EXPLORING ISSUES AND STRATEGIES OF DEVELOPING SKYWAY SYSTEMS: A CASE STUDY OF THE TAIPEI SHIN-YI DISTRICT

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Abstract: In an urban setting, the development of a skyway system has been seen as an important facility to improve local environment, create the urban image, and enhance the prosperity of the area. Furthermore, skyways can offer vantage points for pedestrians to observe the city and enjoy the unique view of the urban streetscape. This paper therefore argues that skyway systems are capable of forming a vibrant element in an urban context.
As the development of skyway systems has recently become a notice in Taiwan, this paper selects the skyway system in the Shin-Yi Planning District, Taipei City as the subject of the research and conducts on-site observations and the questionnaire survey. The survey result shows that the majority of the respondents are content with the skyway system as a whole. However, several issues such as the lack of directional signage, deficient protection from the elements, and incomplete connection with public transit require more discussions in the subsequent skyway development. To build a sustainable skyway system, planners should pay much attention to the three critical strategies—integrating with the public transit system, providing a pedestrian-friendly environment, and enhancing the urban image and landscapes—in their skyway plans.

Key Words: *Skyway, Pedestrian, Shin-Yi District*

1. INTRODUCTION

Since the 1960s, skyway systems (also known as skywalk systems) have become an important feature in many cities around the world. The Twin Cities in the United States, the combination of Minneapolis and St. Paul, have the most extensive skyway system in the world, while their Asian counterparts such as Tokyo, Hong Kong, and Singapore have also developed the system. Recently, the application of skyway systems in an urban area has been adopted by several local governments in Taiwan. For example, Taipei City has built its skyway system in the Shin-Yi Planning District and Taipei County has planned to construct a system in the Particular Area for Xin Ban Qiao Station. Moreover, the plan of constructing 'Ocean Plaza' in Keelung City has been in progress and the 'illuminated bridge plan' in Kaohsiung City has

been proposed by private developers. As a result, this paper reviews the related literature and case studies to examine the notion and the application of skyway systems. This paper further conducts a questionnaire survey and on-site observations to evaluate the achievement of the Taipei skyway system. The ultimate goal of this paper is to provide development strategies for the Taiwanese cities showing interest in building skyway systems.

2. LITERATURE REVIEW AND CASE STUDIES

2.1 Context of Skyway System

A skyway is a pedestrian walkway across the street and connecting adjacent buildings. A skyway system, on the other hand, refers to a network of elevated walkways that link individual skyways and buildings. Skyway systems are usually linked to retail space, professional offices, and department stores in a city core. The idea of allocating pedestrians and vehicles into different layers was first proposed by Europeans (Hass-Klau, 1990). The concept of segregating pedestrians from traffic, however, has mostly been realized in North America (Robertson, 1994).

2.2 Case Studies: Learning from Foreign Counterparts

(A) Objectives of Developing Skyways

Because of the inclement weather in winter, Minneapolis and St. Paul built skyway systems to protect pedestrian from the elements. On August 27, 1962, the first skyway in Minneapolis was opened, which instantly became a local scenic spot. Moreover, the skyway increased the property values of those second-story retailers and had attracted large numbers of people to the area. Consequently, the skyway system had been continuously developed in Minneapolis and had formed a traffic network in the city core (Kaufman, 1985). From then on, the major goal of building the skyway system to provide a climate-controlled environment had shifted to spur the city's economy.

In the 1980s, the local government of Chiba Prefecture, Japan funded a specific organization to design its skyway system in the Makuhari district (Lin, 1995). The skyway system project was initiated by the public sector, with the intention to strengthen the public transit system, expand the service area, and improve the entire area's development. The private developers, however, supported the project for a different reason. That is, they applied for linkages to the system in order to increase their own profits. As a result, one can conclude that the skyway system in the Makuhari area is constructed for the transportation and economic motives.

