibition.

According to the production companies, the foremost factors of competition in foreign markets are the production of international co-production films and the marketing of them. Moreover, using novel technologies and filmmaking styles and the use of star actors (national/international) in casting and producing films with bigger budgets are accepted as the other factors of competition in the sector. Competition is an important factor in creativity, but the lack of it increases the importance of the screenwriting stage for Turkish companies. Taking everything into account, financial deficits and lack of qualified labour are the most important problems restricting creativity in the Istanbul film sector.

Co-productions, mainly motivated by preferred production, funding, marketing and distribution channels, have become the central strategy in the Turkish film market for global integration. Approximately 70% of production companies prefer co-productions to facilitate big-budget film projects. Moreover, they aim to reduce the risks in the sector by benefiting from the support gained through co-productions. However, as co-productions increase creative competition, the increasing quality of film projects, financial advantages and advantages gained through Eurimage membership become the most important motivations for co-production.

On the question of global integration problems for the Turkish film industry, the results show that producers believe the state is responsible for the current position of the industry, in relation to the lack of specialised cinema institutions and support systems, as well as disadvantages due to tax. Furthermore, producers lack necessary capital and support from sponsors, and suffer from deficiencies of the distribution and marketing networks.

Consequently, the Turkish film industry has a dual structure, according to its film production dynamics. While the major production companies, which have strong networks with global actors in the sector, benefit from the production of big-budget films with star actors and large film crews, small-scale, independent producers focus on making auteur films with limited budgets and small film crews.

5.   CONCLUSION

Istanbul is definitely the heart of the Turkish film industry, which is in the process of development, and especially has been since the 2000s. The analyses show that the Turkish film industry, with its varying actors in the production process, displays the characteristics of a cluster in Istanbul, primarily located in the triangle of Beyoglu, Besiktas and Sisli. The spatial dynamics of the Istanbul film industry represent a shift from concentration at one unique centre (Beyoglu) to a sprawl within the triangle (comprising Beyoglu, Besiktas and Sisli). The multi-centred spatial structure realised after this decentralisation process represents a new characteristic for the Istanbul film industry. Despite the fact that clustering seems to have lost some of its significance, the representatives of the sector still emphasise the importance of face-to-face interaction in the clusters.

The Istanbul film industry cluster has a high geographic concentration. When the possibility of face-to-face interaction, capability of fast organisation, and the environment of trust are considered, the cluster seems successful with its existing structure. However, the analysis of the Istanbul film cluster, from the perspective of local-global linkages, indicates problems relating not only to the realisation of external linkages and partnerships, but also to their effect on success. Eurimages and artistically successful movies are the main sources of connection to foreign markets, but the sector's dominant, mainstream firms are in a weak position in terms of global relations and co-productions. Clusters, which may be evaluated as the source of success in the sense of internal relations, are an embodiment of significant deficiencies for the local-global relationships of Turkey. This is because, despite being acknowledged as the source of creativity and innovation, clusters cannot produce economic success independent of other strong external markets or when there are no other connections. Despite dominating the domestic market since the early 2000s, the Turkish film industry needs to develop more

connections with foreign markets and integrate into the global film market to overcome a potential crisis in the near future.

The Turkish film industry seeks to integrate into global markets through co-production, overseas exhibitions, through art-house films for niche markets and distributors, and exhibitions in a culture-like market, however, the implementation of these integration models and their relative achievements in the domestic market since 2000 are still very small in scale compared to the global market. The analyses showed that the Turkish film industry is partially integrated with the global film market, mainly through geo-cultural marketing and co-productions. The industry should follow and develop these global integration models in order to avoid repeating historical problems.

This study questions the film industry to understand the position of Istanbul within the global network. In relation to the global film industry, Istanbul is situated on the periphery of the new global economy. In order to achieve sustainable economic growth and integration into the global economy, it should be more focused on the cultural or creative industries and make improvements to the social, cultural and physical aspects crucial to the industry's growth.

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SPSD

The Role of GeMaSPeKoLa in Supporting the Preservation of Semarang Old Town

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Abstract: The local government of Semarang City has made an effort to preserve all of its historic assets to sustain the local value of the city and has registered for the city to become a World Heritage Site. It has invited local people to participate in these conservation activities. The impetus for this has come from the degradation of Old Town, especially due to the disregard for the preservation of old buildings as they are transitioned into commercial use, where the old facades have not been maintained. This research discusses the management of Old Town through the optimisation of the role that the GeMaSPeKoLa plays and finds suitable strategies for increasing public participation in conservation. Using a descriptive method, the research details the role of the GeMaSPeKoLa as a social community movement concerned with the preservation of Old Town. This kind of social forum strengthens the local public's participation in the preservation activities and helps to prepare Old Town for becoming a World Heritage Site. Through observation and in-depth interviews, the role of the GeMaSPeKoLa in reducing the problems facing preservation are explored. This research builds a strategy to optimise the role of the GeMaSPeKoLa in the preservation activities supporting Old Town becoming World Heritage listed.

1.   INTRODUCTION

Old Town, as one of Semarang City's assets, along with a number of high-value historical buildings, demands serious handling, not only from the government of Semarang, but also from the community. It is necessary to make an effort to preserve the historical value of Semarang City, especially considering Old Town is currently proposed as a World Heritage Site and an international tourism destination that is capable of generating revenue locally.

Old Town is continuously undergoing change, mostly due to construction in the region failing to conserve traditional aspects. Therefore, the Semarang City Government needs to work with the community to preserve Old Town so that it can keep the architectural value of its ancient buildings. Catanese and Snyder (1979) say that the activities of preservation and conservation of historic buildings are an integral part of urban planning. The preservation and conservation of historic buildings is also essentially closely linked to three important matters: (a) the historical development of the city, (b) the old town's historical area or environment, and (c) the diverse

context of "urban architecture" and the architectural style of old historic buildings. Therefore, in preservation and conservation activities there is always a common thread through the relics of architectural work that reflect the cultural values of the communities of the past.

In managing the old urban area, a site of cultural heritage and home to many artifacts, the city government needs to be especially careful with prescribed the forms of preservation and maintenance of objects of historical-cultural value (Pawitro, 2015). Preservation and conservation activities for old buildings with historical value can be packaged and targeted within historical old town areas. The city government's focus on this activity appreciates: (a) the architectural value of old buildings; (b) the historical and cultural values of the city; (c) the value of education, particularly for future generations; and (e) the benefits from tourism and recreation within the city.

Community participation in the conservation of cultural heritage is also a priority for the utilization of cultural heritage sites. According to Suwannarat (2015), public participation is a social process where people can act as stakeholders and be involved in, influence, or decide upon public issues. The level of participation can vary, and the level of public representation reflects not only the importance of the issue but also the social ecology - the structure and quality of life in a community. Participation is interestingly defined by Suwannarat (2015) through the concept of the ladder metaphor, in full the "ladder of citizen participation", where the height of the ladder reflects the quality of participation; the ladder has eight different levels that illustrate the steps of how people participate in a public issue in varied density depending on their personal authority.

The community refers to an entity composed of different groups interacting through a certain mode in a certain region (Healey, 1998). Every community has its own interests and role in the city and society, which usually determines the way its development aligns with its goals. Community participation usually refers to a policy-making process of official or unofficial cooperation among the professionals, family members, community organizations, and administrative officials (Healey, 1998). The achievement of community participation is in its awakening of the community spirit of local residents. The sense of community is the pre-condition for community participation, and this participation can encourage residents to deeply consider how to combine their personal interests with the future of their society and economy, thereby improving the quality of the community participation.

The current problem results from citizens' lack of awareness or care for the preservation and protection of the Old Town area as a conservation asset. An illustrative example of this is that some of the ancient buildings in the Old Town have undergone transformations in their function and façade, where they have been sold by their owners to become cafes, restaurants, and other business. Some were left damaged, badly maintained, and dirty. Local government did not provide a good enough conservation incentive to the owners of old buildings, which meant they did not have enough funding for maintenance. Therefore, community participation is a priority for all conservation of cultural heritage assets.

Conservation efforts must increase public awareness about the existence and importance of cultural heritage buildings and assets so that citizens can be more aware and involved in the participation of conservation activity. Community participation and efforts in cultural heritage preservation tend to be similarly dynamic. Community participation is capable of mobilizing

resources as needed ([Hall, 1999](#)), while preserving cultural reserves is a process of accepting environmental change. Thus, community participation in the conservation of cultural heritage is a process of community involvement in the effort to maintain the existence of cultural heritage. According to ([Sullivan & Mackay, 2012](#)), there are several stages in the preservation of cultural heritage:

1. The identification and description of cultural heritage sites.
2. The interpretation of cultural heritage sites.
3. Planning and making policies on preservation of cultural heritage.
4. The implementation of established policies.

The roles of government include to protect and supervise the community in the direction of all conservation activities, to ensure that they do not stray from the applicable conservation laws. Various groups have formed around community conservation movements for Old Town. In this research, all of the community conservation movements are referred to as GeMaSPeKoLa (*Gerakan Masyarakat Peduli Kota Lama*). The GeMaSPeKoLa have already conducted many activities and movements to conserve and preserve Old Town. These activities were aimed at increasing the awareness of the whole community, in order to work together to realise Old Town as a World Heritage Site. The role of Old Town's community conservation movement (GeMaSPeKoLa) is very important in supporting the government's efforts to preserve Old Town and the surrounding environment as one of the world's tourism destinations.

To further the understanding of the role of GeMaSPeKoLa and look for suitable strategies to increase the level of participation of GeMaSPeKoLa in preserving and conserving Semarang Old Town, the following research looks at community participation in public issues, and the community group as a participant in conservation activities, in the context of the Semarang Old Town heritage site.

2. METHODOLOGY

The research method used in this study is a qualitative approach using an exploratory case study method. An explorative case study is a method that emphasizes the exploration of a case study in order to know the basics of problems facing conservation and facilitate researchers to find significant ways to reduce problems. This study also aims to describe the interaction between phenomena associated with individuals, the community and institutions in the conservation of Old Town. The following steps were taken:

1. Data were categorised into primary and secondary data. Primary data included information about the role of community groups concerned with Old Town conservation. The respondents were local people, academics, members of Old Town Conservation Group, and conservation experts. In-depth interviews were conducted. Secondary data was taken from references, documentation, and visual observation. In the visual observation, the researcher acted as an independent observer, free to observe, examine, and take measurements. According to [Mulyadi (2014)](#), visual observation is very good for understanding the composition and shape of a city, and to evaluate its potential and shortcomings.

2. An in-depth analysis of data from various sources was carried out.

3. The findings of a triangulation analysis was matched with the described theories according to their theoretical background, in order to discover the main characteristics of the role of GeMaSPeKoLa.

3.   RESULT AND DISCUSSION

Conservation experts define conservation through various perspectives on the concept of preservation that focus on different implications. The term conservation commonly used by architects refers to the 1981 Charter of the International Council of Monuments and Sites (ICOMOS) known as the Burra Charter. The Burra Charter mentions that "*conservation is the concept of the process of managing a place or space or object so that the cultural meaning contained therein is well preserved*". This needs to be expanded more specifically to include the maintenance of morphology (physical form) and its function. Conservation activities include all maintenance activities in accordance with local conditions and situations as well as development efforts for further utilization. When associated with the area, the conservation of the Old Town in Semarang City and other sub-sections of the city include an attempt to prevent the activities of social change and inappropriate physical and non-physical utilization of the space.

A conservation program should not only be maintained for it's authenticity and maintenance, but must consider other benefits, such as the economic value it brings to the owner or citizens, and these other considerations are fundamental to the goal of the dynamic preservation concept. In this case, the role of the architect is to determine the appropriate function because not all functions can be utilized. These activities require cross-sectoral, multi-dimensional, disciplined, and sustainable efforts. While preservation is an attempt to preserve cultural heritage for posterity, as historians have said, the present and the future is the past of the next generation (Wirastari & Suprihardjo, 2012).

Semarang Old Town, a unique cultural heritage site in Semarang City, has been proposed as a World Heritage Site. The Old Town of Semarang is located in the northern Semarang subdistrict. The boundaries of Semarang Old Town are as follows: in the north is Merak Street with its Tawang station; in the east is Cendrawasih Road; to the South is Sendowo Street; and to the west area is Mpu Tantular Street and the Semarang River.

The Old Town of Semarang is about 0.3125 km^2. Semarang Old Town is locally known as Little Nederland because it was formerly inhabited by Dutch people. It began to develop into its identity as Semarang Old Town in 1741. The European region began as office buildings and warehouses and later developed into a center of culture and trade with many hotels, elite housing, and other new buildings. The fundamental feature of a European Village is the art deco architecture of the buildings (Hendro, 2015).

Like other cities under Dutch colonial rule, a fort was built as a military centre. This fort has a pentagonal shape and was first built on the west side of Semarang Old Town. The fort has one gate on its south side and five watchtowers. As the Dutch settlement began to grow on the east side of the "Vijfhoek" fort, many houses, churches and office buildings were built in the settlement, which later developed into Semarang Old Town. This settlement is known as "de Europeeshe Buurt" and the architecture and urban planning of the settlement bears resemblance to urban planning and architecture in the Netherlands. Semarang River was also built up to resemble canals in the

Netherlands. At that time, the Viffjhoek Fort remained separate from the Dutch settlement.

With its many colonial buildings, Semarang Old Town was planned as the centre of the Dutch colonial government after the signing of an agreement between Mataram and the Dutch East Indies Company (VOC) on January 15th, 1678. Life inside the Fort was well developed and new buildings started to appear. The Dutch colonial government built a new Christian church called the "Emmanuel" church (now known as "Gereja Blenduk"). To the north of the Fort was built a military command centre to defend the fort.

In 1824, the gate and the watchtower of this fort began to be demolished. The Dutch and other Europeans started to occupy the settlement around Bojong Road (now Pemuda Street) and Semarang Old Town grew into a small city. During Governor General Daendels time (1808-1811), post roads (Postweg) were built between Anyer and Panarukan. The "de Heerenstraat" street (now the Let Jend Suprapto Street) became part of the post road (van Lier, 1928).

A quarter of a century after the end of the VOC, Dutch settlements began to expand to Bojong Road, westward (along Daendels Street) and along Mataram Road. By the 20th century, Old Town grew rapidly and many trading offices, banks, insurance offices, notaries, hotels and shops were built. On the eastern side of the Blenduk Church, an open field was built for military parades or musical performances held in the afternoon (van Velsen, 1931).

The Old Town area of Semarang was designed in a European style, both structurally and aesthetically. This area has a centralized pattern with government buildings and Blenduk Church at its centre. The pattern of urban design is the same as in European cities, while the character and uniqueness of the architecture can be seen in the building details, ornaments, and decorative elements of the buildings. This European architecture brings a sense of architectural diversity to Central Java and the surrounding areas, and in turn enriches the architectural treasures of the country.

However, until now, efforts to improve the quality of the buildings and environment in Semarang Old Town area have not been optimised. With the increasing connectivity and mobility of modernization, the reasons for conservation have multiplied and are frequently changing (Mo & Wang, 2014). The analysis of GeMaSPeKoLa's role in the conservation of Semarang Old Town will be an attempt at exploring patterns and activities of community groups, which should help to refine the ideal model of public participation in conservation activities.

Semarang City Government has made efforts to preserve existing cultural heritage buildings by revitalizing Semarang Old Town with the enactment of Local Regulation No. 16 (2003) on Old Town Building and Environment Planning. These efforts have more subtle benefits for the public, however, there are also efforts to pave the Old Town streets, install old-fashioned street lights and utilise Tawang embankment as a place of recreation. As the Old Town acted as the centre of government and trade in the past, it can be used again as a landmark of Semarang City.

The government is embracing citizen involvement in conservation activities and placing them at the core of conservation, stating that local communities and other agents should actively participate in conserving Old Town, which, as a model, is a first for community-level conservation, but has in fact been adopted in other fields. Local government instituted a traditional market held inside the Old Town area, which sees many people

selling antiques and other old items. To support government programs related to conservation, communities initiated the Old Town Conservation Movement (Gerakan Masyarakat Peduli Kota Lama or GeMaSPeKoLa). This movement was a reaction to the following:

1. The Old Town environment was decreasing in quality.
2. Many ancient buildings were damaged and abandoned.
3. Some buildings have been transformed into modern buildings.
4. Most of the people do not understand the old building conservation rules properly.
5. High level of criminality.

However, the GeMaSPeKoLa was formed as a volunteer group and still receives subsidies from the government through annual project proposals. Community-based organisations often also coordinate with their respective committees, which implement new policies to do social entrepreneurial projects as well as to sustain the conservation movements, and hope to have a more effective impact, at a higher level. To guarantee its success, formal government guidance is needed, which could be an ordinary Memorandum of Understanding (MoU), followed by the establishment of new related regulation.

The public awareness about conservation activities in Semarang Old Town area has accelerated since the government announced that Semarang Old Town would be proposed as a World Heritage Site. People have agreed to support and execute the conservation activities and have been willing to act together with local government and academic experts. On the other hand, based on the field surveys, some communities are still not aware of preservation and conservation activities in Semarang Old Town, which means that the preservation activities of Semarang Old Town have not been run optimally, however, while only partial, encumbered, and poorly organised, the community participation in the preservation of the city's heritage needs to be widely and sustainably supported by the Semarang City Government and the academic society (University). This means that local government and academic experts should continously provide technical assistance to local people's conservation activities, towards the goal of its becoming a World Heritage Site.
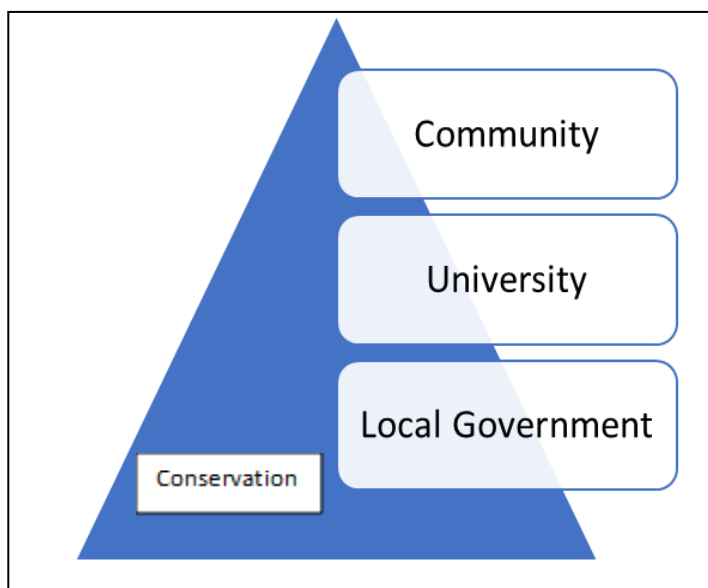

Figure 1. Three pillars of actors in the conservation of Old Town

Currently, in Old Town itself, a lot of activities have been used to revive Semarang Old Town as a historical tourism destination. These activities have mostly been held by communities, academics, and the city government. The city government has long been proactively working to mitigate the Old Town degradation. They issued Local Regulation No. 8 (2003) on Old Town Building and Environment. However, despite the existing regulations, the condition of the old Old Town area is still worsening due to minimal enforcement of the law. The city government, academics, and citizens should be more active in the development of Semarang Old Town employing strategies actively and continuously, which should optimally incorporate the participation of the Semarang public. This is structurally described in the following figure:
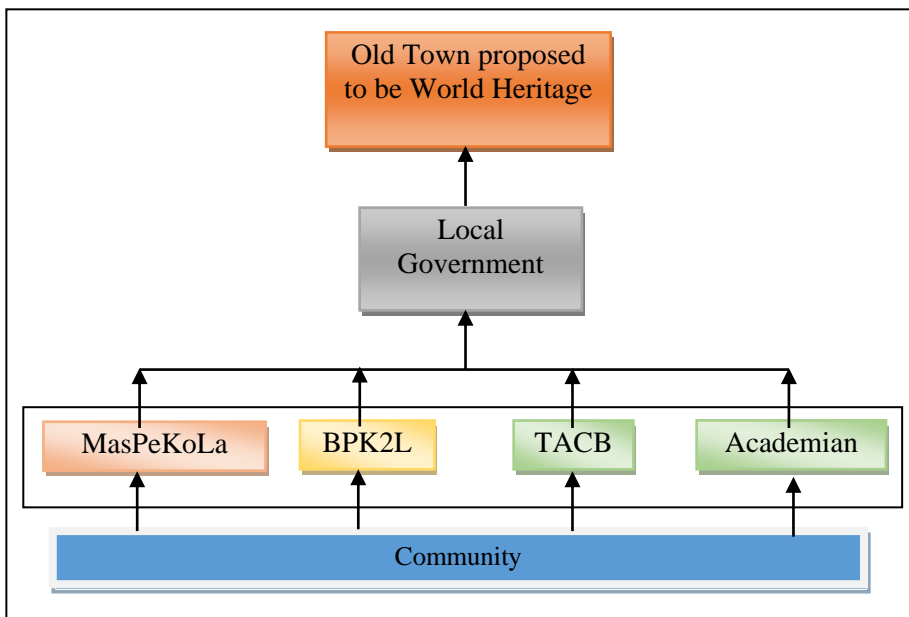
Figure 2. All Groups of Participants in the Conservation of Old Town

MasPeKola is an abbreviation of Masyarakat Peduli Kota Lama (Community that cares for Old Town), BPK2L is Badan Pengelola Kawasan Kota Lama (Old Town Conservation Board) and TACB is Tim Ahli Cagar Budaya (Cultural Heritage Expert Team). Most of their members are from the community that care about the conservation and preservation of Semarang Old Town. They are supporting the local government to prepare Semarang Old Town to become a World Heritage Site. The preservation of the city's heritage needs to be more intensively socialized to the wider public as a synergistic activity, in order to produce social, economic, and cultural benefits for collective life that is not merely documented. Furthermore, it is necessary to have a large-scale official announcement of this conservation effort, emphasising citizen participation. In the Old Town itself there is the community-led Old Town Conservation Movement (GeMasPeKoLa) pioneered by citizens who were aware of the importance of revitalizing the Semarang Old Town, and beyond that are parties aiming to produce a better cultural heritage area. Ten years ago, events called Denting Dawai and Kota Tua were held, playing concert music in several buildings in the Old Town area. The organizer of the event, trying to revitalize Old Town, was optimistic about the pulse of life in the region, however, after several concerts, the event stalled and Old Town was quiet again. In the past three or

four years, there has been a renewed effort to revive the dozens of colonial heritage buildings. According to records, the preservation of Old Town was begun in 1995 by an architect. Until the early 2000s, they encouraged the people and government to reorganize Old Town, beginning with an Old Town Foundation, however, this architect then abandoned their efforts, along with those conservation plans.

After that, other communities that care about Old Town began to appear. The current preservation movements of the last few years can be understood as a new form; these movements are spearheaded by communities who are aware of the importance of safeguarding the area. At the same time, the role of communities such as *Oase*, *Lopen*, *Kokakola*, *Orartoret* and others have been significant in bringing the Old Town area to life. They have repeatedly held activities at places in the Old Town area, including regularly scheduled events for people to come and enjoy. *Oens* Semarang Foundation also played a major role through the Old Town Festival with the Sentiling Market (candlelight market) theme. The theme was taken from the *Koloniaale Tentoostiling* event which was held one hundred years ago in the city of Semarang. They are determined to achieve the status of World Heritage Site by 2020. The following image shows the relationship of these groups:
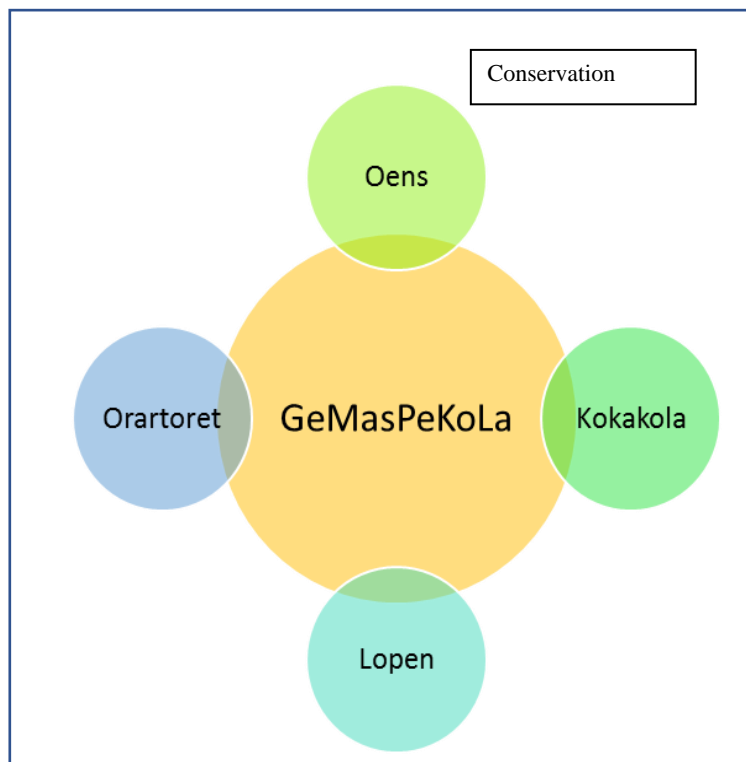

Figure 3. Community Groups of Old Town Conservation

Likewise, *AMBO* is a community group consisting of building owners in Semarang Old Town that have started a movement to preserve the area. Their buildings vary, ranging from empty buildings to buildings that have been preserved and transitioned into commercial buildings. The role of *AMBO* includes discussing the problems that Old Town faces, finding solutions, and communicating those solutions to the people of Semarang Old Town. For example, if there is blocked drainage, *AMBO* plays a role in mobilizing residents of Semarang City to work together to fix it. In this way *AMBO* has contributed greatly to the preservation of Old Town.

Regarding the above matter, the community activities should include disseminating the rules of building conservation, so that the owners of old buildings can renovate or reuse their buildings appropriately. Mentoring is also necessary, especially when a resident renovates an old building, for supervision and guidance during the renovation process in order to follow the conservation rules. *AMBO* also acts as a bridge between residents and other Old Town communities. People's concern for Old Town is also felt by the architect members of "Sketcher". These community groups consist of architecture students from many universities, professional architects, architecture lecturers, and other communities. They often hold drawing events for old buildings in Semarang Old Town and many other places outside of Old Town. They usually exhibit these drawings in Semarang Art Gallery and upload them to social media. These activities then attract new people into those kinds of activities.

On the other hand, a main constraint in encouraging local people to become involved in the GeMaSPeKoLa is lack of knowledge about conservation principles, which has meant that development of the Old Town area often continues based on individual perceptions about conservation. Another problem is the lack of systematic planning from GeMaSPeKoLa, an important aspect of public participation that is often overlooked. Systematic planning can lead to fruitful projects, but there is no systematic planning for people's participation in conservation development, which is a leading reason that these groups do not achieve the expected conservation targets set by local government.
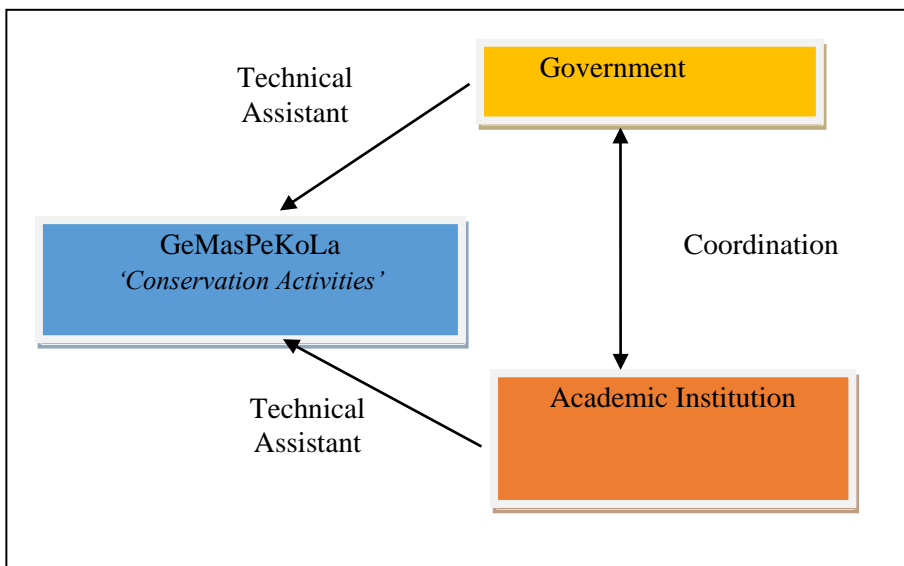

Figure 4. Increasing GeMasPeKoLa participation in conserving Old Town

Based on the above analysis, it could be said that the proper strategy to increase community group participation in the preservation of Semarang Old Town would include the following:

1. Providing technical assistance to community groups through local government and academic institutions.

2. Providing consultation to local people regarding conservation and preservation.

3. Supporting any activities related to Old Town conservation through local government and academic institutions.

4. Supporting the existing community group (GeMaSPeKoLa) through funding. Integrating community group activities with conservation development projects in Old Town to involve people in the area, supporting the conservation development of Old Town and bringing employment opportunities.

5. Empowering the participation of groups to engage in conservation and preservation efforts, and to enabling people to better manage and negotiate with existing conservation development systems, empowering local people to make decisions using their resources, knowledge and skills.

6. Increasing the sustainability of GeMaSPeKoLa conservation and preservation movements, guaranteeing the future of conservation activities and preparing the new model of Semarang Old Town as a World Heritage Site.

4.   CONCLUSION

Community-led Old Town Conservation movements (GeMaSPeKoLa) play a significant role in the Semarang Old Town preservation efforts. Under their management, conservation activities can run optimally, supported by government and academics. To encourage more community participation in Old Town Conservation movements, the government should incentivise the movements to continue their conservation activities and attract more community involvement in the conservation of Semarang Old Town. Moreover, to expand community participation and empower its participants, the government should strategically allow community innovation of different working models at each working step. While it is quite difficult, the challenge is to spread the perspectives and knowledge of heritage, conservation and community rehabilitation to other communities, and to encourage future generations of residents to pursue the same efforts, with the aim of sustaining the historical value of Old Town.

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The Role of Tourist Behaviour in The Determination of Tourist Attractions

Emerging tourist destinations in Jeju Island, South Korea through self-wedding photography

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Abstract: Recently, self-wedding photographs have become popular among soon-to-be-married couples, affecting tourism and industry in Jeju Island. From the research on three sites, *St. Isidore Farm, Camellia Hill and Saryeoni Forest Trail,* this article argues that photographers and self-wedding photographing tourists' role can be important in attracting new visitors by sharing photos through social networking sites. Using a mixed-methods approach - including analysing Instagram photo postings, on-site interviews with managers of the destinations and self-wedding photographers, and questionnaires with self-wedding photographing tourists - this study examines the process of discovering new sightseeing places by tourists through self-wedding photographs. The paper also identifies the characteristics of the photogenic spots and records the changes in places caused by these tourists. This paper challenges the understanding of existing tourism resources by asserting that self-wedding photographs and places in Jeju can be utilized as one of the tourism resources through discussion of wedding photographs and tourism.

1.   INTRODUCTION

Pre-wedding photo shoots became a ritual procedure for the bride and groom since the 1990s in Korea (Kim, M.-G., 1992). Recently, so-called self-wedding photography became a new fashion for wedding photography in Korea. Self-wedding photographing tourism is becoming a new trend in tourism of Jeju Island since 2013, and it is a factor in viewing natural landscapes and existing tourist attractions from a different perspective. As a result, the number of tourists visiting Jeju Island, where self-wedding photography and sightseeing are possible, is increasing (Park, J. h., 2016). Apart from the special purpose of wedding photography, self-wedding photographing tourists also participate in general tourism activities similar to ordinary tourists in Jeju Island. Therefore, it may not be possible to provide statistics for these tourists. However, increasing number of self-wedding

photography products, self-wedding photographers and new self-wedding related industries in Jeju Island may prove this trend.

Many scholars acknowledge that photography is inseparable from tourism (Chalfen, 1979; Garrod, 2009; Larsen, 2006; Sontag, 1990). The former studies focused on the impact or roles of tourist photography (Chalfen, 1979; Garrod, 2009; Larsen, 2006; Markwell, 1997; Oh, 2011; Sontag, 1990; Urry & Larsen, 2011). Despite the growing importance in the wedding and tourism field, few have explored and analyzed wedding photography in tourism (Adrian, 2006; Jia, Lück, & Schänzel, 2016).

The results of this study were taken from a mixed-method study of three famous self-wedding photographing spots in Jeju Island, *St. Isidore Farm, Camellia Hill,* and *Saryeoni Forest Trail.* These three sites are the most frequently mentioned spots in online news (Byun, 2017; Jun, 2017; Moon, 2016).

The purpose of this study is to explore the relationship between wedding photography and tourism and the process of tourism vitalization through the activity of photo taking in *St. Isidore Farm, Camellia Hill* and *Saryeoni Forest Trail.* Moreover, the study analyses the factors of the self-wedding photography tourism trend in Jeju Island, and examinee the tourist motivations and how the tourists navigate the sites.

This paper is divided into four parts. First, the introduction describes the trend of the self-wedding photography and the effect of tourism in Jeju. Second, the research methods explain the mixed-method approach used in this article. Third, by exploring the behaviour and motivation of tourists, the study clarifies the link between self-wedding photography and tourism in Jeju Island. Fourth, conclusions demonstrate the role of self-wedding photographing tourists, implications and limitations of this paper.

2.   RESEARCH METHODS

Figure 1. Research methods

The study uses a mixed-method approach including analysing online photo postings, questionnaires and deep interviews to investigate the possibility of self-wedding photographing spots as tourism resources for Jeju Island.

This study first analysed the background of self-wedding photography tourism in Jeju Island and revealed the changing paradigms of the wedding industry through literature, online news and magazines.

Secondly, through Instagram, this study looks at the places where the tourists and self-wedding photographers pay most attention. This study analysed Instagram photo postings because the location of the photos and

used hashtags could be recognised to easily retrieve landmark photos. 200 recent posts were selected and used from among 21,029 posts with 'Jeju Island self-wedding' hashtag for analysis (as of December 13, 2016). The researchers manually coded 200 photos and calculated the number and the percentage of the pictures.

Thirdly, the phenomena that had not yet been studied academically through in-depth interviews with the managers of *St. Isidore Farm, Camellia Hill, Saryeoni Forest Trail* and self-wedding photographers in Jeju Island (see *Figure 1*) were explored. Interviews were carried out with a total of 8 people; there were 3 managers at each destination and 5 self-wedding photographers living in Jeju Island (see *Table 1*). The in-depth interviews took about 60 to 90 minutes per person on site from October 3 through October 6, 2016. Through in-depth interviews with photographers in Jeju Island the current status of tourists, tourist motives, and preferences for self-wedding photography could be determined. Additionally, the managers of each site were interviewed and the changes of each destination due to self-wedding photography tourism were considered. The study directly quoted the interviews with managers of the sites since there is no secondary source to understand the status of each site. Additionally, this paper uses the same method to examine the new tourism trend of self-wedding photography tourism.

Lastly, tourist surveys were conducted to find additional information about the status of self-wedding photography in Jeju Island and the motives of their tourism. The questionnaires were distributed to the tourists who visited Jeju Island for self-wedding photography. Questionnaires were distributed from December 1, 2016, to June 30, 2017, through Naver cafes, blogs, Facebook/Instagram personal accounts, and KakaoTalk messenger and a total of 44 subjects participated in the questionnaires. The authors then eliminated the data from 18 interviewees who were not relevant to the purpose of the study. Among 44 subjects, data of 26 self-wedding tourists were analysed.

Table 1. Interviewees

		Ref. ID
Managers	St. Isidore Farm	M1
	Camellia Hill	M2
	Saryeoni Forest Trail	M3
Self-wedding Photographer	Jeju and You	P1
	MPnote	P2
	Son Sung-Joo Snap	P3
	Soo Yeon and Dae Hyun's Snap	P4
	Wed Island	P5

3.   RESULTS AND DISCUSSION

3.1   Emergence of self-wedding photographing tourists and changes of the sites

3.1.1   St. Isidore Farm

St. Isidore Farm is a dairy farm complex and is more famous as a Catholic sacred site than a ranch. The managing body is the Association of Rural Industry Development and operates seven business sites.

Most of the scenic spots, tourists' photogenic places, are with the ranch landscapes. The ranch has a grassland of 5 million square meters, and it is engaged in beef production, dairy business and a racehorse business.

Although it was not a sightseeing spot in the past, the number of tourists who shoot in the foreground of 'A Solitary Tree' (also called as an outcast tree), a ranch landscape and a unique Cteshphone architecture, has increased recently. "self-wedding photographing tourists increased from three years ago" (since 2013), and recently, it has become famous as a self-wedding photogenic spot, and a part of the site is becoming a tourist attraction (M1 interview). Currently, it is difficult to accurately measure the number of tourists because there are no admission fees, but "about 600 tourists are visiting each day including general tourists to Cteshphone, 'U-Yubudan' café, and 'A Solitary Tree'" (M1 interview).

Initially, "professional photographers visited Cteshphone". "Self-wedding photographing tourists and general wedding enterprises visited the spot" after seeing these photographs taken by the photographers (M1 interview). Afterwards, the general public who saw photographs of SNS (Social networking service) postings visited the site.

"The most famous spot for photo shooting at the destination is Cteshphone. A lot of couples, self-wedding photographing tourists and many group tourists such as camera clubs visit during spring and autumn. Additionally, families visit the spot during their holidays" (M1 interview).

Another famous shooting spot is 'A Solitary Tree'. "It was originally a place for shepherds to eat their lunch", but the tourists are not controlled despite it being privately owned land (M1 interview). Many tourists photograph with Leedal Oreum (parasitic volcano) in the background on the left side and on the right side with Saebyul Oreum scenes. "Tourists wait for their turn to take photos because of an air of melancholy to the scene" (M1 interview).

As the number of tourists increases, there are positive and negative changes. In 2014, amongst the grassland near Cteshphone, they constructed a parking lot for the increasing number of tourists taking photos of Cteshphone architecture with the Association's budget (M1 interview). In June 2016, the 'U-Yubudan' café, which sells beverages made from organic milk to tourists, opened in the parking lot near Cteshphone architecture. The 'U-Yubudan' café (Organic Milk Cafe) is a preliminary social enterprise operated cafe, and the Association of Rural Industry Development invested in the construction (M1 interview). To meet the needs of increasing tourists, the association is "planning facilities for tourists; milk processing facilities, restaurants, etc." (M1 interview).

However, the administrator of this site tried to "restrict access to the grassland of 'A Solitary Tree'" and "tried to limit shooting on the road within St. Isidore Farm". However, tourists recognized the place as public property rather than private property and "filed complaints" (M1 interview).

3.1.2 Camellia Hills

Camellia Hills is the largest camellia arboretum in Asia, which is home to more than 500 different species of about 6000 camellia trees. Camellia Hills has been a privately established tourist attraction since 2012. Recently, the site has been reborn as a self-wedding photography spot at an exclusive tourist attraction (Moon, 2016). As a result, the site is referred to as a self-wedding shooting spot in Internet news or on SNS accounts (Moon, 2016).

