LANDSCAPE PERFORMANCE SERIES
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Xuhui Runway Park
Methods

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This investigation was conducted as part of the Landscape Architecture Foundation's 2022 *Case Study Investigation* (CSI) program. CSI matches faculty-student research teams with design practitioners to document the benefits of exemplary high-performing landscape projects. Teams develop methods to quantify environmental, social, and economic benefits and produce Case Study Briefs for LAF's *Landscape Performance Series*.

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The full case study can be found at: https://landscapeperformance.org/case-study-briefs/Xuhui-Runway-Park

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Acknowledgements

Xuhui Runway Park Biodiversity Research Team, DLS, CAUP, Tongji University Shanghai

Sasaki Associates, Inc.

The Planning and Design Department of the West Bund Group

Research Strategy

Due to the COVID-19 pandemic, the research team was limited to doing the on-site survey from March to July.

From late July to early August, the research team completed the collection and analysis of the online questionnaire on social benefits. On August 3, the research team participated in the finale webinar held by LAF.

In August and September, the research team completed the on-site research and analysis of the benefits for stormwater management, noise mitigation, and property value. On-site research on biodiversity and carbon sequestration, as well as the interviews with the park managers, were completed in October.

Environmental Benefits

- ***Decreases stormwater runoff depth for surface precipitation by an estimated 81% (from 2 in to 0.4 in) for a 1-hour, 10-year storm event.***

Method:

According to the design data for Runway Park obtained through the designer, Sasaki Associates, the research team calculated the statistical data to obtain the area and proportion of each land use type before and after the park was built as well as the percentage of permeable underlying surface and calculated the runoff volume using the SCS-CN model for the hydrological effect of the runway park.

Calculations:

The hydrological effect of Runway Park construction was calculated using the SCS-CN model, where reference was made to existing studies on the application of the SCS model in Shanghai.

The specific rainfall parameters are set as follows:

Antecedent soil moisture condition is set at AMC I (dry) condition

The rainfall is set at 56.34 mm per hour, the 10-year return period rainfall in Shanghai

The corrected CN value is used and Ia is taken as 0.2S in the rainfall-runoff simulation

CN values were obtained by reference, (see Appendix 1 for details of the calculation procedure):

$CN_{(before)} = 98$

$CN_{(after)} = 72.32$

Specific calculation formula of the runoff depth of surface precipitation (Q) is as follows:

$$Q = \begin{cases} (P - I_a)^2/(P + S - I_a), & (P \geqslant I_a) \\ 0 & (P < I_a) \end{cases}$$

$$I_a = 0.2S$$

$$S = (25400/CN) - 254$$

In the formula[1]:

P = The total amount of one rainfall (mm);

Q= The runoff depth (mm);

I_a= The initial loss (mm);

S = The maximum possible retention of the watershed at that time (mm).

The runoff depth of surface precipitation before the reconstruction: Q_1=53.20mm (2.094488 in)

The runoff depth of surface precipitation after the reconstruction: Q_2=10.15mm (0.3996063 in)

Total runoff reduction:

$(Q_1-Q_2) / Q_1 = (53.20-10.15) / 53.20 = 80.92\%$

Additional Information:

Under the same rainfall and time conditions, the treatment capacity of the runway park for surface runoff infiltration is 80.92% higher than when it was originally used as an airport runway, thus reducing the pressure on the drainage system in the area, achieving the ecological benefits of reducing urban flooding and promoting the resource utilization of rainwater.

Sources:

1. Quan, Ruisong. "Forecast of Land Use Change and Its Hydrological Effect in Shanghai Based on Scenario Simulation." *Journal of Natural Resources* 33, no. 09 (2018): 1552‐1562.

2. Cheng, Jiang, Kai Yang, Lanlan Liu, and Bo Li. "Study on the Impact of Land Use Change on Regional Rainfall and Runoff in the Central City of Shanghai." *Journal of Natural Resources* 25, no. 06 (2010): 914‐925.

3. Hu, Hengzhi. "Study on Robust Decision-Making of Waterlogging Disaster Risk under Climate Change Scenario," 2021. https://doi.org/10.27312/d. cnki. gshsu.20014.00000000074.

4. Fu, Suhua, Xiangliang Wang, Hongye Wang, Xin Wei, and Aiping Yuan. "Study on the Determination Method of CN Value in SCS-CN Runoff Model." *Arid Region Geography* 35, no. 03 (2012): 415‐421. https://doi.org/10.13826/j.cnki.cn65-11.

[1] Quan, Ruisong. "Forecast of Land Use Change and Its Hydrological Effect in Shanghai Based on Scenario Simulation." Journal of Natural Resources 33, no. 09 (2018): 1552‐1562.

Limitations:

- Only the runoff volume comparison under the 10-year return period rainfall condition is considered. In reality, rainfall fluctuates with weather and the calculation results of this model are likely not representative of the real situation.

- ***Saves an estimated 1.04 million gallons of potable water and $3,200 annually by reusing stormwater runoff for irrigation and the park fountains.***

Background:

The stormwater from the park and Yunjin Road is managed along the street through the 5,760-square-meter rain garden on the north portion of the site and the 8,107-square-meter constructed wetland to the south. After treatment at the rain garden and in the forebay, the stormwater meets the quality requirements for recreational use water according to the Surface Water Quality Standard of China. A portion of the treated runoff is collected at a 39.4-cubic-meter underground cistern and used for park operation and maintenance use when necessary. It is sufficient for irrigating 19,700 square meters of planted areas and providing a full water supply for the Runway Fountain in the park.

Method:

The research team conducted an online interview with Ms. Kang, the head of the planning and design department of the West Bund Group, who is also the head of the park management. Through this interview, the research team learned that the park has collected approximately 3,940 cu meters of rainwater per year since the construction of Xuhui Runway Park. The comprehensive water price (including water rate and waterborne fee) in Shanghai is 5.5 yuan per cubic meter.

Calculations:

The comprehensive water price: 5.5 yuan/m^3

Annual amount of rainwater collected by the Xuhui Runway Park: 3,940 m^3 = 1,040,838 gallons

Annual savings on water bills in Xuhui Runway Park:

5.5 yuan/ m^3 * 3,940m^3 = 21,670 yuan

21,670 yuan to USD = $3,208.87 (exchange rate on 8/1/2022)

Sources:

The planning and design department of the West Bund Group

Limitations:

The information was provided by the park operator and was not independently verified by the research team.

- ***Provides habitat for at least 9 observed bird species within a high-density urban environment.***

Method:

The research team of 10 student members conducted a field survey on biodiversity in Xuhui Runway Park on September 25 from 14:00 to 17:30. In this research, the primary focus of the research team was on the observation of bird species populations and the survey of existing plant species.

The research team divided Xuhui Runway Park with a 10X10m grid (Figure 1.4.1). The grid at this scale ensures the clearer ecological hotspot boundary and divides Xuhui Runway Park into three survey sample sections, with 3-4 people at each sample section. The research team used the Line Method and selected 8-9 grid survey sites in each section as sample points for data collection, based on ecological hotspots such as the hard surface, grassland, forestland, water area and wetland. The average time taken for sampling at each survey site was 20 minutes.

The research team recorded data from each survey point through the Biotrack APP, thus facilitating subsequent data integration and analysis by the entire research team. (Figure 1.4.2)

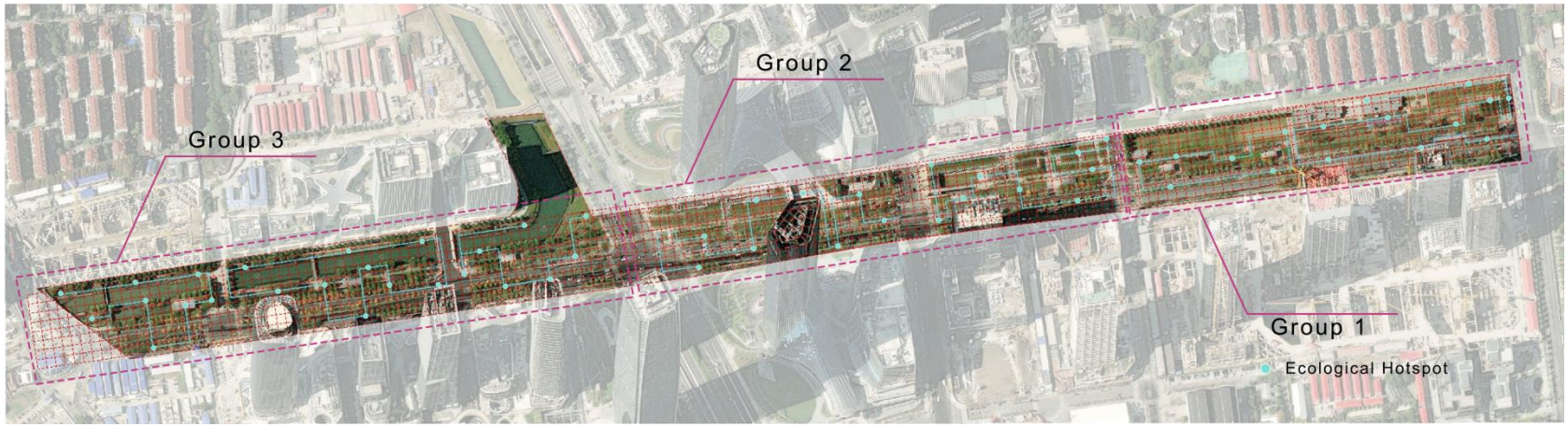

Figure 1.4.1: Biodiversity survey route and selection of sites in Xuhui Runway Park

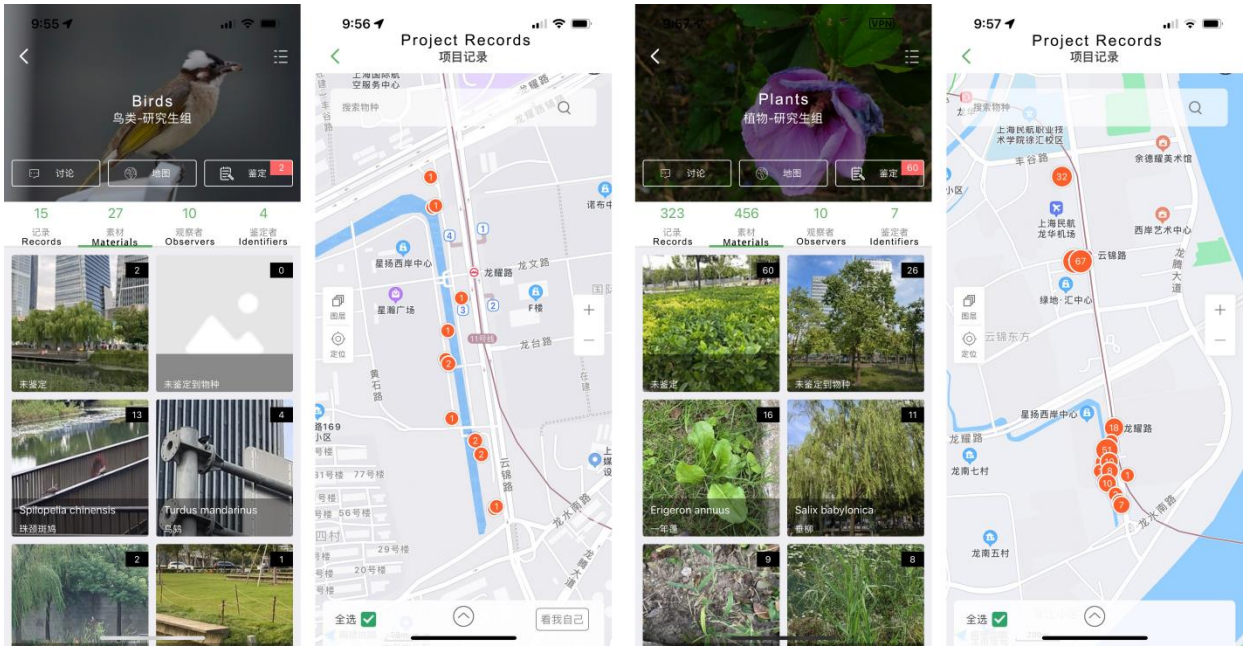

Figure 1.4.2: Records observed bird species and plants with the Biotrack APP

Calculations:

During the on-site observation, there were a total of 15 records of birds found in Xuhui Runway Park, of which a total of 9 bird species were identified. For more details, refer to the table below (Table 1.4.1):

NO.	Scientific Name	Quantity	Behavior
1	*Spilopelia chinensis*	7	Walking / Resting
2	*Passer montanus*	3	Flying
3	*Turdus merula*	2	Singing
4	*Phylloscopus proregulus*	1	Singing
5	*Acridotheres cristatellus*	1	Flying
6	*Copsychus saularis*	1	Foraging for food
7	*Lanius schach*	1	Resting / Hunting
8	*Tachybaptus ruficollis*	1	Swimming in the water
9	*Motacilla alba*	1	Resting

Table 1.4.1: List of bird species, numbers and behaviors found in Xuhui Runway Park

It is worth mentioning that the research team found small *Tachybaptus ruficollis* and *Lanius schach* on the water surface of the artificial wetland at the southern end of the park.

