

Swift Conservation and Interactive Design

This project focuses on protecting Beijing swifts through innovative design and raising public awareness of urban biodiversity conservation. Using the Double-Diamond design process, I conducted surveys to gauge public knowledge, willingness to protect, and participation in swift conservation. In collaboration with ecological experts, swift nest boxes were designed to meet their ecological needs. The design includes a public version for decorative and educational purposes and a research version with a swift identification system. An interactive projection monitors nest activity, engaging the public, while a companion app provides information and encourages participation.



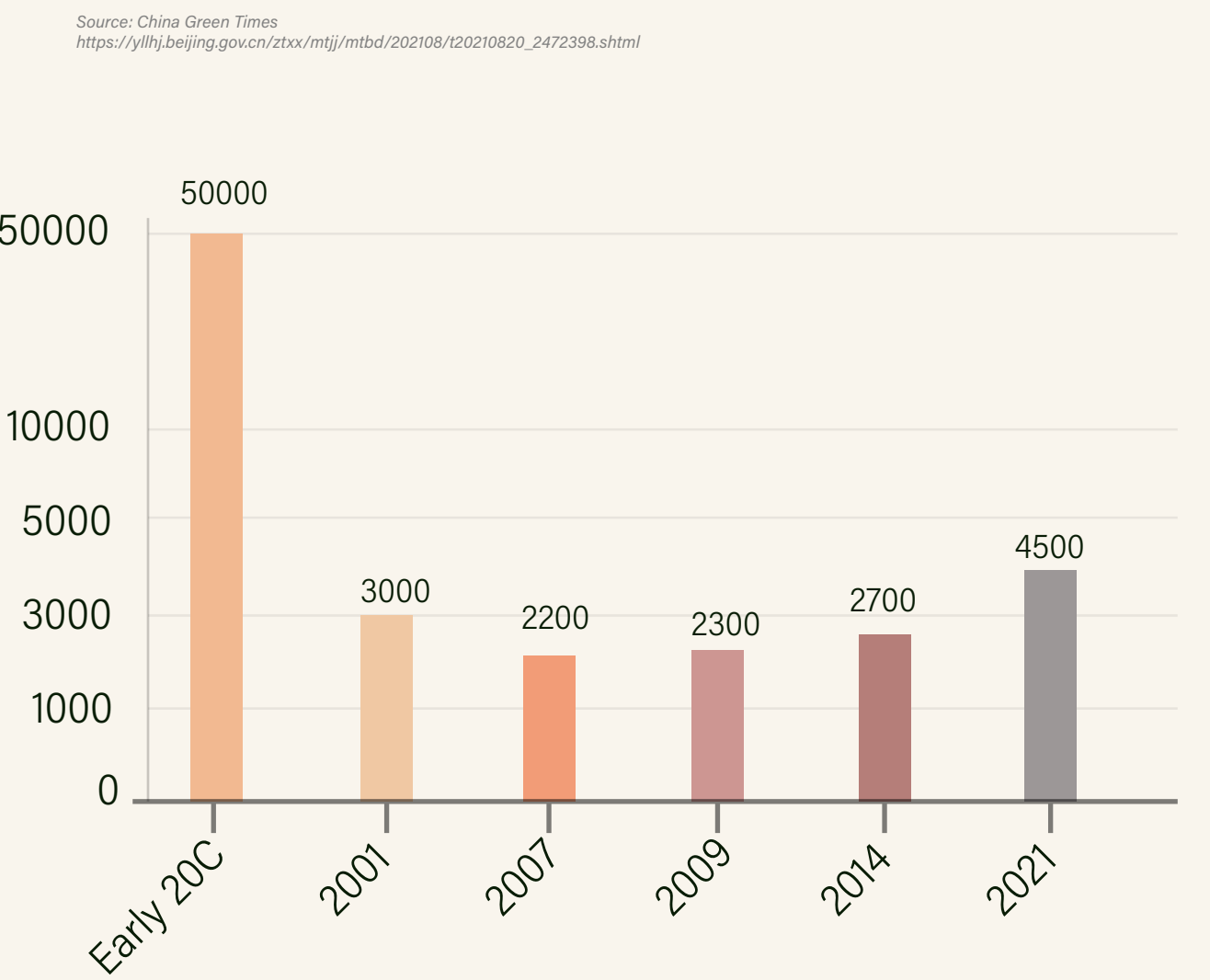
Tianshuo Zhao
Made by AI (MidJourney)