Town Planning Board of Hong Kong realized that the conflict between automobiles and pedestrians had become serious in the 1960s and therefore proposed a skyway system project to separate pedestrians from vehicles, which was later rejected by the government. Nevertheless, The Hong Kong Lang, an enterprise that owns most of the properties in the Central District, built skyways to connect two buildings owned by the company—The Mandarin Hotel and Prince's Building. The success of this example in stimulating economic development inspired the Hong Kong government to actively design an extensive skyway system that is accessible to everyone within the Central District.

In Singapore, there is a major commercial area developed along Orchard Road and Scotts Road. In order to facilitate pedestrian movement, the Urban Redevelopment Authority encourages the development of a comprehensive pedestrian belt and thus permits the erection of skyways linking the buildings in the commercial area (Huang, 2001). The objective of

building a skyway system in Singapore is therefore similar to that of the Hong Kong system—vitalizing the economic development.

2.3 Skyways: Functions and Concerns

The skyway systems have been developed in different cities for more than four decades. It is noticeable that skyway systems have caused several issues while they have achieved the initial goals in terms of the advocates' expectations. This section therefore identifies the benefits and issues encountered in the cities that have built skyway systems.

(A) Benefits of Skyways

To provide a pedestrian-friendly environment and encourage the commercial development in a city core are regarded as the two major and interrelated advantages of skyways.

1) Creating Pedestrian-Friendly Environment

Robertson (1994) argues that skyways can separate pedestrians from vehicular traffic, thus improving pedestrian safety. Moreover, skyway systems, which are connected to numerous buildings in downtown, allow pedestrians to freely stroll the city. A skyway system can also create a vibrant environment if it functions as well as the *path* described in Image of the City (Lynch, 1960), which provides vantage points for pedestrians to enjoy different views of the city.

2) Encouraging Commercial Development

- *Traffic Aspect*

People have changed their travel behaviors because of the development of skyways in downtown. The skyway system allows people to park in the parking garages located on the fringes of the downtown area and then circulate through the system to reach their destinations in the city core. Such a comfortable, safe, and interesting pedestrian space therefore attracts the public to constantly return to the downtown (Robertson, 1994).

- *Economic Aspect*

Some cities not only build skyways for improving pedestrian space but also expect that skyways can attract suburbanites to downtown and therefore revitalize the downtown area. For instance, the retailing in downtown Minneapolis had been deteriorating before the erection of the skyway system. Minneapolis's retail sector, however, was able to recover after the city vigorously built skyways in its downtown. Skyways also caused the same effect in St. Paul, leading Kaufman (1985) to argue that skyway systems are capable of increasing the economic value of a multilevel city.

Besides the ability to attract people downtown, Kaufman (1985) also credits the skyway system for assisting in transforming the city core into a popular spot with a mixture of land uses. He indicates that the skyway system has successfully linked publicly owned buildings (e.g., the city hall), private office buildings, communities, and open space, thus forming a complete pedestrian network in the city core. In consequence, the skyway system helps stimulate the economic development.

(B) Concerns on Skyway Development

With the advantages stated above, the skyway system seemed to become a favored feature for pedestrians and planners. As cities continuously grow, skyway systems, however, have resulted in some negative impacts and have become the target of criticism. Following is an account of some of concerns surrounding the construction of skyways.

1) Impact on Street-Level Retail

Some skyways are built to protect pedestrians from the elements; however, from his observations in 1985, Robertson showed that even on a warm, sunny day, between 71-87 percent of skyway users in four of the surveyed cities (i.e., Cincinnati, Des Moines, Minneapolis, and St. Paul) said that they would choose skyways over the sidewalks. The study implies that people become so accustomed to the convenience offered by skyways and use them regardless of the weather.

As many consumer behaviors have concentrated on the skyway level, the skyway system therefore results in the magnet effect. In St. Paul, while 80 percent of the retail businesses take place at the skyway level, the street-level share has steadily decreased (Kaufman, 1985). Robertson (1993) argues that the decline in property values and competitiveness of street-level retailing has made the street-level retail space unable to lure new stores. As a result, the depressed street-level retail fails to attract people to stay on the streets and the retail sales, in turn, have continued to decrease.