Tachybaptus ruficollis is one of the most common waterbirds in freshwater wetlands throughout China and one of the most common bird species in urban parks with wetlands. It is generally active in ponds, rivers, lakes, reservoirs and even deeper paddy fields where there are aquatic plants and a certain depth (so that it can dive for foraging).

Lanius schach is a typical forest bird that mostly inhabits the tops of tall arbor trees and the tops of telegraph poles. It is a carnivore, mostly feeding on various insects, amphibians and small birds, and belongs to the higher level of consumers in the food chain. *Tachybaptus ruficollis* and *Lanius schach* occur in Xuhui Runway Park and engage in behaviors such as predation and perching. Through such findings, firstly, it shows that the food chain relationship from producer to consumer is formed in Xuhui Runway Park, indicating a complete ecosystem in Xuhui Runway Park; secondly, this reflects the important ecological balance value of Xuhui Runway Park. As an important stepping stone in the green silk system of Xuhui District, it provides a habitat for urban birds that survive in the high-density built environment.

Limitations:

- The observation was not made over a long period of time, especially for bird species. Bird species are classified as resident birds and migratory birds, the occurrence of migratory birds and their behavior are closely related to seasonal factors, making it even more important to conduct the regular observation over a long period of time.

- The research team used the path method for sampling and focused more on the "ecological hotspot" of the artificial wetland area. However, different sample point selection also influenced the results of the biodiversity survey.

Sources:

Xuhui Runway Park Biodiversity Research Team, DLS, CAUP, Tongji University Shanghai

Team members:

Yiqi Wang, Fuyu Luo, Xinning Wang, Xu Shaoqi, Zhengyu Chen, Tongyue Huang, Jiaying Wang, Qizhen Dong, Yifan Liu, Xiaoyu Zhang

Tutors:

Associate Pro. Nannan Dong, Dr. Mohamed Elsadek, Bo Yang, Junjie Wang, Mo Wang

- ***Saves an estimated 167,000 kWh and $15,800 annually by using LED lights instead of standard metal halide lighting.***

Method:

Through the interview with Ms. Kang from the park management department, the research team learned that all the lighting in the Xuhui Runway Park is LED light source and the lighting time in the park is about 5 hours per day.

The total lighting power of the park is 75KW per hour when LED light source is used; however, if the traditional light source (metal halide lamp) were to be used, the total lighting power of the park would be 166.5KW per hour.

Unit electricity charge in Shanghai: 0.636 yuan/ kW· h

Calculations:

	LED- light	Traditional light
Lighting power/h	75	166.5
Average daily lighting electricity consumption (Lighting time is calculated by 5 hours per day)	375	832.5
Average annual lighting electricity consumption (Calculated on the basis of 365 days per year)	136,875	303,862.5
Average annual electricity charge for lighting (electricity charge is calculated at 0.64 Yuan/ kW·h)	87,600	194,472

Table 1.5.1: Comparison table of LED light and traditional light

The total annual electricity savings on lighting in the Xuhui Runway Park:

303,862.5 - 136,875 = 166,987.5 kWh

The total annual cost savings on lighting in the Xuhui Runway Park:

193,256.6- 87,052.5 = 106,872 yuan

106,872 yuan to USD = $15,825.50 (exchange rate on 8/1/2022)

Sources:

The Planning and Design Department of the West Bund Group

Limitations:

The information was provided by the park operator and was not independently verified by the research team.

- ***Contributes a net carbon sink of an estimated 488,039 kilograms of carbon per year in trees and other vegetation, which would have an estimated value of $105,560 if a carbon tax was implemented.***

Method:

The research team's study of Net Carbon Sink and Economic Value of Xuhui Runway Park is divided into two main aspects, Carbon Sink and Carbon Input. The carbon sink and carbon input of the park are calculated according to cover in the park of Arbor tree, Shrub and Grassland respectively.

1. Through the field survey, the research team evaluated the number of different species of trees and area of shrubs. Through UAV scanning, the research team evaluated the area covered by trees as well as grasslands, which was mainly determined by the GNDVI Index to determine the degree of surface vegetation cover and thus identify the three types of surface cover: bare land, land use with average vegetation cover (considered grassland) as well as land use with good vegetation cover (considered to be high-wood) (Refer to Appendix 3 for GNDVI map)

2. The research team used biomass measurements to estimate the average carbon sink capacity of trees. The average carbon sink capacity of shrubs and grasslands, the classification criteria of carbon input and the calculation method, and the total carbon sink and carbon input of trees, shrubs, and grasslands were obtained separately.

3. Finally, the research team calculated the average net carbon sink of Xuhui Runway Park in one year and used the carbon tax approach to derive the economic benefits generated through carbon sink in Xuhui Runway Park.

Calculations:

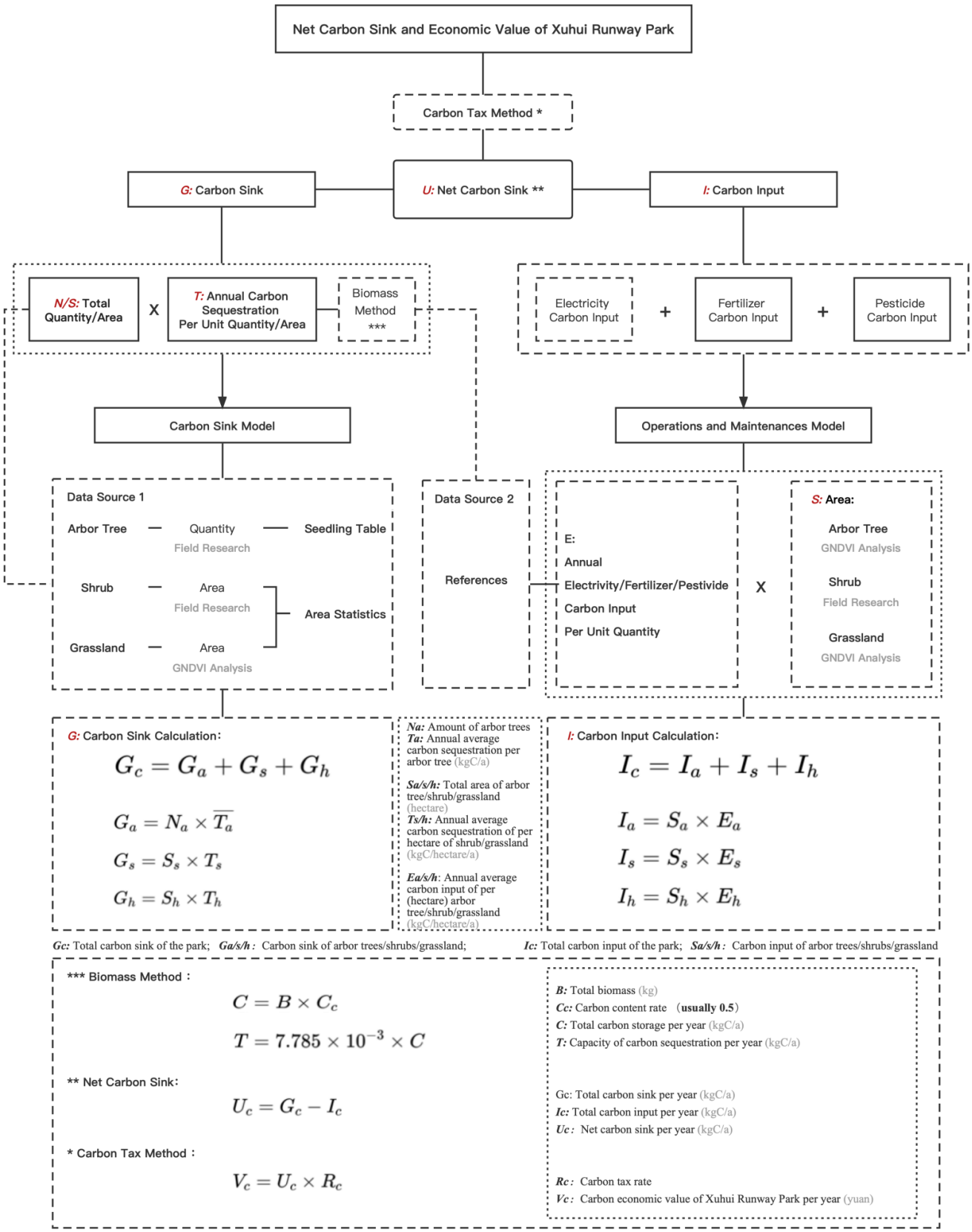

Figure1.6.1: Flow chart of net carbon sink capacity and economic value calculation

Index	Arbor Tree													Index	Shrub	Grassland
NO.	1	2	3	4	5	6	7	8	9	10	11	12				
Scientific Name	*Bischofia polycarpa*	*Aesculus chinensis*	*Michelia alba*	*Liriodendron chinensis*	*Lagerstroemia indica*	*Salix babylonica*	*Sapium sebiferum*	*Cinnamomum camphora*	*Acer buergerianum*	*Liquidambar formosana*	*Ginkgo biloba*	*Sapindus mukorossi*	Total	$S_{s/h}$: Total area of shrub tree/herb (hm^2)	2.35	3.78
Na: Quantity	13	21	30	48	65	74	128	155	158	182	302	1051	2227			
S_a: Total area of arbor trees (hm^2)							3.12									
Ta: Annual average carbon sequestration per arbor tree ($kgC \cdot a^{-1}$)							217.74							$T_{s/h}$: Average annual carbon sequestration per hectare of shrub /grassland ($kgC \cdot hm^{-2} \cdot a^{-1}$)	1643.44	383.02
Ga: Total carbon sink by arbor trees ($kgC \cdot a^{-1}$)							484906.98							$G_{s/h}$: Total carbon sink by shrub /grassland ($kgC \cdot a^{-1}$)	3862.09	1447.80
E_a: Annual average carbon input of arbor trees ($kdC \cdot hm^{-2} \cdot a^{-1}$)							173.03							$E_{s/h}$: Average carbon input per hectare of shrub /grassland ($kdC \cdot hm^{-2} \cdot a^{-1}$)	238.82	284.91
I_a: Total carbon input of arbor trees ($kgC \cdot a^{-1}$)							539.84							$I_{s/h}$: Total carbon input of shrub/grassland ($kgC \cdot a^{-1}$)	561.22	1076.95

Table 1.6.1: List of plant information and calculation results of carbon input as well as carbon sink in Xuhui Runway Park

Total Carbon Sink：

$G_c = G_a + G_s + G_h$ = 484,906.98 + 3862.09 + 1447.80 = 490,216.88 (kgC·a-1)

Total Carbon Input：

$I_c = I_a + I_s + I_h$ = 539.84 + 561.22 + 1076.95 = 2,178.01 (kgC·a-1)

Net Carbon Sink:

$U_c = G_c - I_c$ = 490,216.88 - 2,178.01 = 488,038.87 (kgC·a-1)

Conversion of the economic value of carbon sink:

$V_c = U_c$ X I_c = 488,038.87 X 0.2163（dollars/kgC）= 105,562.81 USD = 760,052.22 yuan

(I_c : The U.S. carbon tax rate for 2021 is $59/ton of CO2, which is equivalent to $0.2163/kgC. Exchange rate between USD and CNY 1:7.2 in October 2022)

Sources:

1. Luo, Yulan, Dongmei Zhang, Lang Zhang, and Xiangbo Chen. “Study on Selection and Collocation of Urban Greening Tree Species under Dual Carbon Goal--A Case Study of Shanghai Expo Park.” *Landscape Architecture* 39, no. 01 (2022): 25–32.