The managing body of the site is an "individual business operator". This site has become famous "since 2009 when Innisfree CF was filmed in Camellia Hills and it became known through various CF, movies, dramas and so on" (M2 interview). In order to promote the site, "the design team started SNS promotion from 2012, and made photo zones with garlands installed for tourists" who take photographs (M2 interview).

According to the M2 interview, there were "655,000 visitors in 2015, about 2,000 tourists a day, and the ratio of group tourists to individual tourists is similar". "Approximately 20 to 30 percent of tourists are couples" and "about 5 to 10 teams a day" are self-wedding photographing tourists.

"From 2014 to 2015, photo zones with a love theme were created with installed garlands" in the gardens of Camellia Hills for the couples. In addition, from 2015, the site is "offering rental services of props for the photography for the tourists (couple set, wedding set, family set rental)".

3.1.3   Saryeoni Forest Trail

Saryeoni Forest is located in the Jeju Biosphere Reserve area designated by UNESCO in 2002, and there are 78 categories and 254 species of vegetation. Saryeoni Forest Trail is the forest path, with a gentle and flat road in the middle of the mountainous area of Mt. Halla. "Forest roads for reforestation projects in one of the national forests of Korea Forest Service" was reborn as the Saryeoni Forest Trail by controlling the vehicles and constructing a trail in 2009 (M3 interview). The Forest Recreation Division of the Environmental Conservation Department in the Jeju Special Self-Governing Province is in charge of the general planning and management of the forest path and hosting of the events. Maintenance and management of the forest trail are taken charge of by the Park and Greenery Division of Jeju city hall and Seogwipo city hall according to the location of trail sections. Additionally, the National Institute of Forest Science of the Korea Forest Service is maintaining the course of Red Oreum and operating programs upon online reservation.

One of the famous places of Saryeoni Forest Trail for the tourists, 'Shiny Forest Trail' is surrounded by dense trees, creating a wooden tunnel-like atmosphere. Another famous place is 'Samdasoo Ranch' near 'Shiny Forest Trail'. Samdasoo Ranch has become known because of the Sony CF, and it is called the "Serengeti of Korea" as its' grassland scenery is similar to Africa and is a place many photographers and tourists regard as a photogenic spot (Choi, 2016). The two names are not official names but are used in the news (Park, M.-r., 2017) and social media to refer to specific places around the Saryeoni Forest Trail.

"About 2,000 tourists visit Saryeoni Forest Trail each day. Currently, shuttle buses are commuting from parking lots to the entrance of the trail" because of the increasing number of tourists and to solve parking problems (M3 interview). At first, the trail was for only hikers, but in recent years it became popular among self-wedding photographing tourists. The two places, Shiny Forest Trail and Samdasoo Ranch, became important places among professional photographers and attracted many self-wedding photographing tourists.

However, Samdasoo Ranch, an organic pasture, suffered and was damaged due to garbage problems, such as props for photographs, caused by tourists including self-wedding photographing tourists, and caused the restriction of visitor access from April 2016 (Choi, 2016). On the other hand, the Shiny Forest Trail is still visited by many tourists for self-wedding

photography and is used as a shooting spot for soon-to-be-married couples, friends, and families.

3.2 Photogenic places of self-wedding photographing tourists in Jeju Island

"The image of the place affects the frequency of photography (Robinson & Picard, 2009)." Furthermore, the frequency of tourists' photographs shows tourists' preference of certain places (Kim, Y. & Son, 2017). Through Instagram photos, photogenic places of self-wedding photographing tourists in Jeju Island were examined, identifying where tourists and photographers preferred (see *Table 2*). 54 photographs each of beach and forest was the highest (26.9%, see *Figures 2* and *3*). The next was photos with farms (9%), plant related posts (camellias 9.5%) and fields (8.5%) that could reflect the season.

Table 2. Photo postings on Instagram

Photo Spots	Beach	Forest	Farm	Camellia	Fields	Grassland	Oreum	Road	Villages	Cafe	Others
Photos	54	54	19	18	17	14	10	7	2	2	4
Ratio (%)	26.9	26.9	9.5	9.0	8.5	7.0	5.0	3.5	1.0	1.0	2.0

Figure 2. Beach   *Figure 3*. Forest

3.3 Behaviours of tourists

In a survey, 20 women (77%) and 6 men (23%) responded to the questionnaires (see *Table 3*, Q1). Of the respondents, 42% were in their early 30s, 31% in their late 20s, and 15% were in their mid-30s (see *Table 3*, Q2). Residents of Seoul represented 65%, Gyeonggi 15%, Busan 8%, Chungcheong, and Gyeongsang and Dae-gu were 4% each.

The most frequent shooting schedules were 38% of 2 nights and 3 days, 3 nights and 4 days 35%, 1 night and 2 days 23% and one-day visits were 4% (see *Table 3*, Q4). This survey result shows that 96% of respondents visit Jeju Island with a schedule of more than 1 night and 2 days.

For the method of photography, 65% of the tourists took selfies using tripod or selfie sticks for their self-wedding photos (see *Table 3*, Q6), while 27% hired professional self-wedding photographers in Jeju Island, 8% took their pre-wedding photos by themselves or were taken by photographers. There are apparently two main categories of self-wedding photographing tourists. One category is the couples taking pictures with a tripod or asking acquaintances to take their photos during their trip to Jeju Island. The other

category is the couples who commissioned professional self-wedding photographers.

One common characteristic of these two is that they prepare the settings for outdoor photography by themselves, which is not included in the wedding packages provided by ordinary wedding businesses. In other words, they purchase items needed for shooting, such as dresses and props, or rent them from companies that affiliate with photographers.

Another common aspect of the two is that they photograph while moving from location to location. They move locations to photograph with different concepts and backdrops.

A difference is that the tourists who photograph by themselves do not have any time constraints, so shooting and sightseeing is often performed at the same time. On the other hand, tourists who have commissioned professional self-wedding photographers should take the photographs within the booked time, usually only one or two days of photographing, and the tourists go sightseeing before and afterwards.

Photogenic places in Jeju Island were explored through the tourists' questionnaires (see *Table 3*, Q7). The most frequent photo spot was a beach (21%) among 68 answers including multiple answers. Saryeoni Forest Trail 16%, Camellia Hills 13% and St. Isidore Farm 13% followed. Moreover, villages were 13%, Oreum 12%, Shiny Forest Trail was 10%, the famous photo spot in Saryeoni Forest Trail, and U-do Island was 1%.

Among these tourists, 56% said they learned about self-wedding photography through SNS accounts of strangers among a total number of 32 multiple answers, internet news or TV was 22%, and self-wedding photos by photographers 16% (see *Table 3*, Q9). This can be interpreted as most of the respondents knowing about self-wedding photography through SNS or the media. Specifically, the most frequently mentioned websites for self-wedding photography were blogs or cafes (38%) and Instagram (35%) among a total of 34 answers including multiple answers (see *Table 3*, Q10). These results showed that 63% (20 answers among total of 32: SNS accounts of strangers 18, and SNS accounts of celebrities 2) of respondents got self-wedding photography information through SNS (see *Table 3*, Q9). Moreover, personal SNS accounts affect the tourist's motivation and behaviour of self-wedding photographing tourism (85% of responses, 29 answers among a total of 34: blogs or cafes 13, Instagram 12, and photographers' blogs or cafes 4).

The result of tourist motivation for self-wedding photographing tourists in Jeju Island are shown in *Table 3*. 33% among a total of 52 multiple answers visited Jeju for their photos because of the various scenery (see *Table 3*, Q8). The second most chosen answers were 21% for capturing the scenery of Jeju Island in their photos and 19% sightseeing before and after the shooting, for the possibility of taking photos that are different from others was 15% and for exotic scenery 10%. These results would seem to demonstrate the internal factors are more important for these tourists.

3.4   Link between self-wedding photography and tourism in Jeju Island

3.4.1   Tourist motivations

The reasons for visiting Jeju Island for their precious pre-wedding photographs can be summarized by an external factor and an internal factor.

The external factor can be explained as cost saving. The transportation cost to Jeju Island became cheaper because of the launch of low-cost airlines from 2005. Consequently, it became easier for tourists to visit Jeju Island (P2 interview). In particular, self-wedding photographing tourists prefer to take their pre-wedding photos on Jeju Island, rather than in other regions in Korea because, compared to taking photographs abroad or even in other regions in Korea, the "transportation fee is even cheaper" if they book round trip airplane tickets on weekdays (P3 interview).

Table 3. Behaviours of tourists

Questions		Number of answers	Ratio
Q1	**Gender**		
	Women	20	77%
	Men	6	23%
	Total	26	100%
Q2	**Age**		
	Mid 20s	1	4%
	Late 20s	8	31%
	Early 30s	11	42%
	Mid 30s	4	15%
	Late 30s	1	4%
	Early 40s	1	4%
	Total	26	100%
Q3	**Region**		
	Seoul	17	65%
	Gyeonggi	4	15%
	Busan	2	8%
	Chungcheong	1	4%
	Kyungsang	1	4%
	Dae-gu	1	4%
	Total	26	100%
Q4	**Tour schedule**		
	1 day visit	1	4%
	1 night & 2 days	6	23%
	2 night & 3 days	10	38%
	3 night & 4 days	9	35%
	Total	26	100%
Q5	**Number of visits to Jeju Island before photoshoot**		
	None	2	8%
	1 time	1	4%
	2 times	4	15%
	3 times	4	15%
	4 times	3	12%
	More than 4 times	12	46%
	Total	26	100%
Q6	**Method of photography**		
	Self-photo shoot using tripod or selfie stick	17	65%
	By professional self-wedding photographers	7	27%
	Mixed	2	8%
	Total	26	100%
Q7*	**Photo taking spots on Jeju Island**		
	Beach	14	21%
	Saryeoni Forest Trail	11	16%
	St. Isidore Farm	9	13%
	Camellia Hills	9	13%
	Villages	9	13%
	Oreum (parasitic volcano)	8	12%
	Shiny Forest Trail	7	10%
	U-do Island	1	1%
	Total	68	100%
Q8*	**Why did you go to Jeju Island for photography?**		

	I can shoot in various scenery backgrounds	17	33%
	I can enjoy sightseeing before and after shooting	11	21%
	Scenery of Jeju Island only	10	19%
	I can take photos different from others	8	15%
	Exotic scenery	5	10%
	Other	1	2%
Total		52	100%
Q9*	**How did you learn about self-wedding photography?**		
	SNS accounts of strangers	18	56%
	Internet news or TV	7	22%
	Self-wedding photos by photographers	5	16%
	SNS account of celebrities	2	6%
Total		32	100%
Q10*	**Referenced websites for self-wedding photography**		
	Instagram	12	35%
	Blogs or cafes	13	38%
	Photographers' blogs or cafes	4	12%
	Search engines (Google, Naver)	3	9%
	Other	2	6%
Total		34	100%

* Multiple answers

In addition, the cost of self-wedding photography, even after paying for commissioned professional self-wedding photographers, is "about two times cheaper than wedding packages", depending on the enterprises (P5 interview).

"Now it's easier to get to Jeju Island from Seoul. It seems that self-wedding has increased in Jeju Island because of that..." (P2 interview)

"In my opinion, these tourists have increased because airplane price got cheaper...Jeju Island has way more self-wedding tourists than other regions because air tickets for weekdays are cheaper, and it only takes an hour." (P3 interview)

However, internal factors may be more essential factors than external factors. Robinson and Picard (2009) argue, the more exotic or more specific the place and the experience, the more powerful the photographs become. Self-wedding photographing tourists preferred a place with an exotic landscape, which is far different from the landscape of their everyday life. The interviews with photographers seem to show that these tourists want to "take photos different from studio photographs", which "look more natural" (P1, P2, P4 and P5 interviews). Additionally, they want to capture the moment in "various types of scenery or exotic scenery" (P3 interview).

"Different with other people. Studio photos are too stiff - same backdrops. The customers think the outdoor photographing is more natural..." (P1 interview)

"The mountains and the sea are about 30 minutes away, so the background is more diverse...various types of exotic scenery compared to the mainland." (P3 interview)

"Everybody shoots in studios so they are sick and tired of it, and they want more natural photographs..." (P4 interview)

These photographs will be more powerful and outstanding when the couples put their photos on the photo table on their wedding day, or when framed pre-wedding photos decorate one side of their living room wall after the marriage. Moreover, these tourists post their pre-wedding photographs on social media and share with the public.

These activities of self-wedding photographing tourists may demonstrate the social role of the photography that enables self-expression and self-projection, as Robinson and Picard (2009) insist with vacation photographs.

3.4.2 Characteristics of photogenic places

The majority of self-wedding photographing tourists have a tendency to "take pictures in various sceneries, such as the beach, forest, Oreum (parasitic volcano), grassland, villages, and so on," that have a diverse landscape feature "rather than taking pictures in just one place" (P3 interview).

Among photogenic places, the beach and the forest were the most favoured places for photographs (P1, P4 and P5 interviews). Specifically, Saryeoni Forest, including Samdasoo Ranch and Shiny Forest, and Gimnyeong beach were preferred photo spots (P1, P2, P3, P4 and P5 interviews). There are over 360 Oreum spots in Jeju Island, and the tourists shoot their photos with Oreum in the backdrop, or on the peak of Oreum. Other photogenic places referred to include Ctesiphon of Isidore Farm which is considered an exotic landscape, and Camellia Hills (P3 and P5 interviews).

"Forest and beach…For east course Gimnyeong Beach, for west course Hyeopjae Beach…Forest is a must go place. Saryeoni Forest or Jeolmul Forest." (P4 interview)

"Shiny Forest, Saryeoni Forest Trail, beach…Shiny Forest, because they can take beautiful photographs. Also, Camellia Hills. They usually seek for the places they saw on SNS." (P5 interview)

The characteristics of the most favoured photogenic places can be summarized in three ways. Firstly, they mainly visited shooting spots that have free admission. The reason for this is that, "in the case of a location with admission fee, the customer (tourist) has to pay the extra admission fee of the photographer, so there is an additional burden" for the tourist (P1 interview).

Secondly, these tourists and photographers prefer places with few people. For their photographs, they "consider countless conditions"; In addition to the composition of the photographs and the expression of the subjects, etc. (P1 interview). In these places with few passers-by they can focus on their photographs.

Finally, they have a short photographing schedule; during a day or two, they shoot at various locations, and some shooting locations were not even named. In other words, "If you have a good place to go while you are driving, and you are taking a car for a while", there is often no name of the place to explain the exact location (P1 and P3 interviews).

These results presumably represent that to these tourists, a key motivator of choosing places to shoot is a suitability of activities for 'accumulating photographs'. In addition, the landscape of places, or 'landscape as stage', is important to these tourists because the landscape is used as a backdrop to their self-wedding photographs.

3.4.3 Link between self-wedding photography and tourism in Jeju Island

Among the total number of tourists in Jeju Island, "self-wedding photographing tourists are not as many" as other ordinary tourists (M2, M3 and P1 interviews). Self-wedding photographers have links with other enterprises, such as hair salons, dress rental businesses, flower shops, etc., but "there is no compulsion to use these companies because it's not a package product" (P4 interview). Therefore, we might say that self-wedding photography in Jeju Island is not directly contributing to the wedding industry or local industry in the form of new tourism.

However, in the same context as Garrod (2009), self-wedding photographs promote and attract new tourists in Jeju Island "through various media such as Instagram, blogs", and Google images (P5 interview). It can also serve as an element that creates an image of place for potential tourists and motivates visitation.

Another possibility is that photographers are encouraged to migrate to Jeju Island because of physical distance, and it is possible to link with other industries. Some of the photographers have moved to reside in Jeju Island from other areas, and another, who was a Jeju resident, came back to Jeju Island after working in another region (P1, P3 and P4 interviews). There were also people who moved to reside deep in rural areas where young people do not live much (P1 and P3 interviews). Their characteristic is that during their free time outside office hours they are like other general tourists and they can be seen as other types of tourists.

In addition, a photographer's Instagram following list shows that besides cafes, restaurants, and guesthouses in Jeju Island, they are connected with diverse industries such as other self-wedding photographers, wedding makeup and hair salons, and dress rental companies. In a variety of ways, self-wedding photography in Jeju Island can assume that there are unlimited possibilities of connection with tourism.

3.5   Discussion

Travel and photography can be interpreted as an inseparable relationship (Larsen, 2006; Sontag, 1990; Urry & Larsen, 2011) and travel has become a strategy for photographic accumulation (Sontag, 1990).

In the pre-travel stage, the photographic images of places help to form travel expectations (Markwell, 1997). Tourists visit tourist attractions to consume the images of places that have already been created (Oh, 2011) through various media in their daily lives. 'Imaginative' travel through the media often creates a desire for movement and to go to such places (Urry, 2007). In this context, photographs play an important role in building tourist motivation and promoting tourist attractions through a variety of media (Garrod, 2009). In the same perspective, Kwon (1998) stated that the honeymoon photos taken by Jeju Island honeymooners in the 1990s were not only reminiscent of the newlyweds but also acted as pamphlets promoting Jeju Island.

Self-wedding photographing tourists and photographers are performing a role in creating the images of places by finding the hidden spots of Jeju Island. In other words, these photographs can shed new light on previously unknown places through SNS postings on social-networking sites. Furthermore, self-wedding photographers and tourists also promote photo spots by sharing photos and have a significant impact on tourist motivation. Also, each can be seen as a medium to spread self-wedding photographs and location information of Jeju Island in their community.

Meanwhile, Shaw and Williams (1994) asserted that tourism products are experience goods, rather than material goods, so there is little material compensation for investment, and many people spend relatively large amounts of money and make detailed travel plans. From this perspective, the self-wedding photographing tourists relatively look for areas which fall outside the realm of conventional products, and spend more time and money on their trip.

These characteristics of the self-wedding photographing tourists make these tourists classified as 'special interest tourists (SIT)' because they set

the travel destination with a special purpose and interest. Read (1980) defines SIT as "travel for people who are going somewhere because they have a particular interest that can be pursued in a particular region or at a particular destination". While the SIT definition of (Douglas & Derrett, 2001) is, "the provision of customised leisure and recreational experiences driven by the specific expressed interests of individuals and groups". These definitions of SIT possibly represent the tourism of self-wedding photography.

These features of self-wedding photography and their potential as tourism resources will require Destination Management Organization (DMO) to understand the interface of wedding photography and tourism. The establishment of DMO is recommended to avoid conflicts caused by an additional influx of tourists, to share profits with the community, and to coexist with the community. Specifically, there are conflicts at St. Isidore Ranch due to the visitors who recognize this private area as public land. In addition, photographers and wedding enterprises often visit the site for commercial purposes, but there are issues that they do not benefit the community. In this case, the proprietor and DMO could take an admission fee from the photographers and grant official permission. Later, the association could gradually attain a fee from the ordinary visitors for the operation and management of the place. And DMO could plan to run a tourism business to take direct profit from it. In other words, there is a way to provide convenience facilities or construct sales facilities for visitors to gain direct profits.

4. CONCLUSIONS

The tourism effect of self-wedding photographing is expanding on Jeju Island. In this context, this study explored the emergence of self-wedding photographing tourism, a new tourism trend in Jeju Island.

Self-wedding tourists visit Jeju Island since they can take photographs of various natural landscapes with one visit. The majority of the tourists tend to take their wedding photographs at the beaches, forests and other natural landscapes in Jeju. They prefer places with free admission rather than paid tourist attractions, and quiet and atmospheric places rather than fancy and crowded spaces.

The study results indicate that self-wedding photographing destinations on Jeju Island have been discovered by both photographers and self-wedding photographing tourists. They play a role in shaping the destination images for prospective tourists. The images of the places set travel expectations and create tourist motivations. Besides this, more than half of the self-wedding tourists surveyed tend to gather information about self-wedding photography through SNS postings before they visit Jeju Island. Photographers and self-wedding photographing tourists act as promoters of tourist destinations through sharing photos on SNS, whether or not they intend to be.

This paper explored the process of tourism vitalization through activities of photo-taking in wedding-based tourism at St. Isidore Farm, Camellia Hill and Saryeoni Forest Trail. This paper gave implications from considering the possibilities as a tourism resource for self-wedding photography and for understanding the interface between wedding photography and tourism.

The primary limitation of this research was the sample size. Clearly, eight subjects for the interviews and 26 subjects for tourist surveys are not enough to make generalizations about self-wedding photography tourism on Jeju

Island. However, from the results of those limited number of subjects, this study explored self-wedding photography tourism as one of the SIT (Special Interest Tourism) types and tried to describe the wave of this phenomenon from the viewpoint of tourism.

We believe this study is the first empirical study about self-wedding photography in the landscape architecture and tourism field. Furthermore, the study provided opportunities to consider self-wedding photography and the places as one of the tourism resources, within the environment of academic discussion.

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Assessment of Inclusive Historical Public Spaces in achieving preservation of such areas in Malang, Indonesia

Case study: Public spaces developed during the Dutch Colonial period

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Abstract: Inclusive public spaces, a sort of "urban lungs" and "social binders", are a representation of responsive, democratic and meaningful space within the context of urban development. In the city of Malang, inclusive public spaces have undergone significant changes, and such changes may lead to a kind of degradation of the historical aspect which can in turn lead to a decline in the overall real condition of an area (spatial, sociological and ecological). Therefore, an assessment of historic spaces used as inclusive public space needs to be done in order to conserve their value to the community. This study aimed to identify the development of, existence of, physical characteristics of, and functions of these Inclusive Historical Public Spaces (IHPS); and also to analyse the integrity of the space values related to people's preferences and needs with respect to these spaces. This research used survey data collection techniques. Analysis and assessment of the space integrity was based on the quality and significance of space consisting of historical, aesthetic, and functional value. The study found that an inclusive historical space is affected significantly by the access to streets, which have different physical characteristics and functions in the four regions in Malang. To realize conservation of IHPS in Malang, which represent the history and image of an overall region, further support is needed through government policy in urban development management, as well as consideration as to the needs and aspirations of the public.

1. INTRODUCTION

Open public space is an important element as a counterweight in both urban and rural space (Subadyo, A Tutut & Poerwoningsih, 2017). The existence of such public space gives evidence of changing human needs over time (Kostof & Castillo, 1992). According to research (Nasution & Zahrah, 2012), many open public spaces are found to be managed by the private sector. However, privatization often has negative impacts, such as limiting access,

increasing consumerism, social inequalities, declining democratic expression and social interaction. Thus, interest should be paid to the development of inclusive space which can be accessed and utilized easily by everyone and which supports human activities (Carr et al., 1992). In order to achieve this ideal of a democratic and inclusive public space, space often with historical significance, some assessment is required.

Malang is a city in Indonesia which still has many traces of historic urban space, including open public space dating from the era of Dutch colonization (Ridjal et al., 2016; Sunaryo et al., 2013). Historic public space can project a certain aesthetic value for the entire region as well as create a sense of inclusiveness for the city (Mehta, 2014). However, many inclusive public spaces within the city have changed over time as the city has grown (Harun, Mansor, & Said, 2015). In Malang, since the beginning of the post-independence era, this situation has led to a decline in the the space's historical value, the quality of spatial-ecology, aesthetics, and also the human sociological function.

An understanding of the importance of historical public places to the townspeople needs to be considered, especially in areas which have undergone continuous change and disassembly, which has caused the loss of historical character and uniqueness. To achieve a sustainable urban form, the existence of such spaces needs to be maintained to preserve the overall vitality of the city (Bandarin & van Oers, 2015). The value of inclusive public spaces is also closely related to the quality of a space's design (physical form/ aesthetic). The aesthetic element has a comprehensive impression that emerges from the community perception (Carmona, 2015). The aesthetic has relation to the way the area is seen by the public (giving a sense of safety and comfort) (Alamoush et al., 2017). This is not only considered to be environmental (social engagement and community empowerment) assets but also monumental (the sensorial experience of the "townscape") assets. The morphological work above shows the spontaneous, balanced development of characters, and natural resources within each of these areas (Romice et al., 2017; Tutuko & Shen, 2016).

Nowadays, citizens of various ages, though in particular the elderly, interact within the context of the public space. Access to such space needs to be taken into consideration to ensure that such people can use the space (Srichuae, Nitivattananon, & Perera, 2016; Yoshii, 2016). Elements and facilities contributing to such access are key to the space's utilization. An important aspect of urban development planning is the ensuring of such accessibility as an aspect of enabling the mobility of people in a developing city. The power of globalization towards local identity and regional diversity affects urban shape shifts and the existence of public space (Kaymaz, 2013). This new insight will strengthen the conservation effort, the regulatory support from stakeholders, and also the awareness of planners and architects (Abdel-Rahman, 2016).

In general, support for historical space is required to prevent the extinction of human civilization itself. The function of such space requires an attention to the aesthetic aspect (as a level of visual comfort satisfaction) and also to the fulfillment of the needs of human activity. Furthermore, the local government should have comprehensive guidance in managing the existing Inclusive Historical Public Spaces (IHPS). The historical space needs to avoid being a mere centralization point of sociometric activity, which may simply relate it to the problems of an inner city (Hardoy & Satterthwaite, 2014).

The objective focus of this research is based on the three main issues (i.e. history, aesthetic and function), which need assessment as well as regard as focal points in preserving and utilizing IHPS in order to maintain sustainability within urban development in Malang. The utilization of IHPS in accordance with the preservation principle will support the vitality of the maintenance area.

This paper discusses the assessment of IHPS, which will be helpful to supporting ideas on the preservation of such urban areas. It is compiled in three main sections. The first section presents the development of IHPS in existence in Malang, which has significant implications on characteristics of public spaces. Secondly, it assesses the public space integrity based on the quality and significance of the IHPS. Then, the last section contains the assessment analysis based on human preference.

2.   METHODOLOGY

This research used a descriptive qualitative method with a survey included (non-experimental). The investigation of the existence of IHPS in Malang, an assessment of them, as well as an analysis of their characteristics as space, provides a starting point for determining the concept and direction for the preservation of such historic space. The existence of IHPS may be traced back through old maps and literature in relation to the periodization in which a particular space was able to survive and are studied further based on the type/character and the forming function. Moreover, assessment and analysis of the public space integrity is based on the quality and significance of the IHPS which consists of historical, aesthetic and functional value (Arifin, Arifin, & Suryadarma, 2002) where the variables, indicators and parameters are shown in the following tables.

Table 1. Variables, Indicators and Parameters Based on the Historical Value

Variable	Indicator	Parameter					
		High	V	Moderate	V	Low	V
Chronological Value	The level of regional age	> 100 years	3	50 – 100 years	2	< 50 years	1
Historical Facts	The number of historical facts	> 5	3	2 - 5	2	< 2	1
Uniqueness	The number of similar objects	None	3	1 – 10 similar object	2	> 10 similar object	1
Historical Events	The level of historical events that occurred	International	3	National	2	Regional	1
Wholeness	The level of wholeness	80 – 100%	3	50 – 79%	2	10 – 49%	1

High historical value, if the total value = 13-15; Moderate historical value, if the total value = 9-12; Low historical value, if the total value = 5-8.
Source: (Australia ICOMOS Incorporated, 2000, 2013; Catanese & Snyder, 1988; Helly & Budiarti, 2005).

Table 2. Variables, Indicators and Parameters Based on the Aesthetic Value

Variable	Indicator	Parameter					
		High	V	Moderate	V	Low	V
Representa-tion of a Particular Style	Regional image representation (Traditional/	Very represent-ative	3	Quite represent-ative	2	Less represent-ative	1

Variable	Indicator	Parameter					
		High	V	Moderate	V	Low	V
(Contextual and Homogeneous)	Colonial/ Chinatown)						
Proportion	Proportion of Width to Height	W/H > 1,5	3	W/H = 1 – 1,5	2	W/H > 1,5	1
Rhythm	Continuity of street wall	Continues	3	Some are disconnec-ted	2	Disconne-cted	1
Scale	Human scale (comparison)	Monume-ntal scale	3	Human scale	2	Intimate Scale	1

High historical value, if the total value = 10-12; Moderate historical value, if the total value = 7-9; Low historical value, if the total value = 4-6.
Source: (Jacobs, 1993; Helly & Budiarti, 2005)

Table 3. Variables, Indicators and Parameters Based on the Functional Value

Variable	Indicator	Parameter					
		High	V	Moderate	V	Low	V
Amenities	Separation between pedestrians and vehicles	Clear	3	Unclear	2	None	1
Accessibility	Link system/ "Oldtown" linkage	Direct linkage system	3	Indirect linkage system	2	Unrelated linkage system	1
Economic Usefulness	Number of commercial front stores	Found > 50%	3	Found 10 – 50%	2	Found < 10%	1
Social Needs	Activity	Found > 3 activities	3	Found 2–3 activities	2	Found only 1 activity	1

High historical value, if the total value = 10-12; Moderate historical value, if the total value = 7-9; Low historical value, if the total value = 4-6.
Source: Carmona et al. (2010)

The value rating was processed by a peer group of the Centre of Environmental and Landscape Study, Department of Architecture, University of Merdeka Malang through expert judgement. This method is used to determine the value of each criterion where the total value of its criteria generates the value of space integrity (Equation 1) (Arifin, Arifin, & Suryadarma, 2002). The overall results are classified into three levels, i.e., high integrity space (rating of 31-39), moderate integrity space (rating of 22-30), and low integrity space (rating of 13-21).

$$I = \sum H + \sum A + \sum F$$

Equation 1. Formula of Space Integrity. *Source: Arifin, Arifin, and Suryadarma (2002)*

Description:
I   = Space Integrity Value;
H = Historical Value;
A = Aesthetic Value;
F = Functional Value.

Subsequently, a community preference analysis was conducted to examine the needs of the community in the use of public space as an inclusive historical space. The respondent data came from selected zones which were based on the Malang *bouwplan* development underlying the centre of Malang from the Dutch colonial era (*Celaket - Kayutangan - Alun-alun*, *Ijen – Gajayana* Stadium, *Tugu – Rampal*, and *Sukun – Kasin*). The data processing used purposive sampling method (Ritchie et al., 2013) in which 30 respondents both in the visitors and residents category were involved in each of those four

zones. The respondents of *Celaket-Kayutangan-Alun-alun* zone consisted of the town square *(Alun-alun)* visitors (n = 15) and its area residents (n = 15). In *Ijen-Gajayana* Stadium, the respondents were composed of the stadium visitors (n = 15) and the cultural conservation building owners/residents (n = 15). In *Tugu-Rampal*, the sample respondents were taken from Tugu and Rampal park visitors (n = 15) and its area residents (n = 15). The respondents of the *Sukun-Kasin* zone consisted of the Sukun Cemetery and Soepraoen Army Hospital visitors (n = 15) and the residents around Raya Dieng, Langsep and Sodanco Supriadi streets (n = 15). This sampling method was based on the users' first determination. The sample group was drawn from 20% of the total number of average weekly visitors to each particular area.

Table 4. Variable, Sub Variables and Operational Variables

Variable	Sub Variable	Operational Variable
Amenities and Images	Image	Maintaining historic physical characteristics
		The availability of pedestrian ways
	Safety and amenities	The availability of street furniture, such as seating, trash bins, street lighting and others
		The availability of vegetation barriers
Access and Linkage	Access	The availability of municipal transport and its improvements
	Linkage	The availability of pedestrian way linkages
	Transit	The availability of halte/ transit shelters
		The availability of car parks
Economic Usefulness	Street market	Structuring and coordinating of street traders
	Investor	Involvement of local communities and investors
		Investor's right to choose the company types
	Utilization	The utilization of IHPS for commercial purposes
Social Needs	Event	Enhancement of type and frequency of activities
	Evening Use	Extra hours of activity (up to night events)
	Facility	Provision of facilities for various ages
		Social integration of support facilities

Source: (Carmona et al., 2010; Helly & Budiarti, 2005)

All respondents (n = 120) gave answers to the questionnaire of operational variables related to public space utilization *(Table 4.)*. The questionnaire contained closed questions with a choice of quantitative answers related to the importance level of IHPS and measured using a Likert scale. The results of the answers were then analysed using (1) the validity and reliability test and (2) further analysis. A validity test was used to determine the validity level of question variables in the questionnaire. That is, it examined the corrected item value for each variable and compared it with the R table (from SPSS 15 software support) by using the scale analysis. Beyond this, Cronbach's Alpha method was applied to the reliability test. The calculation of its method is based on the median intercorrelation among the question items in the questionnaire where reliability is shown when the alpha value is more than 0.6. Finally, the respondents' answers were analysed by using the descriptive analysis method of Chi-Square.

3.   THE DEVELOPMENT OF INCLUSIVE HISTORICAL PUBLIC SPACES IN MALANG

Malang, as the second largest city in East Java, grew rapidly after being taken over by the Dutch colonial government. That rapid development was marked by the expansion of transportation modes and intercity lanes to the north of Malang (Malang-Pasuruan-Surabaya) in the 1870s (Baskoro, 2017;

Handinoto, 1996), and also urban planning from 1917 in eight phases *(Figure 1(a))* (Basundoro, 2015; Santoso, Suryasari, & Antariksa, 2013; Handinoto, 1996).

The first milestone of Malang's urban development (phase I/ *bouwplan* I) was completed on May 18, 1917 in the form of a housing establishment for Europeans *(Oranjebuurt)* in Celaket (Jaksa Agung Suprapto street) and Rampal (Panglima Sudirman, Pattimura and Urip Sumoharjo streets). Later, on 26 April 1920 was initiated phase II of the city expansion (*bouwplan* II) with a focus on the development of a regional administrative centre *(Gouverneur General Buurt)* Malang. In the centre, there was a landmark round square *(JP Coen Plein)* which became a point of confluence and public space distribution (Tugu, Mojopahit, Suropati, Kertanegara, Kahuripan and Sultan Agung streets). Since then, the city was developed and built with a concentric urban spatial structure, like small towns of Europe in the 18th century, where the round square became the city centre. Formerly, all roads in the area used names from the Netherlands.

In *bouwplan* III, the Sukun area was chosen as the European cemetery complex due to its territory being the main access connecting Malang and Blitar (west side of Malang). Moreover, in *bouwplan* IV, middle and lower housing development was placed on the area between Brantas River, with access to the town and Samaan public cemetery. In 1924, *bouwplan* V the housing for affluent residents was built (Ijen street) and the sports area (Gajayana Stadium) surrounded by Semeru, Tangkuban Perahu and Kawi streets. At that time, Dutch and other European families exclusively enjoyed Ijen Boulevard and its surrounding areas, while the indigenous people had to settle for living in the suburbs with their inadequate facilities. In phase VI of urban development, Malang expanded to the old town of Mergosono - *Eilandenbuurt*. In *bouwplan* VII, the city developed an upper class residential area in the west of the city. Lastly, the development and supply of industrial estates was allocated in the southern part of Malang as the final stage of urban development prior to independence (*bouwplan* VIII). The development of Malang city is clearly explained by Handinoto (1996) in Figure 1 (a), that the development of Malang city consists of 8 stages. Further research, Subadyo, A. T. (2010) studied about the development stage of the Malang city by determining development of land use zones in the city of Malang, as shown in Figure 1 (b).