Whyte (1988) indicates that the occurrence of the negative impact on street-level retail is not because the skyway system fails to fulfill its goal, but because it functions too well. It therefore requires more discussion on whether the economic prosperity of skyway-connected establishments is merely a redistribution of exiting resources (Robertson, 1994).

2) Urban Design and City Image
Some critiques point out that many of the skyways were not harmoniously integrated with the buildings, especially the old buildings that are worthy of preservation. Robertson (1993) specifies that although the skyways offer the unique view of the streetscapes, they have sometimes blocked street views and vistas. Furthermore, Robertson (1993) argues that skyway systems can result in two types of negative impact. First, skyways keep pedestrians from walking on the sidewalks, affect the vitality at street level, and influence the public's sensation, visual or mental, regarding the image of the city. Furthermore, skyways are usually linked to professional offices, luxury hotels, high-end stores, and expensive condominiums, thus resulting in a downtown that is perceived as elitist.

3) Issues on Traffic
Besides the criticisms stated above, skyway systems also result in some traffic issues. First, the skyway entrances are usually located in private buildings, making it hard for the skyway users to find their ways to the system. Robertson (1994) therefore stresses the importance of a clear directional system. Robertson (1994) observes that some of the skyways in Minneapolis are not open in the nighttime or on weekends, which affects the accessibility of the skyway system. Moreover, the operating hours are inconsistent on holidays, causing users to be unsure of when the skyways are open.

3. RESEARCH METHOD

The literature above not only discussed the advantages of building skyway systems but also identified a number of issues and concerns regarding the construction and operation of skyways. This paper therefore selects the Shin-Yi District in Taipei as the survey area to conduct on-site observations and questionnaires. The skyways located in the Shin-Yi Planning District, Taipei City, are the first and the only to be connected as a comprehensive system in Taiwan. By conducting the research, this paper aims to objectively examine the Shin-Yi system, explore the benefits and issues caused by the system, and ultimately provide feasible

strategies for skyway development in the future.

3.1 Background of Shin-Yi Skyways

Due to a variety of attractions such as department stores, entertainment establishments, and exhibition halls, the Shin-Yi District in Taipei has been experiencing heavy pedestrian volumes and traffic congestion on weekends. The city therefore built the skyway system to enhance the south-north oriented commercial belt, create a multi-layered pedestrian environment, and provide a convenient and safe shopping route. In addition, by erecting such a system, the Mass Rapid Transit (MRT) Nangang Line situated in the northern end of the system can be connected to the now-constructed MRT Shin-Yi Line at the southern end.

The skyway system construction project was confirmed during the second comprehensive review of Shin-Yi Planning District in 2000. The first construction started in May, 2003 includes three skyways; one connects Taipei World Trade Center and Taipei Financial Center (a.k.a. Taipei 101) whiles the other two links Taipei 101 to Grand Hyatt Taipei and NY NY Department Store (see Figure 1). These skyways were later open in the end of 2003. Moreover, the skyways connecting NY NY Department Store, Warner Village Cinema Center, and the three buildings of Shin-Kong Mitsukoshi Department Store (i.e., A8, A9, and A11) were open to the public on December 15, 2004. The Shin-Yi skyway system measures 2,293 meters long after the final construction of the skyway linked A8 to the A4 building was completed.

Figure 1 Skyway system of Shi-Yi District

3.2 Questionnaire Design

Based on the literature review and the understanding of the Shin-Yi system, this paper designs the questionnaire to examine the system from four main perspectives: the location of skyways and the system-wide design, the image of the environment, the functionality and design of skyways, and the pedestrian space. The intention of conducting the questionnaire survey is to know of the public's experience and attitude towards the skyway system and therefore enable this paper to analyze the relation between the subjects' responses and the skyway planning.