BACKGROUND

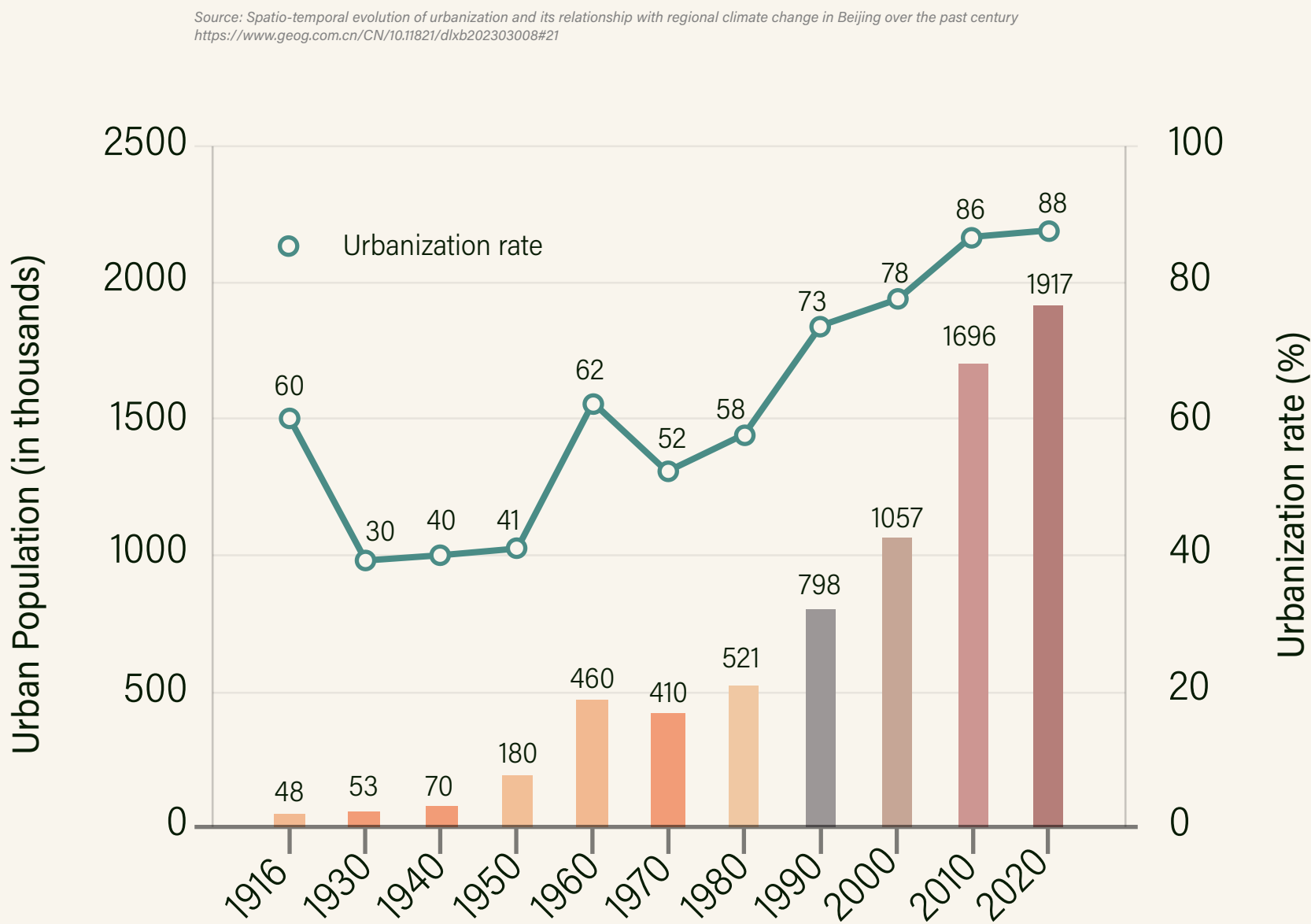
Problem Statement


"With the acceleration of urbanization, changes in the architecture and habitat environment in the city have resulted in a decrease in the habitat of Beijing swifts year by year. To protect this species, we have designed a new swift nest box, combined with an educational installation of public interaction, aimed at increasing residents' understanding and engagement with biodiversity


Statistics on the number of Beijing swifts in the fourth ring road of Beijing from early 20C to 2021



Urban population and urbanization rate of Beijing



In the 1950s and 1960s
 **90%** of the city walls have been demolished.