2. Yin, Weida, Junyi Su, Zhuoya Xu, and Zhicheng Liu. “Estimation and Application of Urban Green Space Carbon Storage Based on Remote Sensing Technology.” *Landscape Architecture* 29, no. 05 (2022): 24–30.

3. Wang, Miaojing, Wei Sun, Fengling Wang, Bin Wu, and Liming Yan. “Low-Carbon Innovation System of Urban Riverfront Ribbon Green Space: The Example of Qingshuihe Riverfront Park in Zhangjiakou City.” *Technology Innovation and Application* 12, no. 24 (2022): 57–60. https://doi.org/10.19981/j.CN23-1581/G3.2022.24.014.

4. Zhou, Muyun. “The Research on Carbon Sink of Park Green Space in Shanghai ---Take Zhongshan Park as an Example.” *LOGISTICS ENGINEERING AND MANAGEMENT* 37, no. 06 (2015): 160–161. https://doi.org/10.19981/j.CN23-1581/G3.2022.24.014.

5. Gong, Sumei. “Net Carbon Sink and Economic Value of Common Garden Plants in Zhengzhou City.” *Journal of Henan Forestry Science and Technology* 39, no. 03 (2019): 21–25.

Limitations:

- That the carbon emission from microorganisms in the soil in Xuhui Runway Park are not taken into account.

- The impact of seasonal factors on carbon sink measurement is not taken into account Especially for deciduous arbor trees, the rate of carbon sink declines significantly during winter when the leaves of deciduous trees fall off.
- The efficiency of carbon sinks varies among plants. Even among plants of the same species, the different growth conditions of plants can affect their carbon sink efficiency. Therefore, there is a discrepancy between the carbon sink level of arbor trees in Xuhui Runway Park calculated by the mean value method and the actual carbon sink level.
- UAV scanning was used to obtain the area of arbor trees and grassland, so there can be an inherent error in computer recognition, which leads to a certain error in the area of grassland and arbor trees.

- ***Reused approximately 29,000 sf of demolished runway concrete and preserved 50,000 sf of the original runway for the main pedestrian path of the park and the birdwatching grove, saving approximately $47,000 in construction costs.***

Method:

Through an interview with Mr. Yu Zhu of Sasaki Associates, the project manager for Xuhui Runway Park, the research team learned that the reuse of materials in the construction of the Xuhui Runway Park is mainly reflected in two aspects: preservation and utilization of the existing concrete runway; and the recycling and reuse of demolished concrete blocks. The area of the existing concrete runway retained for use is 4,660m^2(50,159.82 ft^2), and the area of the demolished concrete blocks for recycling and reuse is 2,720m^2(29,277.84 ft^2).

Calculations:

The average cost of construction for concrete paving per square meter is about 42.93 yuan when the park was built.

The cost savings by retaining, recycling and using the original concrete for paving is:

42.93 * (4,660 + 2,720) = 316,823.4 yuan

316,823.4 yuan to USD = $46,914.90 USD (exchange rate on 8/1/2022)

Source:

Sasaki Associates

Limitations:

The information was provided by the designer and was not independently verified by the research team.

Social Benefits

Overall Background:

Due to the COVID-19 pandemic in Shanghai, the research team was unable to conduct on-site research by August, which caused much inconvenience in distributing questionnaires in Xuhui Runway Park.

Overall Method:

To gain overall knowledge of Xuhui Runway Park, the research team first conducted an online survey through a social media platform called Dianping to assess the general impression of the park, as well as to find potential benefits and problems in the park.

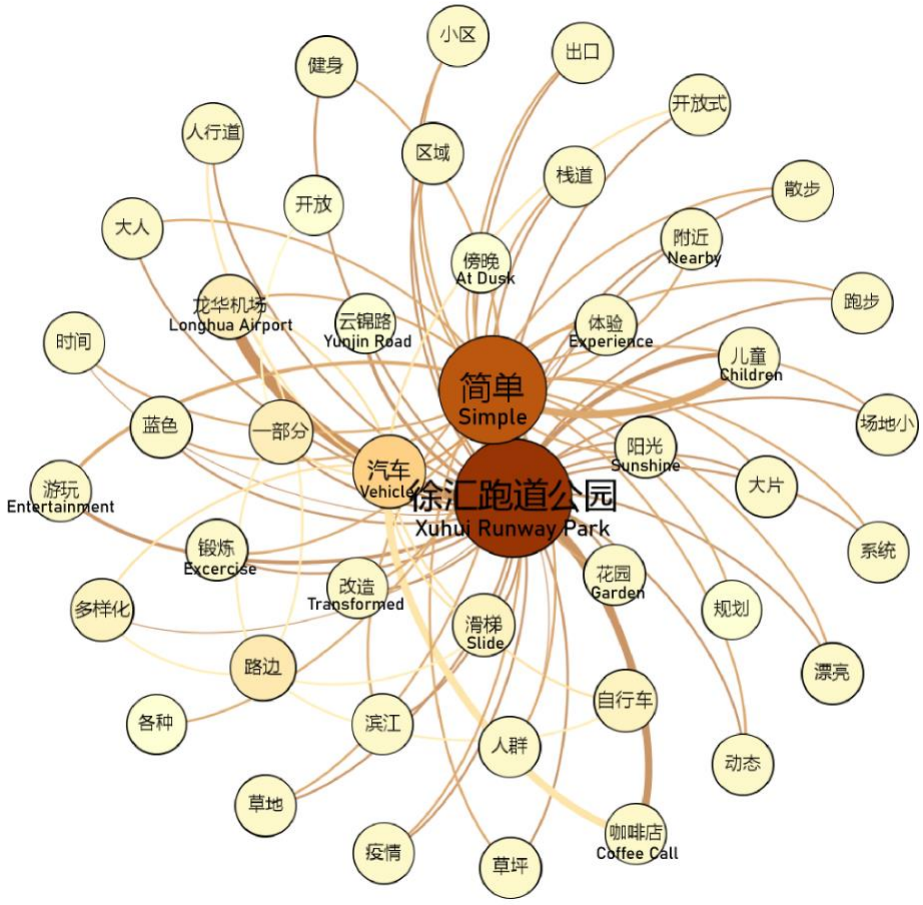

Figure 2.1: Keywords of general impression of Xuhui Runway Park

NO.	Phrase	NO.	Phrase
1	Xuhui Runway Park	6	Nearby
2	Longhua Airport	7	Railway Station
3	Yunjin Road	8	Facility
4	Children	9	Restaurant
5	Riverfront	10	Walk

Table 2.1: Top 10 high frequency words about Xuhui Runway Park

During the second phase, an online survey was developed, guided by the Tongji University research team to assess the perceptions and behavior of users. The survey was conducted from July 26 to August 2. The research team distributed the questionnaire through WeChat Platform (the most common social media app in China), which can be divided into 5 parts based on 26 questions shown in the Appendix. Results from respondents (N=263) were summarized.

Overall Calculations:

Example Calculation (for all listed survey results):

Question:

-- Have you learned about the fact that the park is transformed from a runway of Longhua Airport when in the park? (Single Choice Question)

Options:

-- Totally ignorant

-- Don't know much

-- Generally know

-- Relatively know

-- Know very detailed

112 respondents answered ‘relatively know’

80 respondents answered ‘know very detailed’

263 total respondents

(112+80)/263 = 0.73 = 73%

- 73% of respondents (N=263) know that the park was a transformed runway

Overall Sources:

Survey questions (see Appendix 4) as conducted by the research team

Overall Limitations:

The research team was limited in what could be assessed in person and relied on the online questionnaires to assess users' perceptions and evaluation of the park. Though the online questionnaires have significant advantages in terms of time and labor savings, the online questionnaires are less accurate compared to an offline survey, especially in terms of some perception questions, because the researchers were not able to interview the respondents in real time during their time in the park.

- ***Offers more than 32 types of activities for park users. Walking is the most common type of activity in the park, with 73% of 263 surveyed park users reporting that they often walk in the park. 65% reported that they often drink coffee in the park, while 61% of surveyed users reported that they socialize with family or friends.***

Notable results of the survey regarding ways in which the landscape contributes to the value of the site are as follows:

- 72.62% of respondents (N=263) say they usually go for a walk in the park.
- 60.84% of respondents (N=263) say they usually chat in the park.
- 65.40% of respondents (N=263) say they usually drink coffee in the park.
- 49.81% of respondents (N=263) say they usually run in the park.

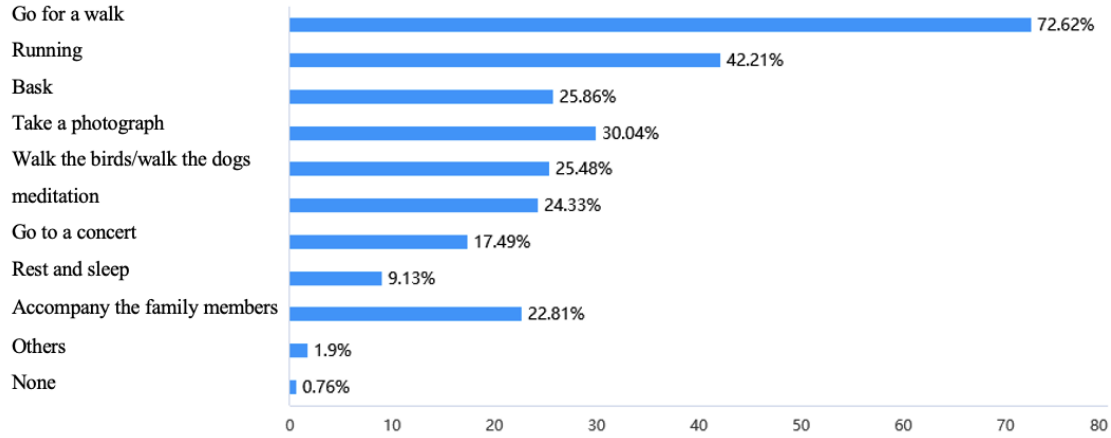

Figure 2.2: Response percentages to 'What kind of relaxation or sightseeing activities do you do most at this park? (Multiple Choice Question)'

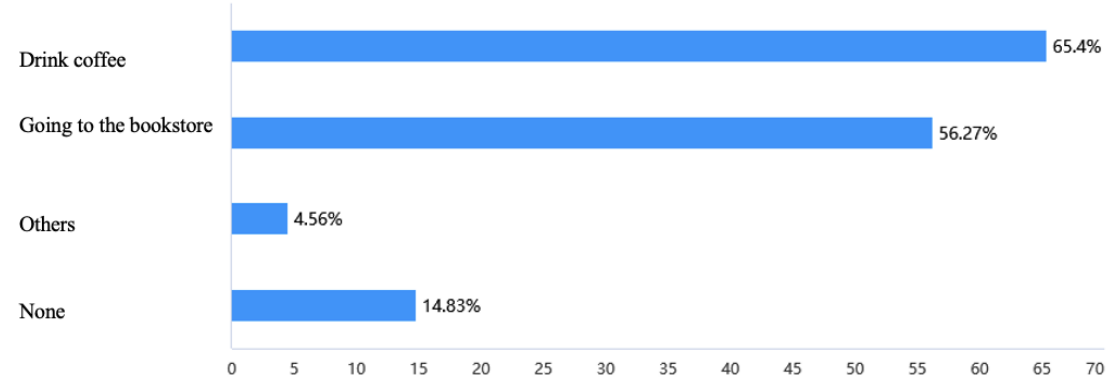

Figure 2.3: Response percentages to 'What kind of relaxation or leisure and consumption activities do you do most at this park? (Multiple Choice Question)'

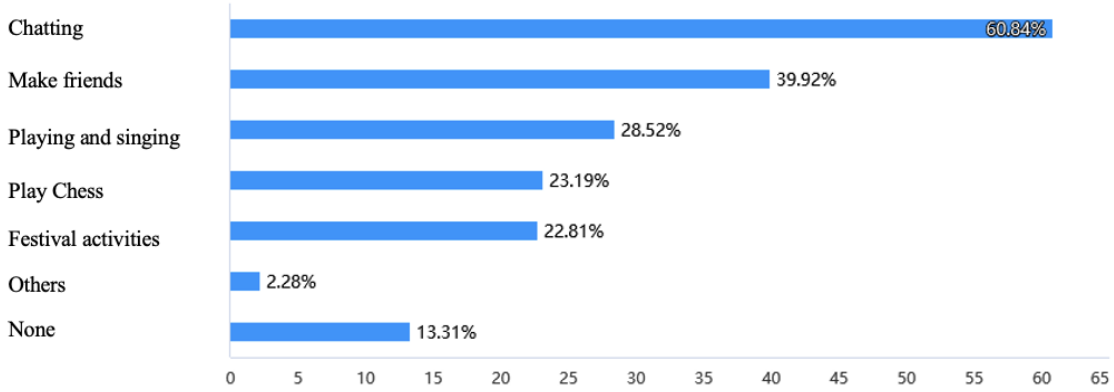

Figure 2.4: Response percentages to 'What kind of relaxation or social activities do you do most at this park? (Multiple Choice Question)'