Based on the city's historical development, the tracking of IHPS evolution is represented by development in the territory in *Figure 1(b),* recorded over three time periods *(Table 5).* The search outcome is then reviewed to see type/characters and functions as IHPS *(Table 6)*. The city development required a renewal/reform of the city structure. However, these days the alteration process is suspected to be having a deleterious effect on the IHPS. The surviving IHPS needs to be evaluated and controlled in order to maintain the urban public spaces' sustainability.
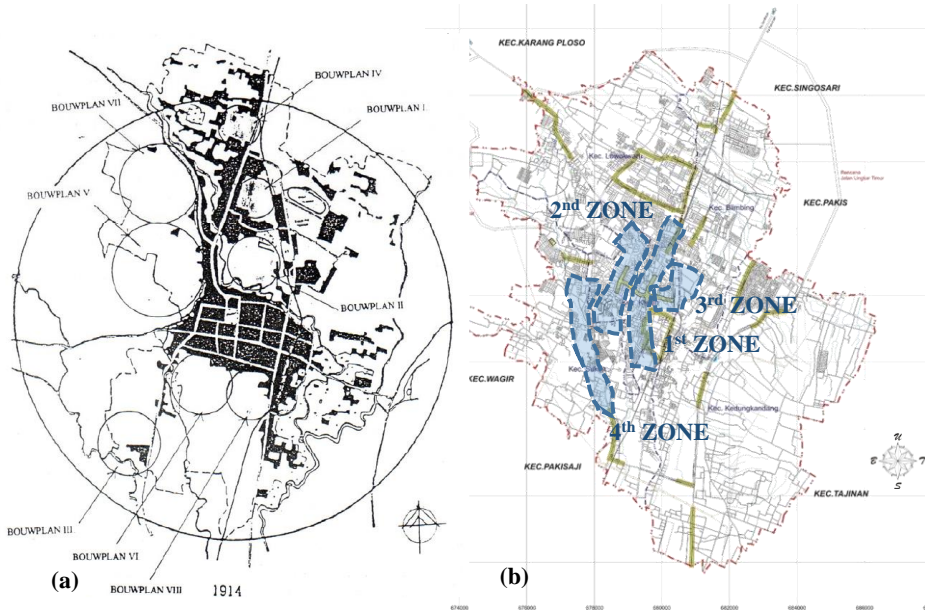
Figure 1. (a) Expansion Points of Malang (Bouwplan I - VIII) Starting from 1917-1935;
(b) Research Area of IHPS
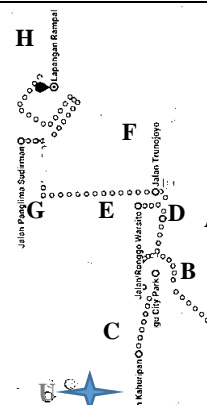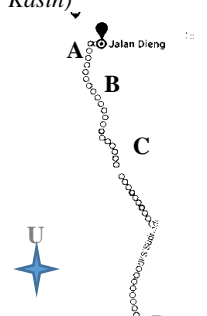*Source*: (Handinoto, 1996; Subadyo, A. T., 2010)
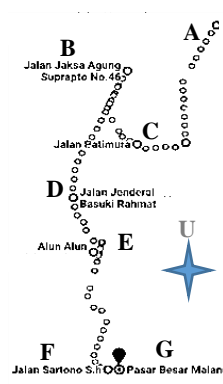
Table 5. The existence of Malang IHPS based on periodization

Zone	Name of IHPS (The Dutch Naming)	Period of Time		
		1900-1942	1942-1972	1972-2002
Zone 1 (Celaket-Kayutangan-Alun-Alun)	Tumenggung Suryo street (Bengawan Solo straat)	Existant	Existant	Existant
	Jaksa Agung Suprapto street (Tjelaket)	Existant	Existant	Existant
	Pattimura street (Klojen Lorstraat)	Existant	Existant	Existant
	Basuki Rahmat street (Kayoetangan)	Existant	Existant	Existant
	Alun-Alun (Aloen-Aloen)	Existant	Existant	Existant
	Sartono street/ Comboran (Voorschotweg)	Existant	Existant	Existant
	Pasar Besar (Pasar/ Petjinanstraat)	Existant	Existant	Existant
Zone 2 (Ijen-Stadion Gajayana)	Mayjen Panjaitan street	Existant	Existant	Existant
	Bandung street (Bandungstraat)	Existant	Existant	Existant
	Jakarta street (Bataviastraat)	Existant	Existant	Existant
	Malabar Park (Malabar Urban Forest)	Existant	Existant	Existant
	Ijen (Ijen Boulevard)	Existant	Existant	Existant
	Semeru street (Smeroestraat/ Smeroeplein)	Existant	Existant	Existant
	Kawi street (Kawistraat)	Existant	Existant	Existant
	Racetrack	Existant	Existant	Not existant
	Wilis Park	Existant	Existant	Not xeistant
Zone 3 (Tugu-Rampal)	Mojopahit street (Speelmanstraat)	Existant	Existant	Existant
	Tugu/ Alun-Alun Bunder (Jan Pieterzoencoen plain)	Existant	Existant	Existant

Zone	Name of IHPS (The Dutch Naming)	Period of Time		
		1900-1942	1942-1972	1972-2002
	Kahuripan street (Riebeeckstraat Van)	Existant	Existant	Existant
	Kertanegara street (Daendels Boulevard)	Existant	Existant	Existant
	Ronggowarsito Park (Vander Cappelen straat)	Existant	Existant	Existant
	Trunojoyo street (Goedangweg)	Existant	Existant	Existant
	Panglima Sudirman street (Klerekstraat/ Rampalstraat)	Existant	Existant	Existant
	Rampal park	Existant	Existant	Existant
Zone 4 (Sukun-Kasin)	Raya Dieng street (Diengstraat)	Existant	Existant	Existant
	Raya Langsep street (Langsepstraat)	Existant	Existant	Existant
	APP Park/ Ijen Nirwana	Existant	Existant	Not existant (changeover to Ijen Nirwana Resort)
	Sodanco Supriadi street (Soekoenstraat)	Existant	Existant	Existant

Table 6. Classification of the type/character and function of IHPS

Zone	Name of IHPS	Type/Character	Function
Zone 1 (Celaket-Kayutangan-Alun-Alun)	A. Tumenggung Suryo street	Concave-convex	Vehicle and pedestrian circulation
	B. Jaksa Agung Suprapto street	Concave-convex	Vehicle and pedestrian circulation
	C. Pattimura street	Straight-flat	Vehicle and pedestrian circulation
	D. Basuki Rahmat street	Curved-flat	Vehicle and pedestrian circulation
	E. *Alun-Alun*	Square	City icon; multifunction park (recreational and social)
	F. Sartono street/ *Comboran*	Straight-flat	Vehicle and pedestrian circulation
	G. *Pasar Besar*	Square	Market; vehicle and pedestrian circulation
Zone 2 (Ijen-Stadion Gajayana)	A. Mayjen Panjaitan street	Curved-concave	Vehicle and pedestrian circulation
	B. Bandung street	Curved-concave-convex	Vehicle and pedestrian circulation
	C. Jakarta street	Straight-flat-boulevard	Vehicle and pedestrian circulation
	D. Malabar Park	Rectangular	City forest
	E. Ijen	Straight-flat-boulevard	Vehicle and pedestrian circulation; townscape
	F. Semeru street	Straight-flat	Vehicle and pedestrian circulation
	G. Kawi street	Straight-flat	Vehicle and pedestrian circulation
Zone 3 (Tugu-Rampal)	A. Mojopahit street	Curved-concave-convex	Vehicle and pedestrian circulation
	B. *Tugu/ Alun-Alun Bunder*	Circle	City icon and park

Zone	Name of IHPS	Type/Character	Function
	C. Kahuripan street	Curved-concave-convex	Vehicle and pedestrian circulation
	D. Kertanegara street	Straight-flat-boulevard	Vehicle and pedestrian circulation
	E. Ronggowarsito Park	Oval-rectangular	City park
	F. Trunojoyo street	Straight-flat	Vehicle and pedestrian circulation
	G. Panglima Sudirman street	Curved-flat	Vehicle and pedestrian circulation
	H. Rampal park	Amorphous square	City park, military training arena, multifunctional field
Zone 4 *(Sukun-Kasin)*	A. Raya Dieng street	Curved-flat	Vehicle and pedestrian circulation
	B. Raya Langsep street	Straight-flat	Vehicle and pedestrian circulation
	C. APP Park/ Ijen Nirwana	Amorphous square	City forest; agro-educational area
	D. Sodanco Supriadi street	Curved-concave-convex	Vehicle and pedestrian circulation

4. ASSESSMENT OF THE PUBLIC SPACE INTEGRITY AND THE PUBLIC PREFERENCE

4.1 Assessment public space integrity

Based on a composite assessment, the integrity value is classified into three levels (high, moderate and low integrity values). High integrity values are seen dominantly in the Tugu-Rampal area, which reflects the successful IHPS *(Table 7.)*. Ijen Boulevard (39), *Alun-alun* (38), and *Tugu/ Alun-Alun Bunder* (38) corridors have the highest integrity rates scattered across zones (Zone 1, 2 and 3). Inclusive public spaces provide an engaging opportunity for various activities, such as relaxation, socialization and education (walking, playing, sitting, chatting or simply resting) (Mehta, 2014) where such activities had occurred in the three IHPS above.

Table 7. The integrity value of Malang IHPS based on historical, aesthetic and functional value

Zone	Name of IHPS	Historical Value		Aesthetic Value		Functional Value		Total	
		V	C	V	C	V	C	V	C
Zone 1 *(Celaket-Kayutangan-Alun-Alun)*	Tumenggung Suryo Street	7	L	7	M	11	H	25	M
	Jaksa Agung Suprapto Street	13	H	11	H	12	H	36	H
	Pattimura Street	7	L	7	M	7	M	21	L
	Basuki Rahmat Street	14	H	10	H	11	H	35	H
	Alun-Alun	15	H	12	H	11	H	38	H
	Sartono Street/ *Comboran*	7	L	6	L	7	M	20	L

Zone	Name of IHPS	Historical Value		Aesthetic Value		Functional Value		Total	
		V	C	V	C	V	C	V	C
	Pasar Besar	15	H	6	L	10	H	31	H
Zone 2 (*Ijen-Stadion Gajayana*)	Mayjen Panjaitan Street	7	L	6	L	6	L	19	L
	Bandung Street	12	H	10	H	8	M	30	M
	Jakarta Street	13	H	7	M	8	M	28	M
	Malabar Park	12	M	7	M	6	L	25	M
	Ijen	15	H	12	H	12	H	39	H
	Semeru Street	14	H	10	H	10	M	34	H
	Kawi Street	13	H	10	H	10	M	33	H
	Racetrack	-	-	-	-	-	-	-	-
	Wilis Park	-	-	-	-	-	-	-	-
Zone 3 (*Tugu-Rampal*)	Mojopahit Street	14	H	8	M	9	M	31	H
	Tugu/ Alun-Alun Bunder	15	H	12	H	11	H	38	H
	Kahuripan Street	10	M	7	M	7	M	24	M
	Kertanegara Street	14	H	12	H	11	H	37	H
	Ronggowarsito Park	12	M	10	H	10	H	32	H
	Trunojoyo Street	11	M	8	M	10	H	29	M
	Panglima Sudirman Street	12	M	10	H	11	H	33	H
	Rampal Park	13	H	10	H	11	H	34	H
Zone 4 (*Sukun-Kasin*)	Raya Dieng Street	12	M	9	M	8	M	27	M
	Raya Langsep Street	10	M	8	M	9	M	27	M
	APP Park/ Ijen Nirwana	-	-	-	-	-	-	-	-
	Sodanco Supriadi Street	7	M	7	M	8	M	22	M

V = value, C = category of value (H = high, if V = 31-39; M = moderate, if V = 22-30; L= low, if V = 13-21)

☐ = the highest value

As a remainder from a past era, the inclusive public space maintains yet a high representation of its original historical character. Square and circle patterns (in Alun-alun and Tugu/ Alun-Alun Bunder), townscape corridor (Ijen Boulevard) and historical buildings (Alun-alun: Tax Office, Bank Indonesia Office, State Treasury Office, Pelangi Hotel, Jami' Mosque, and GPIB Immanuel Church; *Tugu/ Alun-alun Bunder*: Malang City Hall, Complex of State Senior High School 1, 3, and 4, Skodam Hall V Brawijaya, Tugu Malang Hotel, and Splendid Inn; Ijen Boulevard: the housing of the Dutch upper class along the two sides of the street corridor) are the most dominant of the historical aspects of the colonial city design. The space proportion and scale strongly support its aesthetic value. As IHPS, those public spaces are sufficient to provide comfortable use and have been utilized optimally by the community. However, it also needs to be considered that congestion of activity, particularly in public spaces close to intersections, remains problematic (Sedyowati, Suhartanto, & Sholichin, 2018).

The *alun-alun* has an important meaning to cities on Java Island and represents the concept of the urban-hub - the "palace center" idea - based on the high philosophical principles of Hastabrata. It has become the center of community activity and, for Malang, an icon and landmark.

Figure 2. The IHPS of highest integrity value (a) Idjen Boulevard; (b) *Alun-Alun*; (c) *Tugu/ Alun-alun Bunder*

In addition, Ijen - Gajayana Stadium zone has the highest integrity values among Kawi Street, Semeru Street, Gajayana Stadium open space, Bandung Street and Ijen Boulevard. While, Jakarta Street, Bandung Street, and Malabar City Forest have a moderate value, although the value and historical significance of the Jakarta Street corridor is high, in fact, it has undergone many changes, thus lowering its aesthetic value. Furthermore, a low integrity value is shown in Mayjen Panjaitan Street, which has experienced many changes in all areas of value.

Moderate integrity values in Tugu-Rampal are shown on Kahuripan and Trunojoyo streets, even though there are meaningful historic public buildings such as the Senaputra Amusement Park (Kahuripan Street) and Kota Baru Railway Station (Trunojoyo Street). In the Sukun - Kasin zone, all IHPS (Sodanco Supriadi, Langsep and Raya Dieng streets) have moderate space integrity values.

High integrity value IHPS refers to public space which has a high value of historical character, image (inclusivity) and aesthetics in each region. On the other hand, areas of moderate and low IHPS value fulfill less of those three criteria of the IHPS integrity value. Further analysis explains more about the relationship between public space integrity within the area of community preference.

4.2   Public Preference of IHPS

In general, the function of inclusive public spaces should fulfill criteria of being responsive, democratic and meaningful (Carr et al., 1992). Firstly, the "responsive" requirement means that inclusive public space is used for a wide range of activities and interests. Secondly, for the "democratic" requirement, inclusive public space can be used by people from various social, economic and cultural backgrounds, and also is accessible by everyone. Lastly, the "meaningful" requirement means that inclusive public space establishes an important relationship between humans and space as a social context (Carr et al., 1992).

According to Carmona et al. (2010), the success of an inclusive public space can be measured by (1) Amenities and Images, (2) Access and Linkage, (3) Economic Usefulness, and (4) Social Needs variables. Inclusive public space utilization needs to consider peoples' expressed preferences in an effort to meet those required variable parameters. To maintain sustainability, the development of such areas should involve its occupants and user societies (Budihardjo & Sujarto, 1999; Turcu, 2013). Those local communities are not only used as an object of historic area development, but also should be involved as a subject in giving suggestions and thoughts on planning, implementation and supervision.

The analysis of the results of public preference on the needs of IHPS utilization is shown in the following tables. In the first table *(Table 8)*, the operational variables that are considered very important (VH) and important (H) by more than a half of respondents are the physical character enhancements (60%), availability of pedestrian ways (64%), street furniture availability (73%), vegetation barriers (60%), minibus availability (70%), pedestrian way linkage (80%), car parks (77%), coordinating of street traders (54%), investors (63%), commercial purposes (73%), increasing of activity type and frequency (76%) and facilities for various ages (67%). This finding is an indication that the variables which are highly needed by communities in Zone 1, are: Amenities and Images, Access and Linkage need, and Economic Usefulness.

Table 8. Public preference level of Zone 1 *(Celaket – Kayutangan – Alun-alun)*

Variable	Operational Variable	The Number of Respondent Needs (%)*					
		VH	H	M	L	VL	Total
Amenities and Images	Physical character	44	16	7	20	13	100
	Pedestrian ways	33	31	29	7	0	100
	Street furniture	23	50	13	13	0	100
	Vegetation barriers	39	21	16	11	13	100
Access and Linkage	Minibus availability	29	41	30	0	0	100
	Pedestrian way linkage	**50**	**30**	10	3	7	100
	Halte	0	3	50	17	30	100
	Car parks	20	57	10	7	7	100
Economic Usefulness	Coordinating of street traders	27	27	17	7	23	100
	Investors	43	20	17	3	17	100
	Company types	0	10	30	50	10	100
	Commercial purpose	50	23	10	17	0	100
Social Needs	Type and frequency of activity	25	51	7	17	0	100
	Extra hours of activity	13	10	30	30	17	100
	Facilities for various ages	40	27	10	17	7	100
	Support facilities	7	0	37	33	23	100

*VH = very high (very important); H = high (important); M = moderate (quite important); L = low (less important); VL = very low (not important)

[ ] = >50% respondent   [ ] = the highest percentages

In the second table *(Table 9)*, the operational variable needs emphasized most strongly by respondents (more than 50%) include: the physical character enhancements (70%), availability of pedestrian ways (63%), street furniture availability (73%), vegetation barriers (70%), minibus availability (70%), pedestrian way linkage (80%), car parks (87%), coordinating of street traders (54%), increasing of activity type and frequency (76%), extra hours of public activity (60%) and facilities for various ages (67%). From those, the variables, with most pronounced necessity by people in Zone 2, are: Amenities and Images, Access and Linkage needs, as well as Social Needs.

According to Jalaladdini and Oktay (2013), human activity in a space is closely related to time. Importance needs to be adjusted by paying attention to particular periods of time, such as working hours, weekends, holidays and other considerations. The timing of public activities is arranged in such way to avoid the making useless of space (eg. is only used at certain times and not utilized for the bulk of the time). In addition, to succeed, a feasible corridor is needed for the running of activities at different times (Jacobs, 1993). Time management aims to avoid conflict, divide activities among different times and take advantage of certain events such as market days (bazaar). In relation to that, the increasing of activity type and frequency in Ijen - Gajayana Stadium IHPS can be achieved by the careful timing of events.

Table 9. Public preference level of Zone 2 (*Ijen* – Gajayana Stadium)

Variable	Operational Variable	The Number of Respondent Needs (%)*					
		VH	H	M	L	VL	Total
Amenities and Images	Physical character	43	27	20	7	3	100
	Pedestrian ways	33	30	30	7	0	100
	Street furniture	50	23	13	13	0	100
	Vegetation barriers	40	30	17	10	3	100
Access and Linkage	Minibus availability	30	40	30	0	0	100
	Pedestrian way linkage	50	30	17	3	0	100
	Halte	0	3	50	17	30	100
	Car parks	**67**	**20**	10	3	0	100
Economic Usefulness	Coordinating of street traders	7	47	17	27	23	100
	Investors	3	20	17	43	17	100
	Company types	0	10	30	50	10	100
	Commercial purpose	0	50	10	23	17	100
Social Needs	Type and frequency of activity	23	53	7	17	0	100
	Extra hours of activity	30	30	13	10	17	100
	Facilities for various ages	40	27	10	17	7	100
	Support facilities	7	0	37	33	23	100

*VH = very high (very important); H = high (important); M = moderate (quite important); L = low (less important); VL = very low (not important)

☐ = >50% respondent   ☐ = the highest percentages

In the third table *(Table 10)*, the operational variables that show a high level of importance (very important (VH) and important (H)) are: physical character enhancements (80%), availability of pedestrian ways (73%), street furniture availability (73%), vegetation barriers (73%), minibus availability (70%), pedestrian way linkage (80%), car parks (84%), coordinating of street traders (54%), increasing of activity type and frequency (76%), extra hours of public activity (73%) and facilities for various ages (67%). The respondent answers recognised the Amenities and Images, Access and Linkage and Social Needs variables as the main necessity in Zone 3.

Table 10. Public preference level of Zone 3 *(Tugu – Rampal)*

Variable	Operational Variable	The Number of Respondent Needs (%)*					
		VH	H	M	L	VL	Total
Amenities and Images	Physical character	53	27	17	3	0	100
	Pedestrian ways	43	30	20	7	0	100
	Street furniture	23	50	13	13	0	100
	Vegetation barriers	40	33	17	10	0	100
Access and Linkage	Minibus availability	30	40	30	0	0	100
	Pedestrian way linkage	50	30	10	3	7	100
	Halte	0	3	50	30	17	100
	Car parks	**17**	**67**	10	7	0	100
Economic Usefulness	Coordinating of street traders	27	27	23	17	7	100
	Investors	3	20	17	43	17	100
	Company types	0	10	30	50	10	100
	Commercial purpose	0	10	50	23	17	100
Social Needs	Type and frequency of activity	53	23	7	17	0	100
	Extra hours of activity	43	30	30	10	0	100
	Facilities for various ages	40	27	10	17	7	100
	Support facilities	7	0	37	33	23	100

*VH = very high (very important); H = high (important); M = moderate (quite important); L = low (less important); VL = very low (not important)

☐ = >50% respondent   ☐ = the highest percentages

In the fourth table *(Table 11)*, the operational variables that are considered very important (VH) and important (H) by most respondents (more than 50%) are: physical character enhancements (60%), availability of pedestrian ways (63%), street furniture availability (73%), vegetation barriers (60%), minibus availability (70%), pedestrian way linkage (80%), car parks (68%), investors

(60%), commercial purpose (90%) and increasing of activity type and frequency (76%). From those 16 variable operational questions, the fundamental needs were shown in Zone 4 to be Amenities and Images, as well as Access and Linkage. The availability of pedestrian and minibus ways is a necessity in establishing inter-regional linkages. The existence of a street market, as well as increasing the type and frequency of activities is intended to be an optimal use of IHPS.

Table 11. Public preference level of Zone 4 (Sukun – Kasin)

Variable	Operational Variable	The Number of Respondent Needs (%)*					
		VH	H	M	L	VL	Total
Amenities and Images	Physical character	20	40	7	20	13	100
	Pedestrian ways	33	30	30	7	0	100
	Street furniture	23	50	13	13	0	100
	Vegetation barriers	20	40	17	10	13	100
Access and Linkage	Minibus availability	40	30	20	10	0	100
	Pedestrian way linkage	50	30	10	3	7	100
	Halte	10	17	23	20	30	100
	Car parks	21	47	20	7	7	100
Economic Usefulness	Coordinating of street traders	13	17	13	37	20	100
	Investors	27	33	33	3	3	100
	Company types	7	3	20	33	37	100
	Commercial purpose	**23**	**67**	3	7	0	100
Social Needs	Type and frequency of activity	53	23	7	17	0	100
	Extra hours of activity	20	13	23	30	13	100
	Facilities for various ages	13	10	17	20	40	100
	Support facilities	17	13	10	33	27	100

*VH = very high (very important); H = high (important); M = moderate (quite important); L = low (less important); VL = very low (not important)

◻ = >50% respondent   ◼ = the highest percentages (≥70%)

Generally, all operational variables of the Amenities and Images (physical character enhancement, the availability of pedestrian ways, street furniture availability, and the existence of barrier vegetation) is selected by the majority of respondents in all four IHPS zones. Meanwhile, the Access and Linkage becomes the second needs variable in all IHPS zones. Nevertheless, the highest percentage of necessity is shown to be the operational variables of the Access and Linkage variable (the need for pedestrian way linkage of 80% in Zone 1, car parks in Zone 2 (87%) and Zone 3 (84%)). Interestingly, the highest public demand selected in Zone 4 (Sukun - Kasin) is for commercial purpose (90%) in the Economic Usefulness variable.

Table 12. Top priorities in improving community needs on the low-moderate integrity level of IHPS

Zone	Name of IHPS (level of integrity*)	Type/ character	Function	Top Priorities in Improving Community Needs
Zone 1 *(Celaket-Kayutangan-Alun-Alun)*	Tumenggung Suryo Street (M)	Concave-convex	Vehicle and pedestrian circulation	1. Pedestrian way linkage 2. Car park s 3. Activity type and frequency 4. Street furniture availability 5. Commercial purpose 6. Minibus availability
	Pattimura Street (L)	Straight-flat		
	Sartono Street/ *Comboran* (L)	Straight-flat		
Zone 2	Mayjen Panjaitan Street (L)	Curved-concave	Vehicle and	1. Car parks 2. Pedestrian way linkage

Zone	Name of IHPS (level of integrity*)	Type/character	Function	Top Priorities in Improving Community Needs
(Ijen-Stadion Gajayana)	Bandung Street (M)	Curved-concave-convex	pedestrian circulation	3. Activity type and frequency 4. Street furniture availability 5. Physical character 6. Vegetation barriers 7. Minibus availability
	Jakarta Street (M)	Straight-flat-boulevard		
	Malabar Park (M)	Rectangular	City forest	
Zone 3 *(Tugu-Rampal)*	Kahuripan Street (M)	Curved-concave-convex	Vehicle and pedestrian circulation	1. Car parks 2. Physical character 3. Pedestrian way linkage 4. Activity type and frequency 5. Pedestrian way availability 6. Street furniture availability 7. Vegetation barriers 8. Extra hours of public activity 9. Minibus availability
	Trunojoyo Street (M)	Straight-flat		
Zone 4 *(Sukun-Kasin)*	Raya Dieng Street (M)	Curved-flat	Vehicle and pedestrian circulation	1. Commercial purpose 2. Pedestrian way linkage 3. Activity type and frequency 4. Street furniture availability 5. Minibus availability
	Raya Langsep Street (M)	Straight-flat		
	Sodanco Supriadi Street (M)	Curved-concave-convex		

*M = Moderate, L= Low; based on *Table 7.*

The public preference assessment is a manifestation of public awareness in maintaining the environmental sustainability value, especially in IHPS, that has an integrity value focused on history, aesthetics and function. Maximizing the potentiality of regional conservation based on community preferences can enhance the low to moderate integrity values derived from the results of the IHPS integrity assessment. The focus on primary needs enhancement is obtained from ≥70% respondents and the top priorities are shown in sequence on *Table 12*. The majority of low to moderate integrity IHPS is in areas of functionality, such as pedestrian corridors and for vehicle access, while its physical characters tend to be linear line variations.

5.   CONCLUSION

From the assessment analysis of Malang IHPS, it is concluded that actions related to increasing the integrity level should be consistent with the following: (1) High integrity of IHPS: protecting the historical character from various negative changes (including limiting the addition of functions); (2) Moderate integrity of IHPS: adaptive use effort (utilizing, replicating, recreating (reconstructing)) in order to strengthen the existing character; (3) Low integrity of IHPS: optimal renewal effort (in the physical order and function, but also continued supporting of the regional image).

In the future, the development of Malang as a city of destination requires a vigorous public space to be visited by the wider community inclusive of different socio-economic levels. This ideal can be realized if the planning is done comprehensively, holistically and in an integrated fashion. Conservation efforts should take into consideration all regional requirements related to a wide range of issues. These activities should focus on more creative utilization

efforts, should produce new heritage products, lead to implementation of participation programs, as well as economic and socio-cultural activities in those conservation areas, which are wholly supported by public preference.

Based on that, further analysis of regulatory products is required in subsequent research. Such study would aim to assess the effectiveness of regulatory implementation and the extent of government support in trying to preserve and utilize historic areas, especially in IHPS in Malang. Then, the final synthesis will combine previous analysis into formulation of a concept for utilization of the IHPS as the basis for preserving and developing historic areas in Malang.

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Open spaces: spatial configuration, visibility analysis and use

Case study of mass housing in Biskra, Algeria

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Abstract: Open spaces provided in mass housing schemes is considered as one of largest issues in public mass housing, and their use by the inhabitants has been a concern and a topic of interest of many fields, where the focus is on inhabitant behavior in space according to either inhabitant/inhabitant or inhabitant/space relation. This open space constitutes a structuring space for the large housing estates, by the ties that connect between the buildings that compose it and the inhabitants who use it. Amongst the various deficiencies that mass housing schemes particular present today is the inability of promoting successful open spaces, which is mainly reflected by patterns of their use, therefore produce an abandoned, deserted, and degraded spaces, this is generally an indication that something is wrong with their layout design, in this regard, this paper revolves around the use of open public space in the 1000 collective housing units in the city of Biskra (Algeria), which provides a variety of open spaces forms, hence; to know how the spatial configuration and the site organization affect the way spaces are used by the inhabitants, based on the hypothesis that the use of open public spaces in mass housing is intimately linked to the visual fields produced by the spatial configuration. The analysis process draws on two methods, an observation in-situ to explore why in the neighbourhood, some parts are more occupied and more preferred by people than others, using the technique of behavioural mapping, i.e. people counting and spatial use mapping, taking into consideration three age groups (children, adults, elderly), further to look for links between visibility and spatial use, a syntactic analysis is carried out to analyze visibility properties using Depthmap software. The results of this study indicate that the visual factor, the buildings arrangements, and the site organization in the mass housing substantially affect the use and the quality of their open spaces.

1.   INTRODUCTION

This paper is about the open public spaces provided in mass housing schemes, which considered as one of largest issues in public mass housing, and their use by the inhabitants has been a concern and a topic of interest in many fields, where the focus is on inhabitant behavior in space according to either inhabitant/inhabitant relation or inhabitant/space relation. This open public space constitutes a structuring space for the large housing estates, by the ties that connect between the buildings that compose it and the inhabitants

who use it, it is a territory where the different social interactions take place, requires a certain characterization of belonging, and a sense of community.

Each urban environment has an existing pattern of solids and voids, and the solid-void relationships formed by the shape and location of buildings, i.e. buildings create open spaces (voids) for the residents (Can, 2012). Lewis (2005) asserts that public spaces are affected by buildings in two main ways: first of all, their use and how they relate with outdoor space, and secondly, their volumes in terms of the enclosure, where fronts and backs of buildings should be defined and differentiated clearly. Therefore defining public and private spaces that facilitate the mediation between these realms, and levels of penetration, permeability, and visibility are the tools for this negotiation (Lewis, 2005).

Currently, housing layout is of various forms, hence, the physical form and arrangement of residential buildings and their relationship with open space should be deliberated in new housing developments (Woolley, 2003). It is necessary to specify the housing layout types and classify dwellings based on common characteristics and forms to clarify the effect of building arrangement within residential areas on the quality, size and form of open space, thus its effect on social life quality and spatial use by the residents. In this context, several urban studies indicated that the configuration of open space between houses and the way a building is arranged on its site is particularly important, as Gehl (1987) states, "Life between buildings is not merely pedestrian traffic or recreational or social activities. Life between buildings comprises the entire spectrum of activities, which combine to make communal spaces in cities and residential areas meaningful and attractive".

In the recent past, enclosure of open space became the basis for a methodology of layout design in public housing, nevertheless Bill Hillier in his research argued that "the enclosure is not the answer to the urban problem, but the problem itself, its indiscriminate use has been responsible for the creation the fragmentary, unintelligible and largely under-used spaces which form a significant proportion of urban environment" (Hillier, 1988) . In other words, the relation between the building surfaces that enclose the space and the openings which connect it to the system need to be provided in a way which reflects the strategic value of the space, its metric size and the kind of informal uses which is intended to support (Hillier, 1996). So the importance of site-layout design in mass housing is to organize the external physical environment in order to accommodate, facilitate and, constrain human behavior i.e. by locating objects and activities in spaces, arranging buildings on the land, and shaping the spaces between buildings (Lynch, Lynch, & Hack, 1984). Moreover, building arrangement and site organization generate visual fields which are of a great importance on how people behave, appreciate and experience the environment and could be determinant factors in designing urban spaces (Bada & Guney, 2009). This research aims to explore the impact of building arrangement and the visibility produced by it on open public space use by residents within a mass housing.

To meet the increasing housing shortage in most Algerian cities, mass housing neighbourhoods (ZHUN) have been built all over the country since the 70's, it consists of a layout of several block units in various configurations, creating loose outdoor spaces intended to carry out social activities of residents. However many ZHUN housing models in Algeria confront an increasing number of problems linked to their design, and various studies have shown the negative effects of such a poor living open space on its usage by the inhabitants; a study in Batna, a city in Eastern Algeria, showed that the degradation observed in the ZHUN in the area results anonymous open spaces

where residents endured difficult conditions, such as deteriorated social cohesiveness, damaged neighbourhood relations, therefore their avoidance (Naceur & Abdellah, 2003). Another study by Mebirouk, Anissa, & Kaddour (2005) in Annaba city, in the North East region of Algeria, showed that outdoor spaces in public mass housing have failed to respond to the resident's public life; dysfunctional, deserted, and unevenly used space.

Against this backdrop, this paper revolves around the use of open public space in the 1000 collective housing units in the city of Biskra (Algeria), which provide a variety of open spaces forms, hence to know how the spatial configuration and the site organization affect the way spaces are used by the inhabitants, based on the hypothesis that the use of open public spaces in mass housing is intimately linked to the visual fields produced by the spatial configuration, using Space syntax method (Depthmap program) to observe the visibility properties and behavioural mapping, i.e. people counting, to observe the spatial use within the case study.

2.   RESEARCH BACKGROUND

2.1   Space syntax and visibility

The space syntax emerges as a set of theories and methods used for the definition of a structural environment and analysis of spatial configurations. At the end of the 1970s, space syntax was first put forward and applied by Bill Hillier and his team, since then many scholars have made a number of extension studies on space syntax, such as the studies on urban traffic, urban street layout, urban space design, and so on. Space syntax is only one way of thinking about space which believes that space has a great effect on people behavior, use of space and movement (Durson, 2007), this is why its techniques are very much used in contemporary studies of the relationship between spatial use and urban form of neighborhoods and public spaces (Novakovic & Djukic, 2015) property that might influence majorly people's spatial experience (Bada, 2012). Hillier claims that the use of open spaces is bound to the visibility field or isovist properties of space. This means that the visual field generated by space and configuration has a great impact on human behavior. In this context, Turner (2003) states: "we might use visibility analysis to talk about morphological properties of the built environment or to talk about how people can move or interact within the visible space or to discover the significance of objects places within that space".

Study of the visibility using Visibility graph analysis (VGA) was developed by Turner et al. (2001) based on space syntax theory (Hillier & Hanson, 1989) and previous studies on visibility fields (Benedikt, 1979; Theil, 1961). Turner et al. (2001) attempted to study the visual experience through buildings or urban environments by analyzing the properties of visibility fields. The concept of 'isovist' (Benedikt, 1979), has had a long history in various fields of research, it centers on visibility analysis, and is defined by Benedikt (1979) as: "the set of all points visible from a given vantage point in space and with respect to an environment". Turner (2001) asserted that isovists are an intuitively attractive way of thinking about a spatial environment because they provide a description of the space from the point of view of users as they perceive, interact with, and move through it (Varoudis & Penn, 2015).

Space syntax uses VGA primarily in architectural and urban space in order to attain how visibility defines relationships of spatial elements, influences movement and contributes to better understanding of space around us. Turner et al. (2001) presented the computational foundations of visibility graphs as a method to record spatial configurations and relationships. Since then, VGA has realised a series of meaningful characteristics and correlations about architectural and urban space, morphology, movement and space usage (Varoudis & Penn, 2015). The VGA method draws from space syntax theory (Hillier & Hanson, 1989) that seeks for answers through the analysis of the configuration of space and it produces a graph of mutually visible locations in a spatial layout termed visibility graph. VGA is implemented through the open source and multi-platform 'depthmapX' spatial network analysis software (Turner, 2001; Varoudis, 2012), where Turner et al. (2001) suggested a number of local and global measures of spatial properties that can be extracted from the graph and compared these with real-life data of usage to "shed light on the effects of spatial structure on social function in spaces" (Turner et al., 2001), then many studies have argued that there is a significant correlation between visibility analysis measures and the way people use spaces (Bada, 2012; Campos, 1997; Desyllas & Duxbury, 2001; Trova et al., 1999; Turner & Penn, 1999). Space syntax method is chosen to be used in this research to investigate the case study mainly because it provides techniques and tools that allow to analyze and to quantify space and also to link its configuration (spatial aspect) with people's behavior (social aspect).

2.2   Open space use in residential environment and visibility features

In line with the objectives of this research, this part introduces some studies that look at how open public space in residential areas is actually used, based on visibility features that produced by the spatial configuration, and the most significant study in recent years was carried out by Bill Hillier in studying a number of open spaces in the City of London, and he claimed that the use of open spaces is bound to the visibility field or isovist properties of space, in other words, the visual field generated by space and configuration has a great impact on its use, and more space is structured and legible, the more it is better lived by the user (Hillier, 1996).

Several research studies confirmed by using different tools and approaches that the main activity for people in open space is to be in contact with others; to be able to see, to hear and to experience other people functioning in various situations (Bada, 2012). This was principally confirmed by Trova et al. (1999) who have studied how the visual fields, linear properties, and socio-spatial boundaries interact to structure the public space of three sets of housing in Athens using syntactic and isovist analysis. The results showed that people converge on the areas of the greatest visual field and where the correlation between the density of people moving and syntactic variables are higher (Trova et al., 1999). In another study, Bada (2012) has studied four plazas that are situated within residential areas in the city centre of Biskra, Algeria, to look into why, within the same plaza, some parts are busier and more preferred by people than others. He investigated the correlation between people's movement and spatial use to the visual fields created by the spatial configuration. The results showed that people come to a public space through linear properties and then choose the location that offers some privacy, so the

spatial use is strongly related to visual considerations relevant to the type of activity.

Gehl (1987), in his book 'Life between buildings: using public space' argued that open spaces between the street and the building create the possibility for residents to spend time together and to socialize, moreover the specific characteristics of that space are very important for encouraging interaction. His main finding is that the key feature of a public space use is the presence of people, a characteristic that can be encouraged through physical planning. According to him, people tend to occupy the curbs (edges of curbs and pillars), especially places where people could sit and face the pedestrian flows, once they are full, the occupation goes gradually inwards; that means people prefer areas that provide good visibility but keep some privacy, an 'edge effect' (Gehl, 1987). Whyte (1980) and his team chose a variety of public spaces like plazas, streetscapes, playgrounds, even entire neighborhoods like Harlem, and set about observing and recording how and why people use them, in particular, to find what physical features would encourage their use. By using an in-situ observation method, the daily recording and interviewing of users was conducted. The main finding of his research is that the most frequented spaces are sociable places, where people select to occupy the dense areas, to stand and have conversations, or sit in the mainstream of pedestrian paths and flows. Whyte (1980) showed the importance of the visual factor, which deduced that the main activity for people is to look at other people. This means the visibility increases the sense of security and therefore is highly preferred by people.

3.   CASE STUDY PRESENTATION

Biskra is a middle city in the Southeastern part of Algeria, located on the edge of the Sahara Desert in a stretch of oases, around 430 km south of Algiers, it is known as the 'gate to the desert' with very hot summers and mild winters. Like most Algerian cities, Biskra has created two Z.H.U.N on the western and eastern peripheries of the city to satisfy the increasing demand for housing. "West Z.H.U.N" was the first Z.H.U.N initiated in 1975 on a surface of 98 hectares of land, and for the purpose of our study we focus on the 1000 collective housing units; in the southwestern part near the city centre of Biskra (*Figure 1*), one of the most important and well-known neighbourhoods in the city, and one of the oldest collective mass housing, which represents the first operation of West ZHUN, in 1979, and stated to be occupied in 1984. The total area of the estate is about 24,663 hectares; it comprises 123 blocks with the total number of flat units being 1000.

The 1000 housing units are located in a dense urban fabric near to the city centre of Biskra and are surrounded by several neighbourhoods and public buildings (*Figure 2*): A regional museum, a handicraft centre and Hakim Saadan high School in the north part, and residential areas in the South, East and West part. It is accessible from the important artery of the city. National Road N° 03 to the North, as well as from the National Road N°46 to the west. It is delimited by the 104 collective housing estate then 'EL Saihi' district in the East. The southern borders are delimited by the 'Ben Taleb' district, and the western ones by the 60 housing units.
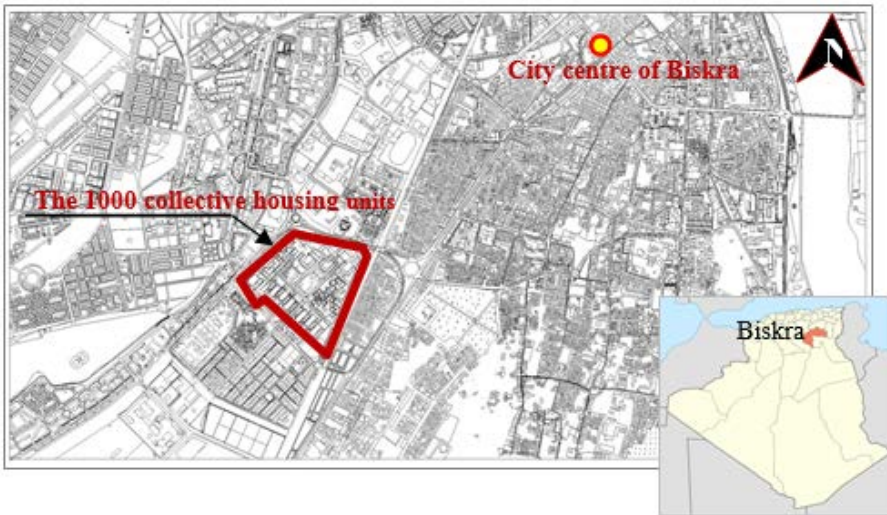
Figure 1. Situation Plan of 1000 Collective Housing Units in Biskra City.
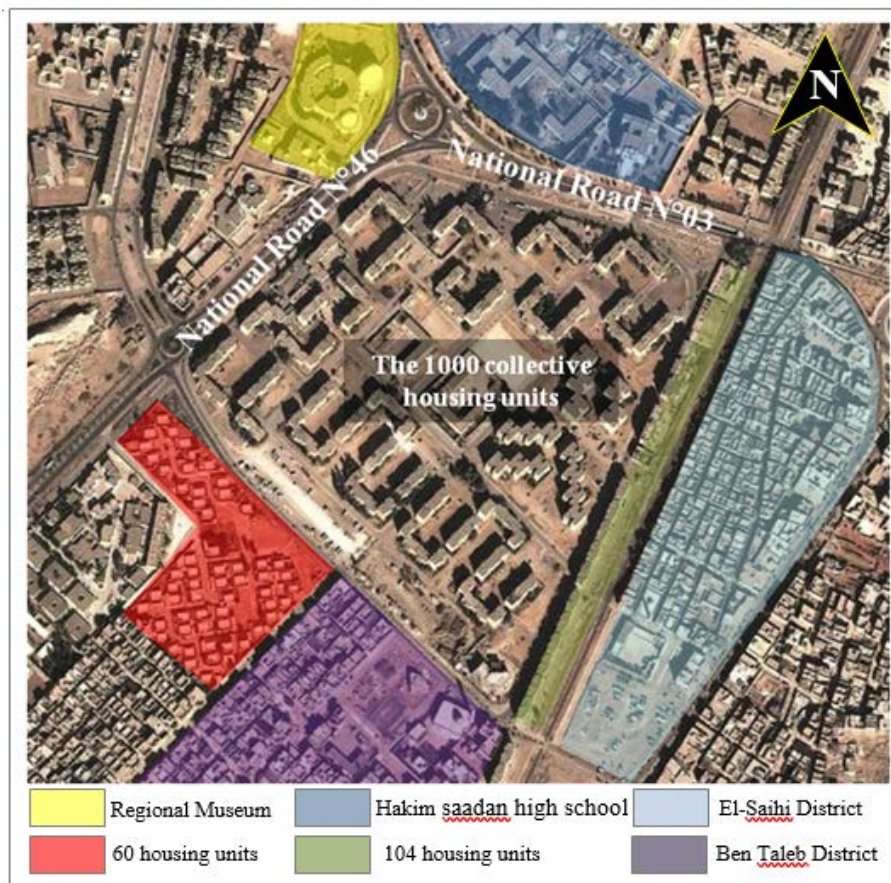
Figure 2. Ground Plan of the 1000 Collective Housing and Its Delimitations.