In the 1950s and 1960s
 Religious and cultural buildings have suffered severe damage.

In the 1950s and 1960s
 **70%** of the courtyard houses have been demolished.

The Beijing swifts once reached a population of 50,000. However, with urbanization and the demolition of ancient buildings, their *nesting sites decreased*. The *installation of anti-bird nets and environmental changes* led to a *reduction in food sources*, resulting in a *sharp decline in the number of Beijing swifts*.

PERSONA

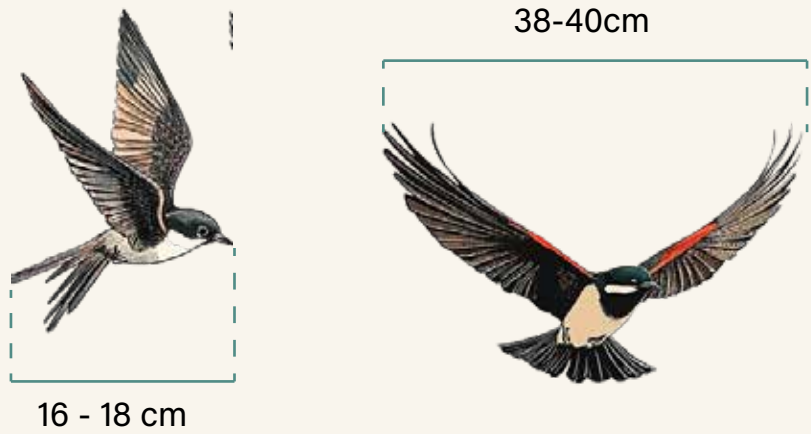


Beijign Swift

Apus apus pekinensis

About

- Lifespan:** 5.5 - 15 years
- Body length:** 171 - 180 mm (adult)
- Weight:** 30 - 40 grams (adult)
- Speed:** 190km/h
- Food:** small insects in the air



Habitat

Habitat: Mainly nested on tall ancient buildings such as the Forbidden City



Picture source: Xiaolian Zhang

Migration Route: Returned to Beijing mid-April every year for breeding during their mating season

Behavioral patterns

Social Behavior: Beijing swifts usually travel in groups and enjoy forming large flocks while flying, displaying strong social behavior.

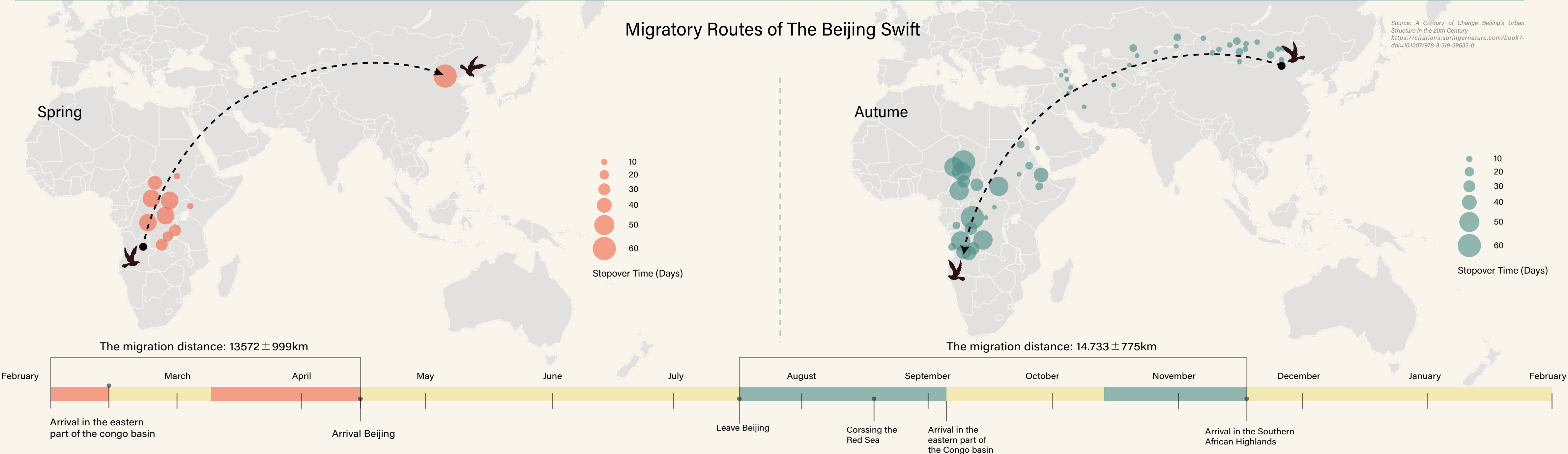
Specist Specificity Foot: The structure of the Beijing swifts claw is different from other birds, and once it falls to the ground it could not to take off agai.