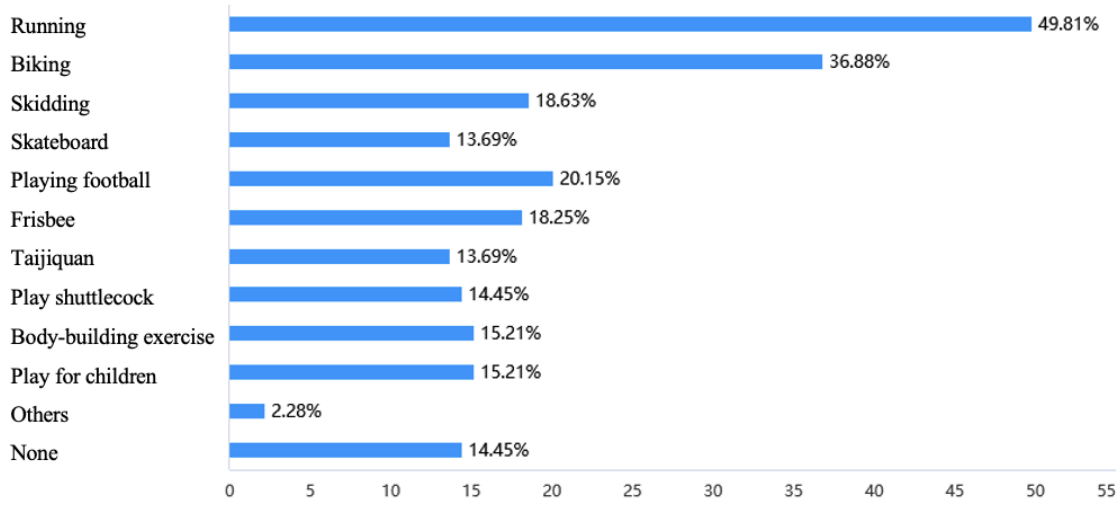

Figure 2.5: Response percentages to 'What kind of sports activities do you do most at this park? (Multiple Choice Question)'

Additional Information:

The activities in the park can be divided into 4 types: relaxation or sightseeing activities, social activities, leisure and consumption activities, and sports activities.

Limitations:

A limitation of the public activity portion is the lack of capturing time and seasonal factors. For example, there is a difference between the summer activities and winter activities. However, due to time limitation, this research did not investigate too many details within this portion in the online questionnaire. Observational methods to identify activities were not possible due to the COVID-19 pandemic limiting site access.

- ***Supports social interaction, with 81% of 263 surveyed site users reporting that they usually go to the park with their family members, friends, or colleagues.***

Notable results of the survey regarding social interaction are as follows:

- 45.63% of respondents (N=263) say they usually go to the park with their family members.
- 35.74% of respondents (N=263) say they usually go to the park with their friends or colleagues.

Options	Subtotal	Percentage
Family member	120	45.63%
Friends/ colleagues	94	35.74%
Others: _____	8	3.04%
Alone	41	15.59%
Valid questionnaire	263	100%

Table 2.10: Response percentages to 'Who do you go to Runway Park with most often? (Single Choice Question)'

- ***Supports awareness of the site's aviation history, with 73% of 263 surveyed park users reporting their awareness that the park was transformed from the former Longhua Airport runway.***

Notable results of the survey regarding ways in which the landscape contributes to this benefit are as follows:

- 42.59% of respondents (N=263) relatively know about the fact that the park was transformed from a runway of Longhua Airport when they are in the park.
- 30.42% of respondents (N=263) know details about the fact that the park was transformed from a runway of Longhua Airport when they are in the park.

Options	Subtotal	Percentage
Totally ignorant	18	6.84%
Don’t know much	23	8.75%
Generally know	30	11.41%
Relatively know	112	42.59%
Know very detailed	80	30.42%
Valid questionnaire	263	100%

Table 2.2: Response percentages to ‘Have you learned about the fact that that the park is transformed from a runway of Longhua Airport when in the park? (Single Choice Question)

Additional information:

The survey also investigated how the respondents know the history and culture of the park, as well as which sites/objects remind them of the history.

- 68.8% of the visitors (N=263) reported that they knew the fact through media propaganda, such as RED, WeChat Official Account, Tik Tok, while 55.5% of the visitors (N=263) get to know the fact through the park promotion. 32.7% of the respondents (N=263) reported that they have paid attention to the construction of the park since it was transformed.
- As for the sites or objects that best reflect the history and culture of the airport according to the surveyed visitor, the linear path in the park and children's playground where people can walk up and down are in the top two.

Options	Subtotal	Percentage
Through the media propaganda (Such as RED, WeChat Official Account, Tik Tok)	181	68.82%
Through the park promotion (Display card in the park, etc.)	146	55.51%
Since the airport runway was transformed, you have paid attention to the construction of the park	86	32.7%
Valid questionnaire	263	100%

Table 2.3: Response percentages to ‘If you know, in what way did you get it?’ (Multiple Choice Question)

Options	Average Score
Linear and straight road in the park	4.48
Children's playground where you can walk up and down and play	3.58
Ground surface pavement made of concrete	3.28
Lamps and Lanterns in sloping shapes on both sides of the runway	2.69
Maple trees planted along the sides of the runway in the park	1.58
Others：	0.36
None of the above	0.03

Table 2.4: Average score of sites/objects showing the history of Runway Park to 'In this park, which of the following sites/objects do you think can make you feel the history and culture of the airport? (This is a sequencing question, please fill in the numbers in brackets in turn)'

- ***Reduces stress according to 85% of 263 surveyed park users who reported that spending time in the park has a positive effect on stress relief.***

Notable results of the survey regarding stress relief are as follows:

- 32.32% of respondents (N=263) consider Runway Park had a slight effect on stress relief.
- 52.47% of respondents (N=263) consider the Runway Park has great effect on stress relief.

Options	Subtotal	Percentage
No positive effect	2	0.76%
Basically no positive effect	9	3.42%
Generally effective	29	11.03%
Slightly effective	85	32.32%
Very effective	138	52.47%
Valid questionnaires	263	100%

Table 2.7: Response percentages to 'Does the park have the positive effect on your stress release/relief? (Single Choice Question)'

-
- ***Improves quality of life according to 81% of 263 surveyed park users.***

Notable results of the survey regarding ways in which the landscape contributes to the academic value of the site are as follows:

- 34.22% of respondents (N=263) consider Runway Park has sightly improved their life quality.
- 46.77% of respondents (N=263) consider Runway Park has significantly improved their life quality.

Options	Subtotal	Percentage
Big negative impact	2	0.76%
Slight negative impact	6	2.28%
Basically no impact	42	15.97%
Slightly improved	90	34.22%
Significantly improved	123	46.77%
Valid questionnaire	263	

Table 2.8: Response percentages to ‘How the park affects your life quality? (Single Choice)’

- ***Creates feelings of safety according to 84% of 263 surveyed park users who said they felt relatively or very safe when in the park.***

Notable results of the survey regarding safety are as follows:

- 34.22% of respondents (N=263) feel relatively safe in Runway Park.
- 49.43% of respondents (N=263) feel very safe in Runway Park.

Options	Subtotal	Percentage
Very insecure	3	1.14%
Relatively insecure	9	3.42%
Generally insecure	31	11.79%
Relatively safe	90	34.22%
Very safe	130	49.43%
Valid Questionnaire	263	

Table 2.6: Response percentages to ‘What do you think of the safety of the park? (Single Choice)?’

- ***Reduces average noise levels from 73.9 decibels on the east side of the park where Yunjin Road is located to 61.0 decibels on the west side of the park, achieving a clearly noticeable reduction and noise buffer from the road.***

Background:

Yunjin Road is composed of sidewalk (width: 3.3m), bicycle lane (width: 2.5m), green belt (width:2m), the two-way four lane (width: 3.75m) and central green belt (width: 2m), which are arranged on both sides of the park. During weekdays and weekends, the traffic flow on Yunjin Road is high, which also makes the serious noise impact on the area near Yunjin Road. Yunjin Road is to the east side of Xuhui Runway Park.

Figure 2.6：Composition of Yunjin Road

Method:

The research team conducted noise decibel measurements in Xuhui Runway Park on Wednesday, September 21, from 2:00 to 4:00 p.m. The research team used the Digital Sound Level Meter to conduct the grid noise sampling in Xuhui Runway Park. The measurement range of the Digital Sound Level Meter is from 30dB to 130dB with the accuracy of ±1.5dB, and it can record the maximum and minimum values of noise over a period of time. The research team divided the park in a 30m*100m grid, and in total, the research team conducted noise measurements at 63 point positions, which can be found in Appendix 5.

Measurements were divided into the east side of the park (closer to the road) and the west side of the park (further away from the road) for comparison.

From 2:00 pm to 4:00 pm, Data Collectors stood at each point position and recorded the maximum and minimum decibels for 1 minute, using the average value of the two as the noise measurement value at this point position.

The data collector labelled the noise point positions in the park on the map of ArcGIS 10.5 and assigned the value to each point position volume in the attribute table. Then using the "Create

TIN"-"TIN to Raster" tool in ArcGIS to transform the noise dot array into the noise map, meanwhile, using the natural breaks to divide it into 8 color segments for visualization, the detailed display is shown in Figure 2.9.

Figure 2.7: On-site photos during measuring the noise mitigation portion

Additional Information:

In general, in an outdoor environment, people can clearly feel the changes in noise volume of 3 dB and more.

When the average noise is increased by 3 decibels, the energy generated by the noise will be enhanced by double, and the pollution generated by the noise will be more serious, potentially resulting greater damage to the human body (depending on noise levels).

Calculations:

Noise decibel at each point position= [Max (Noise decibel) + Min (Noise decibel)] / 2

Average noise volume on the east side of the park:

$$V_1 = \sum(V_1 + V_2 + \ldots + V_n) / n$$

Average noise volume on the west side of the park:

$$V_2 = \sum(V_1 + V_2 + \ldots + V_n) / n$$

表

Noise Spot

FID	Shape *	Id	Line	Volume of Noise
0	点	0	A	83.8
1	点	0	A	77.65
2	点	0	A	76.45
3	点	0	A	73.25
4	点	0	A	73.3
5	点	0	A	71.25
6	点	0	A	77.8
7	点	0	A	72.35
8	点	0	A	77.45
9	点	0	A	71.6
10	点	0	A	73.75
11	点	0	A	68.6
12	点	0	A	72.15
13	点	0	A	71.85
14	点	0	A	67.55
15	点	0	A	77.5
16	点	0	A	69.9
17	点	0	B	82.7
18	点	0	B	60.7
19	点	0	B	63.15
20	点	0	B	65.6
21	点	0	B	63.15
22	点	0	B	64.75
23	点	0	B	60.2
24	点	0	B	64.85
25	点	0	B	63.45
26	点	0	B	69.6
27	点	0	B	61.2
28	点	0	B	62.4
29	点	0	B	63.45
30	点	0	B	65.45
31	点	0	B	62.05
32	点	0	B	61.9
33	点	0	C	75
34	点	0	C	59.8
35	点	0	C	59.3
36	点	0	C	61.3
37	点	0	C	57.85
38	点	0	C	59.65

0 (0 / 63 已选择)

Noise Spot

结果 ArcToolbox 属性 目录 搜索 表

表

Noise Spot

FID	Shape *	Id	Line	Volume of Noise
24	点	0	B	64.85
25	点	0	B	63.45
26	点	0	B	69.6
27	点	0	B	61.2
28	点	0	B	62.4
29	点	0	B	63.45
30	点	0	B	65.45
31	点	0	B	62.05
32	点	0	B	61.9
33	点	0	C	75
34	点	0	C	59.8
35	点	0	C	59.3
36	点	0	C	61.3
37	点	0	C	57.85
38	点	0	C	59.65
39	点	0	C	66.7
40	点	0	C	61.3
41	点	0	C	62.85
42	点	0	C	65.5
43	点	0	C	56.8
44	点	0	C	60.3
45	点	0	C	61
46	点	0	C	59.35
47	点	0	C	59.2
48	点	0	C	60.2
49	点	0	D	66.3
50	点	0	D	59.65
51	点	0	D	61.35
52	点	0	D	77.4
53	点	0	D	73.75
54	点	0	D	61.75
55	点	0	D	62.3
56	点	0	E	58.85
57	点	0	E	59.6
58	点	0	E	57.1
59	点	0	E	57.6
60	点	0	C	62.3
61	点	0	A	71.1
62	点	0	B	66.85

0 (0 / 63 已选择)

Noise Spot

结果 ArcToolbox 属性 目录 搜索 表

Figure 2.8: The noise level(dB) corresponding to the 63 grid point positions marked in ArcGIS

Figure 2.9: The noise map of Xuhui Runway Park in ArcGIS 10.5

Sources:

Measurements taken by the research team on-site. Baidu Map, September 18, 2022. https://map.baidu.com/@13521637.368752375,3632566.67001572,16.73z/maptype%3DB_EARTH_MAP.