3.1   Spatial organization and building arrangement

The 1000 units housing estates contain more than the housing areas, it includes some public and administrative buildings and an outdoor shared space (*Figure 3*), two schools (a primary school and a college) at the centre,

and two soccer fields. At the north-east peripheral axis, there is the urban safety office and the administration building (OPGI), concerning the north-west part, there are the police office and the national gendarmerie. *Figure 3* also shows several types of access to the site, furthermore, all entries to the blocks are oriented toward the inside part of the neighbourhood to preserve the privacy of the residential area.

Figure 3. Spatial Organisation of the 1000 Collective Housing Units

The neighbourhood represents variant configurations of blocks, the most dominant are of a rectangular shape and for the rest are H- shaped. These blocks are arranged into four types of organization:

- I-shaped blocks arranged linearly (*Figure 4* (A))
- Blocks in degraded linear shape are formed by the assembly of H-type units (*Figure 4* (B))
- L-shape blocks (*Figure 4* (C))
- U-shape blocks (*Figure 4* (D))
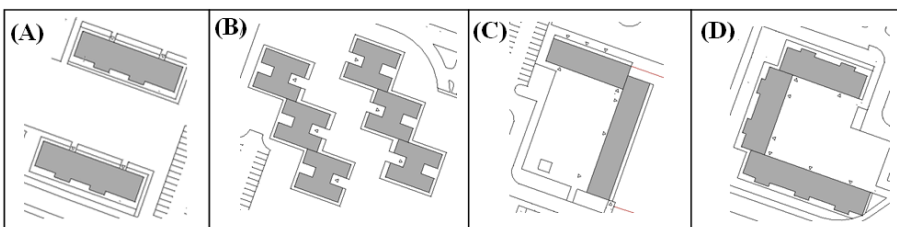
Figure 4. Arrangement Typology in The Mass Housing of 1000 Collective Housing Units, (A): Linear I-Shaped Blocks, (B): Blocks in Degraded Linear Shape Formed by The Assembly Of H-Typed Units, (C) L-Shaped Blocks, (D) U-Shaped Blocks.

The blocks' arrangement shows that the spatial organization of the neighbourhood is based on the principle of centrality and openness, where each number of blocks are organized around a central open public space,

except for blocks in degraded linear shape formed by the assembly of H-type units where the buildings are very close together, structuring a linear public open space.

3.2   Open space classification based on the number of access ways

The arrangement of blocks gives a variety to the estate's open public spaces configuration, which allows them to be group them into three categories (*Figure 5*):

- The open public spaces between the blocks.
- The open public spaces behind the blocks.
- The open public spaces overlooking the street.
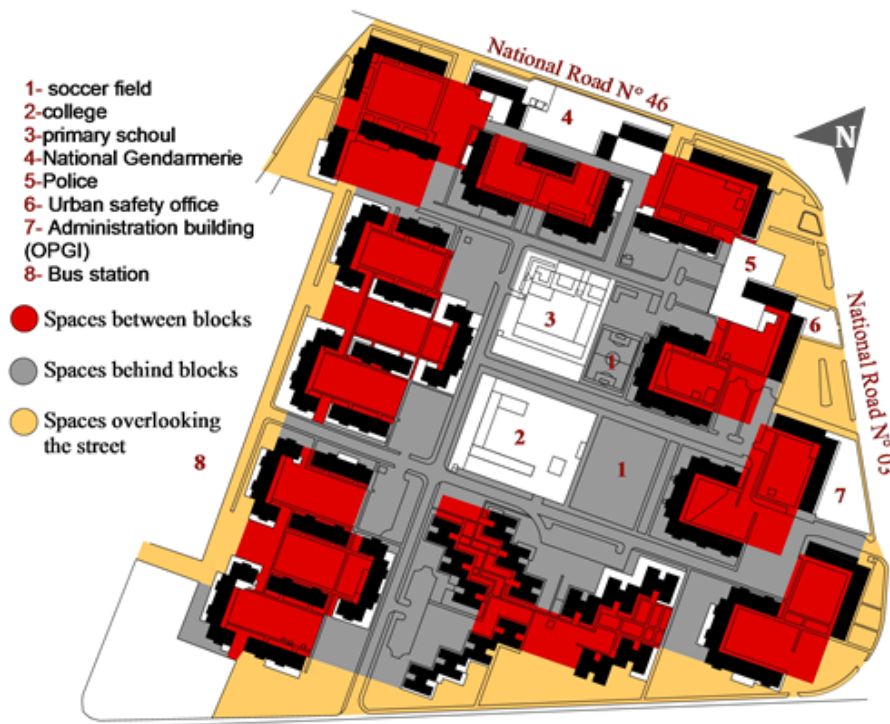
Figure 5. Different Types of Open Spaces in The Estate (The Darkest Colour = Spaces Between Blocks/Semi-Dark Colour = Spaces Behind Blocks/Lightest Colour = Spaces Overlooking The Street).

The shapes of spaces between the blocks can be also classified according to their degree of openness and accessibility in three categories (*Figure 6*):

- **Open public spaces provide a low degree of enclosure:** these have more than two large access ways formed by the arrangement of L-shape blocks facing each other with the I-shape blocks.
- **Semi-open public spaces provide an average degree of enclosure**: are accessible by two large accesses in two sides, and which are formed by the arrangement of L-shaped, U-shaped, and degraded linear shape blocks formed by the assembly of H-typed units.
- **Semi-enclosed public spaces provide a high degree of enclosure**: these are public spaces with a single large access way and other narrow access ways, resulting from by the arrangement of three I-shaped blocks; two of them being parallel and the other one perpendicular.

Figure 6. the Classification of Open Spaces Between Blocks of 1000 Collective Housing Units Based on The Number of Access (The Darkest Colour = High Degree of Openness/Lightest Colour = Low Degree of Openness).

4.   METHODOLOGY

The research methodology adopted was divided into three phases according to the objectives to be achieved. The first phase tackles the use of open public space according to three age categories (children, adults, elderly) using the technique of behavioural mapping, the second phase investigates its visibility using space syntax techniques, and the third one is about overlapping the results of the previous phases, therefore to affirm or deny the hypothesis that revolves around the relationship between the use of open space in mass housing, and the visibility produced by the spatial configuration.

4.1   The use of open spaces according to age categories: observation in situ

The use of open space in mass housing requires its frequentation by the inhabitants that varies according to the time of day and day of the week and is affected by 'the affordance' of a given space (Gibson, 1979). The use of open spaces in Biskra city is most affected by the seasons, time of day and prevailing weather and light conditions. In this regard, the method of behavioural mapping was carried out for two days. Tuesday as a day of the week and Friday as a weekend, in March 2017 from 17.00h to 18.00h, for 10 minutes. This period was chosen because it is the time that is conducive to outdoor activities to avoid the impact of climatic factors in the city of Biskra. We repeated the fieldwork several times, in order to see the different behaviours of the inhabitants and try to understand the way of using these spaces. The context of observations included the number of users, and users' age range (children (under 18 years old), adults (18-50 years old), and elders

(over 50 years old)). People counting considered only static people (sitting and standing positions) and dynamic people (people in activity with corporal mobility), while eliminating people crossing the neighbourhood. For the present work, the goal is to look for any link between occupancy of space and the properties of that space no matter what type of people's activities.
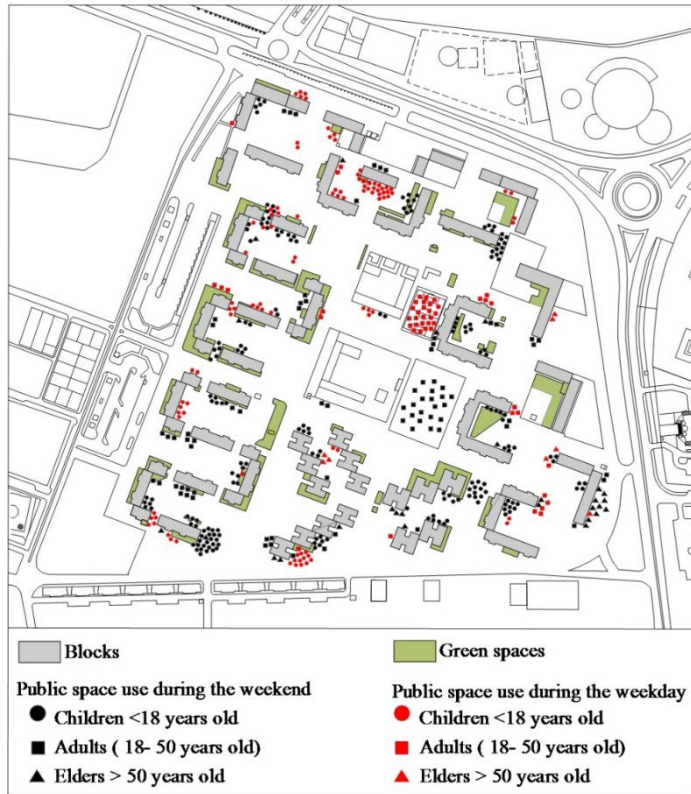
Figure 7. The Use of Open Public Spaces in The Estate, Where The People on The Map Are Represented as Follows: The Child With A Circle, The Adult With A Square, And The Elder With A Triangle, Using Two Colours; Red for The Weekday (Tuesday), And Black for The Weekend (Friday).

The results of the behavioural map (*Figure 7*) show an unequal distribution of users of different age groups (children, adults, elderly) through the open public space, where some places are busier and more used by the inhabitants than others, especially during the weekend, when most inhabitants prefer to pass their time outside instead of staying in their homes, and the number of people with dynamic activities (63,15% of users) on two days is more than the number of people with static activities (sitting and standing) (36.85% of users). This is mainly because of the lack of layout furniture and places of gathering and leisure that can lead to a confusion of use (*Table 1*).

Table 1. Number of People for The Three Age Groups According to Their Activity (Static and Dynamic) on Two Days of The Week (Tuesday and Weekends).

	Static activities			Dynamic activities			Total
	Children (<18)	Adults (18-50)	Elders (>50)	Children (<18)	Adults (18-50)	Elders (>50)	
Tuesday	33	25	08	65	22	00	153
Friday	21	50	27	**167**	27	00	**292**
Total	54	75	35	**232**	49	00	
	164 (36.85%)			**281 (63, 15%)**			445

Table 2. The distribution of users of different age groups (children, adults, elderly), through the different types of open public spaces in the mass housing.

Age categories	Open public spaces of mass housing estate													
	Spaces between blocks								Spaces behind blocks		Spaces overlooking the street		Total (%)
	Open spaces		Semi-open spaces		Semi-closed spaces		Total						
	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%	
Children (<18)	71	27.62	75	29.19	111	43.19	257	89.86	21	7.34	8	2.80	286 (64,27)
Adults (18-50)	16	25.39	20	31.75	27	42.86	63	50.81	58	46.77	3	2.42	124 (27,86)
Elders (>50)	2	10	13	65	5	25	20	57.15	2	5.71	13	37.14	35 (7,87)
Total	89	20	108	24.27	143	32.13	340	76.40	81	18.20	24	5.40	445

Table 2 above indicates that the vast majority of users of these open spaces are children with a percentage of 64.27%, then adults with 27.86%, and finally the elderly who present only 7.87% of the total number of users during the two days; and this can be explained by the inadequate facilities, security concerns, and a lack of interesting activities appropriate for their age group. It has also been noted that public spaces between blocks are the most frequented and used compared to spaces behind blocks and those overlooking the street. According to their spatial configurations, the semi-enclosed public spaces are more occupied by the inhabitants than semi-open and open spaces, and this allows predicting that the more space is limited by buildings (closed), the more it is used by the inhabitants, as these places can guarantee a good level of security and control, compared to others. Concerning the age groups, the majority of children use semi-enclosed public spaces between blocks, where they occupy areas near the entrances of dwellings, which are bare and large spaces, that allow children to play freely, following their parents' orders mainly to stay under their control and to keep an eye on them from the private interior spaces which provide good visibility (natural surveillance), however, adults prefer to occupy the spaces behind blocks away from the entrances, to keep some privacy, then elderly almost always ignore these spaces, most of them prefer to occupy the semi-open spaces between blocks (*Table 2*).

Although the open spaces were large and the investigation was carried out during two days of the week, the mode of use is still very low. It seems that the inhabitants only use the outside spaces for passage and not for the living and leisure, this is mainly due to the lack of layout furniture, playgrounds with safety standards, and rest areas for any age category, and may negatively affect the security and social control of the district.

4.2   Visibility analysis using syntactic measurements

In term of visual analysis, two techniques will be used to study the visibility in the neighbourhood's open public spaces using space syntax method. Visibility Graph Analysis (VGA) and Fewest Lines Analysis in order

to understand the relationship between the visibility of space and their use, based on the properties of visibility and taking into account visual barriers higher than 1.20 meters where most of these obstacles are informal green spaces. Two syntactic measures are considered, integration that identifies the most visible and accessible spaces, and local measure of connectivity that indicates the visual connections between each space within the neighbourhood, using the "UCL Depthmap" software, from the export of a DXF format file containing the visible limits of spaces.

4.2.1   Visibility graphs analysis

As it can be seen on the Visibility Graph Analysis (*Figure 8*), the values distribution of integration and connectivity are very close. The most integrated and connected areas are located in the centre of the neighbourhood, exactly near the two schools (primary school and College), and this means that these spaces are deeper and more accessible and well connected to other spaces. On the other hand, the spaces overlooking the street are moderately integrated and connected, except the southeastern peripheral axis, which has higher values. The least integrated and connected spaces are those between blocks with low values, especially which are the most closed (*Table 3*).
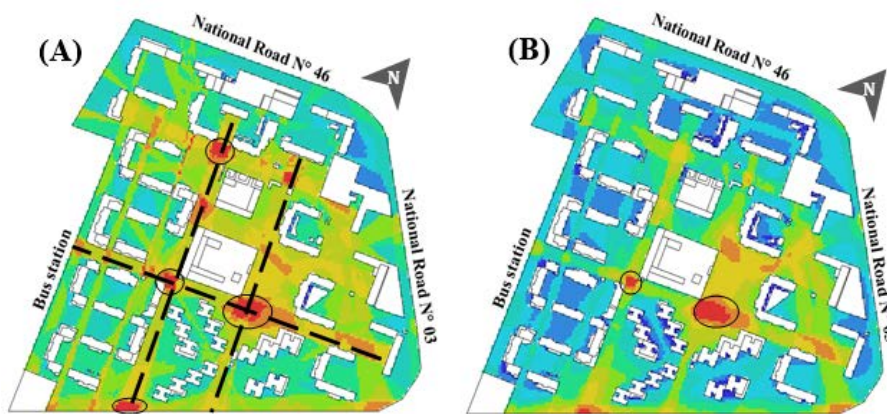
Figure 8. (A) Results of The VGA for The Visual Integration Values of Open Public Space Between The 1000 Collective Housing Units (B) Visual Connectivity of Open Public Space Between The 1000 Collective Housing Units (Red (The Darkest Colour) = High Values)

Table 3. Results of the VGA for The Integration and The Connectivity Values of Each Open Space Type in The Housing Unit Estate.

Visibility Graph Analysis (VGA)	Spaces between blocks			Spaces behind blocks	Spaces overlooking the street
	Open spaces	Semi-open spaces	Semi-closed spaces		
Integration	0.49	0.54	**0.45**	**0.68**	0.46
Connectivity	0.28	0.41	**0.23**	**0.55**	0.33

4.2.2   Fewest Lines Analysis

The Fewest Line Analysis (subsets) allows to give the main axes of the possible movement structure and to understand the spatial system in terms of accessibility and visibility in the neighbourhood. In other words, this analysis

allows identifying the impact of spatial configuration and building arrangement on visibility and visual accessibility of open spaces. It is used to confirm the VGA results.

It is also noted that the values distribution of integration and connectivity in the axial map are very close (*Figure 9*), which highlights that the axis linking the north-east with the north-west (the most integrated and connected), as well as the two axes linking the south-east peripheral axis with the north-east going through the central area (moderately integrated and connected) are the structuring elements of movement in the neighbourhood. Segregated and less connected axes are also located on peripheral zones and in spaces between blocks which are the most closed (*Table 4*).
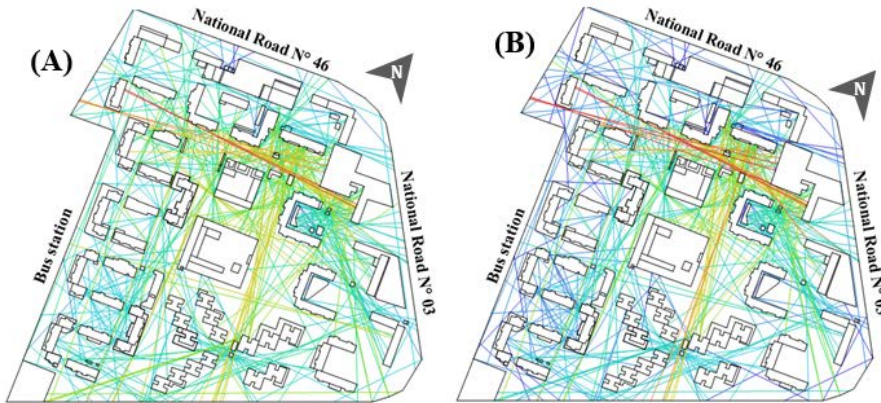
Figure 9. Results of The Fewest Line Analysis (Subsets) for The Visual Integration Values of Open Public Space Between The 1000 Collective Housing Units (B) Visual Connectivity of Open Public Space Between The 1000 Collective Housing Units (Red (The Darkest Colour) = High Values / Blue (Lightest Colour) = Lower Values).

Table 4. Results of The Fewest Lines Analysis for The Integration and The Connectivity Values of Each Open Space Type in The Housing Unit Estate.

Fewest Line Analysis	Spaces between blocks			Spaces behind blocks	Spaces overlooking the street
	Open spaces	Semi-open spaces	Semi-closed spaces		
Integration	0.43	0.42	**0.36**	**0.48**	0.38
Connectivity	0.35	0.38	**0.24**	**0.42**	0.27

4.3   Overlap of behavioural map and visibility

The confrontation of the configurational properties with the use and the occupation of the open public space in the 1000 housing unit estate by the different age groups on two days of investigation, by superposition the VGA and the axial map (Fewest Line Analysis) with the behavioural map, give the following maps shown in *Figure 10*:
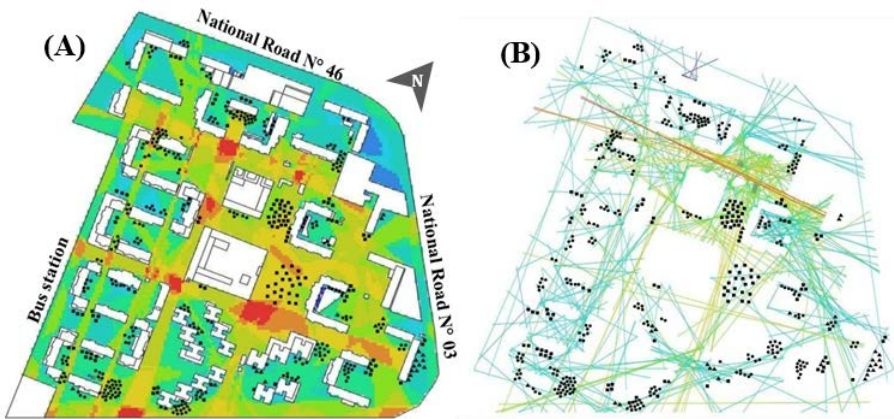
Figure 10. Overlapping People's Spatial Occupation and Visual Integration Map, (a) Overlap of Behaviour Map and VGA Map, (B) Overlap of Behaviour Map and Axial Map (Fewest Line Analysis). (Red (The Darkest Colour) = High Values / Blue (Lightest Colour) = Lower Values). Static and Dynamic People in The Map Are Represented By Dots.

Table 5. The Distribution of Users of Different Age Groups (Children, Adults, Elderly), Through The Different Types of Open Public Spaces in The 1000 Collective Housing Unit Estate, With The Syntactic Measurement (Integration) of Two Analyses; VGA and Fewest Line.

		Open public spaces of mass housing 1000 units				
		Spaces between blocks			Spaces behind blocks	Spaces overlooking the street
		Open spaces	Semi-open spaces	Semi-closed spaces		
The use of open public spaces according to age categories	Children (<18)	71	75	**111 (43.19%)**	21	8
	Adults (18-50)	16	20	27	**58 (46,77%)**	3
	Elders (>50)	2	**13 (65%)**	5	2	13
	Total	89	108	**143**	81	24
Visibility (Integration HH)	VGA	0.51	0.50	**0.45**	0.68	0.46
	Fewest line analysis	0.43	0.42	**0.36**	0.48	0.38

According to the Figure 10, it can be seen that there is a discrepancy between the visual integration values either in VGA or the axial map and the number of users occupying these spaces. From the *Figure 10* (A), the least

integrated spaces are occupied by the inhabitants, especially by children (43.19%) occupying the spaces between blocks semi-closed, with low values (I = 0.45). However, 46.77% of adults prefer to occupy spaces beside soccer fields as well as spaces behind blocks which provide more visibility with higher integration values (I= 0.68), and 65% of elderly occupy the moderately integrated zones (I= 0.50) (*Table 5*).

Same results occurred from the *Figure 10* (B), where most of the children (43.19%) avoid integrated axes and occupy the segregated zones where the mean integration value of axes that pass through these spaces is 0.36, then the 65% of elderly occupy the moderately integrated zones (mean value of axes= 0.42), however 46.77% of adults prefer to occupy spaces which contains a number of integrated axes with high mean integration value (I= 0.48) (*Table 5*).

So, the overlapping of observation data with the visibility graphs (in one map) showed that a large number of inhabitants occupy the most closed spaces which provide less visibility, furthermore, each age group chose to occupy places mainly according to their visibility and accessibility generated by the spatial configuration.

5.   DISCUSSION AND CONCLUSION

The results of this research show an inverse relationship between visibility and open space use, where the total users of these spaces in two days of investigation that composed mainly of children occupy the most closed spaces which provide less visibility, and this contrasts somewhat with findings of previous studies (Bada, 2012; Campos, 1997; Desyllas & Duxbury, 2001; Hillier, 1996; Trova et al., 1999) which reported that the more space is visible the more it is occupied by people. We also note that for each age category the preferred places are chosen mainly according to their visibility generated by building arrangement as follows:

Children (under 18 years old) occupy the spaces between the blocks semi-closed and tend to play in areas near the entrances of dwellings that are characterized by very low integration values. It may be that the children occupy these spaces generally according to their parents' orders mainly to stay under their control and for them to keep an eye on them from the private interior spaces which provide good visibility (natural surveillance), moreover to avoid high-visibility and movement spaces for security and control reasons.

Elderly inhabitants prefer to occupy moderately integrated spaces, then adults occupy space at the back edges of blocks that provide good visibility and accessibility, where they can see the pedestrian flows while keeping some privacy, and that is what (Gehl, 1987) called 'edges effects', finding that the edge of the public space is the favorite place for people, because it can offer a better view with extended visual fields. One of the main characteristics of public space is supposed to be its visibility and access by all (Carr et al., 1992; Mitchell, 2003). However, in practice it is not necessarily so, especially in open spaces of mass housing where the visible effects might take form in many different ways, from the use and/or avoidance of use of the space by the inhabitant, to a change in the way that the image of a public space is perceived by different age categories that can reflect socio-cultural consequences.

In conclusion, this study indicates that the visual factor, the building arrangements, and the site organization in mass housing substantially affect the use of their open public spaces by different age categories. Children avoid the places of visibility (spaces between blocks semi-closed), whereas the

adults and the elderly occupy the places with a good visibility (spaces behind blocks and those overlooking the street). So the spatial use is highly dependent on visibility, accessibility and connectivity to the surroundings, thus, on the enclosure, degree of space is key to good functioning; visual access is a decisive factor in public spaces use (Montello, 2007). This tells us about the deep integration between the physical features of open spaces in mass housing and the way inhabitants occupy them, hence the visibility is an important factor that must be taken into consideration in the mass housing layout design, but in a way that takes into account the needs of all age groups; "Visual thinking in particular becomes a very important mode of thought that may change people's view of their environment in order to improve it" (Meziani, Ghazal, & Hajjdiab, 2015).

The outcome of this investigation is neither complete nor exhaustive. Although our interest in this research is on the impact of visibility produced by the spatial configuration on spatial use, numerous factors may also influence the use of these spaces. Other interesting directions for future research could consider the building height or the effect of the visibility from each building surrounding the open space, moreover study people's use of space which may be coupled by other measures that address people's perception in terms of their relations with space (e.g. territoriality) as a factor more important than physical ones in building a positive relationship with a territory, thus to maximize the use and the quality of these spaces.

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Research and Practice on Disaster Prevention Planning in Villages based on Planning Support System

Overview: Potential public policies on spatial planning for sustainable urban forms A Case Study

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Abstract: Global geological hazards have brought huge losses, and the fast development in China is no exception. At present, China's hazard prevention and mitigation research and construction is mostly concentrated in the cities, while the rural, mountainous regions suffering the most serious damage and loss from geological hazards are neglected. In these areas, hazard prevention planning is missing or uses the city standard, lacking scientific analysis and theoretical support. Therefore, the study of disaster prevention and mitigation in remote regions is becoming more urgent. Existing studies on geological hazard prevention mainly focus on urban areas but ignore remote and rural areas where large numbers of people live. By drawing experience from disaster prevention and reduction in urban areas and incorporating effective scientific methods, this study aims to establish a planning support system for disaster mitigation to reduce the impact of disasters in rural areas on people and their property. The most significant contributions this research and practice offers is as follows. Firstly, the high-precision data of the villages, which is usually lacking and difficult to acquire, can easily and quickly be obtained by unmanned aerial vehicles (UVA) equipped with optical sensors and laser scanners. Secondly, combining high-precision data and the disaster evaluation model, geological disaster risk assessment technology has been developed for rural areas that addresses not only the natural factors but also human activities. Thirdly, based on disaster risk assessment technology, disaster prevention planning that has been constructed specifically for villages is more quantitative than before. Fourthly, with the application of a planning support system in disaster mitigation, a scientific and effective solution for disaster rescue can be achieved automatically. Lastly, this study selects a suitable area for implementation and demonstration, which can verify the feasibility and effectiveness of the system and enrich the knowledge base through a demonstration case. Based on the above research, a scientific hazard prevention strategy is put forward, which provides a scientific basis for decision-making and a support method for disaster prevention planning in villages.

1. INTRODUCTION

With rapid economic and social growth, the extent of geological hazard consequences increases yearly around the world (Hufschmidt, Crozier, & Glade, 2005). China has become the region with the highest frequency of geological disasters in the world according to the report released by the Emergence Events Database of the Global United Nations Development Programme (*Figure 1*). Statistics show that geological hazards leading to natural disasters are now the second leading cause of casualties in China, only after earthquakes (Peng & Wang, 2015), presenting a major challenge to the security of people's life and property. This situation is related to the specific geographical location and topography of China (Wu, Ren, & Niu, 2014).
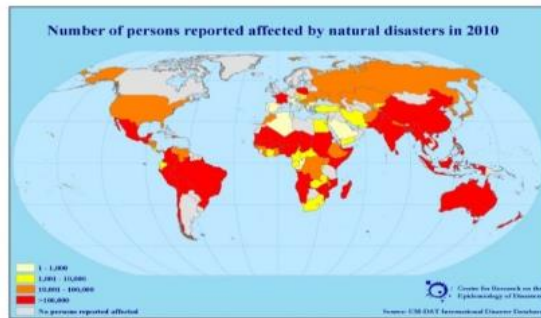
Figure 1. The Influence of Natural Disasters Around The World by Emergence Events Database in 2010

According to statistics, 80% of casualties caused by natural disasters had were in rural areas; nearly 2 million houses have collapsed, with the majority in rural areas. Both the frequency of and loss from natural disasters in villages and towns are significantly higher than those in cities (M. Liu et al., 2015). In addition, most people live in villages in China, representing about 640 million according to 2013 census data. Most villages in China are located in mountainous areas with inconvenient transportation, relatively small economies and inadequate basic infrastructure. Compounding this problem, the development of disaster prevention planning in China is at a preliminary stage (H. Liu, Zeng, & Xu, 2014), and most of the research and disaster prevention and reduction construction has happened in city regions (McCall, 1998), meaning that the village regions, which are relatively more prone to the problems associated with geological disasters, are rarely involved. Therefore, the research of disaster prevention and control in villages and towns is particularly important and urgent.

Geological hazards are a type of natural hazard, defined by scientists as either the probability of a reasonably stable condition to change abruptly (Scheidegger, 1994) or as the probability of occurrence of a potentially damaging phenomenon within a given area and in a given period of time. The most common form of geological disasters are landslides, collapse, debris flow, and so on (Guzzetti et al., 1999).

As geological disasters have become more common, scholars and scientists around the world have increasingly taken to the study of disaster prevention and reduction (Liverman et al., 2001; McCall, 1998; Petro, Klukanova, & Kovacikova, 1997). From previous research, numerous studies have evaluated geological hazards and assessed geological hazard sensitivity or susceptibility (Lamelas et al., 2009; Muço et al., 2012). Those studies focused on the formation of geological disasters through relevant models,

which led to the production of the prediction map for the probability of the occurrence of geological hazards (Fenton et al., 2014; Youssef et al., 2012). The recent trend is towards the development of warning systems (Ciampalini et al., 2015) and land utilization regulations aimed at minimizing the loss of lives and property damage without investing in long-term, costly projects for disaster prevention and reduction (Baban, 2009).

Compared to previous studies, this research investigates three novel aspects in the field. Firstly, the general terrain area for geological hazards is complex and basic data acquisition is difficult. In order to improve the accessibility and accuracy of basic data acquisition, this study uses unmanned aerial vehicles (UAV), equipped with optical sensors and laser scanners to obtain data. Secondly, the existing literature on disaster prevention and reduction is mainly concerned with urban regions (Bathrellos et al., 2012; Zhou & Zhao, 2013) and there has been little focus on villages and towns, despite its relatively greater urgency. Therefore, this study is aimed at the region of the villages and towns more prone to geological hazards. Lastly, a planning support system (PSS) has been used for disaster prevention and reduction in villages in this study. Studies show that planning support systems are mostly used for land use planning, assessment and planning of water resources and so on, where the application for disaster management and control is overlooked.

2.　　　METHODOLOGY

"Define the problem, analyse the problem" has been the pattern of research of disaster prevention and mitigation in villages. *Figure 2* shows an overview of the content and methodology that is used in this study. The research process can be divided into three parts. In the problem definition phase, the main problems associated with disaster prevention and mitigation in villages are organised and summarised by collecting and analysing large amounts of material. For the main problems, specific techniques and methods have been used to analyse the cause of the problems and find solutions respectively in the last two phases. Four key technologies have been developed through the study flowchart, which can be described in detail as follows.
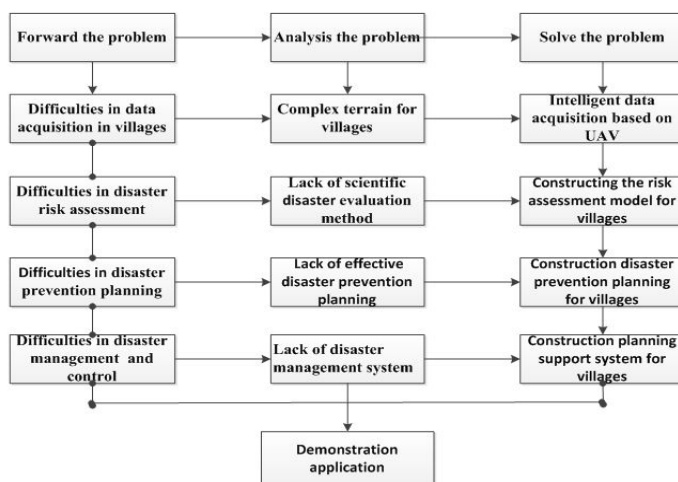
Figure 2. Flow Diagram of The Study

2.1 The intelligent acquisition and analysis technology of spatial data based on unmanned aerial vehicles

Unmanned aerial vehicles are a widely used efficient data gathering method. The unmanned aerial vehicle system (*Figure 3*) adopted in this research is composed of the following four parts, an Unmanned Aerial Vehicle (UAV) with a flight control system, a small digital camera, ground monitoring systems, and matched operating software. Route planning for the UAV was implemented using the TOPUAV plan (*Figure 4*), a professional route planning software. In order to ensure accuracy for the mosaic images, some technical indicators must be produced. First of all, adjacent photos must have at least 75% longitudinal overlap. Secondly, the adjoining flight line must have at least 50% lateral overlap. Furthermore, the image resolution of the lowest point in a flight block must greater than 0.2 m (*Figure 5* and *Figure 6*).

Figure 3. Electric Fixed-Wing UAV Platform
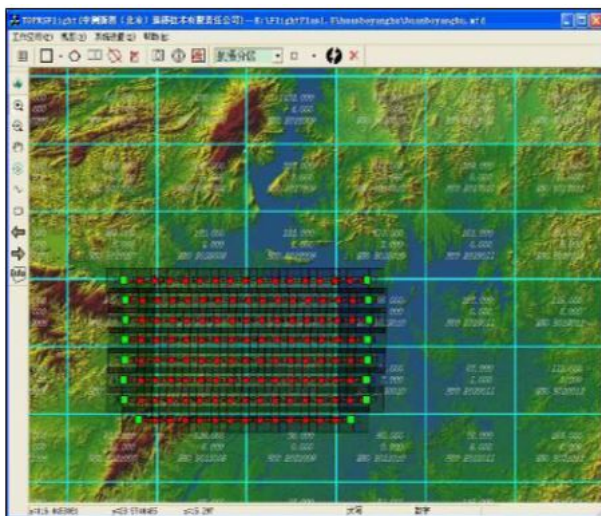
Figure 4. Route Plan Using TOPUAV Plan
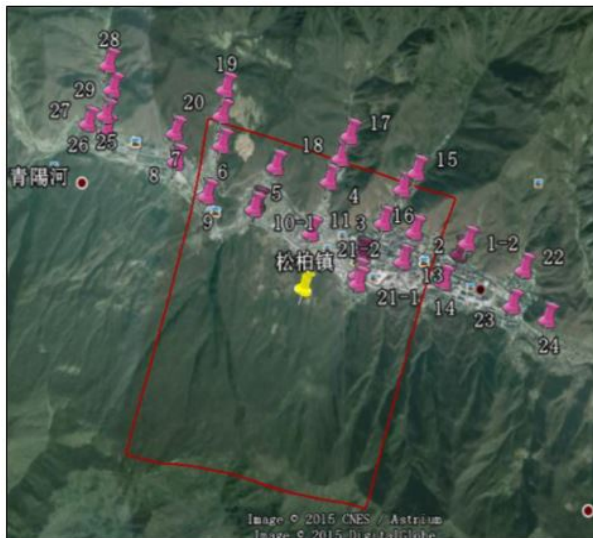
Figure 5. UAV Route Planning of Case Area
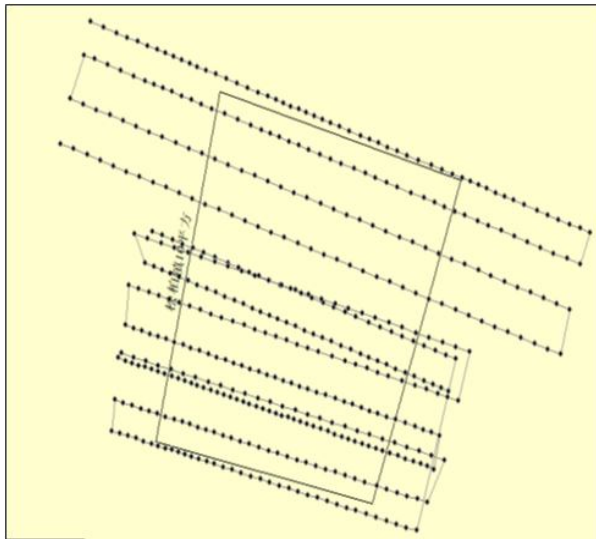
Figure 6. Ground Control Points Layout Scheme of The Case Study Area

The UAV platform used for data acquisition has a fixed-wing aerodynamic configuration. This UAV has the advantage of simple structure, it is light and strong. Ejection take-off can be achieved with a rubber band and landing by parachute, which means it can autonomously take off and land, reducing the requirements of the UAV operator. The UAV is highly flexible, can adapt to various complex conditions and can be quickly assembled in a short time. This UAV system is equipped with a digital camera system to obtain high resolution remote sensing images, which can provide the first remote sensing data for emergency mapping. The system can also be equipped with high-definition video capture equipment and a wireless digital image transmission system to rapidly capture comprehensive real-time video on the disaster or accident sites. Through the whole process of data acquisition and subsequent processing (*Figure 7*), the method can quickly access post-disaster terrain and ground object information, represented by the digital elevation model (DEM) and digital surface model (DSM). Therefore, this method has the characteristics of fast, flexible and efficient access to spatial information, especially in mountainous areas with complex terrain.
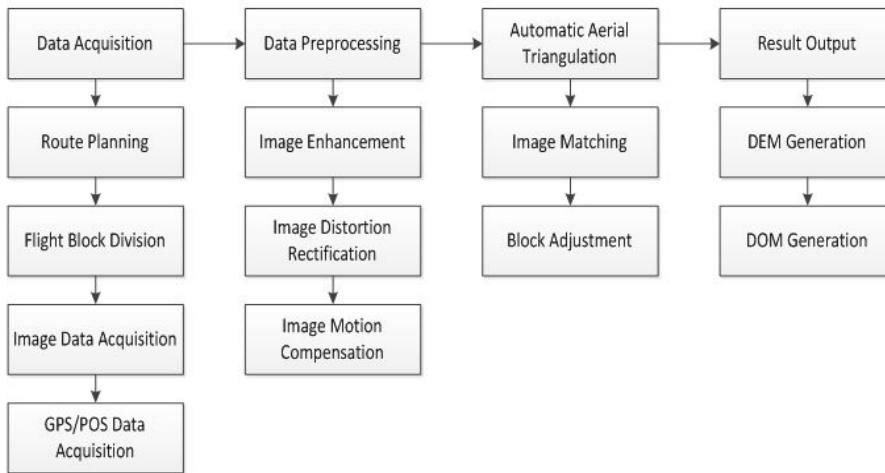
Figure 2. Geological Disaster Risk Assessment Technology in Villages

2.2 Geological disaster risk assessment technology in villages

High-precision data obtained by the UAV allows for new methods of studying the spatio-temporal distribution of geological disasters. This study investigated and summarised hazard-inducing factors from historical cases, including both factors from natural and human causes. Based on this data acquisition technology, multiple methods have been employed to quantify the risk of geological hazards. Those methods used to assess the risk of geological hazards have been detailed in *Table 1*. Unlike previous disaster evaluation, this research method has two significant aspects. First is the spatial autocorrelation analysis. In theory, geological hazards, as a kind of geographical data, exist in terrain that have a spatial dependence that has usually been overlooked. Therefore, Moran's I index has been adopted to determine the geological hazard's degree of spatial autocorrelation using GIS spatial analysis tools. Next is the application of the spatial autocorrelation model. This study compares multiple models, such as the spatial lag model (SLM) and the spatial error model (SEM). SLM and SEM are more suitable for analysis of disasters as dependent variables with spatial interdependence. Overall, the geological disaster risk assessment technology has been developed for rural areas.