Breeding Habits: Beijing swifts Choose suitable nesting sites during the breed-ing season, usually in high buildings, where both parents care for the young.



Picture source: Xiaolian Zhang

Migratory Routes of The Beijing Swift





Questionnaire

POPULATION
215 valid questionnaires

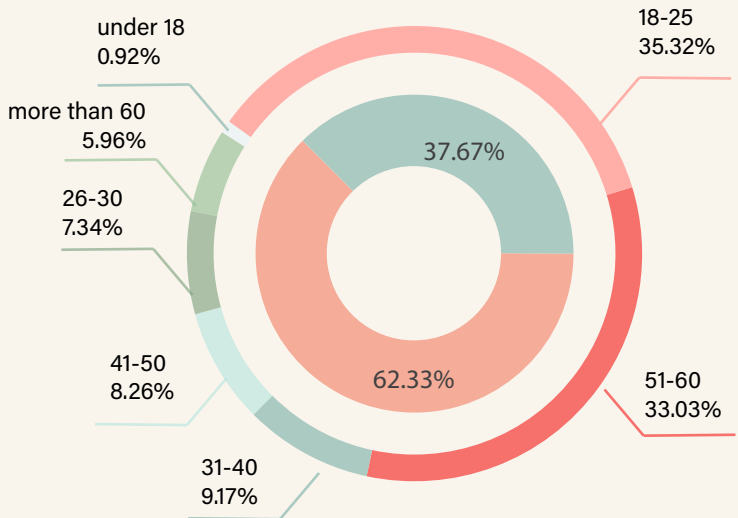
DATE
2024.9.29-2024.10.6

01. Do you know or have you seen the Beijing swift in Beijing?
- A. Yes, I know. B. Yes, but I've never seen it.
- C. No, I don't know it and I've never seen it.
02. Do you know the Olympic mascot Nini from the 2008 Beijing Olympics (whose design was based on the Beijgn siwft)?
- A. Yes, I know B. No, I don't know
03. Are you interested in learning about the living habits and characteristics of Beijing swifts?
- A. Yes, I'm interested B. No interest
04. What do you think is the reason for the dramatic decline in the number of swifts in Beijing? (Multiple choice)
- A. The restoration of ancient buildings destroyed the swifts' habitat
- B. The reduction of wetlands and water pollution leads to a decrease in insect population
- C. Air pollution affects the health of swifts
- D. Pesticide use reduces food sources for swifts
05. What positive effects do you think the Beijing Swift has on the urban ecosystem? (Multiple choice)
- A. Increase species diversity
- B. Prey on pests to maintain ecological balance
- C. It is one of the indicators to measure urban ecological health
- D. It is part of Beijing's history and culture and contributes to natural education
06. Would you like to participate in the protection of the Beijing Swift?
- A. Yes, I would participate B. No interest
07. Which of the following volunteer protection actions do you find effective? (Multiple choice)
- A. Set up a volunteer team to regularly monitor swift activities
- B. Establish a protection group and share monitoring records
- C. Report problems to relevant government departments and seek policy support
- D. Work with architectural associations to provide nesting Spaces for swifts in future buildings