Limitations:

- Noise monitoring of the park was not conducted at other times of the day or other seasons. For example, choosing weekends or other times of the day (morning, evening) to conduct the research would more accurately capture the site condition.
- Sound levels before construction (when the site was an airport) were not comparable to its current condition, therefore distance from the source of noise was used as a comparison.

- ***Supports high rates of satisfaction with the park for 84% of 263 surveyed park users.***

Notable results of the survey regarding satisfaction with the site are as follows:

- 42.21% of respondents (N=263) feel relatively satisfied with the Runway Park.
- 42.21% of respondents (N=263) feel very satisfied with the Runway Park.

Options	Subtotal	Percentage
Very dissatisfied	4	1.52%
Not so satisfied	2	0.76%
Generally satisfied	35	13.31%
Relatively satisfied	111	42.21%
Very satisfied	111	42.21%
Validate questionnaire	263	100%

Table 2.5: Response percentages to 'How satisfied are you with the park? (Single Choice Question)'

Economic Benefits

- ***Contributed to a 47% increase in average residential property values within 500 meters of the park from 2019 to 2021. In comparison, increase in average residential property values within 1,000 meters of the park increased by 32% over the same period.***

- ***Catalyzed a 27% increase in annual growth in average residential sale prices within 500 meters of the park from 2019 to 2021. In comparison, average residential prices within 1,000 meters of the park increased by 11% over the same period.***

Method:

House property buying and selling platforms such as Lianjia (Home Link) and Anjuke provide transaction information on the sale and purchase of housing over the years, including the size of the property and the selling price of the property. The research team selected a number of residential districts within a radius of 500m, 1000m and 2500m, with Xuhui Runway Park as the center, and analyzed the house property value fluctuation before and after 2019 (when the park was completed and opened) including the comparison of unit price, total price increase and average annual price increase. Among them, residential districts with basically the same construction time, basically the same housing conditions, but different distances from the Xuhui Runway Park were selected for comparison.

	Built Year	Distance to The Xuhui Runway Park
Jinlong Garden	1996	500m
Zhoujiawan Estate	1996	1000m
Wannan Fifth Village	1990	1500m

Table 3.2: Basic information Table of Residential Districts

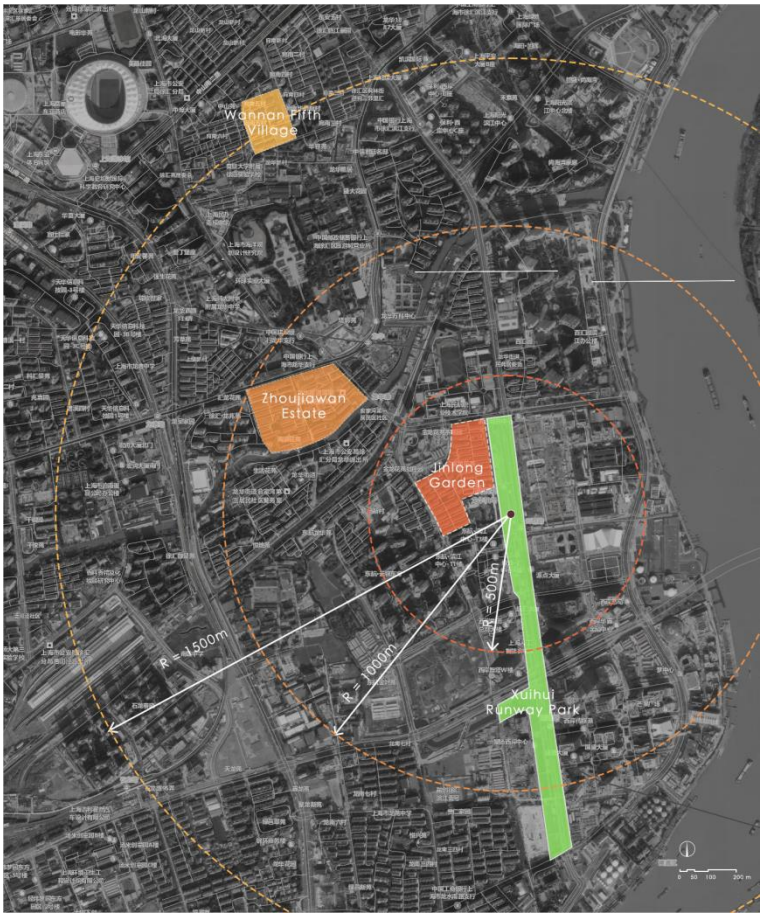

Figure 3.3: Diagram of Residential District and Xuhui Runway Park Location

Calculations:

1. Total house property price increase in year X - Y.

(House property sale price in Year X - House property sale price in Year Y) ÷ House property sale price in Year X = Total increase ratio %

2. Average annual price increase in years X-Y.

$$m = \sqrt[n]{\frac{B}{A}} - 1$$

In the formula, m = Average annual price increase, A =House property sale price in Year X, B =House property sale price in Year Y, n = years - 1

3. Growth of annual growth rate of house price:

Growth of annual growth rate of house price = Annual growth rate in year A - Annual growth rate in year B

Calculation Result:

		Jinlong Garden	Zhoujiawan Estate	Wannan Fifth Village
Unit-Price (K RMB)	2015	37.40	34.32	37.19
	2016	58.98	51.57	62.02
	2017	68.73	62.17	72.36
	2018	66.27	59.12	77.08
	2019	64.83	59.64	92.23
	2020	70.36	65.09	104.34
	2021	95.51	78.41	146.65
Average annual price increase in Year 15-19 (%)		20.13	20.22	35.36
Total property price increase in Year 15-19 (%)		73.35	73.75	148.03
Average annual price increase in Year 19-21(%)		47.31	31.48	59.01
Total property price increase in Year 19-21 (%)		47.31	31.48	59.01

Table 3.1: Price Change Statistics

From the <u>distance</u> aspect:

Average property values in residential districts within 500 meters of the park increased by a total of 47.3% between 2019-2021, while house property values within 1,000 meters of the park increased by a total of 31.5% during the same period.

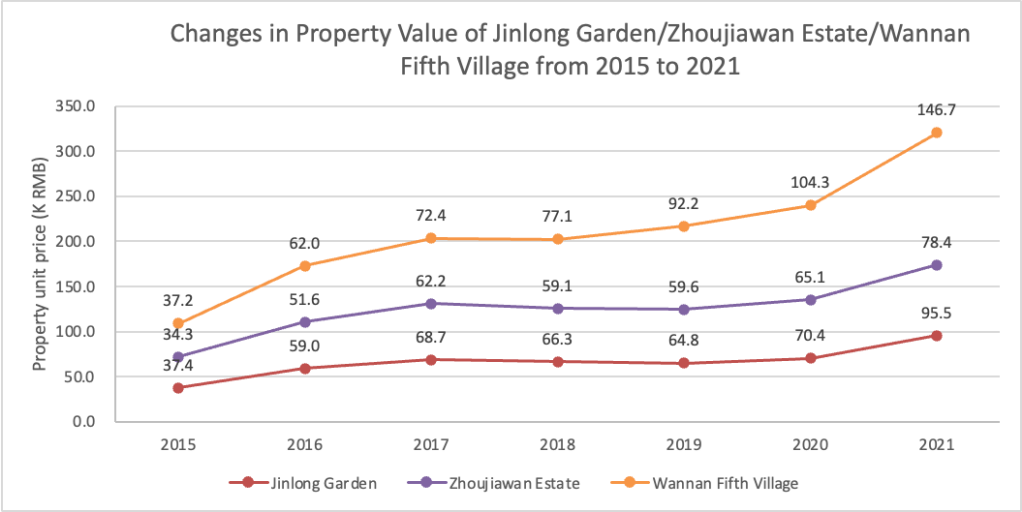

Figure 3.1: Changes in House Property Value of Jinlong Garden/Zhoujiawan Estate/Wannan Fifth Village from 2015 to 2021

From 2015 to 2019, the total property price increase in Jinlong Garden was 73.3%, with an average unit price of 64,800 RMB in 2019, while the total house property price increase in Zhoujiawan Estate was 73.8%, with an average unit price of 59,600 RMB in 2019. It can be seen that before the completion of the Xuhui Runway Park, the two residential districts, both located on Longhua Street, had a similar price increase ratio and close property values.

From 2019 to 2021, the total property price increase in Jinlong Garden is 47.3%, with a unit price of 95,500 RMB in 2021; while that in Zhoujiawan Estate is 31.5%, with a unit price of 78,400 RMB in 2021. It can be seen that after the completion of the runway park, the house price of Jinlong Garden rose significantly higher than the Zhoujiawan Estate, which is further away from the park. It can be argued that under the same conditions, the closer the neighborhood is to the runway park, the faster the house prices rise and the higher the house property value.

From the time aspect:

After the completion of the Xuhui Runway Park, the annual growth rate of residential house prices within 500 meters increased by 27.18 percentage points, while the annual growth rate of residential house prices within 1,000 meters increased by 11.26 percentage points, and that within 1,500 meters increased by 23.65 percentage points, thus realizing a significant contribution to house price growth.

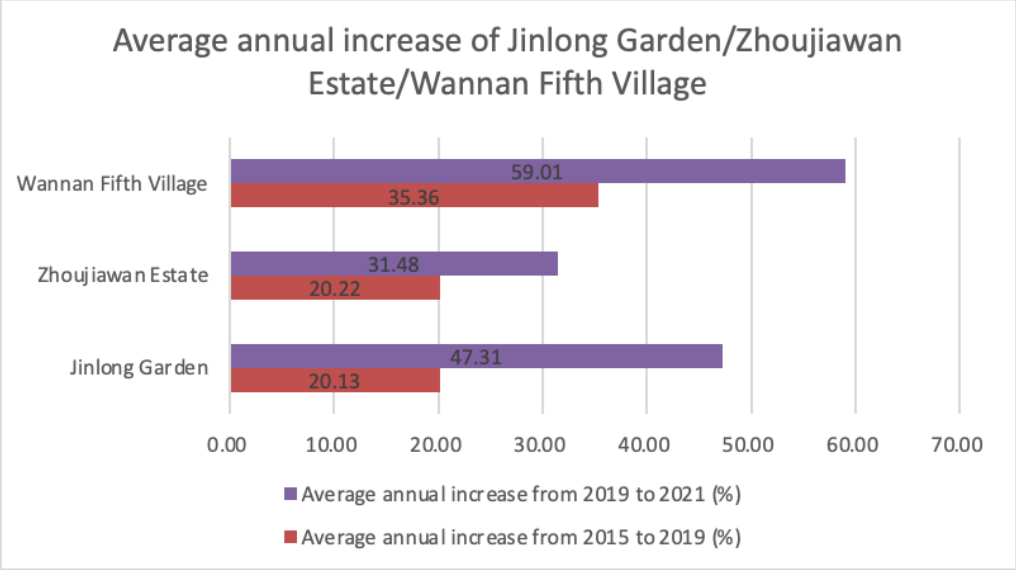

Figure 3.2: Average annual increase of Jinlong Garden/Zhoujiawan Estate/Wannan Fifth Village

Prior to 2019, annual house price growth in these three residential districts was slow, and it accelerated significantly after the completion of Runway Park in 2019. For example, during 2019 to 2021, the annual growth rate of house prices in Jinlong Huayuan, which is the closest to the park, reaches 47.31%, which is more than twice the growth rate before 2019. The annual growth rates of house prices in Zhoujiawan Estate/Wannan Fifth Village after 2019 also reach 31.48% and 59.01%, respectively, both significantly higher than the growth rates before 2019. It can be considered that the runway park has a significant positive effect on the improvement of the surrounding property values.