Table 1. Disaster Evaluation Methods

Method	Content	Tool
Spatial autocorrelation analysis	Measure spatial dependence of geological disaster distribution	GIS
Correlation analysis	Measure correlation coefficient between factor and hazards	SPSS
Spatial regression model	Quantify the influence of disasters	GEODA
Logistic regression model	Measure occurrence probability of hazards	SPSS, GIS
Fuzzy comprehensive evaluation model	Measure the risk of hazards	GIS
Neural network model	Measure the risk of hazards	GIS

2.3   **Database construction**

Database construction is the basic work of the support system for disaster prevention and reduction. Databases can store and manage massive amounts of data and are therefore ideal for a planning support system of disaster prevention and reduction in villages that needs to store and manage high volumes of data.

In this study, the database should include not only the traditional spatial data, mainly remote sensing images, LiDAR point cloud data and the Digital Elevation Model, but also social and economic data with spatial attributes covering population distribution, administrative districts and the built-up area. Furthermore, it should include multi-resource data about stratigraphic lithology, landform partitions, and disaster prevention and reduction knowledge. Due to the diverse data sources, it is difficult to store uniform coded data and maintain updates. Meanwhile, data distribution and multi-user access also requires a new, consistent programmable solution to facilitate the various applications of the data.

This paper develops a multiple source database based on the ArcSDE for Oracle *(Figure 8)*. As a major database engine for GIS, ArcSDE has the advantages of mass storage, multi-client concurrent access. Backed by Oracle's commercial Relational Database Management System (RDBMS), software performs better in terms of data integrity and consistency, as well as its advanced data management technology, such as asynchronous buffering, space index and multi-client concurrent access. The combination of ArcSDE and Oracle can not only solve the problems of storing, managing and quick access in RDBMS for spatial and non-spatial data, but also unify data encoding, data standard formatting and update mechanisms.
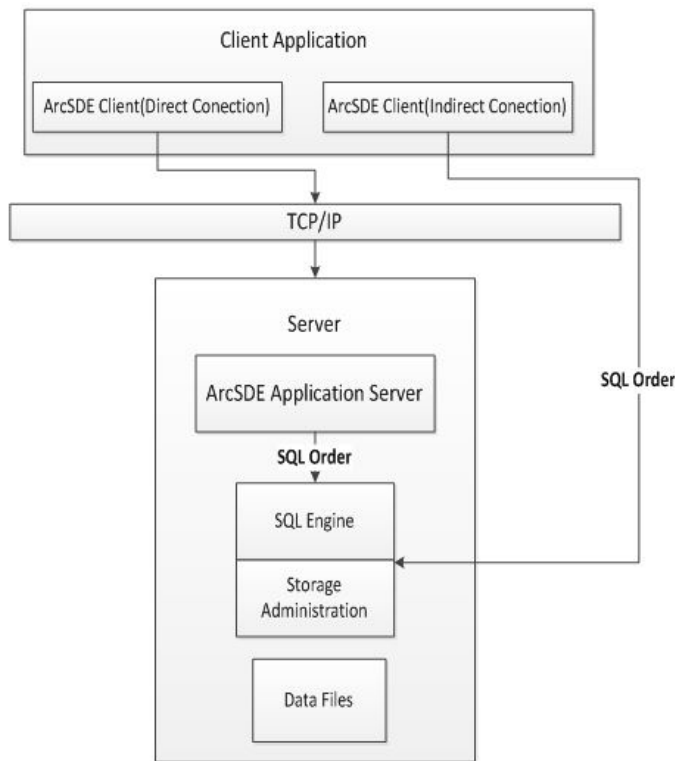
Figure 3. The Database Architecture Diagram

2.4   Planning support system for disaster prevention and reduction

By drawing experience and lessons from disaster prevention and reduction in cities and planning support system construction in urban areas and incorporating effective scientific methods, this paper establishes a framework for disaster prevention and reduction planning support systems in village-town areas. The main principle of the system is to maximally reduce the impact of disasters on people and property in those areas from the perspective of village-town planning.

For the system architecture, developers use an object-oriented approach to conduct system development. There is some background knowledge of planning and related disciplines incorporated into the system, and data interactions between the client and RDBMS server may be confidential. Developers therefore adopted the C/S system architecture (*Figure 9*) for this system development. Additionally, system developers use C# combined with ArcEngine to do integrated development.
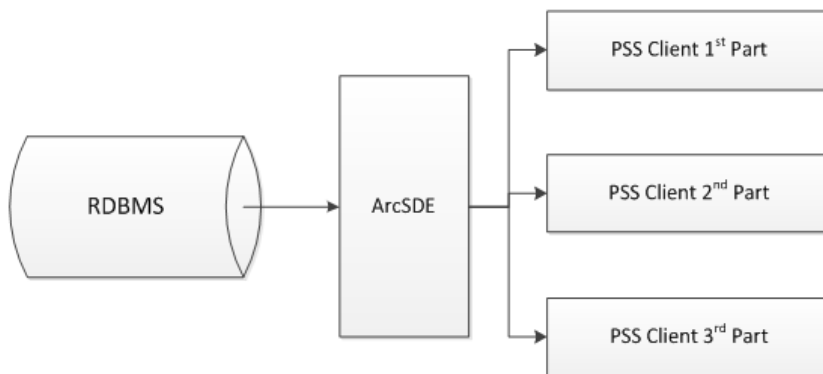
Figure 4. System Architecture Diagram

The planning support system includes the client presentation layer and business layer (*Figure 10*). The presentation layer's development is based on components provided by Windows, Net Framework 4.0 and ArcEngine (*Figure 11*). Developers strive to customise a set of interfaces for target users. In order to satisfy the demands of a particular user, the business layer uses the COM components provided by ArcEngine to conduct integrated development. The main functions of the business layer are as follows.

Database: the database includes the fundamental geographic database and case database.

Data input: this function can load many kinds of raster data and vector data, which can be recognized by ArcGIS.

Property edit: this function can add fields, remove fields and sort fields.

Graphics edit: this function can conduct graphics merging, graphics cutting, etc.

Map symbolisation: users can define the lines, font, colour, etc.

Spatial analysis: this function can conduct buffer analysis, superimposed analysis, path analysis and disaster risk prediction, and planning and decision-making.

Data output: this function can conduct format transmission such as raster, vector and CAD.
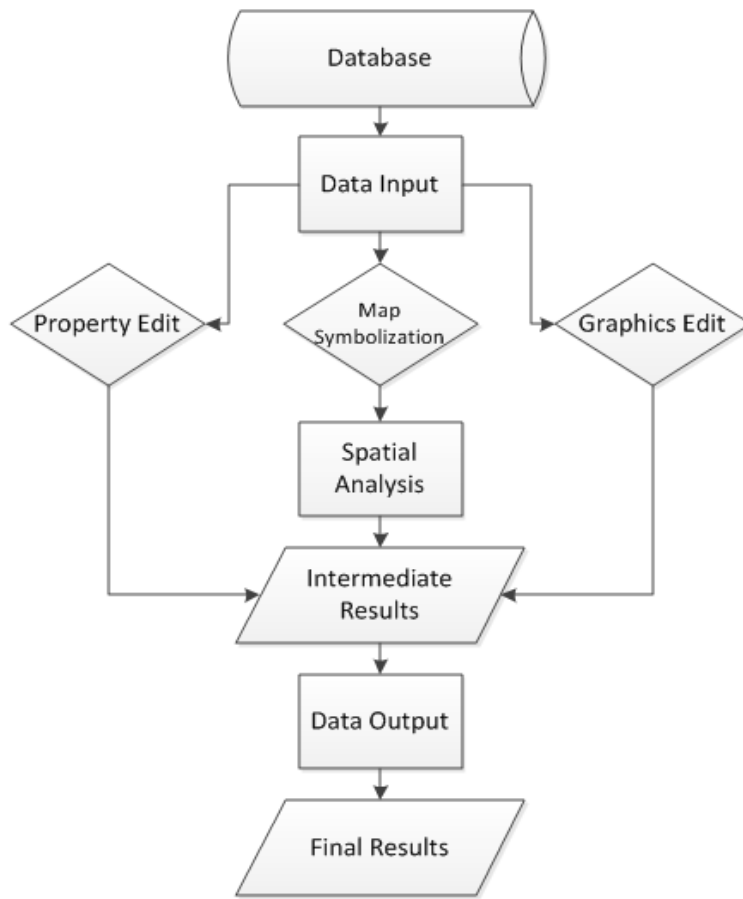
Figure 5. Working Process of The Business Layer

Figure 6. Part of The Source Code of The Planning Support System

3. APPLICATION OF PLANNING SUPPORT SYSTEM FOR DISASTER PREVENTION AND REDUCTION IN CASE AREA

3.1 Case area introduction

China's geological environment is frail and it is subject to extreme climatic change. Compounding this, in the current period of rapid economic growth, construction projects increase continuously and blindly. This leads to increasingly frequent geological disasters in China. This is especially obvious in the case area, Shennongjia. Shennongjia is located in the western region of China's Hubei province (*Figure 12*), with a total area of 3,253 square kilometres and permanent resident population of about 76,700, as of 2014. Located in the eastern part of Ta-pa Mountains, Shennongjia is a typical mountainous area: limited by the terrain, the area is remote and poor, with villages and population distributed unevenly.

Figure 7. The Location and Geological Hazard Spot Distribution in The Shennongjia Area
(Data Source: Shennongjia Land and Resources Bureau)

Based on the statistical analysis of past disasters, geological disaster is the most serious threat in Shennongjia. By 2014, there were 283 known geological hazard spots, mainly collapses, landslides and debris flows (*Figure 12*). The

disaster scales are mostly micro and small, but the occurrences are frequent and wide ranging. Therefore, the study selects Shennongjia as the case area, which the planning support system for disaster prevention and reduction in villages is applied to.

3.2 Composition of planning support system for disaster prevention and reduction in the study area

The planning support system for disaster prevention and reduction in villages is the combination of planning and so called "3S" technologies (GIS, RS and GPS), which covers the plan scheme, socioeconomic indicators and the massive amount of spatial data. In the planning support system, a scientific and effective planning scheme for disaster prevention can be crafted intelligently. The system consists of a basic rural spatial information database, rural disaster base case, disaster risk assessment model-based case and rural planning support method-based case for disaster prevention and reduction, which is designed and implemented on a 3S technology integrated computer platform (*Figure 13*).
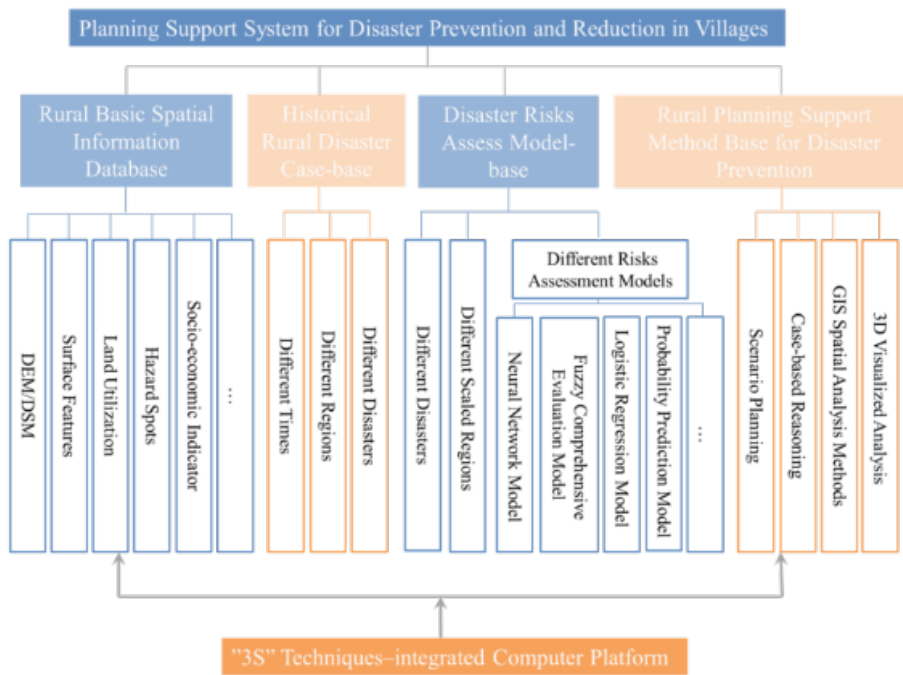

Figure 8. Structure Diagram of The Planning Support System for Disaster Prevention And Reduction in Villages

3.2.1 Basic rural spatial information database

With the aim of geological disaster prevention, the basic spatial information database of the case area was built in ArcGIS, and covers the distribution of geological disaster spots, topography-physiognomy information, geologic structural information, village construction map and detailed information of key areas (*Figure 14*, *Figure 15*, and *Figure 16*). The multiple-source data which was acquired by remote sensing image interpretation, field research, GIS spatial analysis and data mining, was efficiently stored and managed in the database.

Data Set		Data Name	Data Content	Data Type
Shennongjia Area Basic Spatial Information Database	Raw Information	1. Topographic map of the whole region	Geographic, geomorphic and constructive information of Shennongjia area in 2014	vector
		2. Text notes of the whole region	Names of places, roads, rivers,lakes,vegetation,etc	vector
		3. Administrative division of the whole region	Boundary lines of villages and towns	vector
		4. Remote sensing images	Shennongjia area, Songbai town, Muyu town in 2014	raster
		5. 1:500 topographic map of Songbai township	Information of road, building, pipeline, etc of the township in 2014	vector
		6. 1:500 topographic map of Muyu township	Information of road, building, pipeline, etc of the township in 2014	vector
	Natural Element Information	1. River system	Information of river location and type	vector
		2.DEM, slope, aspect, curvature	The whole region: 10m precision The townships: 5m precision	raster
		3. Physiognomy	Geomorphology information	vector
		4. Denudation-planation surface	Denudation-planation surface information	vector
		5. Stratum lithology	Stratum lithology information	vector
		6. Geological fault lines	Information of geological fault lines	vector
		7.Engineering geological rock group	Character of engineering geological rock groups	vector
		8. Rainfall capacity	Month average rainfall in 2014	vector
		9. Vegetation coverage	Vegetation type and cover rate	
	Artificial Construction Information	1. Population distribution	Population of all villages in 2014	vector
		2. Road system	Information of road location and grade in 2014	vector
		3. Building	Distribution, structure, storeys and quality of buildings	vector
		4. Land use	Land use type and range in 2014	vector
		5. Socio-economic indicator	GDP, population, households, etc	vector
	Disaster Information	1. Geological hazard spots over the years	Location, type and scale of geological hazards(2005-2014)	vector

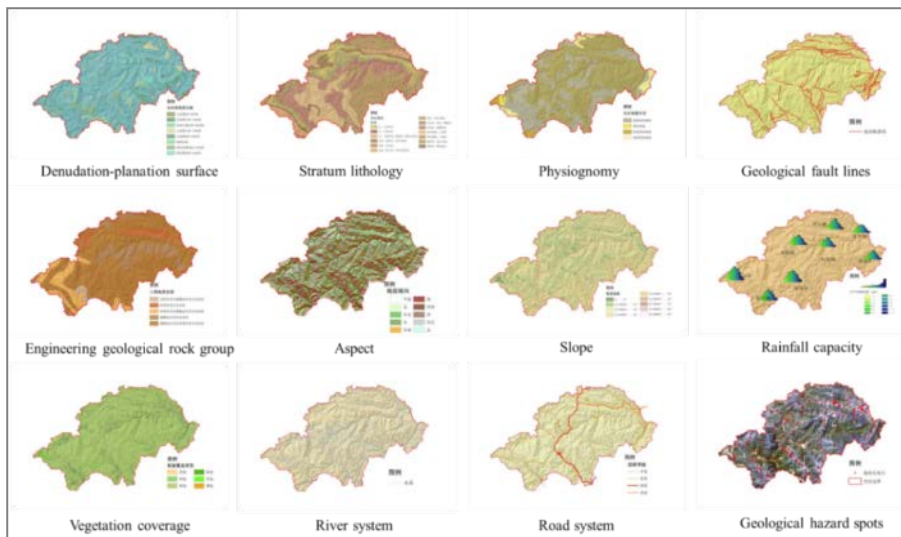*Figure 9.* Basic Spatial Information Database of The Case Area (Shennongjia Area)

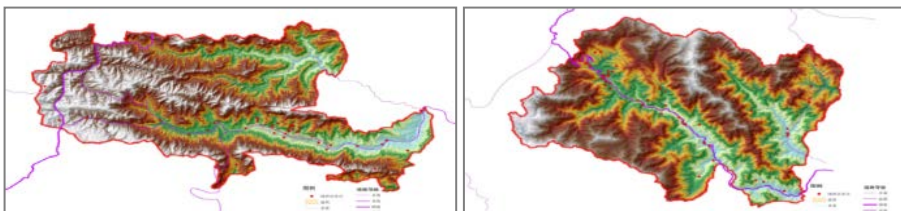*Figure 10.* Content of Partial Data in Basic Rural Spatial Information Database

Figure 11. Basic Spatial Information of The Key Regions
(left: Songbai Town; right: Muyu Town)

3.2.2 Historical rural disaster base case

In accordance with the related research, the study selected landslide, collapse, debris flow, earthquakes and floods as objects of the base case and determined the different storage content for different disasters. Based on the principle of case selection, the research group has collected, classified and

arranged 2,292 global disaster cases (1990-2016) from disaster bulletins, news reports and disaster databases (*Figure 17*), such as EM-DAT. The most direct function of the base case is to match the cases for references based on the retrieval demands of users, and knowledge extraction from the base case can contribute to the construction of the knowledge base. Based on the base case, general rules of disasters can be explored to develop strategies and and methods of disaster prevention and reduction.
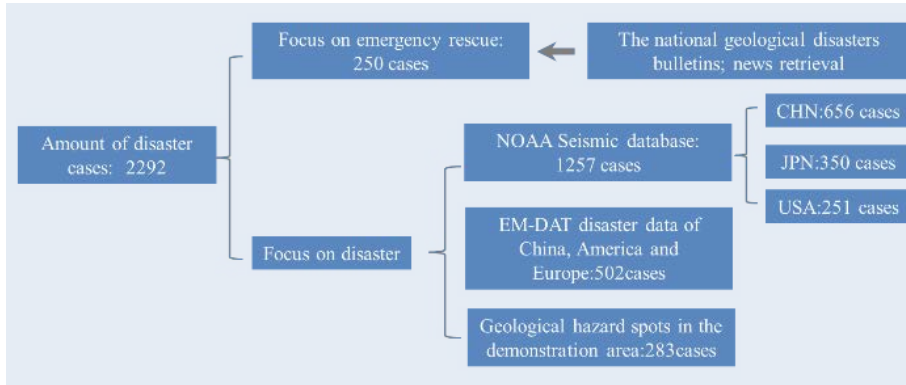

Figure 12. Composition of Historical Rural Disaster Base Case (Current)

3.2.3   Disaster risks assessment model-based case

The model-based case contains disaster risk assessment models for different disasters and different scaled regions, such as the fuzzy comprehensive evaluation model, neural network model and logistic regression model. The research contents of the disaster risk assessment include classified recognition of natural disasters, disaster probability prediction and vulnerability evaluation of hazard-affected bodies. With respect to the case area, Shenongjia, the study selects landslide, collapse, debris flow, earthquakes and floods to carry out the risk assessment (*Figure 18*).
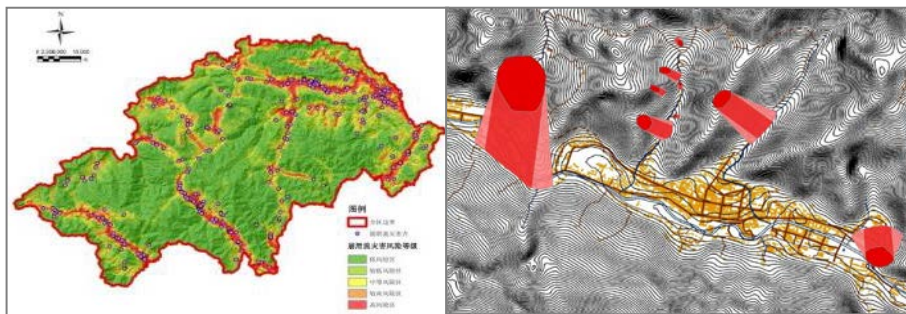

Figure 13. Results Based on Some Risk Assessment Models (Left: Binary Logistic Risk Assessment Model of Collapses, Landslides and Debris Flows in Shennongjia; Right: Prediction Research of Landslide Affected Area in The Key Region of Songbai Town)

3.2.4   Rural planning support method-based case for disaster prevention

The method-based case, which includes scenario planning, case-based reasoning, GIS spatial analysis methods and 3D visualized analysis, can support generation of a rural planning scheme for disaster prevention.

(1) scenario planning

In this study, the scenario refers to a certain situation, namely condition, background and circumstance, related to a disaster, such as the physical environment and socio-economic factors. Scenario planning requires analysis of the probability of disaster development. Since different inducing factors and different disaster intensities can lead to different disaster scenarios, which would differently impact villages, corresponding planning methods for different disaster scenarios must be supplied. In the method-based case, scenario planning steps aimed at rural disaster prevention include (a) scene factor extraction and knowledge representation, (b) initial scene building, (c) dynamic scene simulation.
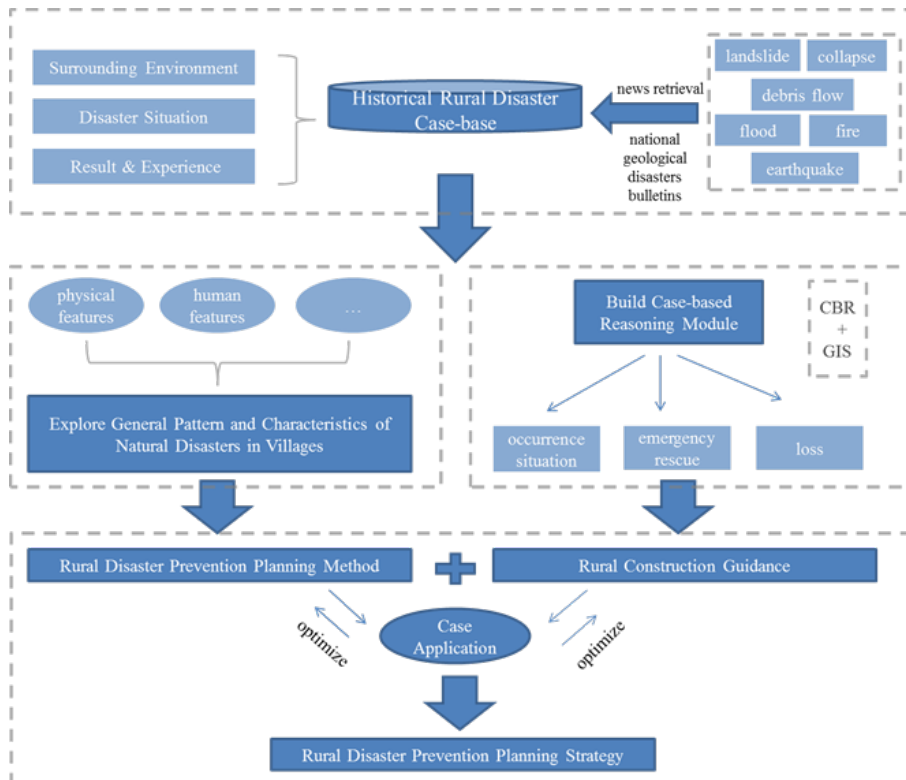

Figure 14. Research Strategy of Case-Based Reasoning

(2) case-based reasoning

As an important branch of Artificial Intelligence (AI), case-based reasoning, aimed at solving new problems by examination of existing experiences and cases, is a new learning mechanism and reasoning method. The historical rural disaster base case is an important foundation for the case-based reasoning. Once disaster occurs, based on similarity matching, solutions for the historical disaster case that is the most similar to the current disaster scenario would be selected as reference for emergency decision-making (*Figure 19*).

(3) GIS spatial analysis methods

On the one hand, GIS spatial analysis methods in the method-based case can be used to analyse the occurrence mechanism, development process and tendency of different disasters, to build a comprehensive disaster evaluation system and contribute to the prevention of disasters and reduction of disaster-related loss. On the other hand, the planning schemes for disaster prevention, such as emergency shelter layout and escape route organisation, can be

generated by the GIS spatial analysis method using buffer analysis and shortest route analysis.

(4)   3D visualised analysis

3D visualisation is a significant technology used to dynamically display underground and ground features of topography and geology. In this study, 3D models and visual representation is based on LiDAR (Light Detection and Ranging) point cloud and remote sensing image data (*Figure 20*). The formation and development process of the disaster object is dynamically simulated. The plan and section of a landslide body, ground fissure, ground subsidence area and flood submergence area can be intuitively described by 3D visualisation, which would help related researchers and planners understand and analyse disasters better.
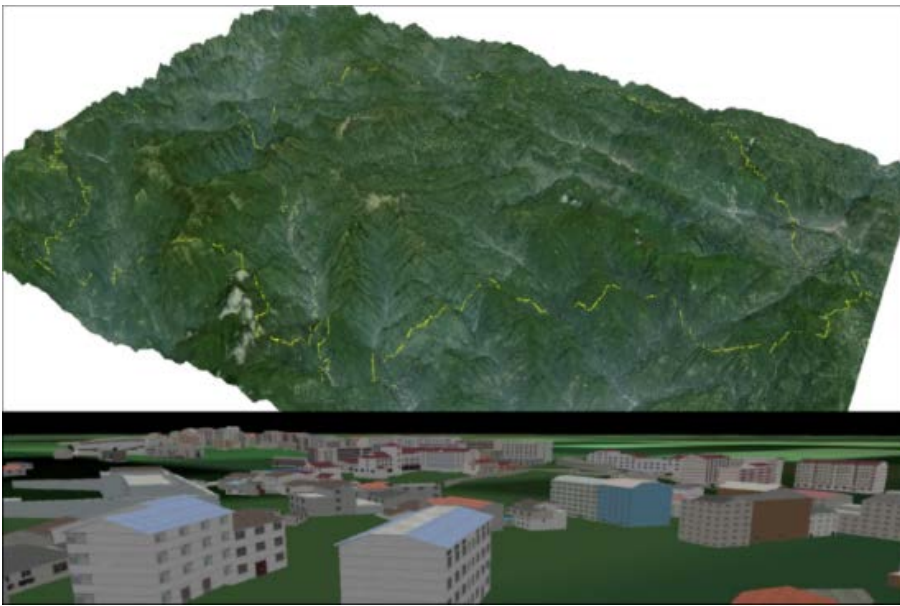

Figure 15. 3D Visualised Representation of Shennongjia

3.3   Planning support system for disaster prevention and reduction

The steps towards realising the system are as follows: (a) develop an automatic map drawing module using multi-source data, mainly from UAV measured data and LiDAR data, to build a basic rural spatial information database; (b) aimed at different disasters, develop a risk assessment module similar to the geographic information processing function in ArcGIS, to provide a risk assessment platform for basic data and automatic map drawing data; (c) construct a disaster base case and planning support method-based case, developing modules of scenario planning, case-based reasoning, GIS spatial analysis methods and 3D visualised analysis to assist decision-making and schemes of disaster prevention planning in villages (*Figure 21* and *Figure 22*). The main implementation methods contain C#+AE secondary development, automatic image registration, image segmentation and classification, multi-source image fusion, and generation of high accuracy DEM and DSM by LiDAR point cloud data.
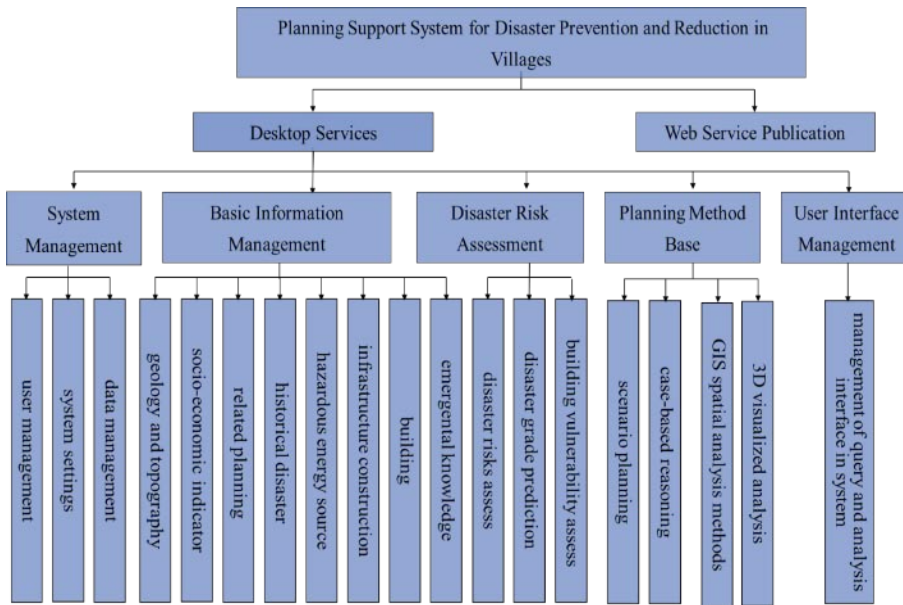
Figure 16. The Framework of a Planning Support System for Disaster Prevention and Reduction in Villages

Figure 17. Main Functions of The System

4. DISCUSSION AND CONCLUSIONS

Because of the high frequency of the geological disasters in the villages of China, the work of disaster prevention and reduction is very meaningful in villages. In this paper, based on the case area of Shennongjia, which is a typical hilly and mountainous area prone to geological hazards, some conclusions could be drawn as follows.

1. Using UAV equipped with optical sensors and a laser scanner, rapid extraction methods and technologies for data-acquisition of the terrain, landform and construction, transportation and municipal facilities in rural areas have been developed. Those methods can either replace or improve solutions for acquiring data in villages.

2. In order to analyse the influence of geological disasters more scientifically, the risk assessment of geological disasters should incorporate multidisciplinary and interdisciplinary disaster research combined with the geological and engineering disaster database and case database. In this paper,

evaluation models for geological disasters have been constructed that are more suitable for villages and towns in China based on a variety of mathematical models.

3.Disaster prevention planning theory and methods for the rural areas of China have been researched and developed in this study based on the actual situation of disaster prevention and reduction in villages. The disaster prevention planning is not only aimed at the special terrain and landform of villages, but also based on the disaster assessment model as above.

4.Distinguished from the general disaster warning system, this study constructs a support system for disaster prevention and mitigation based on the integration of 3S technology. The system can provide a full range of disaster relief programs which can quickly and effectively provide a scientific disaster relief program for rural areas.

5.Based on conclusions 1-4, the planning support system for disaster prevention and mitigation has been constructive for the case area, selected as a typically affected area. Through its application in the case area, the actual planning support system of disaster prevention and mitigation has been tested to verify the feasibility and effectiveness of the system.

Overall, this study clearly demonstrates the research on a planning support system of disaster prevention and mitigation with application in the Shennongjia area. Compared with previous studies, this study shows an obvious technical advantage for data acquisition using UAV in villages and towns. In addition, this paper has not only considered the influence of natural factors, but also the influence of human factors in the disaster risk evaluation, and based on the scientific disaster evaluation model, the method of disaster prevention planning is explored, usually lacking for villages and towns of China. Additionally, the application of the planning support system in disaster prevention and reduction has greatly improved the science and effectiveness of the disaster mitigation work.

However, any research has advantages and drawbacks, this study is no exception. On the one hand, the construction of the disaster prevention and mitigation planning support system is not deep enough: the number of historical rural disaster cases could be expanded and the interface of the planning support system further improved. On the other hand, Shennongjia presents only a limited number of case areas, so further studies should be done to select different types of villages to apply the planning support system of disaster prevention and mitigation.

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A Study of Flood Disaster Risk Communication Model and Adaptive Behaviours for River-Watershed residents in Taiwan

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Abstract: Due to global climate change, rainfall patterns have become more centralized and are causing serious damage more frequently and heavily. After the experiences of typhoons in Taiwan, the importance of risk communication with residents, especially in the vulnerable river watershed area, has become the main issue of disaster prevention policy; however, this effort is frustrated by the lack of related academic research. This study aims to analyse key factors in risk communication mechanisms and how they influence the decision-making of adaptive behaviours. Firstly, this study builds a conceptual framework of the risk communication process to determine how adaptive behaviours are triggered and guided by risk communication. Questionnaires based on this framework were sent to households in the Kaoping River watershed area to verify its utility using a structural equation model (SEM). Based on the framework, an empirical analysis was performed to analyse the key factors influencing decision-making of adaptive behaviours using multinomial logistic regression. The results show that adaptive behaviours are affected by internal awareness of disaster and by risk communication mechanisms and the external environment. The crucial communication channels through family, friends, neighbours and local governments are highly effective. The key factors influencing decision-making of adaptive behaviours are awareness of disaster and adaptive behaviours. People with higher awareness of disaster and adaptive behaviours are more likely to have positive adaptive behaviours. Furthermore, due to the interaction of environments, risk communication patterns and socioeconomic attributes, people from different communities have different adaptive behaviours. Based on the empirical results, some risk communication measures are proposed to improve disaster-prevention strategies.

1.   INTRODUCTION

Due to the increasingly apparent influence of global climate change and the greenhouse effect, the steeply rising and rugged terrain of Taiwan, the complex distribution of its hydrological model, combined with development in the watershed area, the watershed area faces extreme precipitation that often results in major disasters during typhoons. Statistics have revealed that the severity of disasters caused by typhoons is related to an increase in extreme precipitation. Moreover, the frequency of typhoons related to extreme precipitation is trending significantly upwards and contributing to the rising

number of major disasters (e.g. Nari, Morakot, Fanapi); during the period between 1970 and 1999, there was a major disaster on average once every 3-4 years, which increased to once per year during the 10 year period after 2000 (*Figure 1*) (Hsu & Chou, 2011).
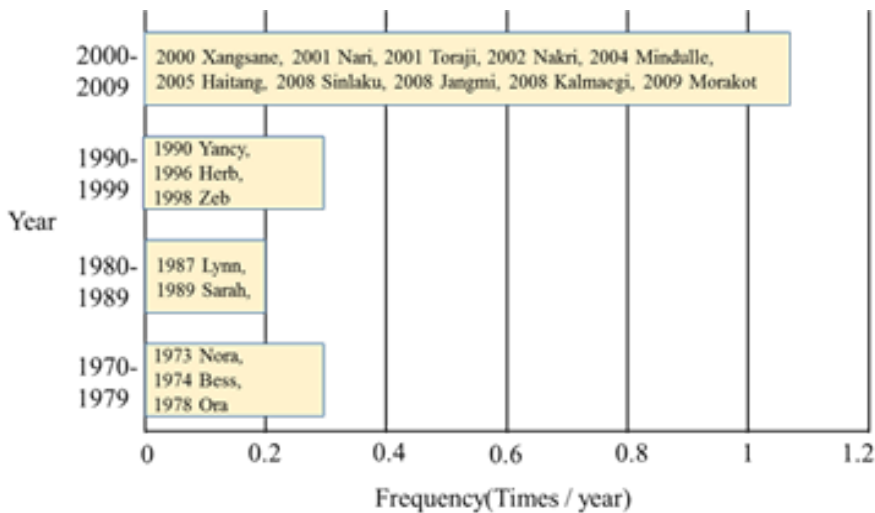

Figure 1. Changes in The Number of Typhoons Hitting Taiwan With Extreme Precipitation

It was also revealed in the International Panel on Climate Change's *Fourth Assessment Report* that past carbon emissions have contributed to global warming. To adequately respond to the impact, adaptive behaviours have therefore become increasingly necessary, and the most pressing task is to form adaptive strategies for climate change. The Executive Yuan of Taiwan officially approved the *Adaptation Strategy for Climate Change* in Taiwan in June, 2012, declaring the provision of disaster related information and improvement of warning systems and adaptability as the key climate policy for the future (Hong & Lu, 2015); it emphasises local level participation and implementation of adaptive concepts. While this is an important direction, prior work related to disaster risk management has often neglected the aspects of public awareness and disaster response, instead focusing narrowly on form and design at a technical level and information provision, such as the production and supply of disaster potential maps. As a result, the government in practice often makes crucial mistakes when launching policies related to disaster prevention and reduction, warning response systems and adaptive strategies.

In the case of Typhoon Morakot in 2009, despite the astonishing total forecast rainfall, and due partially to inadequate public disaster warnings, the public had a low perception of threat levels and did not take adequate emergency measures. Additionally, there was a red alert issued in the debris flow alert for the settlement of Xiaolin Village and the Kaohsiung/Pingtung area, but the population there failed to understand the severity represented by such an alert, which led to difficulty with the advisory evacuation and the withdrawal of the village, ultimately resulting in large-scale devastation. It is clear that any disaster risk governance policy, steered by the government and other experts, will remain inadequate in the absence of a comprehensive risk communication mechanism. Moreover, the public should be properly informed of the relevant policies and governance mechanisms for disaster risk. Hence, due to increasingly intense and diverse disasters, proper risk communication and participation mechanisms will be required so that the government, relevant organisations and households can jointly participate in

disaster risk management. Adaptive policies for outreach and disaster will help to mitigate the impact of disasters under extreme weather.