3.3 Survey Process

This paper began with the on-site observations and collected related information during peak and non-peak hour of weekdays and weekends in the 2nd and 3rd week of August, 2005. The questionnaire survey, accomplished by convenience sampling, was carried out in January, 2006 and 146 valid questionnaires were retrieved. The subjects of the survey are the pedestrians on the skyway system and the questionnaires were distributed during peak periods—4 p.m. to 9 p.m. on weekdays and 1 p.m. to 10 p.m. on weekends.

3.4 Background Information of Respondents

Following is the background information about the total of 146 respondents.

1) Age: Under 20 years old: 41 copies (28% of total respondents); Age of 20-40: 72 copies

(49%); Age of 40-60: 32 copies (22%); Over age 60: 1 copy (1%).
2) Gender: Male: 70 copies (48%); Female: 76 copies (52%).
3) Education: Elementary school and below: 0 copy (0%); Junior high school: 7 copies (5%); Senior high school/Higher professional school: 38 copies (26%); College: 76 copies (52%); Graduate school: 25 copies (17%).
4) Occupation: Student: 55 copies (38%); Service sector: 40 copies (27%); Military, government employees, and teachers: 18 copies (12%); Retail: 25 copies (17%); Industrial sector: 4 copies (3%); Agricultural sector: 0 copy (0%); Unemployment: 1 copy (15); Other: 3 copies (2%).

3.5 Reliability Analysis

To ensure the effectiveness and credibility of the survey results, this paper conducts the reliability analysis by using Cronbach's alpha coefficient to inspect the consistency of the questionnaire. A survey can be defined as having the relatively higher reliability if the alpha coefficient is more than 0.70. Table 1 shows the coefficient value of each survey based on different aspects. From the reliability analysis, it is evident that the results of the questionnaire are highly reliable.

Table 1 Reliability analysis of questionnaire

Dimension	No. of Question	Cronbach α
Location and systematic planning	7	0.8371
Environmental Image	5	0.7814
Mechanism and design of Structure	8	0.7495
Pedestrian Space	10	0.8166

4. BENEFITS, CONCERNS AND DEVELOPMENT STRATEGIES

By reviewing the related literature and conducting on-site observations and the questionnaire survey, this paper is bale to analyze the advantages and downsides of the current skyway system and further provide a variety of planning strategies for skyway development.

4.1 Benefits of the Shin-Yi system

(A) Creating a Pedestrian-Friendly Environment

To create a climate-controlled environment and offer a convenient connection between major buildings are the two objectives of developing the Shin-Yi system, which are also the two advantages of skyways recognized by the majority of total respondents (see Figure 2). Another two benefits favorable among the respondents are 'needless to wait traffic lights' and 'avoiding the conflict between pedestrians and vehicles'. Overall, the survey results reveal that most of the respondents are satisfied with the skyway system, leading the paper to conclude that the Shin-Yi system has achieved its goal on creating a pedestrian-friendly environment.