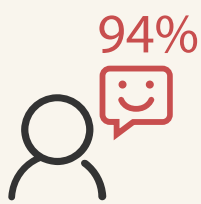
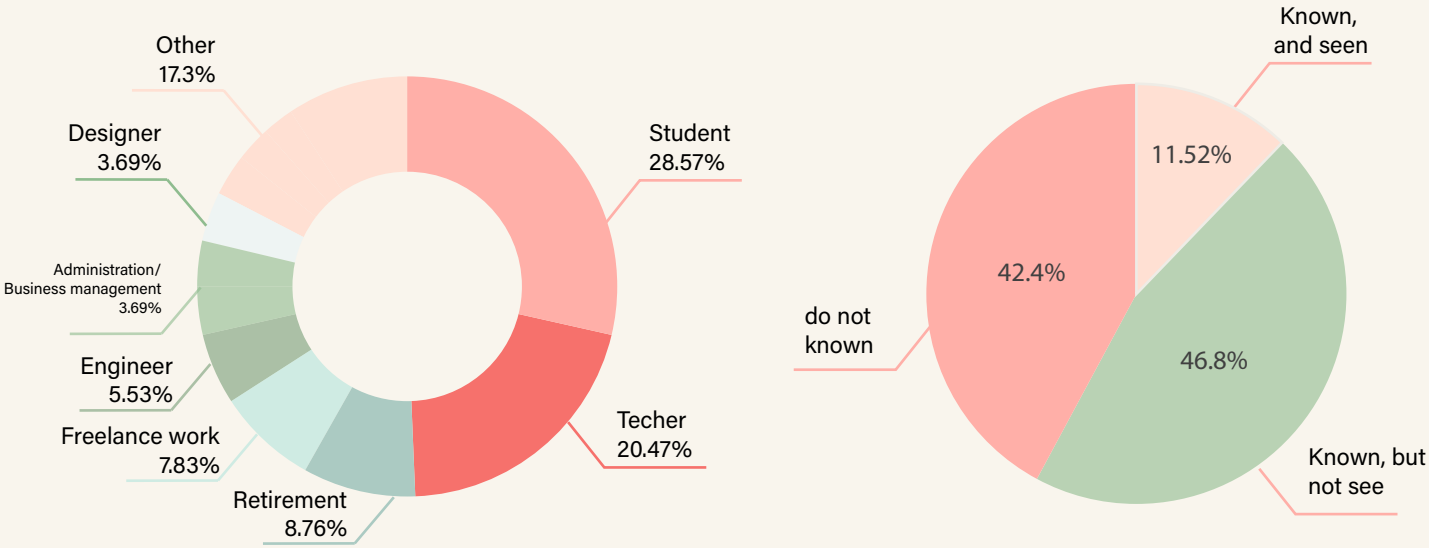
08. If you were designing a new swift nest, what ideas would you like? (Multiple choice)
- A. Swift Tower
- B. A swift's nest hanging from the outside of the building
- C. Light projection of interactive swift images
- D. More apps to share information with Swifts
09. Where do you think swift nest boxes should be installed?
- A. Ancient buildings in the city
- B. High trees or streetlights in parks
- C. External walls of buildings in the community
- D. Buildings or trees near the square

This survey mainly focuses on four aspects, including the **basic information of respondents, the public's understanding of Beijing Swift, the assessment of the awareness of Beijing swift protection, and the design of swift nests.**

● The outer circle is age and the inner circle is sex



● The circle on the left is occupation, and the circle on the right is what people know about swifts



94% of people are interested in **learning** about the lifestyle and characteristics of Beijing swifts.

● Most people believe **wetland reduction and water pollution** are decreasing insect populations, leading to fewer Beijing swifts.