Unfortunately, there is a scarcity of Taiwanese research on the relationship between risk communication and household adaptive behaviour or the relationship between the different factors in the risk communication process. Taiwan will effectively improve its household and community adaptive capacity and mitigate the impact caused by extreme weather under climate change if it achieves the following: a thorough assessment should be undertaken for current flood disaster related risk communication, and the state should control risk awareness, attitude and adaptive behaviour in targets of communication, and thereby improve the risk communication and adaptive strategies in its current practice. To this end, this paper analyses households in the sensitive area of the Kaohsiung and Pingtung watershed to discover their views on risk communication, disaster risk awareness and adaptive behaviours. A structural equation model (SEM) will be used to verify the conceptual framework of risk communication for household adaptive behaviour, and detail the relevance of factors in the risk communication process and their relationship to adaptive behaviour. The analyses then utilises multinomial logistic regression to build the adaptive behaviour decision-making model and determine the key factors affecting adaptive behaviours. Finally, the results of the analysis are given along with further suggestions for the drafting of effective risk communication and adaptive household strategies directed towards the government or relevant departments responsible for flood disaster response.

2.   LITERATURE REVIEW

2.1   Risk Communication Related Literature

The National Institute of Health defines risk communication as "the interaction of mutual exchange of information and opinions by relevant individuals, groups or agencies to collectively determine how to prevent or manage risk" (Yuan, 2007). Risk communication is closely related to risk awareness, risk attitudes and the use of risk management methods. The risk communication between the residents, local communities, government agencies, and other stakeholders is indispensable in terms of effective risk management (Tigere, 2013). Risk communication covers a wide range of activities and meanings, including discovering discrepancies over risk awareness, presenting and explaining risk information, promoting the focus on environmental or health related issues, enhancing public risk awareness, changing risk attitudes, affecting personal risk behaviours and promoting protective actions, providing strategies for emergency information, improving disaster warning systems, and developing risk management cooperation protocols, as well as resolving conflicts (Covello, Slovic, & Von Winterfeldt, 1986; O'Riordan et al., 1989).

Poussin, Botzen, & Aerts (2014) analysed the influencing factors of adaptive behaviour based on the protection motivation theory (PMT). The study suggests that the availability of information related to adaptive measures enhances individual coping appraisal and thereby promotes the adoption of adaptive behaviours. Lindell & Perry (2003) proposed the information communication process in protective behavioural decision modelling and stressed the dual importance of timely supply of correct risk information by

the risk communicator and understanding of the requirement for risk information by the receiver, which serves as their main reference for making behavioural decisions using the proper channels and message content. Rohrmann, (2000) proposed the risk communication process framework (*Figure 2*) and suggested a high correlation between the process of how people cope with hazards, how risk information is processed and evaluated, and how the perception of information changes risk awareness, risk assessment and behavioural decisions. Although the model mostly focuses on the correlation between the message and behaviour, successful risk communication must be regarded as an interactive process (Leiss, 1996; Renn, 1992) and hence the query, feedback and mechanism for interaction with risk managers is highly important (Rohrmann, 2000).
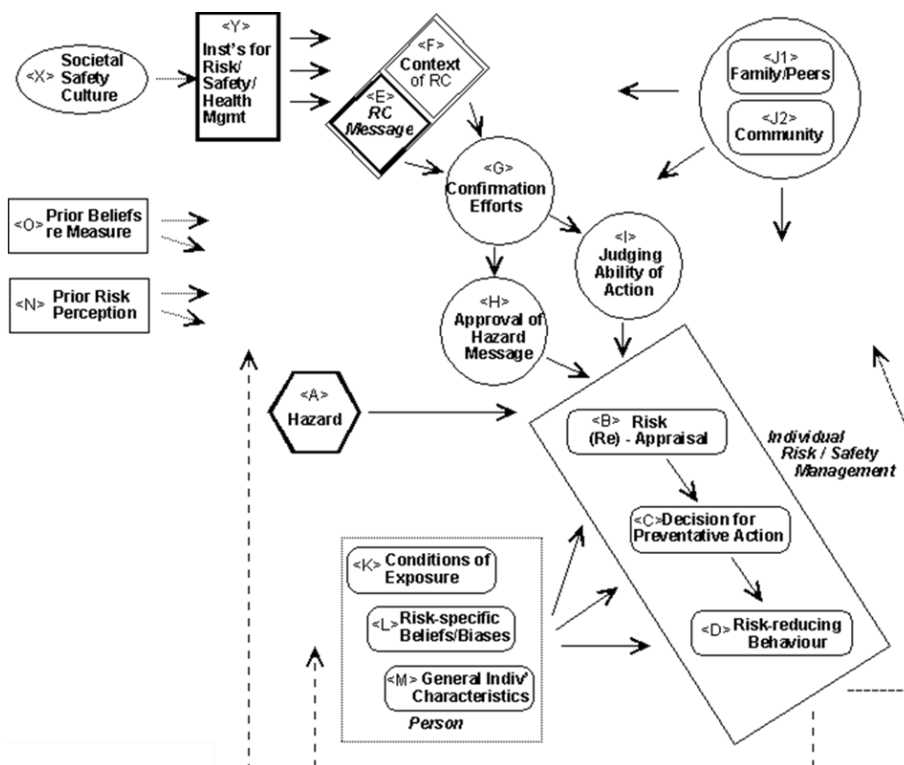

Figure 2. Risk Communication - Process Framework

Prior literature regarding the analysis of risk messages mostly focuses on the message source, message transmission channel, and the analysis of message content, exploring the influence of different message sources, channels and content on the message perceivers. Li (2011) stated in their study that more explicit information content on disasters would help the residents understand disaster information and enhance disaster risk awareness. Moreover, the resident valuation of demand for disaster information would affect government intent in the supply of disaster information and increase participation in community disaster prevention campaigns. Kuo (2014) analysed whether the availability of risk information could enhance public risk perception and the results suggest that emergency evacuation maps would help to raise public awareness for threats to life and safety and personal property loss. There also exists a significant relationship between flood risk perception and prior experience and education. The study conducted by Lindell, Lu, & Prater (2005) reveals that although the public most commonly acquire typhoon related information via local media (particularly from local TV

stations), the emergency evacuation decisions in times of disasters are mostly influenced by peers and local government. Driscoll & Salwen (1996) discovered that the public differentiates between different communication channels, regarding TV and radio as more professional and placing more trust in them. This paper therefore analyses the correlation between risk communication and adaptive behaviours for message source, channel and content.

## 2.2	Influencing factors for adaptive behaviours

Parry et al. (2007) define an adaptive behaviour as an adjustment in natural or human systems, in response to actual or expected climatic stimuli or their effects, that moderates harm or exploits beneficial opportunities. Grothmann & Patt (2005) applied PMT as the basis for their model of private proactive adaptation to climate change (MPPACC) (*Figure 3*), which explores the factors affecting individual decision-making for adaptive behaviours with emphasis on the significance of psychological cognition in private adaptive behaviours.
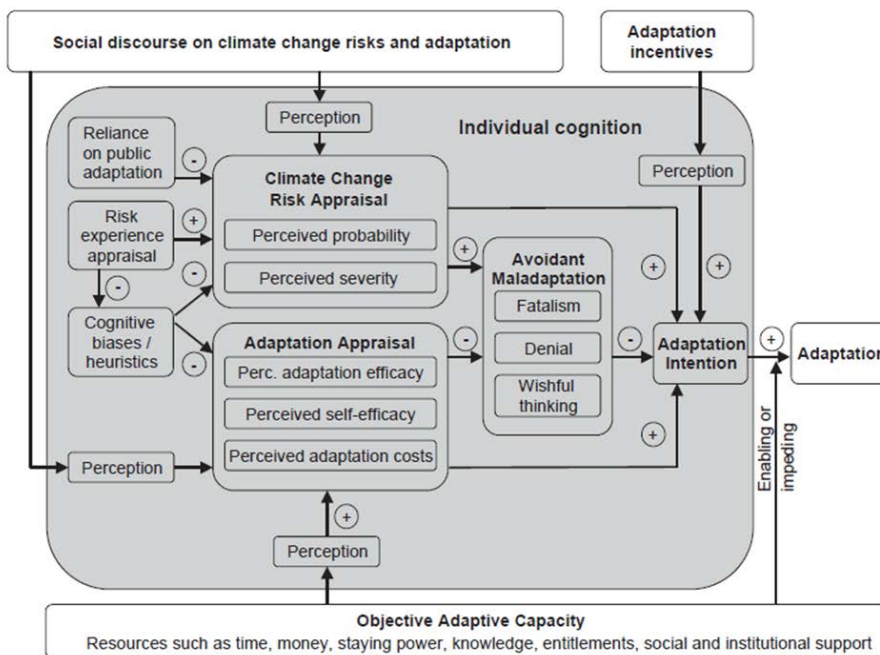

Figure 3. Process Model of Individual Proactive Adaptation to Climate Change (MPPACC)

The literature suggests that people observe signs in the natural environment to determine the level of disaster and whether or not to adapt their behaviour correspondingly (Liao & Teng, 2012). Moreover, the level of community participation or frequency of contact with friends and relatives also enhances information perception and risk awareness (Drabek & Boggs, 2018; Lindell & Perry, 2003). Furthermore, individuals with higher risk awareness will more intensively learn about disaster risk, disaster prevention and relief related knowledge, disaster prevention measures, local resources and routine training (Beringer, 2000), which will thereby facilitate proper individual adaptive behavioural changes. Rogers (1997) believes that human awareness of the environment comes from experience of disaster and will produce adaptive behaviours for the environment through learning from prior

experience in disasters. Psychological factors such as optimistic bias, fatalism and perceived responsibility will also affect adaptive behaviours. Bočkarjova, van der Veen, & Geurts (2009) pointed out in their study that the public tends to have lower risk perception if they perceive that preparation for floods and disasters is the responsibility of the government, and are therefore less likely to prepare for disasters. Additionally, socioeconomic conditions, such as gender, occupation, race and education level, all influence adaptive behaviour, according to many studies. Research from Tsao & Chang (2008) indicates that females are more proactive than males in adapting their behaviour. Griffin, Dunwoody, & Neuwirth (1999) suggest that older age is associated with fear of disaster and hence higher risk perception and likelihood of adaptive behaviours. Edwards (1993) discovered that families with higher education levels, higher family income, and with children are more inclined to take preparation measures. In summary, the prior literature suggests that the influence factors of adaptive behaviours can generally be divided into external environmental factors and internal private factors. External environmental factors include the natural and social environment and risk communication mechanisms, while internal individual factors include risk perception and adaptive behaviour perception. Moreover, risk perception and adaptive behaviour perception are not only affected by external environmental factors but also differ by demographic characteristics, experience in disasters and individual psychology.

3.   CONCEPTUAL FRAMEWORK AND RESEARCH DESIGN

3.1   Conceptual Framework of Risk Communication for Household Adaptive Behaviour

The paper refers to the research of Lindell & Perry (2003), Rohrmann (2000), and Grothmann & Patt (2005) to establish the conceptual framework of risk communication for household adaptive behaviour, as shown in *Figure 4*.

First, risk communication mechanisms and environmental factors affect individual psychological factors and collectively affect the formation process of perception and attitude through private socioeconomic attributes, experience in disasters, and the interaction of psychological factors. Based on the influence of aforementioned factors, in the process of disaster cognition, the individuals will determine disaster risk, behavioural effect and costs, as well as self-efficacy of adaptive behaviours, supported by individual familiarisation with the disaster prevention plan - including the adaptive map for the disaster site and emergency evacuation route - integrated with their disaster risk attitude; all of which affect subsequent decisions in adaptive behaviours.
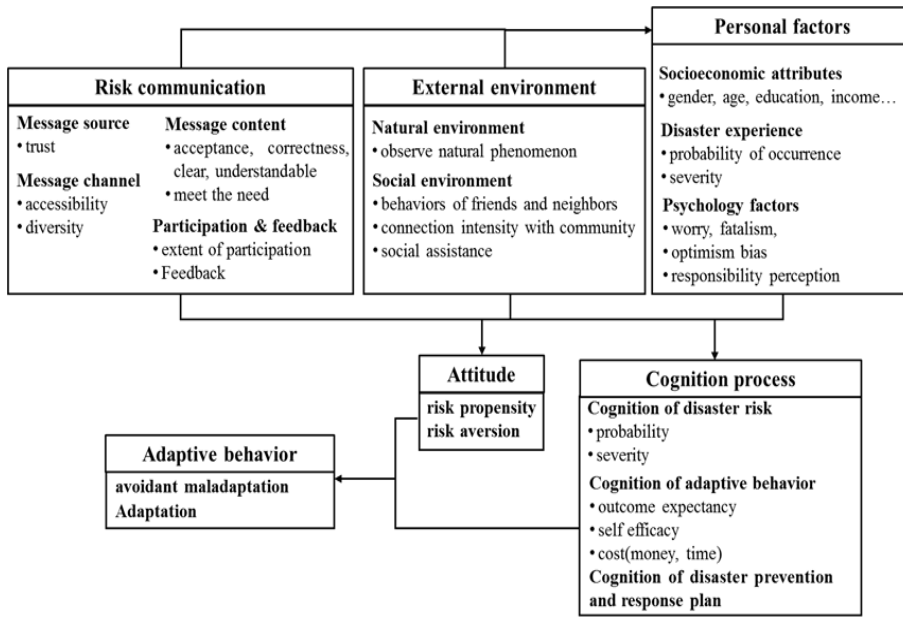
Figure 4. Conceptual Framework of Risk Communication Process

3.2 Questionnaire drafting and sampling design

The interview content of the questionnaire was drafted in accordance with the conceptual framework of risk communication for household adaptive behaviour, including (1) disaster perception and experience in disasters, (2) psychological factors of disasters, (3) risk communication mechanisms and socio-environmental factors, (4) evaluation and decision-making of adaptive behaviours, and (5) socioeconomic attributes.
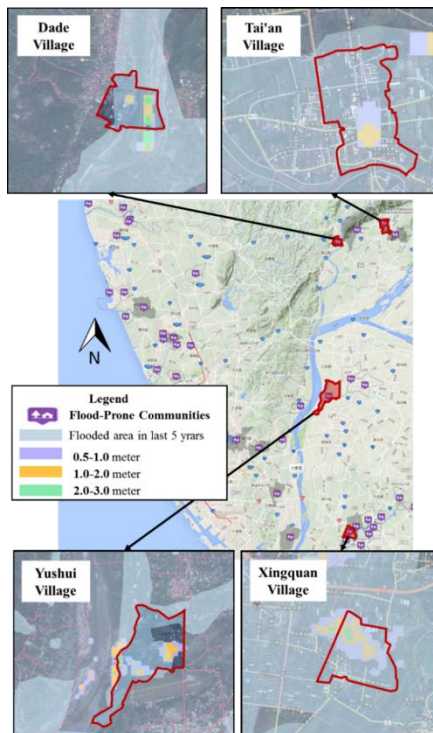

Figure 5. Position and Potential Flooding Map of Surveyed Village

The paper conducted an investigation in different areas, including Dade village in the Qinshan district and Tai'an village in the Meinong district of Kaohsiung city, and Yushui village in the Jiuru district and Xingquan village in the Wandan district of Pingtung County (*Figure 5*). The questionnaire was distributed by random sampling of household units and the principal decision makers of the households completed the questionnaire, as representatives of the overall household adaptive behaviour. Field tests were conducted on January 11, 2016. As of February 27, 2016, a total of 239 questionnaires were recovered, including 195 valid questionnaires; the effective recovery rate was 81.25%.

4. RISK COMMUNICATION FRAMEWORK AND DECISION-MAKING ANALYSIS

The questionnaire data underwent proper sorting and conversions before simplifying the variables to yield a better fit for the model in accordance with the parsimony principle and principal component analysis. The SEM model was applied to test the risk communication framework for household adaptive behaviour and to determine the relation of variables in the framework. After this, the multinomial logistic regression model was applied to build the adaptive behaviour decision-making model and find out the key influencing factors affecting adaptive behaviour decision-making.

4.1 Factor Analysis – Principal Component Analysis

After establishing the conceptual framework through the theory and logic of the relevant literature, this paper takes those aspects as the latent variables in the SEM model and simplifies the questions pertaining to those aspects through principle component analysis to yield the measured variables. *Table 1* shows the variables of aspect questions after principle component analysis.

Table 1. SEM Model Variable Description Table

Latent variable	Measured variable
External environment	Community connection
	Natural & social environmental cues
Risk communication mechanism	Message content
	Accessibility of channels & trust of sources--- Local community
	Accessibility of channels & trust of sources--- Electronic & print media
	Accessibility of channels & trust of sources--- Modern communication
Internal cognition	Cognition of disaster
	Cognition of adaptive behaviour
	Psychology factors
Adaptive behaviour	Emergency measures
	Adaptive measures

4.2   Empirical Analysis on the Risk Communication Framework for Household Adaptive Behaviour

This paper adopts SEM to test the conceptual framework of risk communication for household adaptive behaviour, which yields the final model after multiple model simulations (*Figure 6*). The overall model fit reaches a GFI value of 0.87, compared with the ideal value of 0.8 (Bagozzi, 1988; Browne & Cudeck, 1992; Seyal, Rahman, & Rahim, 2002).
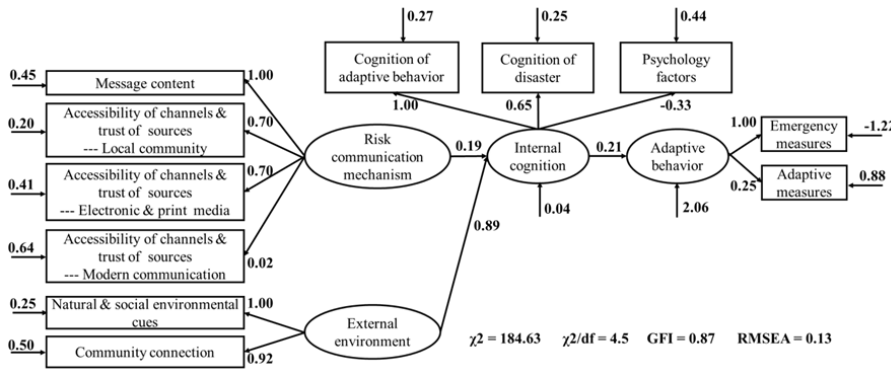

Figure 6. SEM Empirical Model Results

In the structural model, "risk communication mechanism" and "external environment" significantly affect internal cognition and further affect the household adaptive behaviour. This suggests that risk communication mechanisms and the external environment can strengthen the internal cognition of the individuals in the adoption of subsequent adaptive behaviours. It is notable that "external environment" (factor loading 0.89) is stronger in terms of influence of internal cognition compared with "risk communication mechanism" (factor loading 0.19), which further highlights the significance of the community environment on household adaptive behaviour.

For the risk communication mechanism, "message content" (factor loading 1.00) has the greatest influence, suggesting that household awareness of the message content, clearness of content and the facilitation of household adoption of adaptive measures are highly important factors for the risk communication mechanism, followed by "media channel accessibility and trust" and "communication channel accessibility and trust" (both factor loadings are 0.70). It is apparent that public accessibility to and trust in media channels such as the TV and newspapers is relatively higher, while media still acts as one of the practical channels. Moreover, a high level of "community channel accessibility and trust" similarly suggests that the public consider acquiring relevant messages from friends, relatives, neighbours, village heads and local government agencies convenient and highly trustworthy. Moreover, community channels play considerably important roles in the risk communication process while "the accessibility and trust of communication and new types of channels" appeared insignificant in the test, with factor loading of merely 0.02. It can be inferred that the public are both widely unfamiliar and have low trust in the communication channels of telephone and text messages via mobile phone and newer types of communication channels like internet and mobile phone apps.

Among the environmental aspects, "Natural Social Sign" (all factor loadings 1.00) and "community connection" (all factor loadings 0.92) show

significant and strong influence, suggesting the public observe natural phenomenon and the behaviour and conduct of friends, relatives and neighbours as references in the awareness formation process. Moreover, the intensity of the community connection positively influences internal cognition; the frequency of exchange with friends, relatives and neighbours, and the level of community preparation for flooding help the formation of disaster awareness.

Regarding internal cognition, "adaptive behaviour cognition" (factor loadings 1.00) shows the greatest influence, followed by "disaster cognition" (factor loadings 0.65) and finally the "psychological factor" (factor loadings -0.33). This shows that individual awareness of adaptive behaviours plays an important role in the internal cognition formation process, including the consideration of the projected adaptive behaviour effect, self-efficacy cognition, and the costs of adopting adaptive behaviours. Moreover, disaster awareness positively influences the process of internal cognition formation. In contrast, individual psychological factors, including fatalism, optimistic bias and perceived responsibility have a negative influence.

Finally, the factor loading parameters for adaptive behaviour aspects shows that "emergency measures" (factor loading 1.00) has greater factor loading than "adaptive measures" (factor loading 0.25). This phenomenon suggests that the overall responding public still prefers to take emergency measures in times of disaster and still neglects routine adaptive measures – a situation that requires further improvement.

4.3 Empirical analysis for the decision-making model of household adaptive behaviour

After testing the risk communication framework for household adaptive behaviour through the SEM model, the framework helps to clarify the correlation between various key influencing factors in the process from conducting disaster risk communication to adopting adaptive behaviours. Nonetheless the model does not analyse the key factors affecting the decisions in household adaptive behaviour. Hence, the paper further applies multinomial logistic regression to analyse the relation between variables and adaptive behaviour decisions, in addition to establishing the decision-making models for emergency measures and adaptive measures.

4.3.1 Variables Selection

The selection of independent variables takes the principal component from the results of principle component analysis as the variables and adds socioeconomic variables in addition to setting the emergency measures and adaptive measures as the independent variables. The category of intensity for facing disaster response proposed by Burton, Kates, & White (1993) is taken into consideration for dividing the dependent variables into emergency measures and adaptive measures. The specific emergency and adaptive measures are concluded and subdivided into "inactive or low level of activeness", "medium level of activeness" "and "high level of activeness" under the emergency measures or adaptive measures (as shown in *Table 2* and *Table 3*). The details of variable selection and description of variables as shown in *Table 4* show the analysis of the relationship between independent variables and emergency measures with the corresponding level of adaptive measures.

Table 2. Types of household emergency measures for this study

Level of Response		Specific Adaptive Behaviour
Inactive Emergency		Not adopting any measures
Active Emergency	Low level of activeness	Store water and food, prepare flashlights, emergency lighting, battery and other equipment
	Medium level of activeness	Pile up sand bags, set up flood-prevention gate, activate water pump, relocate valuables to higher-level floors
	High level of activeness	Emergency evacuation

Table 3. Types of household adaptive measures for this study

Level of Response		Specific Adaptive Behaviour
Inactive Adaptation		Not adopting any measures
Active Adaptation	Low level of activeness	Purchase accident insurance and reclaim compensation from the government
	Medium level of activeness	Strengthen building structure, do not place valuables in lower-level floors, and request the local government to improve flood prevention facilities
	High level of activeness	Move to a place less likely to flood

Table 4. Multinomial Logistic Regression Variables Description Table

Type of Variable		Variable Names	Variable Description
Independent variable	Risk communication mechanism	Message content	continuous variable
		AC&TS - Local community	continuous variable
		AC&TS - Electronic & print media	continuous variable
		AC&TS - Modern communication	continuous variable
	External environment	Natural & social environmental cues	continuous variable
		Community connection	continuous variable
	Internal cognition	Cognition of adaptive behaviours	continuous variable
		Cognition of disaster	continuous variable
		Psychology factors	continuous variable
	Socioeconomic attributes	Gender	Categorized variable: 1 = Male, 2 = Female (reference group)
		Age	Categorized variable:1 = Under 26, 2 = 26-50 ,3 = 51-75, 4 = Over 75 (reference group)
		Education level	Categorized variable: 1 = Under junior high school, 2 = Above Junior high school and ,under College, 3 = Above College(reference group)
		Household monthly income	Categorized variable: 1 = Under 20,001, 2 = 20,001-40,001, 3 = Above 40,001 (reference group)

Type of Variable		Variable Names	Variable Description
		Village	Categorized variable: 1 =Yushui Village, 2 = Xingquan Village, 3 = Dade Village, 4 = Tai'an Village (reference group)
	Adaptive behaviour	Emergency measures	Categorized variable: 1 = Inactive or low level of activeness in emergency measures, 2 = Medium level of activeness in emergency measures, 3 = High level of activeness in emergency measures (reference group)
		Adaptive measures	Categorized variable: 1 = Inactive or low level of activeness in adaptive measures, 2 = Medium level of activeness in adaptive measures, 3 = High level of activeness in adaptive measures (reference group)
Dependent variable	Adaptive behaviour	Emergency measures	Categorized variable: 1 = Inactive or low level of activeness in emergency measures (reference category), 2 = Medium level of activeness in emergency measures , 3 =High level of activeness in emergency measures
		Adaptive measures	Categorized variable: 1 = Inactive or low level of activeness in adaptive measures (reference category), 2 = Medium level of activeness in adaptive measures, 3 = High level of activeness in adaptive measures

Note: Accessibility of channels & trust of sources abbreviated as AC&TS

4.3.2 Emergency Measures Decision-Making Model

For model fit, the *p*-value of the Chi-squared test is smaller than 0.01 and establishes the final model significance. Regarding the test for correlation between independent variables and dependent variables, Cox and Snell R^2 and Nagelkerke R^2 reached 0.15, suggesting a correlation between independent variables and dependent variables. The emergency measures decision-making model fit test and test results summary are shown in *Table 5*.

4.3.2.1 Influence of Risk Communication Mechanism on Emergency Measures

"Community channel accessibility and trust" reaches significance in the level of activeness in emergency measures. High "communication channel accessibility and trust" means higher likelihood of adopting "inactive or low level of activeness in emergency measures". It can be inferred that most of the friends, relatives, neighbours or village heads will remind residents to store food, water, flashlights and perform other simple emergency measures before typhoons. Nonetheless, "medium level of activeness in emergency measures" and "high level of activeness in emergency measures" do not necessarily lead to such reminders and, therefore, the community channel has greater influence on low level of activeness for emergency measures.

4.3.2.2 Influence of External Environment on Emergency Measures

"Community Connection" reaches the 0.05 significance level with an odds ratio of 2.977, indicating that a stronger community connection leads to a

greater likelihood of "medium level of activeness in emergency measures." This suggests that, apart from the routine exchange with friends, relatives and neighbours, residents should voluntarily care about the community flood issues because it will deepen their knowledge of the relevant emergency measures. Therefore, beyond the average simple low level of activeness in emergency measures, the residents will additionally stack sand bags, install flood prevention gates and prepare water pumps, as well as taking other emergency measures.

4.3.2.3   Influence of Internal Cognition on Emergency Measures

Regarding internal cognition, "disaster cognition" and the "psychological factor" both reach 0.05 in significance level. Compared with other variables, "disaster cognition" has a more significant and stronger influence on the decisions of emergency measures, suggesting consistency with the literature results, while enhanced disaster awareness aids the adoption of emergency measures. On the other hand, those with higher scores in "psychological factors" will be relatively less likely to choose "medium level of activeness in emergency measures" and "high level of activeness in emergency measures," suggesting that people more inclined to negative psychological factors such as fatalism, optimistic bias or perceived responsibility are less likely to have medium level or higher activeness in emergency measures.

4.3.2.4   Influence of Socioeconomic Background on Emergency Measures

"Residence of Village" significantly influences the level of activeness in emergency measures. Tai'an Village is used as a reference group to compare with other villages and the results show that the likelihood for Yushui villagers and Xingquan villagers to adopt "high level of activeness in emergency measures" is higher. The reason could be that the people from the two villages have a greater awareness of the content of community disaster prevention and emergency evacuation routes. The number of participants from the public involved in flood control drills is also higher, explaining the higher likelihood of "high level of activeness in emergency measures" compared with other villages. Additionally, the likelihood of Dade villagers adopting a "medium level of activeness in emergency measures" is significantly lower than that of Tai'an village, which could be the result of a discrepancy in the disaster experience and demographic composition.

Results from the female reference group suggest that the likelihood of males adopting a high level of activeness in emergency measures is significantly lower than that of females. As suggested by the literature, females are more concerned with floods than males and are more likely to have high levels of activeness in taking emergency measures.

Results from the reference group aged 75 years old suggest that the likelihood of those aged below 26 years adopting "medium level of activeness in emergency measures" is significantly higher than those aged over 75 years. It is likely that those relatively younger will have greater motivation and strength, and could therefore take more active emergency measures.

Results from the reference group with monthly household incomes greater than NT$40,000 show that the likelihood of those with average monthly household incomes falling between NT$20,001 and 40,001 to have medium level or higher activeness in emergency measures is significantly smaller than those with incomes greater than NT$40,000, suggesting consistency with the literature. Since those with higher average monthly incomes own relatively

more resources, they are able to cope with the costs required for adopting emergency measures.

4.3.2.5 Influence of Active Level of Adaptive Measures on Emergency Measures

Taking "high level of activeness in adaptive measures" as a reference group reveals that the likelihood for those adopting a "medium level of activeness in adaptive measures", adopting a "medium level of activeness in emergency measures" is significantly higher than those adopting a "high level of activeness in adaptive measures." Moreover, those adopting an "inactive or low level of activeness in adaptive measures" are less likely to adopt a "high level of activeness in emergency measures" than those adopting a "high level of activeness in adaptive measures" are to adopt a "high level of activeness in emergency measures." It is apparent that the level of activeness in adaptive measures has a significant positive impact on the level of activeness in emergency measures.

Table 5. Emergency Measures Decision-Making Model Fit Test and Test Results Summary Table

	Chi-square	df	significance
-2 log-likelihood	141.59	42	0.000

Cox & Snell $R^2 = 0.52$ Nagelkerke $R^2 = 0.60$

Variable name	Medium Level of AEM			High Level of AEM		
	estimated value	significance	Exp(B)	estimated value	significance	Exp(B)
Intercept	-2.662	0.375	.	-1.485	0.555	.
(AC&TS) - Electronic & print media	-0.373	0.403	0.689	0.193	0.595	1.213
(AC&TS) - Modern communication	0.133	0.767	1.142	-0.005	0.988	0.995
(AC&TS) - Local community	-1.246	0.020**	0.288	-0.177	0.703	0.838
Message content	-0.592	0.147	0.553	-0.147	0.649	0.863
Natural & social environmental cues	0.031	0.954	1.031	-0.197	0.621	0.821
Community connection	1.091	0.036**	2.977	-.017	0.958	0.983
Cognition of disaster	2.840	0.000***	17.119	1.312	0.010**	3.712
Cognition of adaptive behaviour	-0.611	0.222	0.543	-0.289	0.483	0.749
Psychology factors	-1.255	0.010**	0.285	-0.325	0.366	0.723
Village Yushui	-0.481	0.641	0.618	2.540	0.000***	12.674
Xingquan	-0.458	0.554	0.632	1.179	0.087*	3.251
Dade	-3.176	0.003***	0.042	-1.367	0.128	0.255
Tai'an	0ᵇ	.	.	0ᵇ	.	.
Gender Male	-0.759	0.211	0.468	-0.843	0.083*	0.430
Female	0ᵇ	.	.	0ᵇ	.	.
Age <26	4.432	0.049**	84.123	0.242	0.901	1.274
26-50	1.432	0.378	4.189	0.677	0.607	1.969
51-75	-0.011	0.994	0.989	0.333	0.775	1.395
>75	0ᵇ	.	.	0ᵇ	.	.
Education level L	0.940	0.420	2.561	0.723	0.463	2.060
M	-0.356	0.630	0.700	0.609	0.365	1.839
H	0ᵇ	.	.	0ᵇ	.	.
<20,001	-1.341	0.164	0.262	-0.905	0.261	0.404

		Chi-square	df	significance		
-2 log-likelihood		141.59	42	0.000		

Cox & Snell $R^2 = 0.52$ Nagelkerke $R^2 = 0.60$

		Medium Level of AEM			High Level of AEM		
Variable name		**estimated value**	**significance**	**Exp(B)**	**estimated value**	**significance**	**Exp(B)**
Household monthly income	20,001-40,001	-1.523	0.064*	0.218	-1.129	0.099*	0.323
	>40,000	0^b	.	.	0^b	.	.
Adaptive measures	Inactive/low	-1.004	0.378	0.366	-3.630	0.000***	0.027
	Medium	1.458	0.072*	4.299	-0.594	0.302	0.552
	High	0^b	.	.	0^b	.	.

Note 1: *** $p <0.01$, ** $p <0.05$, * $p <0.1$

Note 2: 0^b suggests the variable as reference group and hence the parameter is set to zero.

Note 3: Activeness in Emergency Measures (AEM)

Note 4: Accessibility of channels & trust of sources is abbreviated as AC&TS

Note 5: Education level - Under junior high school (L); Above Junior high school and under college (M); Above college (H)

4.3.3   Adaptive measure decision-making model

The adaptive measure decision-making model shows significant explanatory power if the Chi-squared test *p*-value is smaller than 0.01. The Cox and Snell R^2 and Nagelkerke R^2 reach 0.15, suggesting correlation between the independent variables and dependent variables. The adaptive measure decision-making model fit test and test results summary are shown in *Table 6*.

4.3.3.1   Influence of Risk Communication on Adaptive Measures

"Media channel accessibility and trust" falls below the significance level of 0.01, suggesting the likelihood of those with higher scores in "media channel accessibility trust" to adopt a "high level of activeness in adaptive measures" is far lower than the likelihood to adopt "inactive or low level of activeness in adaptive measures". The reason could be that the media channel represents passive message perception and is more likely to receive government related subsidy programs from TV news or newspapers and magazines, or flood disaster insurance information from insurance companies, with relatively less information content on the "high level of activeness in adaptive measures".

Under the significance level of 0.01, those with higher scores in "communication and new type of channel accessibility and trust" are more likely to adopt a "high level of activeness in adaptive measures" than to adopt an "inactive or low level of activeness in adaptive measures". It can be inferred that newer channels, such as internet or mobile phone apps, are proactive message channels where the public must voluntarily acquire flood disaster related information. This also suggests the possibility of achieving more proactive action for issues related to flood disasters with more diverse information matching individual requirements. For this reason, those with a higher score in "communication and new types of channel accessibility and trust" are more likely to adopt a "high level of activeness in adaptive measures".

4.3.3.2 Influence of External Environment on Adaptive Measures

The external environment variables do not significantly influence adaptive measures, suggesting that there is no significant difference between the natural social signs and community connection in terms of the activeness level in household adaptive behaviour. The statistical results of the questionnaire suggest that the responding public is speculated to show an overall unfamiliarity with the adaptive measures, and therefore the influence of the external environment on the household in terms of activeness level in adaptive measures is insignificant.

4.3.3.3 Influence of Internal Cognition on Adaptive Measures

The "adaptive behaviour cognition" corresponding to both "medium level of activeness in adaptive measures" and "high level of activeness in adaptive measures" reach the significance level of 0.05. Higher "adaptive behaviour cognition" will lead to higher likelihood of adopting "medium level of higher activeness in adaptive measures", suggesting that the projected adaptive behaviour effect and self-efficacy cognition significantly influence the household adoption of adaptive measure decisions.

4.3.3.4 Influence of Socioeconomic Background on Adaptive Measures

"Residence of village" significantly influences the level of activeness in household adaptive measures, where the likelihood for Yushui villagers, Xingquan villagers and Dade villagers to choose "high level of activeness in adaptive measures" is significantly smaller than Tai'an villagers. The reason for the high likelihood of Tai'an villagers to display a "high level of activeness in adaptive measures" compared with people from other villages is that Tai'an village is located in an area susceptible to flooding with a larger population. Approximately 98% of the public have experienced a flood within 5 years, while the demographic composition shows relatively higher education levels and incomes compared with other villages. Likelihood of the village to display "high level of activeness in adaptive measures" is higher than those in other villages.

Results for the reference group aged 75 years or older reveal that under the 0.1 significance level, the likelihood for those aged under 26 years old to adopt a "medium level of activeness in adaptive measures" is significantly less than for those aged under 75 years old, which differs from the results of the emergency measures. Younger people are more likely to neglect daily or disaster adaptive measures but are more likely to adopt proactive emergency measures in times of disaster due to higher mobility.

Moreover, "education level" also shows significant influence on the level of activeness in adaptive measures. For the reference group with education levels at university/junior college (inclusive) and under the significance level of 0.1, those with education levels below junior high school are significantly less likely to choose "medium" or "higher levels of activeness in adaptive measures" than those with education at university/junior college (inclusive) or higher levels; those with education at university/junior college and lower levels are less likely to display a "higher level of activeness in adaptive measures" than those with university/junior college (inclusive) level education and higher. The results are consistent with the literature review; people with higher education levels are more likely to adopt more proactive adaptive measures.

4.3.3.5   Influence of Emergency Measures on the Level of Activeness in Adaptive Measures

In the reference group for "high level of activeness in emergency measures," the odds ratios for those adopting "inactive or low level of activeness in emergency measures" corresponding with those adopting "medium level of activeness in adaptive measures" and "high level of activeness in adaptive measures" are 0.062 and 0.029 respectively, suggesting those that display an "inactive or low level of activeness in emergency measures" are less likely to adopt a medium or higher level of activeness in adaptive measures. Additionally, the odds ratio for those adopting a "medium level of activeness in emergency measures" to adopt a "high level of activeness in adaptive measures" is 0.047. Namely, those adopting a "medium level of activeness in emergency measures" are less likely to adopt a "high level of activeness in adaptive measures". Higher levels of activeness in emergency measures are therefore more likely to correlate with adaptive measures with higher level of activeness.

Table 6. Adaptive Measure Decision-Making Model Fit Test and Test Results Summary Table

	Chi-square	df	significance
-2 log-likelihood	141.59	42	0.000

Cox & Snell $R^2 = 0.52$ Nagelkerke $R^2 = 0.60$

Variable name		Medium Level of AAM			High Level of AAM		
		estimated value	significance	Exp(B)	estimated value	significance	Exp(B)
Intercept		6.325	0.017	.	3.372	0.329	.
AC&TS - Electronic & print media		-0.341	0.404	0.711	-1.295	0.014**	0.274
AC&TS - Modern communication		-0.054	0.835	0.947	1.861	0.002***	6.430
AC&TS - Local community		0.185	0.692	1.203	-0.681	0.230	0.506
Message content		0.044	0.890	1.045	-0.121	0.761	0.886
Natural & social environmental cues		-0.702	0.140	0.496	-0.763	0.194	0.466
Community connection		0.070	0.825	1.073	0.631	0.113	1.880
Cognition of disaster		0.011	0.980	1.011	-0.003	0.996	0.997
Cognition of adaptive behaviour		0.834	0.088*	2.303	1.276	0.025**	3.581
Psychology factors		-0.491	0.194	0.612	-0.192	0.675	0.825
Village	Yushui	-2.320	.004***	0.098	-5.154	0.000***	0.006
	Xingquan	-0.452	0.562	0.636	-2.691	0.004***	0.068
	Dade	-1.348	0.160	0.260	-3.919	0.001***	0.020
	Tai'an	0ᵇ	.	.	0ᵇ	.	.
Gender	Male	0.146	0.748	1.157	.595	.330	1.812
	Female	0ᵇ	.	.	0ᵇ	.	.
Age	<26	-2.262	0.095*	0.104	-3.069	0.134	0.046
	26-50	-0.890	0.346	0.411	-1.767	0.257	0.171
	51-75	-0.010	0.991	0.990	-0.325	0.818	0.722
	>75	0ᵇ	.	.	0ᵇ	.	.
Education level	L	-1.588	0.070*	0.204	-2.015	0.077*	0.133
	M	-0.562	0.430	0.570	-1.562	0.060*	0.210
	H	0ᵇ	.	.	0ᵇ	.	.
Household monthly income	<20,001	0.186	0.783	1.204	0.251	0.783	1.286
	20,001-40,001	0.831	0.185	2.296	1.163	0.142	3.199
	>40,000	0ᵇ	.	.	0ᵇ	.	.
Emergency measures	Inactive / Low	-2.780	0.000***	0.062	-3.540	0.000***	0.029
	Medium	-0.915	0.392	0.401	-3.050	0.017**	0.047
	High	0ᵇ	.	.	0ᵇ	.	.