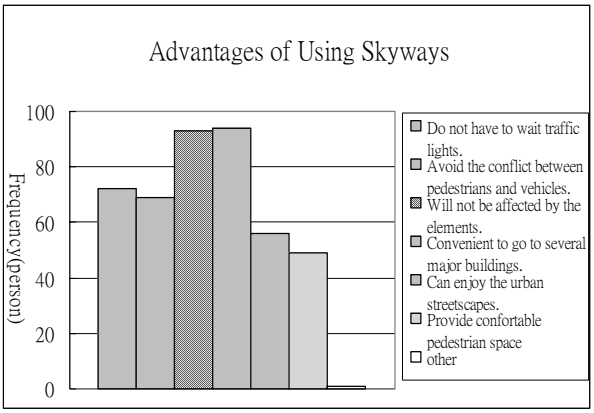

Figure 2 Advantages of using skyway

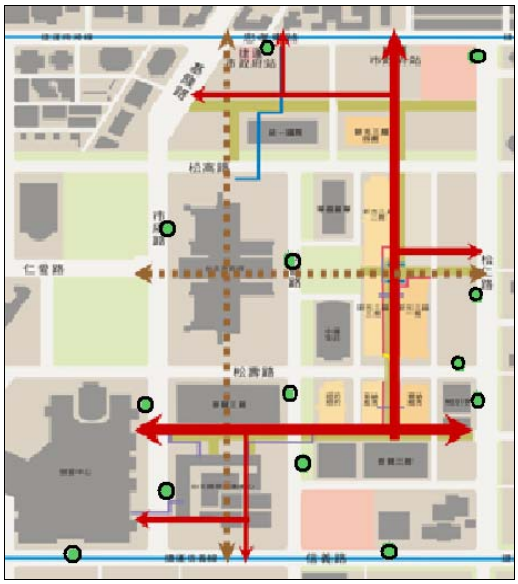

Figure 3 Pedestrian activity system

(B) Stimulating Commercial Development

The spatial distribution of the Shin-Yi planning district shows that the A9, A11 building of SKM, Warner Village, and NY NY Dept. Store are the major activity cores of the entire area (see Figure 3). The survey result also reveals that the three skyways, coded from 3 to 5, have been frequently used (see Figure 4). As a result, this paper argues that the pedestrian movement in this area is formed and fostered by the allocation of the primary commercial and entertainment facilities. The presence of the skyway system, on the other hand, attracts people to the area, facilitates the pedestrian circulation, and therefore stimulates the commercial development.

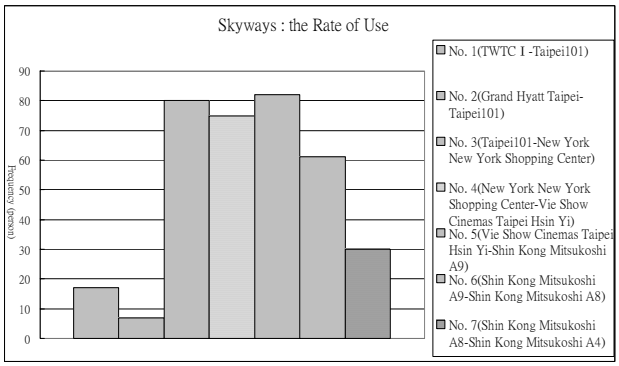

Figure 4 Rate of usage

In Minneapolis and St. Paul, the skyway systems are used as a redevelopment tool to revitalize their deteriorating downtown. The Shin-Yi planning district, however, is currently in a phase where the retailing has been highly developed. It is therefore less likely for the paper to declare that boosting the local economy is one of the achievements of the Shin-Yi system. It is, however, undeniable that the Shin-Yi system has benefited the commercial development of the district.

4.2 Issues of the Shin-Yi System

(A) Lack of Clear Directional Signage

Due to the lack of clear directional signage, the skyway users are unable to locate themselves and are likely to get lost in the system. Among the respondents, 67% of them have been aware of this issue and 61% of them feel the necessity of improving the circumstances (see Figure 5 and Figure 6).