Sources:

Lianjia (Shanghai), September 21, 2022. https://sh.lianjia.com.

Anjuke (Shanghai), September 21, 2022. https://shanghai.anjuke.com.

Limitations:

- The increase in house property values cannot exclusively be attributed to the introduction of Xuhui Runway Park. Other forces across local, national, and global scales were at play during the study period that affects the reported data. The construction of surrounding commercial facilities, such as the AI Tower opening in 2020 and the AI Plaza opening in 2021, brings tremendous development prospects and opportunities to the area where the park is located, which will inevitably boost the area's residential property values.
- The house prices of the selected residential districts can only be used as an indicator to judge the level of house property value improvement, while it cannot be fully equated with the total house property value of the area.

Features

- ***Increased the percentage of green space and permeable sub-bedding surface from 2.53% to 41.89%.***

As shown in Table 1.1.1, the original green land area within the site is 2.53%, which reaches 41.89% after being transformed into the runway park, effectively improving the site's ability of rainwater interception and pollution reduction.

Current Land Use Type and Proportion of Xuhui Runway Park					
Land use type	Public Building	Paths and Squares (inside the park)	Road and Squares (Yunjin Road)	Water Area	Green Space
Area (m^2)	1,185.67	18,241.86	49,983.24	15,613.47	61,275.76
Proportion (%)	0.81	12.47	34.16	10.67	41.89
Land Use Type and Proportion Before The Construction of the Xuhui Runway Park (Longhua Airport Runway)					
Land use type	Industrial Land			Water Area	Green Space
Area (m^2)	141,463			1,137	3,700
Proportion (%)	96.69			0.78	2.53

Table 1.1.1: Land Use Type and Proportion Before and After the Construction of the Runway Park

- ***Continues to increase in plant species diversity, with the number of plant species found the park increasing by 32% (from 82 to 108) from project completion in 2020 to 2022.***

Method:

The research team of 10 student members conducted a field survey on biodiversity in Xuhui Runway Park on September 25 from 14:00 to 17:30. In this research, the main focus of the research team was on the observation of bird species populations and the survey of existing plant species.

The research team divided Xuhui Runway Park with the 10X10m grid (Figure 1.4.1). The grid at this scale ensures the clearer ecological hotspot boundary and divides Xuhui Runway Park into three survey sample sections, with 3-4 people at each sample section. The research team used the Line Method and selected 8-9 grid survey sites in each section as sample points for data collection, based on ecological hotspots such as the hard surface, grassland, forestland, water area and wetland. The average time taken for sampling at each survey site was 20 minutes.

The research team recorded data from each survey point through the Biotrack APP, thus facilitating subsequent data integration and analysis by the entire research team. (Figure 1.4.2)

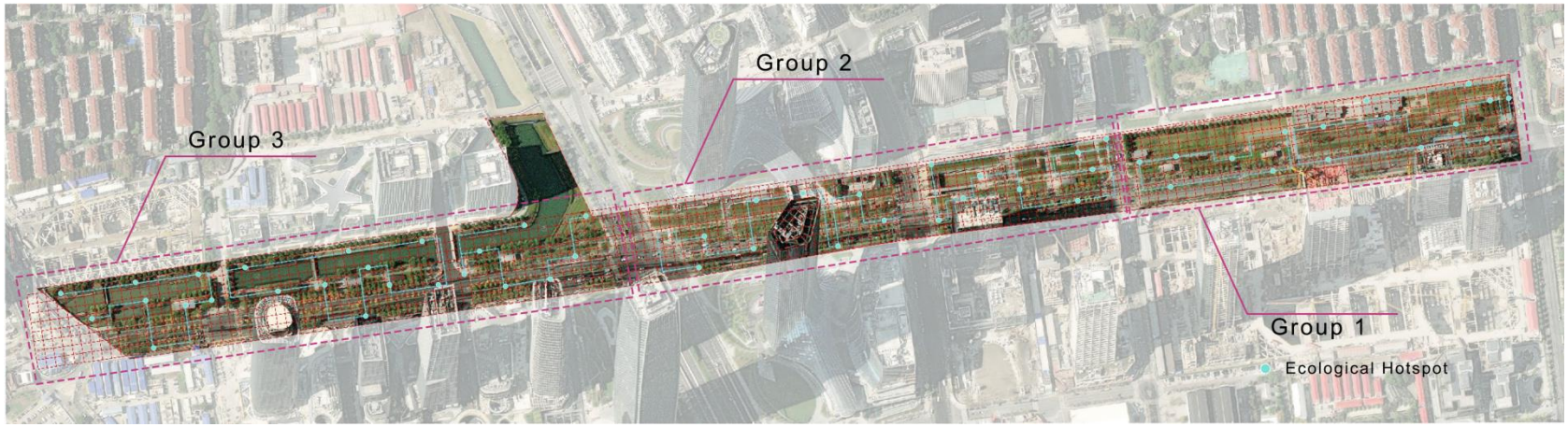

Figure 1.4.1: Biodiversity survey route and selection of sites in Xuhui Runway Park

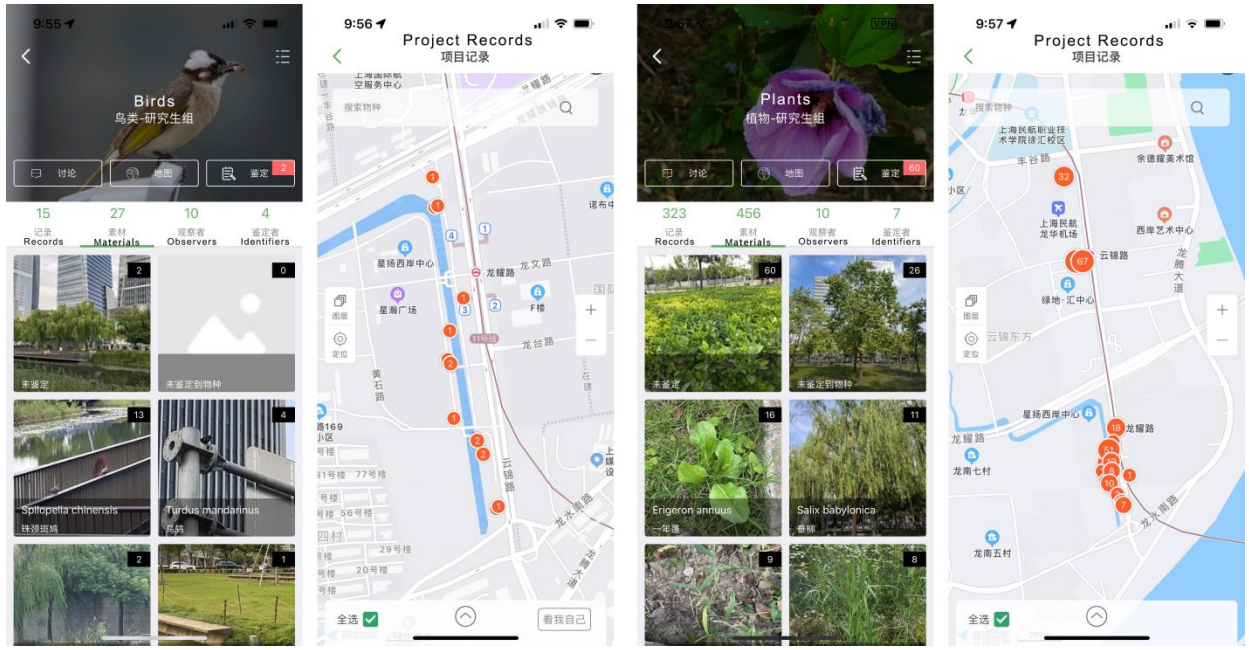

Figure 1.4.2: Records observed bird species and plants with Biotrack APP

Calculations:

In total, there were 323 records of plant populations in Xuhui Runway Park, including 14 species of arbor trees, 8 species of shrubs and 86 species of groundcovers. (Refer to Appendix 2 for more details).

In the pre-research stage, the research team learned from Mr. Zhu Yu, the project manager of the Xuhui Runway Park, that a total of 82 plant species were planted at the completion of the Xuhui Runway Park in 2020.

Diversity improvement ratio of plants in Xuhui Runway Park from 2020 to 2022:

(Number of plant species in 2022 - Number of plant species in 2019) / Number of plant species in 2019:

（108 - 82）/ 82 = 31.7%

Therefore, from 2020 to 2022, the improvement percentage of plant diversity in Xuhui Runway Park is 31.7%.

Additional Information:

During this survey, the research team found many unexpected groundcovers and shrubs within the artificial wetland at the southern end of the park. These unexpected species are not deliberately planted, but are common indigenous plants in Shanghai, such as *Setaria viridis*. These plants contribute to the creation of urban wilderness in high-density built environments. Meanwhile, the research team found that there are many indigenous trees in the Xuhui Runway Park, such as *Acer buergerianum*, *Cinnamomum camphora*, *Sapindus saponaria*, *Sapium sebiferum*, *Nandina domestica*, *Ligustrum japonicum*, *Euonymus japonicus*, etc. As the richness of plant populations continues to increase, the quality of biological habitats in the park is also improving, and the ecosystem of the park and the surrounding area is constantly being improved.

Limitations:

- The research used the path method for sampling and focused more on the "ecological hotspot" of the artificial wetland area. However, different sample point selection also influenced the results of the biodiversity survey.

Sources:

Xuhui Runway Park Biodiversity Research Team, DLS, CAUP, Tongji University Shanghai

Team members:

Yiqi Wang, Fuyu Luo, Xinning Wang, Xu Shaoqi, Zhengyu Chen, Tongyue Huang, Jiaying Wang, Qizhen Dong, Yifan Liu, Xiaoyu Zhang

Tutors:

Associate Pro. Nannan Dong, Dr. Mohamed Elsadek, Bo Yang, Junjie Wang, Mo Wang

Appendix 1

Referring to the values in Table 1.1.2, the CN value before the park reconstruction:

$CN_{(before)} = 98$

Table 3-6 CN Value Table Under SCS Model	
Land Use Type	CN Value
Commercial & Industrial Land	95
New Style Residence	92
Road Plaza Land	98
Farmland	86
Water Area	100
Green Land	80

Table 1.1.2: CN Value Table Under SCS Model[2]

The calculation of the CN value after the park is completed is performed referring to Table 1.1.3, Runway Park corresponds to condition 4, 10a in Table 1.1.4.

Y=0.732, a= 0.0149, b= -0.03456

CN = （Y - b）/ a = （0.732+0.3456）/ 0.0149 = 72.32

therefore: $CN_{(after)}$ =72.32

Condition	Proportion of permeable underlying surface	Runoff coefficient in different years			Runoff coefficients of different design rainstorm return periods								
		Period of low flow	Period of normal flow	Period of high flow	0.5 a	1 a	3 a	5 a	10 a	20 a	30 a	50 a	100 a
2006	19.46	0.348	0.534	0.608	0.541	0.631	0.722	0.751	0.783	0.809	0.822	0.837	0.854
C 1	24.46	0.329	0.517	0.592	0.518	0.612	0.706	0.737	0.771	0.798	0.812	0.827	0.845
C 2	29.46	0.312	0.501	0.576	0.496	0.593	0.69	0.723	0.758	0.787	0.801	0.817	0.836
C 3	34.46	0.296	0.485	0.56	0.474	0.573	0.675	0.708	0.745	0.775	0.79	0.807	0.827
C 4	39.46	0.282	0.47	0.545	0.452	0.554	0.659	0.694	0.732	0.763	0.779	0.797	0.818

Table 1.1.3: Impact of green area rate change on runoff coefficient at different rainfall conditions[3]

[2] Cheng, Jiang, Kai Yang, Lanlan Liu, and Bo Li. "Study on the Impact of Land Use Change on Regional Rainfall and Runoff in the Central City of Shanghai." *Journal of Natural Resources* 25, no. 06 (2010): 914-925.

[3] Cheng, Jiang, Kai Yang, Lanlan Liu, and Bo Li. "Study on the Impact of Land Use Change on Regional Rainfall and Runoff in the Central City of Shanghai." *Journal of Natural Resources* 25, no. 06 (2010): 914-925.