Note 1: *** $p <0.01$, ** $p <0.05$, * $p <0.1$

Note 2: 0ᵇ suggests the variable as reference group and hence the parameter is set to zero.

Note 3: Activeness in Adaptive Measures (AAM)

Note 4: Accessibility of channels & trust of sources is abbreviated as AC&TS

Note 5: Education level - Under junior high school (L); Above Junior high school and under

5.   DISCUSSION

This paper aims to analyse the relationship between disaster risk communication and household adoption of adaptive behaviour, in addition to determining the key factors affecting adaptive behaviours. The households in the Kaopingxi River watershed areas are used as the research subjects and information was acquired through questionnaire surveys. The SEM model is used to test the conceptual framework of risk communication for household adaptive behaviour established by the paper in accordance with a literature

review. The paper analyses the relationship between risk communication elements and adaptive behaviour and further adopts multinomial logistic regression to build the household adaptive behaviour decision-making model and analyse the key factors affecting adaptive behaviour decisions.

The analytical results of the SEM model also reveal that the public is more widely familiar with emergency measures in times of disasters but unfamiliar with the routine or post-disaster adaptive measures. It could be that the current direction of promotion for flood-prone communities mostly emphasises drills for emergency public response procedures; nonetheless, the decision-making model suggests a correlation between emergency measures and adaptive measures, meaning not only selling disaster insurance and strengthening building structures, but developing the high-risk areas to reduce the impact of typhoons and floods. For this reason, the public should be educated on the value of daily adaptive measures via the communication process, and in order to improve the community's disaster adaptive strategies, through disaster consequence reduction combined with emergency drills prior to disasters occurring.

Moreover, the analytical results of the SEM model show that internal cognition is subject to significant influence from risk communication mechanisms and the external environment. In particular, the community channels play an important role in the risk communication mechanism; its accessibility is convenient and has a high level of public trust. Moreover, the intensity of the connection between community residents also significantly positively influences adaptive behaviour. The analysis of the adaptive behaviour decision-making model suggests that different villages have significant differences in their level of active adaptive behaviour and such difference could result from the difference in disaster experience, the socioeconomic background of the community, the user characteristics of the risk communication channel and the relation between the community residents. Consequently, the different villages show varying characteristics across all aspects. Hence, household risk communication strategies should be formed with respect to the community scale, and only after pre-investigation on the use of communication channels by the public, their socioeconomic background, and disaster related awareness. Information should be conveyed and exchanged through the communication channels and an approach suitable for that community regarding their particular gaps in awareness for existing disasters or lowering the negative psychological factors of the public.

Disaster risk communication is part of disaster management and is a continuous process, representing the interaction of individuals, groups or agencies exchanging information and opinions with each other. Hence, assessment standards should be established after designated implementation of assessment, allowing the public to express views on risk communication, and after an evaluation of the effectiveness of risk communication, examining whether the proposed disaster awareness and adaptive behaviours appropriately match the current risk communication mechanism according to their particular requirements. The risk communication model will only be improved to adequately accommodate the local public through continuous correction and adjustment.

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Sustainable Strategy:
Comprehensive Computational Approach for Wind Path Planning in Dense Urban Area

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Abstract: This paper introduces a comprehensive framework that assesses the urban heat environment and formulates urban wind paths. Compared with other ecosystems, the wind environment and heat environment in urban areas can be much more complicated and dynamic. Nonetheless, it is of great concern considering the agglomerated population and industries at stake. Hence, multiple computational techniques are developed to assess the contemporary heat environment, and to formulate feasible policies to improve it to a more liveable state by introducing the solution of natural wind. Three key factors are considered: solar radiation, which is the major source of heat; wind direction and wind speed, which transports heat in space; and urban land surface, which may affect radiation reflection, contain auxiliary heat sources or cause vertical air flow. Hence, mesoscale meteorological data are applied to provide information about solar radiation, and are used for simulating local wind flow; Landsat images can be translated into land surface temperature figures; and building and land use databases provide information about built-up features. These combined, the local heat environment in urban areas can be mapped and monitored in a periodic fashion, with wind path analysis providing possibilities in cooling down the hotspots. Practices in cities including Fuzhou and Wuhan have proved constructive, with some others still underway.

1. INTRODUCTION

1.1 Urban heat environment and wind paths

The deterioration of the urban heat environment has had severe social and economic consequences, including human casualties, equipment dysfunction and others (Medina-Ramón et al., 2006). Though partially a result of global climate change (Luber & McGeehin, 2008), this phenomenon is also largely caused by the change of impervious surface, change of land use, urban traffic, decreasing water bodies, and other factors closely related to local human activities that can be regulated by policy and engineering efforts (Golden, 2004 ; Xu, 2010).

Correspondingly, many researchers are digging into the relationship of surface-air temperature and urban construction. Early investigations included the analysis of static surface heat patterns in Shanghai (Chen et al., 2002), and studies on dynamic changes and change simulation were introduced later (Xue, 2007; Feng et al., 2016). A comprehensive measurement for local response to solar radiation, known as Local Climate Zones, was introduced in 2012 (Stewart & Oke, 2012); the tool was later applied to both empirical research and policy studies (J Wang, Zhan, & Xiao, 2015; Cai et al., 2018).

Other researchers have focused on the possible use of wind to disperse heat from local heat islands. Such studies date back to the 1990s (Ishida, Tsumura, & Takagi, 1997) , and were followed by studies on Hongkong, Taiwan, Wrocaw, Cologne, and Szeged. These studies analyze natural wind paths through cities using meteorological models, such as Weather Research and Forecast (WRF) and the Regional Boundary Layer Model (RBLM), and rely on spatial policies to ensure the availability of the passage (Li & Rong, 2014). Simulations at the street block scale with Computational Fluid Dynamics are used to determine the optimal building group in key areas.

As for the estimation and analysis of surface temperature distribution, remote sensing images are widely used due to their coverage, spatial resolution, and periodicity. Merging techniques have been developed to downscale Landsat and MODIS images to balance spatial and temporal resolution (Bonafoni, 2016). Morphological methods can be applied to identify a Local Surface Urban Heat Island from Land Surface Temperature, providing a refined view of local hotspots.

The above research provides multiple methods for assessing the urban heat environment from different aspects and at different scales, and together provide the foundation of the framework described in this paper.

1.2   **This study**

This paper proposes a comprehensive framework that combines the assessment of the current urban heat environment, analysis of impervious surface, simulation of wind flow and formulation of spatial policies. The model contains four essential parts: 1) the morphological model retrieves land surface temperature from Landsat 7/8 ETM+ images and identifies Local Urban Heat Islands from its spatial pattern; 2) the geo-spatial model generates Local Climate Zones (LCZ) from the Digital Elevation Model, building database and land use database, and calculates the surface ventilation potential distribution; 3) the meteorological model simulates the local wind field at different air pressure levels, indicating potential passages for natural wind; 4) the fluid dynamics model aids optimization of building patterns in certain key areas and urban hotspots.

The model works as follows:

1) Land Surface Temperature (LST) is retrieved from Landsat 7/8 ETM+ images of the target area, which is then imported into MATLAB scripts that calculate the Multi-Scale Shape Index and local curvedness. These two parameters, together with a temperature threshold, are combined to find Local Urban Heat Islands, where MSSI is higher than 0.5 (indicating a higher temperature than surrounding pixels) and curvedness is higher than 0.05 (indicating an area that is large enough to be significant).

2) The Digital Elevation Model (DEM), building database and mesoscale meteorological data are imported into the Weather Research and Forecast model, which generates local wind fields that contain three

CSV data files, respectively representing a wind speed matrix for east-west vector, north-south vector and vertical vector. Data from the local weather station is used for explicating wind directions within the city. Potential natural wind paths are identified accordingly.
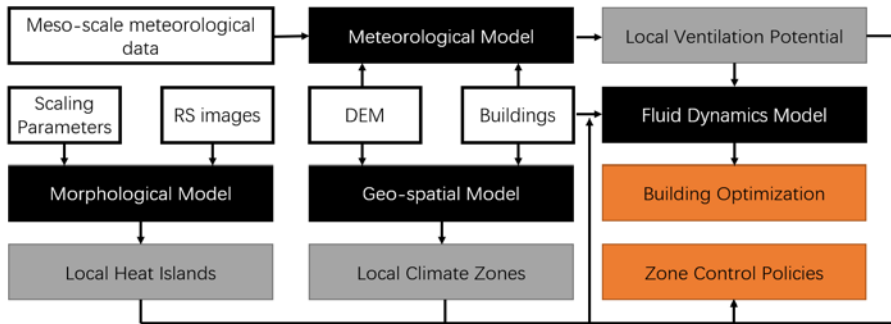

Figure 1. Workflow of The Model

3) The DEM, land surface and building database are imported into the GIS-based geo-spatial model that calculates numerous indicators related to local ventilation potential and local climate characteristics. Land pixels are given a potential ventilation index and LCZ codes.

4) Local ventilation potential and potential natural wind paths are combined to delineate areas with low ventilation potential but are on crucial positions of wind paths. Building models in such areas are altered into a variety of versions, which are then compared using Computational Fluid Dynamics (CFD) software so that an optimized version can be selected to support renewal plans. Unbuilt areas are tested under different construction scenarios so that the corresponding restrictions can be formulated.

Details of the model components will be introduced in the next chapter.

2. MODEL COMPONENTS

2.1 Morphological model

The morphological model imports Landsat images calculate latent Land Surface Temperature (LST) patterns and locates local urban heat islands on the MATLAB platform.

2.1.1 Retrieving latent LST

Due to its high spatial resolution, Landsat7 ETM+ is appropriate for urban studies and research relating to LST. Since they have only one thermal band, the classic Mono-window Algorithm is proposed to retrieve the land surface temperature (Qin, Karnieli, & Berliner, 2001), in which

$$T_{surface} = \{a(1 - C - D) + [b(1 - C - D) + C + D]T_{sensor} - DT_a\}/C$$

where $T_{surface}$ is the retrieved LST (°C), T_{sensor} is the sensor brightness temperature (K), T_a denotes effective mean atmospheric temperature (K), as a and b are constants with a value of 67.4 and 0.46 respectively, while C and D are intermediate variables denoted as

$$C = \varepsilon\tau$$
$$D = (1 - \tau)[1 + (1 - \varepsilon)\tau]$$

Where ε and τ are land surface emittance and atmospheric transmittance. The average estimation error is 1.1 °C if the inaccuracy of ε, τ and T_a are considered (Zhan, Meng, & Xiao, 2015).

2.1.2   Locating local urban heat island

Two parameters are then calculated for each pixel on latent LST, respectively the Multi-Scale Shape Index (MSSI) and curvedness.
By projecting the LST pattern $f(s)$ to scale space through

$$S(f(s), \sigma) = f(s) * k(s - u, \sigma) = \int\_s^0 f(u)k(s - u, \sigma)du$$

Where $k(\cdot, \cdot)$ is the Gaussian kernel, with different smoothing magnitude σ centered at each location u on the surface s. A normalized distance is presented as

$$d = (D(f, \sigma))/\sigma = \|S(f, \sigma) - f\|^2/\sigma$$

and the optima scale σ can be identified by the maxima of d.
The MSSI is then evaluated as the SI at each point at the optimal scale, where the SI of a point on a surface is represented as (Koenderink & van Doorn, 1992).

$$SI = \pi/2 \arctan (\kappa\_2 + \kappa\_1)/(\kappa\_2 - \kappa\_1), SI \in [-1,1]$$

Where κ_1 and κ_2 are the principle curvatures evaluated from a noise continuous latent LST surface through eigenvalues of the Hessian matrix. How it represents the relationship of a point with its surroundings is shown in *Figure 2*.
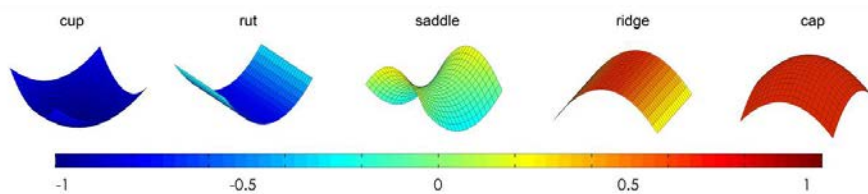

Figure 2. The Surface Morphology in The Range of Shape Index

2.2   Meteorological model

The meteorological model uses mesoscale meteorological data and building data to simulate wind speed and wind direction to a refined spatial resolution using the Weather Research and Forecast (WRF) model. Previous research found that WRF, at its best, can run on kilometer-level resolution (Jiménez et al., 2010; Yang, Zhang, & Qian, 2012). Hence, 1km is chosen as the spatial resolution for the simulation.
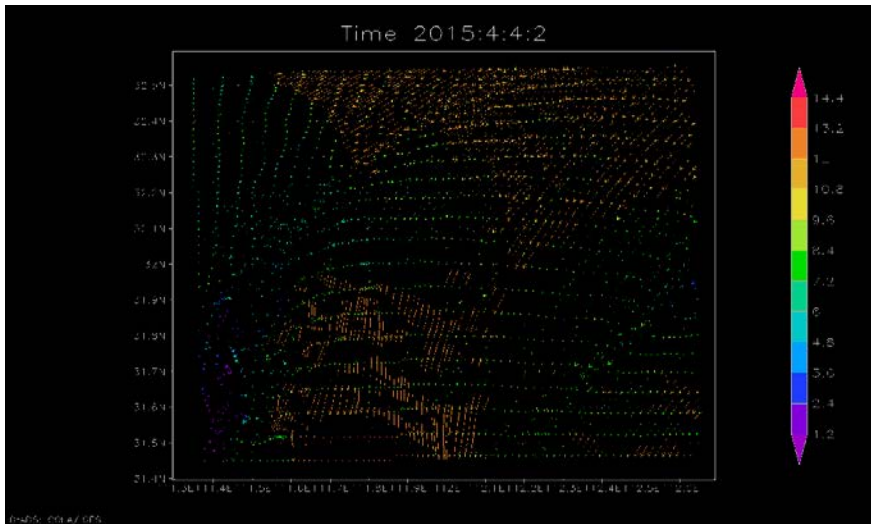
Figure 3. An Example of The WRF Simulation Result, with Vertical Speed Emitted.

WRF is a numerical weather prediction (NWP) and atmospheric simulation system designed for both research and operational applications (Skamarock et al., 2005). To incorporate the urban surface and variables into the simulation process, an urban canopy model (UCM) originally developed by Kusaka et al. (2001) and Kusaka & Kimura (2004) and later modified by Chen et al., (2002), is coupled with the WRF model. The UCM estimates the surface temperature and heat fluxes from the surfaces of the roof, wall and road, as well as calculating the momentum exchange between the urban surface and the atmosphere (Skamarock et al., 2005).

The SLAB model, as one of the UCM surface layer schemes, is applied in this study. Urban geometry is represented as some surface parameters, such as roughness length, albedo, thermal inertia and moisture availability. As anthropogenic heat is not measured and there is no anthropogenic heat emission consideration in the SLAB scheme, this scheme is selected to simulate the overall atmospheric environment at the mesoscale.

Simulations in this study are done in WRF, version 3.6, and all the parameters used in the SLAB model are listed in *Table 1*. An example of the WRF simulation result is shown in *Figure 3*.

Table 1. Parameters Used in The SLAB model

Parameters	Value
Roughness Length (m)	0.80
Moisture Availability (-)	0.10
Albedo (-)	0.15
Emissivity (-)	0.88
Thermal Inertia ($Js^{-1}K^{-2}m^{-4}$)	3.52×10^6

2.3   Geo-spatial model

The geo-spatial model utilizes DEM and building data to retrieve Local Climate Zones and key indicators in evaluating local ventilation potential. The process is scripted as a Python program and runs on the ArcGIS 10.2 platform.

2.3.1 Ventilation potential

The macroscopic wind environment and overall ventilation potential of a city are dependent on its climatic and geographic conditions, but ventilation capabilities within the city are also largely determined by its built environment. Microscopic simulation with Computational Fluid Dynamics has proven that various factors exert their influence, including the overall density of buildings，building height, the area density of buildings facing the orientation of winds (i.e., Front Area Density, FAD), and open space provided by squares, green space, and roads (Yin & Zhan, 2016).

To quantify these factors, a set of indicators, as shown in *Table 2*, are defined to describe the built environment: Building Density, Height-Width Ratio, Front Area Density, Absolute Degree of Folding, Porosity, Building Height Variety, and Building Group Proximity. Additionally, another set of indicators describe the segments of the local road network: Road Width, Road Height-Width Ratio, and Wind Orientation Coherence. Among these indicators, FAD and Wind Orientation Coherence are related to the result of macroscopic wind environment simulation, where local wind direction is generated. All indicators can be calculated from the city geodatabase in the ArcGIS environment, to which the Analytic Hierarchy Process (AHP) is applied to determine the weights of various indicators for buildings.

Table 2. Indicators in Built-Up Environment Analysis

Indicators	Definition	Implication on Ventilation	Data Source	Resolution
Building Density	Building Base Area / Raster Unit Area	Relates to ventilation levels on walking height	Building Survey of Wuhan, 2012	500m
Front Area Density	Total Front Area / Raster Unit Area	Relates to ventilation levels on walking height	Building Survey of Wuhan, 2012	500m
Degree of Folding	(Sum of (Building Base Area * Building Height)) / Raster Unit Area	Relates to average wind velocity	Building Survey of Wuhan, 2012	500m
Degree of Porosity	(Maximum Building Height*Raster Unit Area - Total Building Volume) / (Maximum Building Height * Raster Unit Area)	Relates to open space available for air flows	Building Survey of Wuhan, 2012	500m
Building Group Height Deviation	Standard Deviation of Building Heights in the Raster Unit	Relates to front area turbulence and wind velocity	Building Survey of Wuhan, 2012	500m
Road Height-Width Ratio	(Average Height of Correspondent Buildings) / (Distance Between Correspondent Buildings)	Relates to fraction resistance against winds and secondary air flows generated by high-rise buildings	Building Survey of Wuhan, 2012	By vector polygons

Indicators	Definition	Implication on Ventilation	Data Source	Resolution
Building Group Proximity	Distance to the Nearest Building	Relates to open space available for air flows	Building Survey of Wuhan, 2012	By vector polygons

Source: Yin & Zhan, 2016

2.3.2 Local Climate Zones

The LCZ is a framework proposed recently that describes the response of a certain area to meteorological factors, validated through circling places with radii of hundreds of meters in a few different cities. In this study, the target city is classified into climate zones with homogenous climate responses based on a variety of indicators, so that climate behavior at the local scale can be distinguished (Stone, Vargo, & Habeeb, 2012).

Indicators, shown in *Table 3*, are selected to reflect the meteorological properties of the land surface factors. They are considered as properties of a certain area of the land surface, which can be taken as a multi-dimensional vector for each 500m*500m pixel. The K-means clustering is applied to avoid empirical values in partitioning the observation artificially. Regarding the pixels as *n* observations, for each observation, the property is a *d* dimensional vector *p*. To separate the pixels into *k* sets, the clustering process attempts to find

$$arg\,min \sum\nolimits_{(i=1)}^{k} \sum\nolimits \| \boldsymbol{p} - \boldsymbol{\mu}_i \|^2$$

where μ_i is the mean of cluster i.

Table 3. Indicators Used for LCZs Classification

Indicators	Definition	Meteorological Implication	Data Source	Resolution
Sky View Factor	The fraction of sky visible from a certain point of the land surface.	Response actively to solar radiation and heat dissipation.	Building Survey of Wuhan, 2012	500m
Building Surface Fraction	The fraction of building a footprint in a curtain land unit.	Relates to surface run-off and moisture.	Building Survey of Wuhan, 2013	500m
Impervious Surface Fraction	Fraction of impervious surface.	Relates to surface run-off and moisture.	Landsat ETM+	500m
Pervious Surface Fraction	The fraction of pervious surfaces such as vegetation and water.	Relates to surface run-off and moisture.	Landsat ETM+	500m
Vegetation Index	Coverage of vegetation.	Relates to energy and water transitions.	Landsat ETM+	500m

Indicators	Definition	Meteorological Implication	Data Source	Resolution
Water Index	Coverage of water bodies.	Relates to energy and water transitions.	Landsat ETM+	500m
The height of the Roughness Elements	The height of construction and natural relief.	Affects the airflow and heat dissipation within an urban area.	Building Survey of Wuhan, 2012	500m
Terrain Roughness Class	Classification of roughness height.	Affects the airflow and heat dissipation within an urban area.	Building Survey of Wuhan, 2013	500m
Digital Elevation Model	Depicts the morphological property of relief.	Affects the airflow and heat dissipation within an urban area.	DEM, 2012	500m
Surface Admittance	The capability to absorb and emit energy.	The efficiency of transmitting energy.	Landsat ETM+	500m
Surface Albedo	The overall reflectance.	The efficiency of reflecting short wave radiation.	Landsat ETM+	500m

Source: Jiong Wang, Zhan, & Guo, 2015

2.4   Fluid Dynamic Model

In wind path planning, certain neighborhoods or building groups may significantly affect the neighborhoods and their surroundings by important blockading paths of natural wind (Ng, 2009). With the help of Computational Fluid Dynamics (CFD) simulations, such influencing variables can be quantified and visualized with the three-dimensional model of the neighborhoods in question (Guo & Zhan, 2015). For the neighborhoods themselves, analysis and optimization of the microscopic wind environment consist of three steps: cognitive space delineation, wind environment optimization, and analysis and validation of wind environment optimization.

In cognitive space analysis, space syntax is applied to the CAD layout plan of the target neighborhoods to calculate the spatial distribution of the Integration Index, which represents the accessibility and potential intensity of activities in a certain space. Thus, areas with a high Integration Index are to be given higher priority in wind environment optimization.

3.   PLANNING PRACTICES

3.1   Study area

Two Chinese cities, Wuhan and Fuzhou, are selected as case studies. Wuhan is located in central China, and Fuzhou is located on the southeast coast (*Figure 4*). Both are dense cities suffering severe heat in summer, known as Chinese "stove cities." Wuhan is in the east of the Jiang-Han plain, with very even terrain but many large lakes and two major rivers crossing the city, where 25.79% of the administrative area is water. Fuzhou is on a typical

estuary basin, surrounded by hills and mountains. They are both Subtropical monsoon climates, but wind resources are different due to their specific geographical environments. Following is an introduction to the analysis and planning results of these two cities.
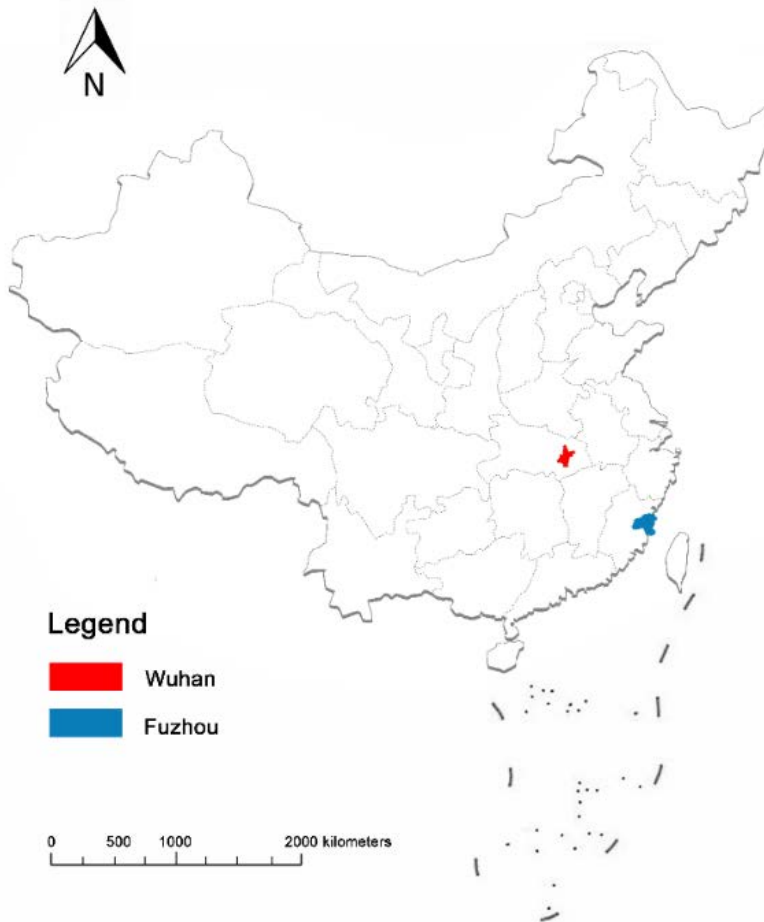

Figure 4. Study Area

3.2   Data

In these two cases, all LST retrieval is based on Landsat7 ETM+. Considering the quality of remote sensing images and its compatibility with other source data, images were chosen for August 8, 2013, for Wuhan and June 14, 2014, for Fuzhou. As the initial and boundary conditions of the WRF simulations, the NCEP Final (FNL) Analysis data, taken on the same dates as Landsat7, were downloaded and utilized. The SLAB parameters are addressed in *Table 1* as the default. Other data includes building vector datasets, separately produced in 2012 for Wuhan and 2014 for Fuzhou, meteorological station positions, and yearly weather recordings for each station in the same year as the building datasets respectively.

3.3   Result and analysis

The LST distributions at 10 am are displayed in *Figure 5* and *Figure 6.* The highest LST in Wuhan is around 47.6ºC, while in Fuzhou the value is up to 50ºC. The water bodies in both cities display the lowest temperatures, as

well as some mountain valleys and large green lands. Within the boundary of the urban area in Wuhan, the average LST in the built-up area reached above 43°C, where most urban citizens live and work. The thermal conditions in the north of Fuzhou seem severe as well, where the average built-up LST is above 45°C. Since the temperature differences between urban areas and surrounding places are 25°C and 35°C, the urban heat islands in Wuhan and Fuzhou are serious enough to require adaptation and mitigation response. As described in the introduction, the excessive heat in urban areas can be optimized by air circulation; therefore, the urban ventilation path is extremely important.
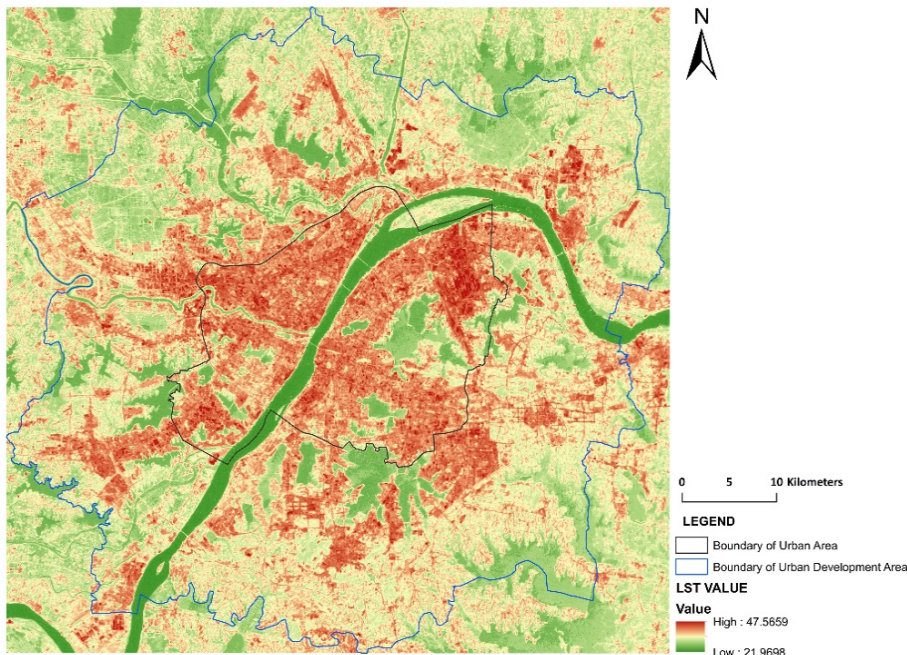

Figure 5. LST Distribution in Wuhan from Landsat7 ETM+, August 8th, 2013

The air flow within urban areas is originally based on a natural wind source created by pressure and terrain differences. For these cases, WRF is used to discover the natural wind sources of Wuhan and Fuzhou, both qualitatively and quantitatively.

Typical hours were chosen to represent the daytime and night-time situations respectively. According to *Figure 7* and *Figure 8*, the natural wind resource in Wuhan generally comes from the southwest, where there is a river canyon between mountains. As Wuhan lies in the Jiang-Han plain and is surrounded by higher terrain, the speed of natural wind near the surface may reach 10 meters per second during the day and 7 meters per second at night. The situation in Fuzhou is more complicated because Fuzhou lies on the coast of the East China Sea. On the basis of simulation results, the main wind resource comes from the south and east of Fuzhou, respectively major mountains and sea coast. The direction changes a little at night as air mainly flows from the land to the sea due to the heat capacity of the ocean. The SLAB module considers urban areas coarsely and naively; thus, the results may only reflect the wind source patterns. Therefore, a more detailed depiction of the wind path within urban areas requires further analyses based on data from other sources.
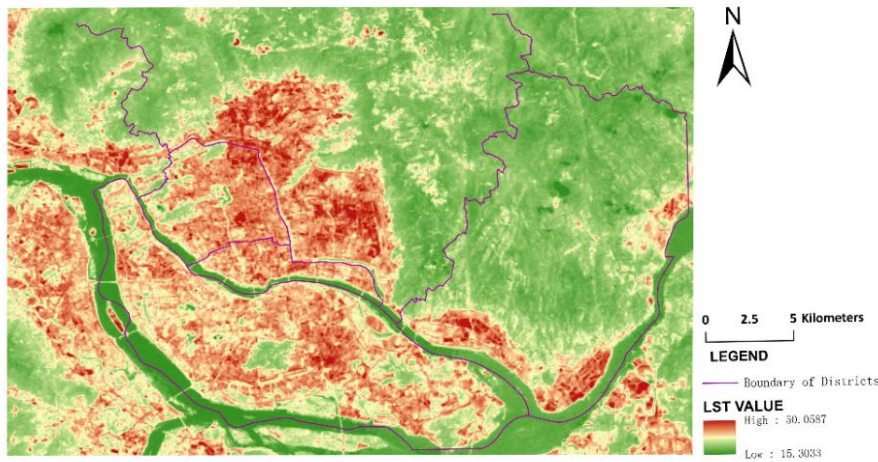
Figure 6. LST Distribution in Fuzhou from Landsat7 ETM+, June 14th, 2014
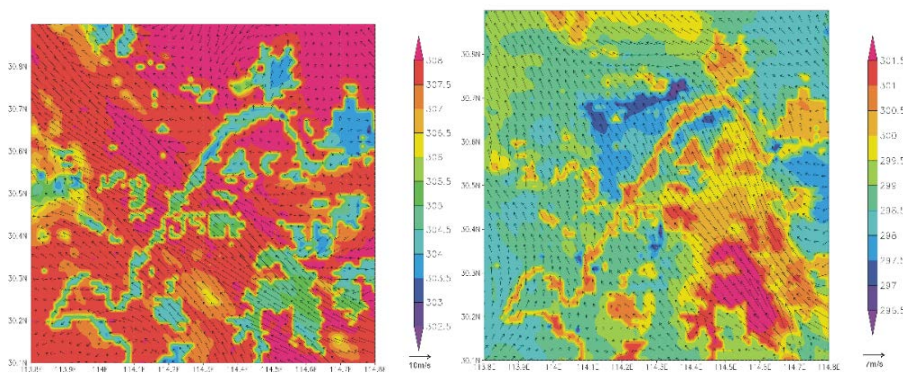

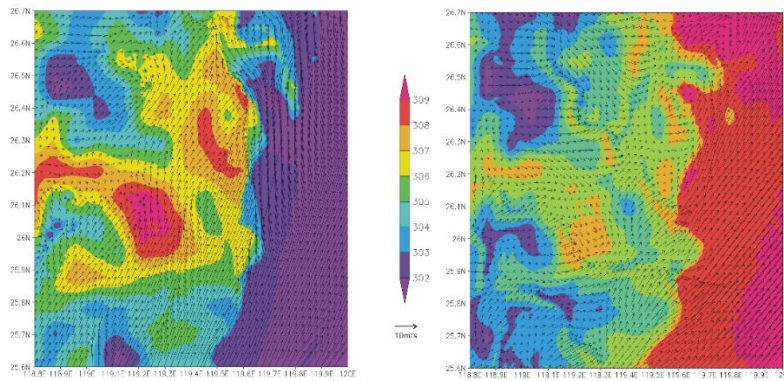*Figure 7.* WRF Simulation in Wuhan. Left: Daytime; Right: Night-time

Figure 8. WRF Simulation in Fuzhou. Left: Daytime; Right: Night-time

In order to accurately depict ventilation conditions inside the urban areas, the wind rose analysis is employed. *Figure 9* and *Figure 10* show the wind rose of each weather station for Wuhan and Fuzhou. *Figure 9* shows that the main wind direction in Wuhan is from southwest to northeast, the same direction as the Yangtze River, however, small variations exist at the local scale, especially around large water bodies, such as the Yangtze River, East Lake, Moshui Lake, and South Lake. Due to the impact of river breeze and lake breeze, the wind direction of the weather stations around these lakes generally flows from the water areas to the land. Additionally, the wind speed around the water areas is generally larger than other places. *Figure 10* indicates that the predominant wind direction in Fuzhou is from southeast to

northwest, mainly affected by the sea breeze, but as Fuzhou is surrounded by mountains, mountain-valley wind resources are also very abundant, especially from the mountains to the north and the south of the city. As a result, the wind direction near the city center mainly corresponds with the sea breeze, but the wind direction near the edge of the urban areas is mainly influenced by the mountain-valley breeze. The wind speed near the city center is significantly slower than the city periphery due to high-intensity construction inside the city.
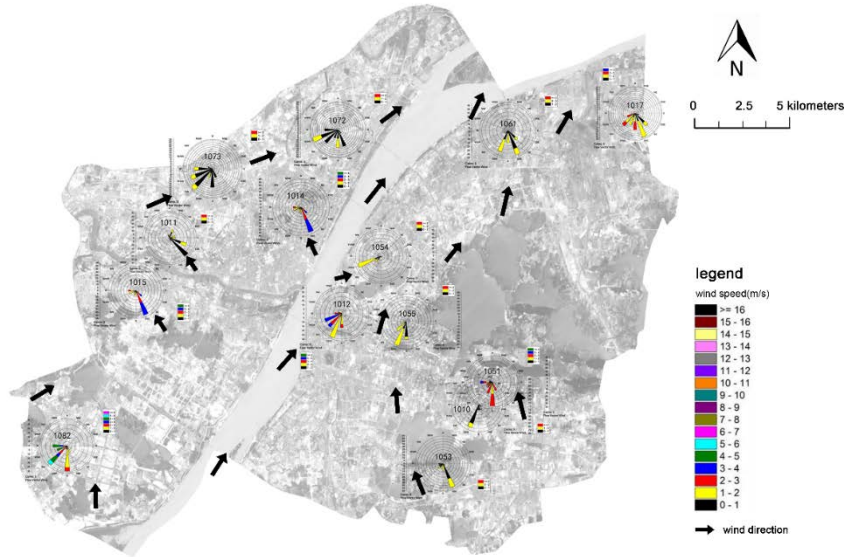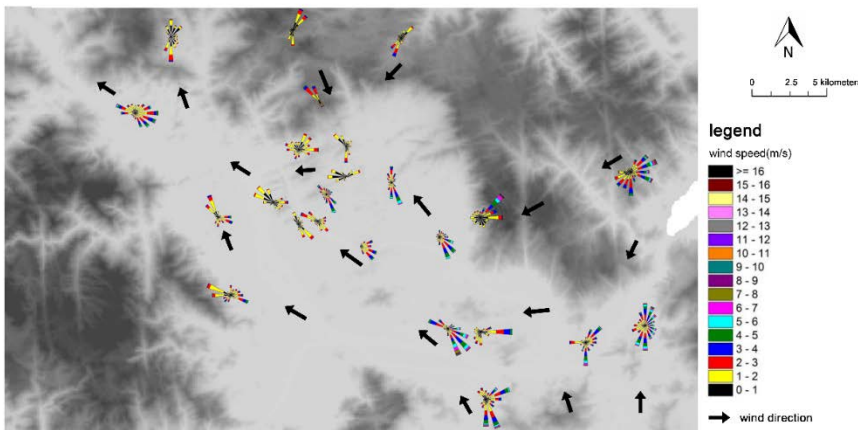

Figure 9. Wind Rose Analysis of Wuhan

Figure 10. Wind Rose Analysis of Fuzhou

3.4 Building environment analysis

To identify intra-urban construction characteristics, to excavate the potential ventilation path, the local ventilation potential is calculated. Here the Frontal area index (λf) is taken as an example. The λf distribution in Wuhan (*Figure 11*) shows that the overall λf is high in the city center areas, which means high-intensity construction and bad wind permeability. Nonetheless, there are still some spaces with low λf that can be beneficial to the local wind environment. These spaces are usually water areas, open spaces, green spaces, and wide roads. Also, once these spaces are strung together, there would be a

good intra-urban ventilation path. *Figure 12* shows that areas with higher λf in Fuzhou are mainly located in the north, and especially in the city center. The building density in the south is significantly lower. Owing to geographical features, Fuzhou has almost no natural water bodies and hills inside the city, leading to massive, intensive construction. The only area with lower λf in northern Fuzhou should be maintained so as to prevent ventilation conditions from further deteriorating.
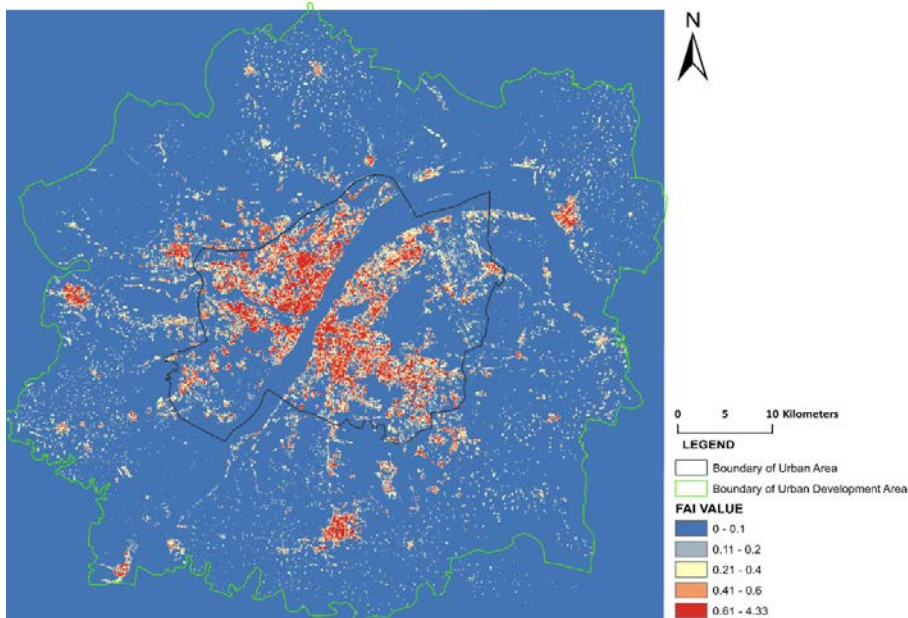