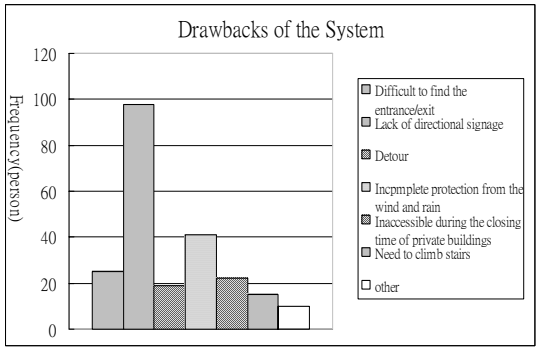

Figure 5 Draws of the system

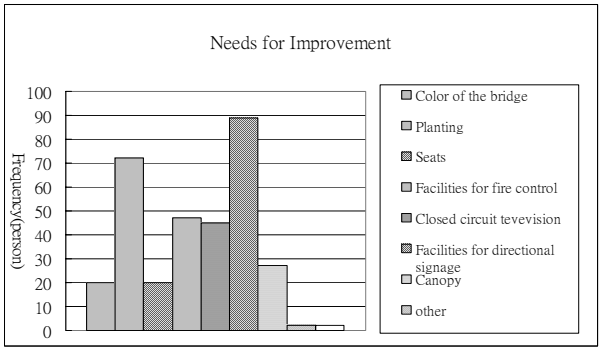

Figure 6 Needs fir improvement

(B) Protection from the Elements

The Shin-Yi skyways with covering can keep people from being exposed to the sun and rain. However, this kind of open-sided skyway is unable to provide a full protection, thus letting pedestrian face the fierce wind and rain alone. Moreover, this paper observes that parts of the system were not well designed with drainage facilities and the accumulated water on the surface of skyways might therefore affect the safety and comfort of the pedestrian space.

(C) Connection with Public Transit

More than a quarter of the respondents visit the area by MRT system (see Figure 7). It is, however, observed that the Shin-Yi system is not linked to the City Hall station located on the north end of the district (see Figure 1). Interestingly, 49% of total respondents also claimed the need for a better linkage between the skyway system and the MRT stations (see Figure 8). Moreover, about 23% of total respondents take bus to the area; however, there are only few bus stops situated at the peripheries of the skyway system (see Figure 3). The evidence reveals that the current skyway planning does not give careful consideration to the integration with the public transit system.

(D) Dispute on Facilities for Disabled

Given the consideration regarding the expense and the rate of use, the public sector does not have any plan of increasing facilities for the disabled at present. To circulate through the skyway system, the disabled or the elderly need to utilize the elevators located in the shopping malls. The survey shows that many of the respondents think there is no need to install additional elevators (see Figure 9 and Figure 10). It is, however, debatable that whether the facilities for the disabled can be ignored in a pedestrian-friendly environment or not. Hence, this issue requires further evaluation and discussions.