Rainfall type	Fitting formula	AMC I			AMC II			AMC III		
		a	b	R2	a	b	R2	a	b	R^2
0.5 a	Y=aX+b (Y:Runoff coefficient, X:CN value; a,b: Constants)	0.026 6	-1.578 0	0.999 9	0.046 5	-3.628 3	1.000 0	0.057 3	-4.746 8	1.000 0
1 a		0.022 9	-1.175 3	1.000 0	0.039 4	-2.879 5	1.000 0	0.045 5	-3.558 6	1.000 0
3 a		0.018 4	-0.704 1	1.000 0	0.031 1	-2.033 1	1.000 0	0.034 0	-2.402 8	1.000 0
5 a		0.016 8	-0.536 4	1.000 0	0.028 2	-1.737 2	0.999 9	0.030 3	-2.031 2	1.000 0
10 a		0.014 9	-0.345 6	0.999 9	0.024 9	-1.403 3	0.999 6	0.026 3	-1.627 8	0.999 9

Table 1.1.4: Impact of CN value change on runoff coefficient at different rainfall conditions[4]

Antecedent Moisture condition (AMC): Soil Conservation Service USA introduced the API (Antecedent Precipitation Index), which is the total amount of rainfall (mm) 5 d before rainfall, in order to take into account the effect of antecedent soil moisture on runoff. Antecedent Moisture Condition (AMC) was classified into 3 levels according to the Antecedent Precipitation Index (API): AMC1 as dry, AMC2 as normal, and AMC3 as wet.

The runoff curve number (CN): CN is a comprehensive parameter in the SCS-CN model that reflects the characteristics of the catchment area before rainfall, which is related to AMC, slope, vegetation, soil type and land use type, etc. The CN value decreases with increasing infiltratable subsurface.

[4] Fu, Suhua, Xiangliang Wang, Hongye Wang, Xin Wei, and Aiping Yuan. "Study on the Determination Method of CN Value in SCS-CN Runoff Model." *Arid Region Geography* 35, no. 03 (2012): 415–421. https://doi.org/10.13826/j.cnki.cn65-11.

Appendix 2

NO.	Scientific Name	Community Layer	NO.	Scientific Name	Community Layer
1	*Trifolium repens*	Herb	1	*Salix babylonica*	Arbor Tree
2	*Imperata cylindrica*	Herb	2	*Acer buergerianum*	Arbor Tree
3	*Echinochloa crusgalli*	Herb	3	*Liriodendron chinense*	Arbor Tree
4	*Euphorbia maculata*	Herb	4	*Liquidambar formosana*	Arbor Tree
5	*Pinellia ternata*	Herb	5	*Zelkova serrata*	Arbor Tree
6	*Atriplex patens*	Herb	6	*Aesculus chinensis Bunge*	Arbor Tree
7	*Acorus calamus*	Herb	7	*Acer buergerianum*	Arbor Tree
8	*Plantago asiatica*	Herb	8	*Morus alba*	Arbor Tree
9	*Ailanthus altissima*	Herb	9	*Sapium sebiferum*	Arbor Tree
10	*Zephyranthes candida*	Herb	10	*Sapindus saponaria*	Arbor Tree
11	*Elephantopus scaber*	Herb	11	*Ginkgo biloba*	Arbor Tree
12	*Axonopus compressus*	Herb	12	*Yulania denudata*	Arbor Tree
13	*Cuphea hookeriana*	Herb	13	*Cinnamomum camphora*	Arbor Tree
14	*Cyperus alternifolius subsp*	Herb	14	*Lagerstroemia indica*	Arbor Tree
15	*Lemna minor*	Herb			
16	*Setaria viridis*	Herb			
17	*Cynodon dactylon*	Herb			
18	*Rorippa indica*	Herb	1	*Rhododendron simsii*	Shrub
19	*Youngia japonica*	Herb	2	*Hibiscus moscheutos*	Shrub
20	*Paederia scandens*	Herb	3	*Ilex cornuta*	Shrub
21	*Centella asiatica*	Herb	4	*Ligustrum japonicum*	Shrub
22	*Reineckea carnea*	Herb	5	*Serissa japonica*	Shrub
23	*Solidago canadensis*	Herb	6	*Euonymus japonicus*	Shrub
24	*Setaria pumila*	Herb	7	*Nandina domestica*	Shrub
25	*Sonchus oleraceus*	Herb	8	*Photinia serrulata*	Shrub
26	*Pennisetum alopecuroides*	Herb			
27	*Geranium wilfordii*	Herb			
28	*Eclipta prostrata*	Herb			
29	*Alternanthera sessilis*	Herb	58	*Acalypha australis*	Herb
30	*Campsis grandiflora*	Herb	59	*Equisetum arvense*	Herb
31	*Phragmites australis*	Herb	60	*Sapium sebiferum*	Herb
32	*Arundo donax*	Herb	61	*Cayratia japonica*	Herb
33	*Metaplexis japonica*	Herb	62	*Coleus scutellarioides*	Herb
34	*Portulaca oleracea*	Herb	63	*Alternanthera philoxeroides*	Herb
35	*Digitaria sanguinalis*	Herb	64	*Amaranthus tricolor*	Herb
36	*Dichondra micrantha*	Herb	65	*Cyperus rotundus*	Herb
37	*Ophiopogon japonicus*	Herb	66	*Conyza canadensis*	Herb
38	*Miscanthus sinensis*	Herb	67	*Nymphoides peltatum*	Herb
39	*Canna indica*	Herb	68	*Hemerocallis fulva*	Herb
40	*Aglaia odorata*	Herb	69	*Ophiopogon bodinieri*	Herb
41	*Lindernia crustacea*	Herb	70	*Phyllanthus urinaria*	Herb
42	*Nandina domestica*	Herb	71	*Emilia sonchifolia*	Herb
43	*Equisetum diffusum*	Herb	72	*Erigeron annuus*	Herb
44	*Taraxacum mongolicum*	Herb	73	*Hosta plantaginea*	Herb
45	*Leptochloa chinensis*	Herb	74	*Iris tectorum*	Herb
46	*Lythrum salicaria*	Herb	75	*Polypogon monspeliensis*	Herb
47	*Microstegium vimineum*	Herb	76	*Veronica arvensis*	Herb
48	*Saururus chinensis*	Herb	77	*Geranium sinense*	Herb
49	*Dianella ensifolia*	Herb	78	*Veronica pusilla*	Herb
50	*Allium senescens*	Herb	79	*Boehmeria nivea*	Herb
51	*Liriope spicata*	Herb	80	*Viola philippica*	Herb
52	*Hydrocotyle vulgaris*	Herb	81	*Aster subulatus*	Herb
53	*Centipeda minima*	Herb	82	*Buddleja lindleyana*	Herb
54	*Cyperus iria*	Herb	83	*Oxalis corniculata*	Herb
55	*Hydrocotyle sibthorpioides*	Herb	84	*Forsythia viridissima*	Herb
56	*Salvia uliginosa*	Herb	85	*Metaplexis japonica*	Herb
57	*Sesbania cannabina*	Herb	86	*Aster subulatus*	Herb

Table: Plant biodiversity summary table (9.25 on-site research)

Appendix 3

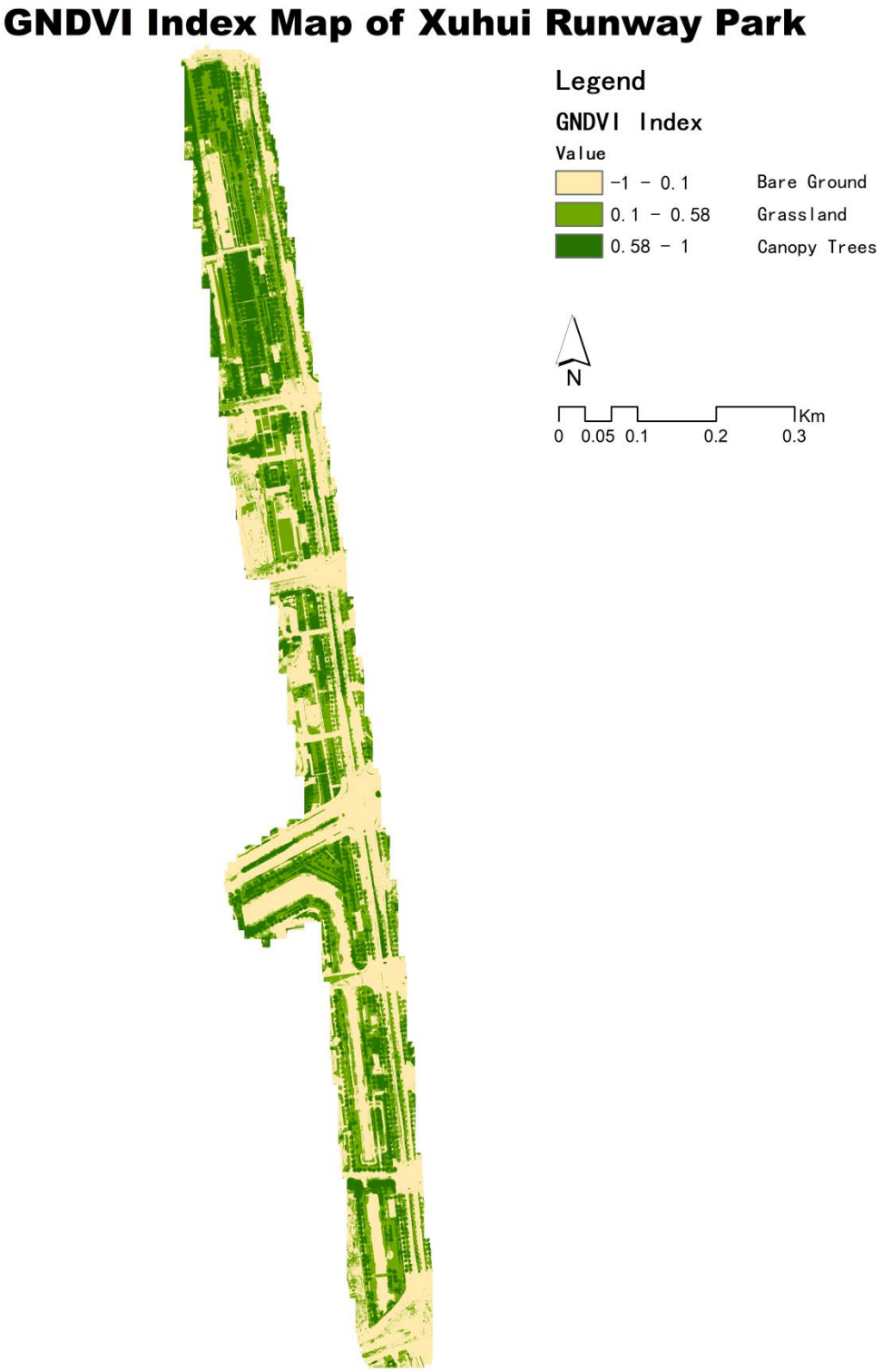

Figure: GNDVI Index Map of Xuhui Runway park

Appendix 4

Online Questionnaire Sample:

Survey and Investigation on the use of Shanghai Xuhui Runway Park

Hello, this is a questionnaire conducted by college students from the Department of Landscape Architecture of Tongji University. The purpose of this survey is to understand the public usage of Xuhui Runway Park. It will take approximately a few minutes of your time to answer this questionnaire. Your participation should be of course voluntary. Since your participation is very important to the successful completion of our project, we heartfeltly invite you to participate in answering our questionnaire. Your answers will be kept strictly and reliably confidential and remain anonymous, your answers will be used exclusively for research objectives.

1. What is your gender: (Single Choice Question)*
   ○ Male ○ Female
2. What is your age group: (Single Choice Question)*
   ○ Under 12
   ○ 13-18
   ○ 19-35
   ○ 36-60
   ○ above 60
3. What is your highest qualification? (Single Choice Question)*
   ○ Elementary/primary school or below
   ○ Middle/high school
   ○ Associate degree
   ○ Bachelor's degree
   ○ Master's or professional degree
4. What is your current employment status? (Single Choice Question)*
   ○ Student
   ○ Freelancer
   ○ Full-time employment
   ○ Part-time employment
   ○ Unemployed
   ○ Retired

○ On maternity/sick leave

5. Where do you live in Shanghai? (Single Choice Question) *

○ Huangpu District
○ Xuhui District
○ Changning District
○ Jing'an District
○ Putuo District
○ Hongkou District
○ Yangpu District
○ Pudong New Area
○ Minhang District
○ Baoshan District
○ Jiading District
○ Jinshan District
○ Songjiang District
○ Qingpu District
○ Fengxian District
○ Chongming District

I. The questions about history and Culture of Xuhui Runway Park:

6. Have you learned about the fact that the park is transformed from a runway of Longhua Airport when in the park? (Single Choice Question) *

○Totally ignorant

○Don't know much

○Generally know

○Relatively know

○Know very detailed

7. If you know, in what way did you get it? (Multiple Choice Question) *

□Through the media propaganda(Such as RED, WeChat Official Account, Tik Tok)

□Through the park promotion(Display card in the park, etc.)