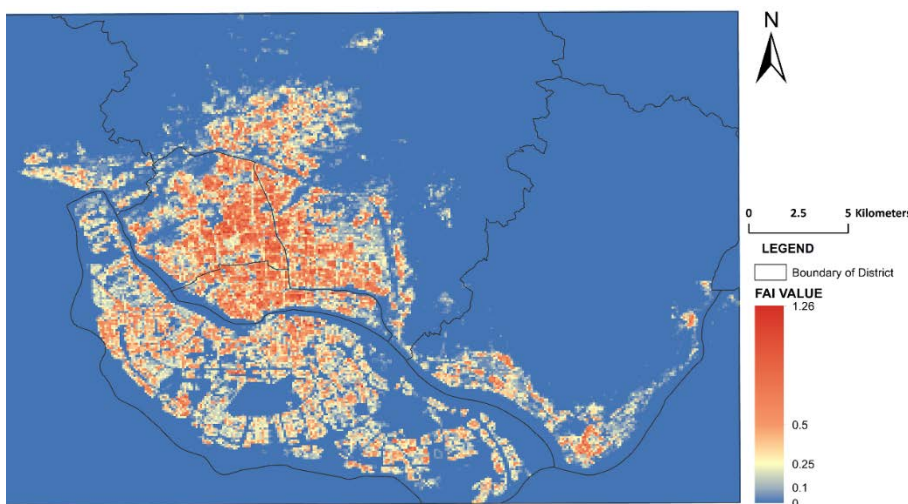*Figure 11.* FAI Analysis of Wuhan

Figure 12. FAI analysis of Fuzhou

With previous analysis of wind resources, integrating urban meteorological data and the built environment, wind path maps were generated for both cities. Wind path maps reflect where the wind comes from, as well as how air circulates within cities. In Wuhan, the Yangtze River is a major wind path running through the city. The intra-urban wind path comes from the combination of meteorological data analysis and FAI analysis. Fuzhou is distinguished from Wuhan by its more abundant wind resources, both from mountain-valley breeze and sea-land breeze, hence the situation in

Fuzhou may be more complicated than Wuhan. The intra-urban wind path in Fuzhou flows mainly in the direction of the Minjiang River.
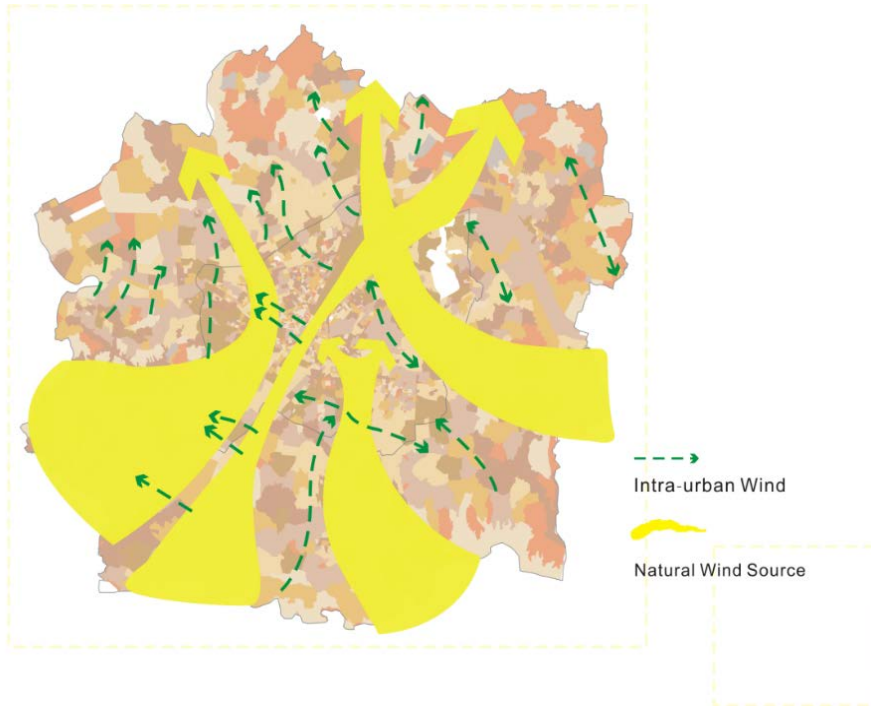

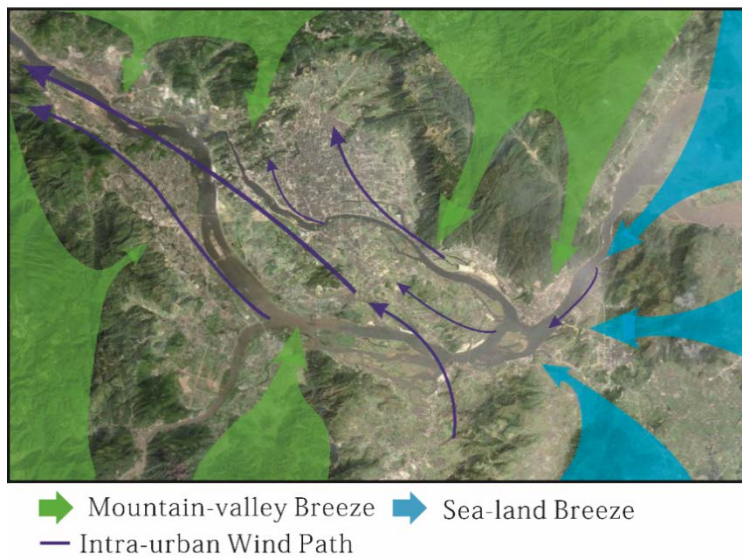*Figure 13*. Wind Path Mapping in Wuhan

Figure 14. Wind Path Mapping in Fuzhou

3.5　　Planning implementation

Even with the current vast amount of urban climate research, its application to urban planning is still very limited (Eliasson, 1996). This paper has formulated strategies that should be taken to: 1) protect urban wind entrances, and 2) give some planning guidelines to control the spatial form of ventilation paths, thus preventing the urban heat environment from further deteriorating. The former ensures the natural wind resource can blow into urban areas, whereas the latter can facilitate the passing of wind through more places to accelerate the air flow and carry off excessive heat. The width and direction

of the ventilation path and the height and configuration of buildings around the path are the main controllable indicators. Besides this, street furniture, billboards, and street plants should be arranged in accordance with the wind direction to reduce wind obstruction.

4.　CONCLUSION

Now that the ecological environment has become a public concern, planners should incorporate ecological and sustainable considerations into urban studies, planning and policy making. This research combines remote sensing, geographical information technologies and meteorological modeling, not only to explore measures to examine and evaluate the urban heat environment, but also to provide a better scientific basis for urban wind path planning. Due to the complexity of air circulation and ventilation, the analysis method of the urban ventilation corridor needs to be further improved and the research about how to explicitly locate potential air paths still awaits exploration. Further developments, such as how to explicitly locate and extract potential air paths automatically and how to improve the urban ventilation environment on the basis of inventory planning, is of great interest to us.

5.　DISCUSSION

The workflow in this paper provides new insight and a novel approach to exploring urban ventilation paths. To some extent, it provides a spatial and quantifiable foundation for decision-making. There are, however, some limitations worthy of discussion.

1) The linkage between different model components needs to be further strengthened. RS technology was employed to analyze the UHI phenomenon; the meteorological model was involved in locating wind resources, and GIS was used to analyze the urban land surface roughness and local climate. The three technologies are based on different platforms and data, so the analysis of each level lacks strong continuity and progression.

2) The workflow is more feasible for current wind tunnel excavation, so it is more applicable to cities that have almost completed urban construction, meaning dense urban areas. As for cities undergoing rapid urbanization, this workflow is not suitable for pre-planning urban ventilation paths because the data needed in this workflow is almost entirely based on the current level of development in the built area. However, exploring how to pre-plan urban ventilation for these cities is very necessary as it can help to mitigate future bad situations.

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SPSD

Key factors on migration assuming disaster risk of a megathrust earthquake:

A case study in the Pacific coastal area of Japan

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Abstract: Seismologists anticipate the occurrence of a massive earthquake with a hypocenter near Japan's Pacific coast within decades. This study was conducted in October 2015 among 6000 subjects residing in Kochi and Kanagawa Prefectures in Japan, and it investigated ways that residents of the coastal areas perceive the relative safety of urban versus rural areas and the effects of such views on people's desire to relocate to a non-coastal area. This study revealed that the evaluation of safety and resilience to the areas were different and that the extent to which the evaluation affects migration for disaster prevention is extremely small.

1.   INTRODUCTION

1.1   Japan, land of earthquakes

This paper presents the statistical results of a large-scale social survey on factors influencing the perceptions of individuals regarding the relative safety of urban versus rural areas for recovery in the event of a huge earthquake disaster and other findings of a study that considered whether such views directly contribute to the possibility of migration for disaster prevention purposes.

An island country situated at the very east of East Asia, Japan is widely known as a land of frequent earthquakes. According to one Cabinet Office report (Cabinet Office Government of Japan, 2017), the hypocenters of approximately 20% of major earthquakes of magnitude six and over occurring worldwide have been situated either in Japan or its immediate vicinity, and the historical record demonstrates that Japan has suffered damage from large-scale earthquakes to an extent essentially unequalled in any other corner of the globe.

The Great East Japan Earthquake of March 2011 (magnitude 9.0; *Figure 1*) remains particularly vivid in the country's memory, along with the Kumamoto Earthquake (magnitude 7; *Figure 2*) of April 2016. The number of fatalities and missing persons after the Great East Japan Earthquake totalled about 20,000 people, and large numbers of evacuees are still living in

temporary housing. Since immediately after that earthquake, the author has made repeated visits to Sendai, one of the cities struck by the disaster, to document the implementation process of policies for the rehabilitation of farmland damageds by the tsunami (Makiyama & Yamashita, 2015).

Figure 1. Damage to A Large Embankment (Photo by Ryohei Yamashita on June 2011)

Figure 2. A Collapsed Wall at Kumamoto Castle (Photo by Kimihide Yamamoto on Aug. 2016)

Figure 3. Farmland Laid to Waste by The Tsunami (Photo by Ryohei Yamashita on Nov. 2011)

Fatalities from the Kumamoto Earthquake exceeded 100 people, and as with the areas hit by the Great East Japan Earthquake, the process of reconstruction and recovery is still underway. In addition to having substantial social and economic impacts, the earthquake set off major landslides in areas including the Aso region, which is a World Agricultural Heritage site. Even for Japan, this is an area with a long and eventful history of damage from major earthquakes—indeed, the list of such events is so long and numerous that it would be difficult to number and describe them all.

Each time areas have been hit, they have steadfastly confronted the task of reconstruction and recovery from the ravages suffered during the earthquakes, aided by the generous support of the entire country and the wider world beyond. In the process, a body of practical on-site knowledge (both explicit and tacit) has been built up alongside scholarly understandings on disaster planning.

In this context, "resilience" refers to the power of adaptability displayed by disaster-affected communities in their recovery. A higher degree of attention began to be paid to post-disaster resilience during the reconstruction and recovery process that followed the March 2007 Noto Earthquake (magnitude 7.0) in Ishikawa Prefecture, and long-term surveys were conducted to assess the local residents' awareness of matters such as disaster prevention and tsunami escape response (Aoki & Hayashi, 2009; Hayashi & Aoki, 2016).

Whether triggered by the occurrence of earthquakes or by the perceived risk of future earthquakes, migrations are a factor exerting profound and ongoing influence on the development of social resources, and their social impact is highly significant from the perspectives of disaster prevention and regional development planning. In the context of the relationship between earthquake risk and migration, this study examined differences between urban and rural areas in residents' cognition of the safety of their residential spaces.

1.2   Megathrust earthquake risk in the near future in Japan

We can be confident that the ongoing risk of large-scale earthquakes and their attendant tsunamis in the Japan vicinity will remain high in the future. Of all the various future possibilities, particular public attention has focused on the prospect of a series of Nankai "megathrust" earthquakes with hypocenters in the Tonankai-Nankai offshore areas. The principal brunt of such an event is predicted to be borne by Japan's Pacific coast, along which the country's urban functions are concentrated. The phrase "Nankai megathrust earthquakes" is not an official term, so there is also a criticism of lowering disaster prevention consciousness in an area corresponding to the edge of the range of damage estimation. However, as it is common practice today to be described in government debates and documents, that name will also be used in this paper.

Because earthquakes are by nature impossible to accurately predict, the debate on the likely scale and extent of damage of the anticipated Nankai megathrust earthquakes has produced a mass of conflicting opinions. Thus, the various local governments in the areas expected to be affected are lacking in definitive information, and many elements of local disaster planning have been inadequate. However, among the predictive datasets released by the national government in 2012, the surface intensity map presented in *Figure 4* shows that most of the Pacific coast—including the bulk of Japan's major urban centers—is forecast to experience high-level tremors causing significant damage.
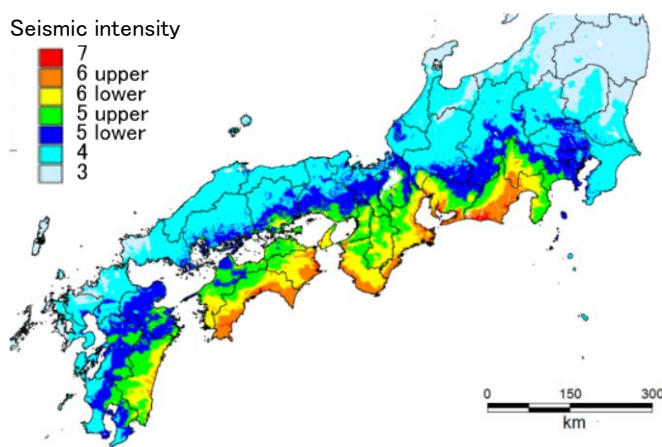

Figure 4. Example Forecast of Surface Seismic Intensity Distribution.
Source: Cabinet Office Government of Japan, 2017

The policy term "pre-disaster prevention" has become common in Japan in recent years, and regional planning for the coming earthquake is promoted based on this precautionary principle (T. Hori, 2017). Thus, preparing for the impact of a potential massive earthquake in the Nankai Trough area is important not only for coastal areas, but also for the inland zones, where migration is expected to occur as earthquake victims scramble to reach safer ground.

2.   RESEARCH DESIGN

2.1   Literature review

It has long been known that experiences of earthquake damage and the perceived risk of future earthquake damage have a major impact on individuals' decisions to relocate from vulnerable areas. For example, research focusing on areas affected by the Great East Japan Earthquake demonstrated significant population movement (Koike, 2013), for which possible causative factors include drastic changes in the labor environment due to the disaster (Higuchi et al., 2012), and changes in individuals' patterns of behavior in daily life (Uchida, Takahashi, & Kawahara, 2011). Outside of Japan, multiple reports have documented trends in population migration occurring in the aftermath of Hurricane Katrina, which struck the United States in 2005. Most of the existing literature on migrations related to earthquake risk or damage has tended to account for evidence of population movements by focusing on individual socioeconomic contexts and disparities in regional development; however, the diversity of regional characteristics and the complexity of the factors at play make a single overarching explanation difficult to achieve (M. Hori, Schafer, & Bowman, 2009). In France, researchers have attempted to construct a conceptual model to predict how population movements might be impacted by coastal residents' cognitive awareness of increased disaster risk related to climate change (Quinn et al., 2018). Studies have demonstrated how regional attachment has both positive and negative influences on risk perception (Ruiz & Hernandez, 2014), such that those who have a strong attachment to an area are particularly reluctant to leave even in a case of disaster (Bonaiuto et al., 2016). Boheim & Taylor (2002) examined the economic costs associated with migration to a new area, and (Clark & Huang, 2003) proposed relationships between migration behaviors and personal attributes such as securing housing based on family composition and income level.

Although the above-mentioned studies have greatly increased our understanding of disaster-related migrations, limited research has investigated influences on migration accruing from perceptions of the relative benefits of urban or rural characteristics in the case of disasters. Since metropolitan areas are widely considered to be more vulnerable than rural zones to the depredations of huge earthquakes, it is important to identify the factors influencing people's understanding of the differences between these two types of settlements (Kita, 2017; Kosugi, Baba, & Tanaka, 2017). After the Great East Japan Earthquake, a number of people were expected to move from urban areas to rural areas, but in fact it was not so many. This showed that Japan's problem of population leveling due to population movement between urban and rural villages did not become a driving force even for a huge earthquake. However, there is a possibility that the experience had some influence on the next generation.

On the other hand, one study empirically showed that the transfer rate from the Tsunami damaged area increased by more than 30% after the Great East Japan Earthquake in March 2011 (Thiri, 2017), and another found that disparities in income and assets had a strong influence on individuals' decisions to stay or to move immediately after the disaster (Hashimoto & Kawawaki, 2015).

Taking previous findings into consideration, the question of what kinds of migration can be predicted to occur when the risks posed by the Nankai

megathrust earthquakes begin receiving regular mass-media coverage is an issue of profound interest. Although statistical predictions of population movements using cohort analysis have been undertaken in the past, such studies did not consider the intentions of the people subjected to such analysis (Chen, Maki, & Hayashi, 2010). Renewed analysis of the current situation is all the more significant in the aftermath of the Great East Japan Earthquake.

2.2   Research approach

Studies based on detailed social surveys have indicated that whether to migrate in the event of a disaster is not determined on the basis of the disaster's physical or ecological severity, but rather on how the experience was handled psychologically (Jansen, Hoekstra, & Boumeester, 2017). Accordingly, it is important to examine the factors impacting migration as a means of mitigating risks related to disasters in Japan, where additional Nankai megathrust earthquakes are predicted to occur in the future.

Based on the above issues, this paper analyzes the characteristics of potential migration intentions in the case of a massive earthquake in the Nankai Trough area. The study aims to verify the validity of the working hypothesis that "a global view of the region is formed by elements such as individual attributes, living region characteristics and disaster risk recognition factors, and regional view and relocation intention are related." Through testing this hypothesis of intention formation, we attempted to glean the actual state of migration intentions in the case of a huge earthquake disaster.

For the purposes of this research, the "regional view" incorporates the concepts of safety and toughness against disaster risk, whereby "safety" denotes robustness against the risk that the earthquake will threaten stable daily life, and "toughness" refers to the resilience of the region, meaning the speed and extent of restoration from extremely unstable conditions accruing from earthquake damage to the physical and social stability of daily life.

These two concepts are particularly important due to the uncertainty of the conditions that will signal the predicted huge earthquake. For example, it remains unclear whether the massive earthquake will be preceded by any warning signs from seismologists or if it will be experienced more suddenly; it is uncertain whether the risk level will be accurately calculated from forecasting reports such as damage simulations, and the length and severity of the aftershocks also remain unknown.

The purpose of this research is to clarify the impact of disaster risk on migration intentions within the context of a regional study in a wide area; however, the environment will vary depending on the disaster situation. Therefore, this study aims to extract characteristics of potential migrants and the conditions impacting their movement by considering regional views of safety and toughness.

3.   DATA COLLECTION

A questionnaire survey was conducted in October 2015 using the online survey method, whereby emails were sent to participants and replied to online, making use of linked services provided by specialized agencies. The online survey method has become a mainstream tool for carrying out large-scale social surveys in recent years. Making use of user-registration ID, it is possible

to initially check and filter out respondents replying multiple times, and regular screenings also prevent the intake of invalid answers, thus excluding from the totalization those participants whose responses exhibit frequent changes in indices such as occupation and age, gender, home-place, etc., which should be easily determinable on an objective basis.

In addition, systems have been independently developed to exclude frivolous responses, such as those filled out in too short a time or filled out repeatedly using the same number to reply to multi-choice questions. Such developments have increasingly enhanced the credibility of data gathered in this manner over recent years.

The survey respondents were residents of seven prefectures considered liable to be affected by the Nankai megathrust earthquakes, namely Kanagawa Prefecture, Shizuoka Prefecture, Aichi Prefecture, Mie Prefecture, Wakayama Prefecture, Tokushima Prefecture and Kochi Prefecture. The respondents' age range was set at 20 years and over. Responses were recovered on an averaged basis per prefecture in order to prevent imbalances arising between the prefectures. The total number of replies was 6295 and the resulting figures are presented in *Figure 5*.

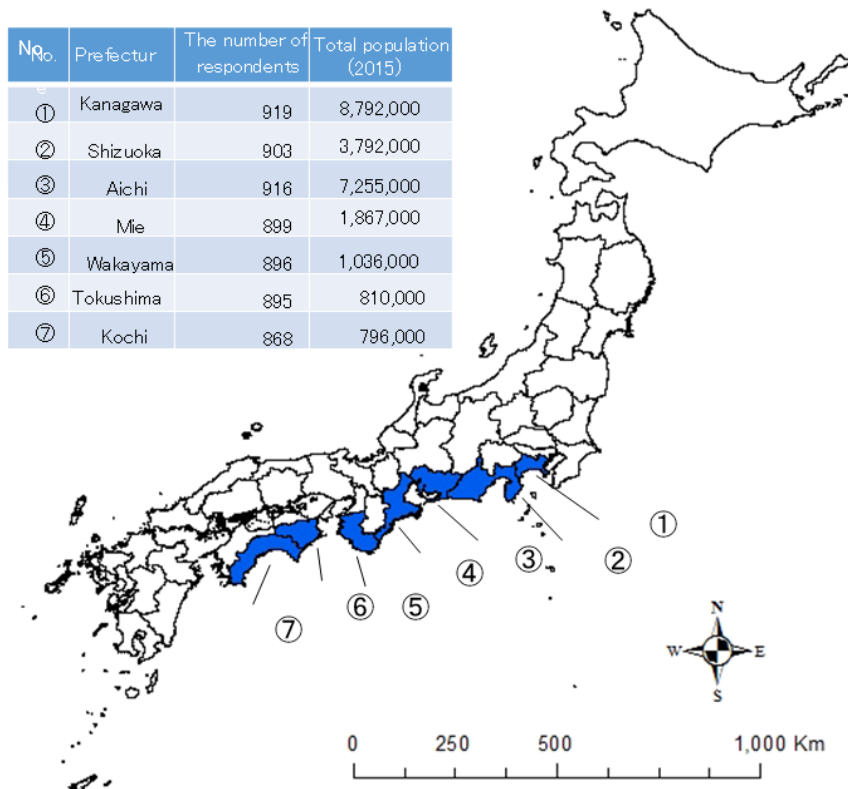| No.	Prefecture	The number of respondents	Total population (2015)
①	Kanagawa	919	8,792,000
②	Shizuoka	903	3,792,000
③	Aichi	916	7,255,000
④	Mie	899	1,867,000
⑤	Wakayama	896	1,036,000
⑥	Tokushima	895	810,000
⑦	Kochi	868	796,000

Figure 5. The Seven Prefectures Covered in The Survey (Shaded Area) and Number of Responses from Each Prefecture

Table 1. The items and their details concerned with this analysis

No.	Question	decision branch
①	Do you think a huge earthquake will occur off the Pacific Ocean (around the Kanto off the coast of Shikoku) in the future?	"1. Absolutely occur"; "2. I do not know"; "3. Absolutely not occur"
②	To what extent do you think a huge earthquake would affect the area and the living environment in which you currently live?	"1. It would be so enormous that you would have to evacuate and move away for a long time"; "2. Little damage would occur"; "3. I cannot believe that damage would occur to me"; "4. I do not know"
③	If a disaster such as a huge earthquake happened while you were away from home, could you become a returning refugee?	"1. There is a fairly high probability"; "2. There might be a chance"; "3. It will not become absolute"
④	In general, do you think you would feel safer in urban or rural areas amid the social disorder caused by the huge earthquake, the occurrence of damage, and/or the possibility of security deterioration?	"1. Urban area"; "2. Rural area"; "3. I cannot say either way"
⑤	Generally, in case of long-term social upheavals due to a huge earthquake, do you think that recovery and reconstruction of a safe and secure life would be more rapid in urban areas or rural areas?	"1. Urban area"; "2. Rural area"; "3. I cannot say either way"
⑥	Would you consider changing your residence for the purpose of protecting your safety and property due to the risk of a huge earthquake?	"1. Have specifically considered (already actually moved for disaster prevention purposes)"; "2. Might consider it"; "3. Would not consider at all"

The main data entry items requested information on respondents' age, gender, occupation, family composition, household income and postal code on the condition that use of such information would be limited to research purposes. Apart from these basic entry items, several other questions were posed, as shown in *Table 1*.

4. DATA ANALYSIS

4.1 Overview of the respondents

a) *Table 2* presents a breakdown of the total 6,295 sample responses by gender and age. Female respondents were more numerous among the younger cohorts respondents, whereas males predominating predominated among the older respondents. Extreme polarizations in opinion between the

generations were not in evidence. In addition, as seen in *Figure 6*, people living in two-generational families formed the core and most numerous groups of respondents. The income distribution also shows a good balance from below- to above- the national average (*Figure 7*).

Table 2. Age and Gender Distribution of Respondents

Age ＼ Sex	Male	Female	Total
Under 29	193	737	930 (14.8%)
30 ~ 39	496	1,072	1,568 (24.9%)
40 ~ 49	791	874	1,665 (26.4%)

50 ~ 59	758	503	1,261 (20.0%)
Over 60	607	264	871 (13.8%)
Total	2,845	3,506	6,295 (100%)

The sample numbers were sufficient to meet the analysis criteria in all categories even when responses such as "other" and "no answer" were excluded. Judged in an overall manner, it can be concluded that the recovered samples form a satisfactory group for analysis.

For the purposes of the analysis, the population density of respondents' area of residence was allocated by municipality, and the entire sample was graded into five ranked categories (less favored area, rural area, intermediate area, urban fringe area, city area). In addition, samples with the responses "other" in *Figure 6* and "no answer" in *Figure 7* were excluded. *Table 3* presents the total respondent numbers for each area category.
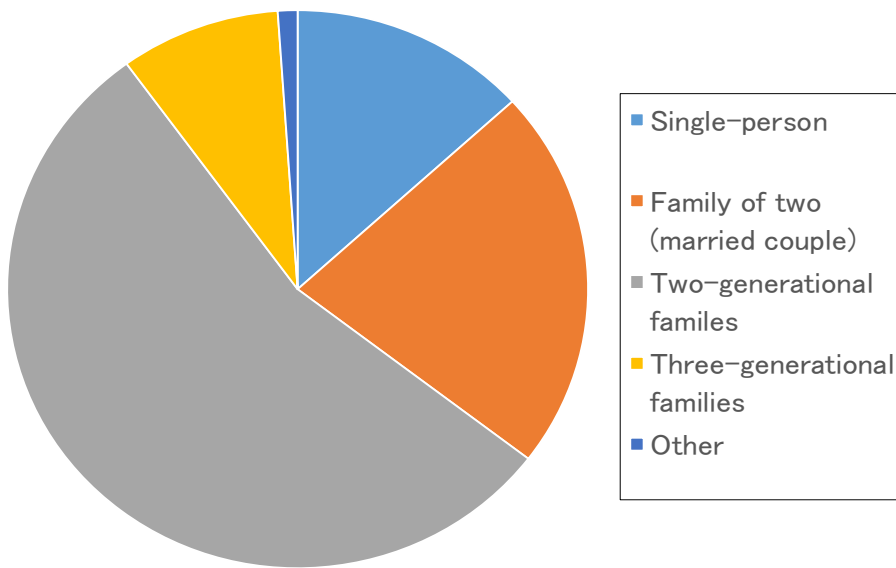

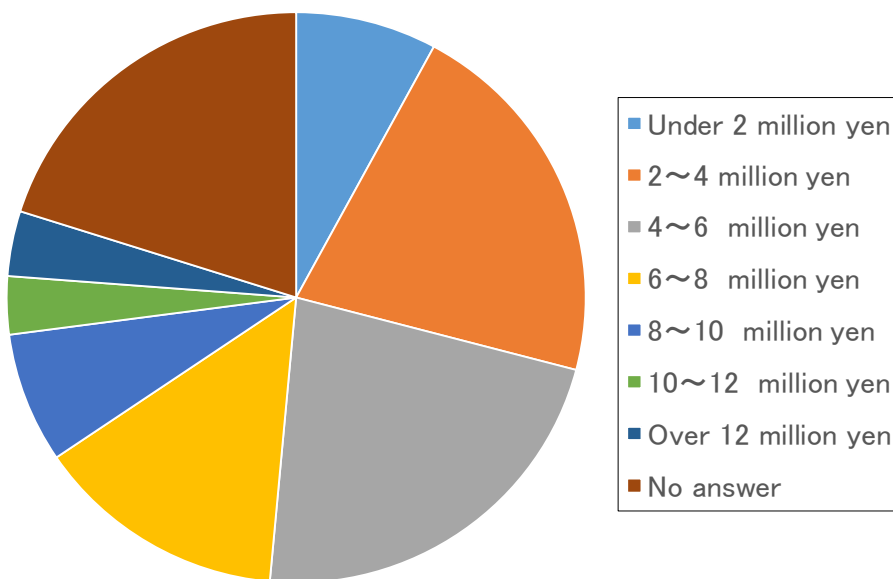
Figure 6. Family Composition of Respondents

Figure 7. Household Income Distribution of Respondents

4.2 Analysis framework

Taking the respondents' individual attributes, current living environments and notions regarding the occurrence and resulting damage of large-scale earthquakes as dependent variables, the influence of differences in perception of the relative safety and resilience of urban vs. rural areas against the dependent variables of the respondents' individual attributes, current living environments and notions regarding the occurrence and resulting damage of large-scale earthquakes were statistically analysed.

Individual attributes are comprised of the age and genders given in *Table 3*.

Table 3. Sample Numbers with Excluded Samples Not Counted

Area Category	Range of population density (/ km2)	Age \ Sex	Under 29	30 ~ 39	40 ~ 49	50 ~ 59	Over 60	Total
Less favored area	0 ~ 382.9	Male	21	82	128	111	101	935
								(18.8%)
		Female	96	167	133	61	35	
Rural area	382.9 ~ 1026.51	Male	26	82	131	135	115	1,002
								(20.1%)
		Female	102	160	130	74	47	
Intermediate area	1026.51 ~ 1506.61	Male	33	86	121	116	99	1,033
								(20.7%)
		Female	134	168	148	92	36	
Urban fringe area	1506.61~ 3303.60	Male	34	76	150	122	93	976
								(19.6%)
City area	3303.60 ~	Female	106	164	132	70	29	
		Male	38	84	141	142	94	1,036
								(20.8%)
		Female	102	181	139	77	38	
Total			692 (13.9%)	1250 (25.1%)	1353 (27.1%)	1000 (20.1%)	687 (13.8%)	4982 (100%)

Note: n=1219, log-likelihood －1398.25． *** 1% significant

Cognitions of the occurrence of a large-scale earthquake were ranked in three categories ("inevitable," "don't know," and "will never happen"), and responses were solicited on this basis. Four answer choices measured the harm respondents imagined suffering in the event of a large-scale earthquake ("enough to make moving or long-term evacuation inevitable," "enough to cause a little damage," "can't imagine any harm coming to me," and "don't know").

Figure 7 presents results for questions on respondents' current living environments on the basis of household incomes, along with the possibility of having difficulty commuting home in the event of a large-scale earthquake, for which three responses were solicited ("quite high possibility of this happening," "it could possibly happen," and "it won't happen").

Answers regarding safety and resilience in the event of a large-scale earthquake were solicited for three graded categories ("urban area," "don't know," and "rural area"). Because coastal fishing villages are more vulnerable to tsunamis, such areas were intentionally contrasted with the city and assigned to the category "rural area."

In addition to the above items, the respondents' imagined possibility of migrating in the event of a large-scale earthquake was ranked into three categories ("would think about it definitely," "would think about it a bit," and "wouldn't think about it").

5. ANALYSIS OF FINDINGS

Table 4 presents the distribution of the responses for all samples on cognitions of the safety and resilience against harm and damage of different areas in the case of a large-scale earthquake. A point of significant interest is the marked discrepancy between urban and rural areas in participants' evaluations of safety versus risk and of resilience against harm and damage.

Table 4. Notions of Regional Safety and Resilience to Damage in Case of Large-Scale Earthquakes

	Safer	More resilient
City area	905 (18.2%)	2,695 (54.1%)
Not sure	1,801 (36.1%)	1,218 (24.4%)
Rural area	2,276 (45.7%)	1,069 (21.5%)

Table 5 and *Table 6* present the results of the multiple regression analyzes that were performed using these indices as objective variables against each of the dependent variables listed above (individual attributes, current living environments and notions regarding the occurrence and resulting damage of large-scale earthquakes). The dependent variables were selected by the stepwise variable selection method. As a result, the following trends became clear:

Firstly, there appears to be greater potential for 1) r young women, and 2) people living in areas with a high population density, to have difficulty getting home in the event of a large-scale earthquake. However, 3) the risk of a large-scale earthquake was perceived as low, and the less likely individuals were to think of themselves as being at any real risk of harm from an earthquake, the more likely they were to respond that urban areas are safer than rural areas in the event of a large-scale earthquake.

Table 5. Result of Multiple Regression Analysis on The Regional View of Safety

Objective Variable	Safe area for huge earthquake（1. City, 2. Don't know, 3. Rural）				
	coefficient	SE	t-value	p-value	95% CI
Constant term	2.426	0.47			
Gender (1. M, 0. F)	0.082	0.022	3.688	0.000	0.038 ~ 0.125
Age (5 grades)	0.048	0.009	5.366	0.000	0.030 ~ 0.066
Cognition of huge earthquake occurrence (3 grades)	-0.028	0.012	-2.331	0.020	-0.052 ~ -0.004
Damage assumption (4 grades)	-0.049	0.010	-4.931	0.000	-0.069 ~ -0.030
Household income (4 grades)					

Objective Variable	Safe area for huge earthquake (1. City, 2. Don't know, 3. Rural)				
	coefficient	SE	t-value	p-value	95% CI
Possibility to be a stranded commuter (3 grades)	0.045	0.017	2.724	0.006	0.013 ~ 0.077
Population density of living area (5 grades)	-0.093	0.007	-12.595	0.000	-0.108 ~ -0.079

Table 6. Result of Multiple Regression Analysis on The Regional View of Resilience

Objective Variable	Safe area for huge earthquake (1. City, 2. Don't know, 3. Rural)				
	coefficient	SE	t-value	p-value	95% CI
Constant term	1.580	0.045			
Gender (1. M, 0. F)	0.187	0.023	8.317	0.000	0.232 ~ 0.995
Age (5 grades)					
Cognition of huge earthquake occurrence (3 grades)					
Damage assumption (4 grades)	0.050	0.010	4.824	0.000	0.030 ~ 0.071
Household income (4 grades)					
Possibility of being a stranded commuter (3 grades)	0.050	0.018	2.834	0.005	0.015 ~ 0.085
Population density of living area (5 grades)	-0.060	0.008	-7.549	0.000	-0.076 ~ -0.045

In addition, 4) for women 5) living in areas with a high population density, the more likely individuals are to consider themselves at risk of major harm from an earthquake and to have difficulty getting home in the event of a large-scale earthquake, the more likely they are to respond that an urban area will recover from a large-scale earthquake more rapidly than a rural area. These tendencies hint at the current situation of the population structure, as younger women are steadily departing rural areas for cities.

Next, we analysed how these cognitions related to the intention to migrate in preparation against the risk of a large-scale earthquake. Correlations were made on the basis of the relationships examined in *Table 5 and Table 6* to assess the possibility of individuals' migrating through the agency of factors such as risk information and the occurrence of foreshocks.

Table 7 presents the distribution of data indicating the possibility of migrating in preparation against the risk of a large-scale earthquake. The study found that the proportion of individuals considering migrating due to the risk of a large-scale earthquake (including both those who had already migrated in recent years and those considering such a move to some extent) was approximately 30%, and their current location of residence did not impact the volition to migrate. Given the uneven distribution of the Japanese population, this proportion can be judged to be very substantial indeed. *Table 8* presents

the results of correlations between this finding and the cognitions on safety and resilience discussed above, showing that there is almost no noticeable correlation between these factors.

Table 7. Opinion Distribution of Possibility of Migration Considering The Risk of A Large-Scale Earthquake

Think realistically	314 (6.3%)
	【 L.A. (53), R.A. (56), I.A. (84), U.A. (65), C.A. (56) 】
Think faintly	1,346 (27.0%)
	【 L.A. (248), R.A. (259), I.A. (288), U.A. (260), C.A. (291) 】
Can't transfer	3,322 (66.7%)
	【 L.A. (634), R.A. (687), I.A. (661), U.A. (651), C.A. (689) 】

Table 8. Correlation of The Possibility of Migration in Preparation Against The Risk of A Large-Scale Earthquake and of Cognition of An Area's Safety and Resilience

Explanatory variable	coefficient	SE	t-value	p-value	95% CI
Safety	.003	.011	.288	.773	-0.019 ~ 0.026
Resilience	-0.020	0.011	-1.841	.066	-0.040 ~ 0.001

6.   DISCUSSION

This study's findings indicate that the proportion of people currently considering a migration due to perceptions of the high risk of a large-scale earthquake is negligible. Even if I include those considering such a move "to some extent," were included, the total yields a figure of only approximately 30%. In addition, whereas trends in thinking on the safety and resilience of local communities can be explained to some extent from the current living environment and individual attributes and awareness of the risk of a large-scale earthquake, these factors have no bearing on whether an individual will migrate. Thus, it is difficult to predict where people will migrate from and to when directly confronted with the risk of an earthquake on the basis of current surveys such as this one.

However, as shown in *Table 4*, since cognitions of an area's safety before the disclosure of risk differs entirely from perceptions of an area's resilience after the disclosure of risk. It is possible that variations in assumed migration patterns may be conjectured on the basis of whether the period before the disclosure of risk is longer or shorter.

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For investigation regarding the impact of planning policy on spatial planning implementation, International Community of Spatial Planning and Sustainable Development (SPSD) seeks to learn from researchers in an integrated multidisciplinary platform that reflects a variety of perspectives—such as economic development, social equality, and ecological protection—with a view to achieving a sustainable urban form.

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