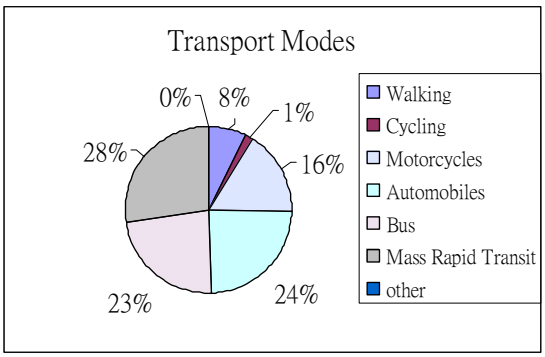

Figure 7 Probability of mode choice

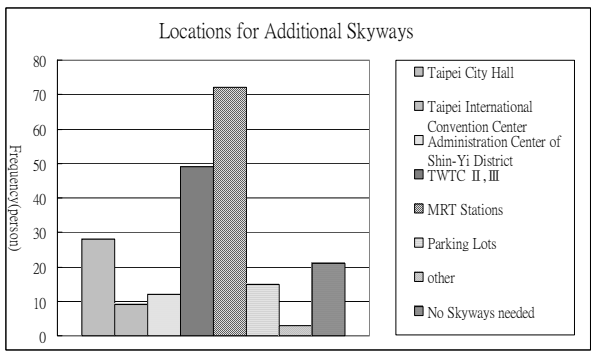

Figure 8 Location for additional skyway

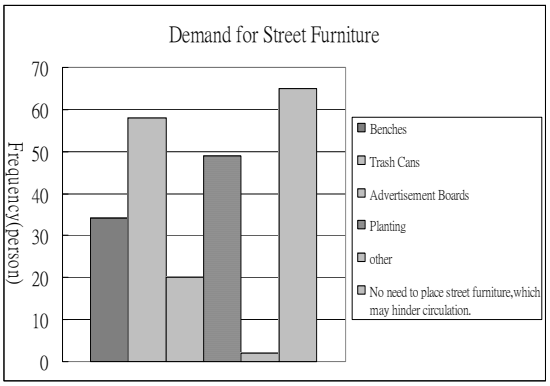

Figure 9 Demand for street furniture

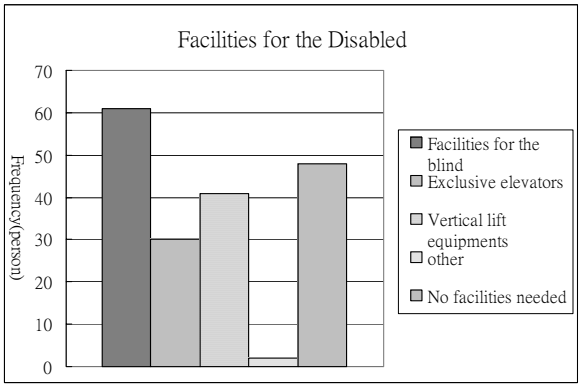

Figure 10 Facilities of the disabled

(E) Dullness of the System

From the questionnaire survey, about 71% of total respondents are content with the exterior design of the skyways because it effectively minimizes the visual impact caused by the skyways (see Table 2). Nevertheless, approximately a half of the respondents expect the improvement of planting in the skyway system (see Figure 6). It therefore takes efforts for the planning department to assess related strategies on planting and adding interest to the skyway system.

Table 2 Respondence on the use of skyways

Category	Highly Agree and Agree	Neutral	Disagree and Highly Disagree
Skyways are wide enough for pedestrians to smoothly pass through.	75	16	9
The pavior of skyways is suitable for walking.	58	38	4
The nighttime lighting of skyways is sufficient.	70	27	3
The exterior design of skyways is pretty.	71	21	8
Skyways block the views of the pedestrians at street-level.	8	38	54
The skyway design is correspondent with the area's image.	74	22	4
On the skyways, one can enjoy the different views of urban landscapes.	73	24	3
Skyways become the landmark and represent the entrance to the area.	61	34	5
Skyways facilitate your activities in the district.	86	10	4
You are stratified with the Shin-Yi skyway system as a whole.	83	15	2

4.3 Development Strategies for Skyway Development

One the one hand, issues exploded above is the negative outcomes should be corrected. On the other hand, suggestions and active responses through questionnaire also form a very good foundation for further improvement. By combining issues and suggestions, this paper offers the following strategies for the future planning of the Shin-Yi system and the development of skyway systems in other Taiwanese cities (see Table 3).

(A) Establishing the Construction Model

From the experiences of foreign cities, there are two models to build a skyway system: 'Ordinance' and 'Administrative Plan'. The former requires a thorough system of regulations decreeing basic principals, while the later depends on a comprehensive plan providing a set of guidelines. Based on the local attributes, cities that want to build a skyway system can choose any of the models at their discretion. The Shin-Yi system is constructed under the administration plan; however, in spite of the reserved locations specified in the urban planning, there is no relevant guideline in the skyway plan. To avoid the additional costs resulted from the negotiation process between the government and private developers, it is essential to establish the construction model before building the skyway system.

(B) Connecting Public Transit to Skyways

A well-designed connection between public transit and the skyway system can effectively reduce the use of private vehicles and create a humanity-oriented urban environment. The Shin-Yi system, although designed with the similar intention, fails to provide an uninterrupted pedestrian space. Therefore, the future development plan should make the objective—linking public transit and the skyway system—a top priority.

(C) Creating a Pedestrian-Friendly Environment

One major advantage of building a skyway system is that it can provide a comfortable, climate-controlled pedestrian space. The only drawback of the Shin-Yi system, in terms of providing a friendly environment, observed in the survey is the lack of clear directional signage. The planning department should therefore make sure that the system has already achieved its goal of creating a pedestrian-friendly environment and then adjust its skyway design to enrich the diversity of the urban space.