□Since the airport runway was transformed, you have paid attention to the construction of the park

8. In this park, which of the following sites/objects do you think can make you feel the history and culture of the airport? (This is a sequencing question, please fill in the numbers in brackets in turn)

[ ]Linear and straight road in the park

[ ]Children's playground where you can walk up and down and play

[ ]Ground surface pavement made of concrete

[ ]Lamps and Lanterns in sloping shapes on both sides of the runway

[ ]Maple trees planted along the sides of the runway in the park

[ ]Others：

[ ]None of the above

II. The questions about arriving at the runway park:

9. How do you generally arrive at the park? (Multiple Choice Question) *

□By walk

□By bike

□By subway

□By bus

□By car

□Others: _____

10. What's your biggest reason for choosing this means of transportation? (Single Choice Question) *

○Arrive quickly: Green travel is faster when the distance is closer

○More convenient: There are shared bikes rental points, subway stations and bus stops near the park.

○Economical: low transportation cost

11. How long will it take you to get to the park? (Single Choice Question) *

○Within 5 minutes

○5- 15minutes

○15- 30minutes

○30 minutes-1 hour

○More than 1 hour

III. The questions about the use of the runway park:

12. When do you usually come to Runway Park? (Multiple Choice Question) *

□Monday to Friday

□On weekends

□On holidays

13. What time do you usually choose to come to Runway Park from Monday to Friday? (Single Choice Question) *

○before 9 am ○9 am - 12 pm

○12pm - 2 pm ○2 pm- 6 pm

○6 pm - 9 pm ○after 9 pm

Answer according to option 1 of question 12

14. What time do you usually choose to come to Runway Park on weekends? (Single Choice Question) *

○before 9 am ○9 am - 12 pm

○12pm - 2 pm ○2 pm- 6 pm

○6 pm - 9 pm ○after 9 pm

Answer according to option 2 of question 12

15. During the holidays, what time do you usually choose to come to Runway Park? (Single Choice Question) *

○before 9 am ○9 am - 12 pm

○12pm - 2 pm ○2 pm- 6 pm

○6 pm - 9 pm ○after 9 pm

Answer according to option 3 of question 12

16. How long do you usually spend in this park? (Single Choice Question) *

○Within 15 minutes

○15 to 30 minutes

○30 minutes- 1 hour

○More than 1 hour

17. Who do you go to Runway Park with most often? (Single Choice Question) *

○Family member

○Friends/ colleagues

○Others: _____

○Alone

18. What kind of relaxation or sightseeing activities do you do most at this park? (Multiple Choice Question) *

□Go for a walk

□Bask

□Walk the birds/walk the dogs

□Go to a concert

□Accompany the family members

□None

□Running

□Take a photograph

□Meditation

□Rest and sleep

□Others _____

19. What leisure and consumption activities do you do most often at this park? (Multiple Choice Question) *

□Drink coffee

□Others _____

□Going to the bookstore

□None

20. What social activities do you do most at this park? (Multiple Choice Question) *

□Chatting

□Playing and singing

□Festival activities

□None

□Make friends

□Play Chess

□Others _____

21. What kind of sports activities do you do most often at this park? (Multiple Choice Question) *

□Running

□Skidding

□Biking

□Skateboard

□Playing football

□Taijiquan

□Body-building exercise

□Others _____

□Frisbee

□Play shuttlecock

□Play for children

□None

IV: The questions about the feeling and evaluationof Runway Park:

22. Which of the following descriptions do you think fits your feelings and impressions of the park? (Multiple Choice Question) *

□“Convenient to reach”, you can reach the park easily and quickly

□“Beautiful scenery”, you found a beautiful, attractive place or area (scenery, etc.)

□“Abundant space”, various types of space can meet your different leisure needs

□“Always full of energy”, at different times, you can feel the vitality and attractiveness of the venue

□“Good vegetation conditions”, plants planned in the site make you feel natural, beautiful and appreciated

□“Attractive site”, well-designed activity areas (runway, rain garden, sunken grass, etc.)

□“Suitable for children to play”, children can play happily in the site

□“With historical and cultural connotation”, sites or imprints that reflect previous history and culture

□“Convenient facilities”, complete sanitary, catering and commercial facilities to meet service needs

□“Children-friendly”, provide children with a wealth of playgrounds and spaces

□“Elder-friendly”, provide the site and space for daily activities for the elderly

□“Disabled-friendly”, friendly for disabled people with reduced mobility

□“Good ecological environment”, it has a positive effect on the ecology of Longhua Street and Xuhui District

□“Provide educational chances”, allow the public to receive education and popularization of science in the site

□What are the other meanings and why? _____

23. How satisfied are you with the park? (Single Choice Question) *

○Very dissatisfied

○Not so satisfied

○Generally satisfied

○Relatively satisfied

○Very satisfied

24. What do you think of the safety of the park? (Single Choice Question) *

○Very insecure

○Relatively insecure

○Generally insecure

○Relatively safe

○Very safe

25. Does the park have the positive effect on your stress release/relief? (Single Choice Question) *

○No positive effect

○Basically no positive effect

○Generally effective

○Slightly effective

○Very effective

26. How the park affects your life quality? (Single Choice Question) *

○Big negative impact

○Slight negative impact

○Basically no impact

○Slightly improved

○Significantly improved

Appendix 5

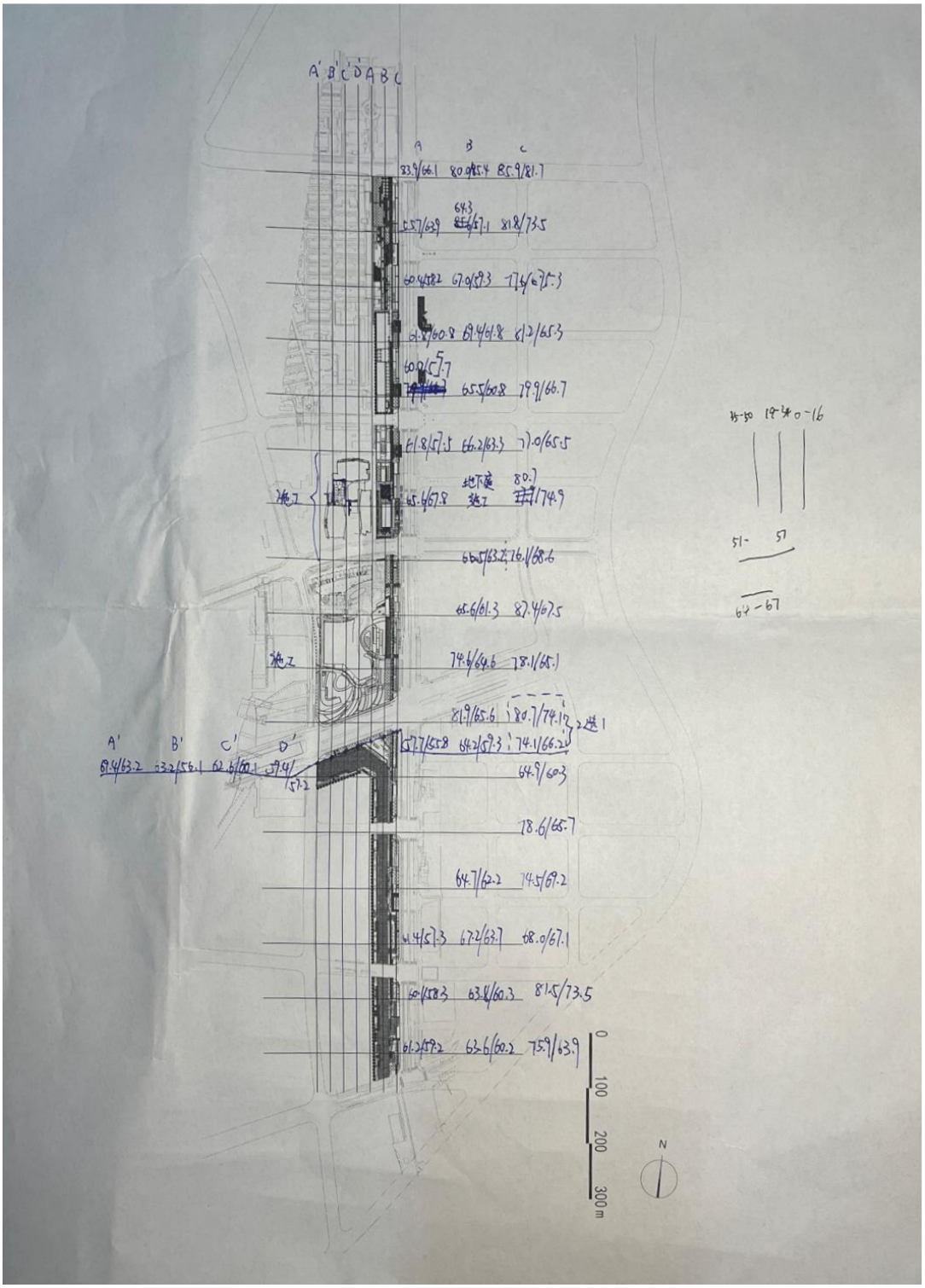

Figure: On-the-spot record drawing of noise measurement in Xuhui Runway Park

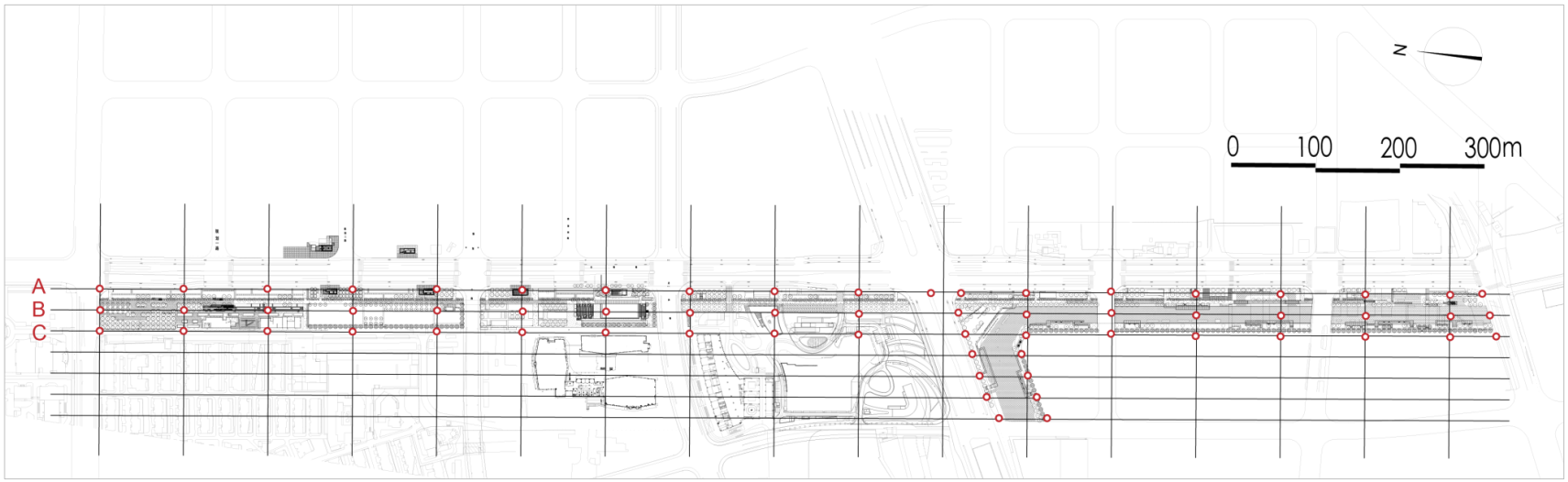

Figure: Diagram of noise measurement point position in Xuhui Runway Park