(D) Avoiding the Negative Economic Impacts

The literature shows that the skyway systems in different cities have resulted in adverse influences on the street-level retail businesses. The Shin-Yi system, however, does not have the magnet effect because the district has mixed land uses and the commercial activities are thriving. On the other hand, many cities in Taiwan are encountering the difficulties that their downtown has been deteriorating. As a result, this paper argues that those Taiwanese cities planning to build skyway systems should cautiously evaluate their ability to avoid the negative impacts on retailing before initiating the skyway plan.

Table 3 Skyway development: issues and strategies

Aspect	Issues	Strategies
Pedestrian Environment	1) Entrances are located in the private buildings; the operating hours are inconsistent.	1) Evaluating the feasibility of operating the skyway system 24/7 or regulating the unified operating hours.
	2) The system lacks the directional signage, making pedestrians get lost in the system.	2) Establishing a clear directional system.
	3) The open-sided skyways can not provide a full protection from the elements.	3) Designing the skyways by considering the attributes of local climate.
Traffic	1) The connection between the skyway system and public transit is insufficient.	1) Integrating these two transportation systems; strengthening the relation.
Economy	1) Skyways negatively affect the street-level retail businesses.	1) Emphasizing the improvement in pedestrian environment at the street level; providing a ground-level public space that is different from the skyways.
Urban Image	1) The skyway system is not harmoniously coordinated with the surroundings.	1) Giving careful considerations to the surrounding buildings and the image of the area.
	2) Skyways take away the pedestrians on the street, thus adversely influence the vitality of the street.	2) Building the skyway system while promoting street-level commercial development and improving the street
Landscape	1) Skyways affect the views of those on the street.	1) Paying attention to the urban context while designing the skyway network.
	2) Skyways may destroy the characteristics of urban streets.	

(E) Enhancing the Image of the Area
The visual impact caused by the skyways has drawn some criticisms. The design of the Shin-Yi system therefore aims to reduce the visual oppression resulted from the volume of the skyways. To create a vibrant and glamorous urban environment, the expected image of the area, the location of the skyways, and the possible visual impacts are the key elements in skyway development strategies.

(F) Setting up a Management and Maintenance System
To build a sustainable skyway system and effectively manage the system, establishing a management and maintenance system is critical for the skyway planning.

5. CONCLUSIONS AND SUGGESTIONS

The development of a skyway system is worthy, for both the public and private sectors, to deliberate, evaluate, and implement, because skyways can create a multi-layered pedestrian space, provide a humanity-oriented urban environment, and result in concentrated economic effects. By reviewing the related literature and conducting the questionnaire survey, this paper attempts to make viable recommendations for the future skyway planning in Taiwan. Following are the conclusions and suggestions of the research.

A well-designed skyway system is beneficial for pedestrian environment, transportation, and commercial activities. The skyway systems, on the other hand, may result in serious issues such as negative impacts on the local economy and landscape. Overall, the application of skyway systems in a city setting requires more discussions and assessments. Following is an account of the concerns confronting the Shin-Yi system.

1) Insufficient regulations and guidelines regarding urban planning.
2) The defective connection between the skyway system and public transit.

3) A careful evaluation on installing facilities for the disabled.
4) Incomplete directional signage.
5) The dullness of the pedestrian environment on skyways.

A good skyway planning should have the attributes of convenience and continuity in traffic and economic effect. Furthermore, the pedestrian environment provided by the skyway system should be considerate of safety and comfort. Finally, the skyway planning must enhance the self-evidence and glamour of the urban environment. This paper concludes the following development strategies for the skyway planning in the future.

1) Establish the construction model of planning skyway systems.
2) Create an actual pedestrian-friendly environment.
3) Connect the skyway system and public transit system.
4) Enhance the image of the area and enrich landscape.
5) Avoid the negative economic impacts.
6) Set up a management and maintenance system.

For the subsequent research on skyway systems, this paper suggests that in addition to the guidelines of skyway planning, it is feasible to apply the theories of urban design, sustainable transport, and transit-oriented development into the construction of skyway systems. In conclusion, planners who attempt to build skyway systems in other Taiwanese cities should pay attention to the issues presented in the paper and utilize the development strategies to creatively make their skyway system plans.

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