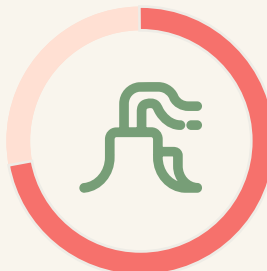
Decreasing ancient architecture

65%



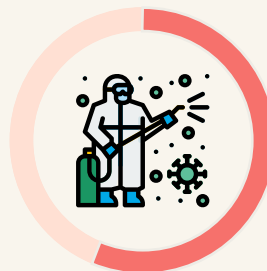
Decreasing wetlands

75%



Air pollution

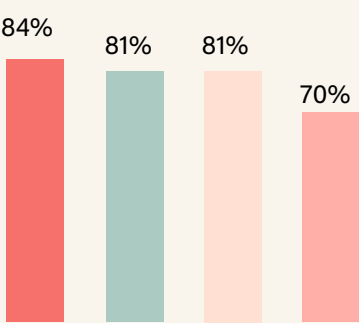
72%



Pesticide use

56%

● Most people believe that the Beijing swifts play a **positive role in the diversity of the urban ecosystem.**

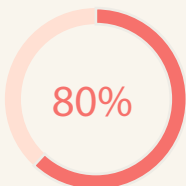


- Increase species diversity
- Control pests and maintain ecological balance
- Is one of the indicators for measuring the ecological health of a city
- Is part of Beijing's historical and cultural heritage and helps with nature education.

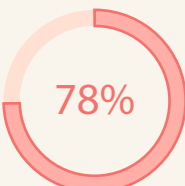


96% of people said they would **participate** in the conservation efforts for Beijing Swiftlets.

● Most people believe that a **volunteer team organized to regularly monitor swift activities for conservation efforts** is effective.



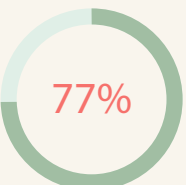
Forming volunteer teams for monitoring



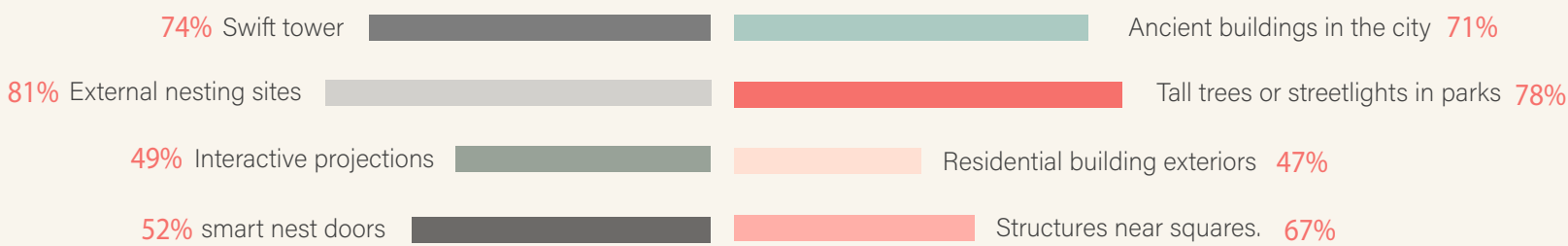
Establishing conservation groups for record sharing

Seeking government support

Collaborating with architects to create nesting spaces



● People prefer **place them in public place such as parks rather than hang outside buildings.**



Street Interviews

In order to further explore the problem of low willingness to participate in the questionnaire, this study conducted a street interview in Beijing and conducted face-to-face interviews with **18 interviewees from different groups**, including **6 students and children, 6 working adults and 6 elderly**, using random sampling method.



Working Adults

Age: 25-55

Low Interest

Picture source: freepik.com

- 70%** willing to learn about and participate in conservation efforts
- 90%** not willing to install a nest box on their building
- Low Interest** influenced by practical constraints such as time, energy, and economic factors.



Students & Children

Age: 5-25

High Interest

Picture source: Nhvngg

- 90%** willing to participate in conservation activities and to invite others to join.
- 80%** willing to hang a nest box, but required parental help.
- high interest and potential**, targeted measures need to be designed to overcome barriers, such as school support or parental involvement.



Elderly

Age: over 55

High Interest

Picture source: freepik.com

- 90%** willing to engage in conservation efforts.
- 60%** opening to installing a nest box on their building, and they showed strong interest in bird studies and attracting birds.
- highest engagement** in both knowledge acquisition and practical involvement, representing a valuable community resource for conservation efforts.

Expert Interviews

Beijing Normal University
Associate Professor of Zoology

Xinru Zhao



Picture source: Xinru Zhao

I believe that the protection of the Beijing Swift should not only protect a single species, but should focus on the protection of biodiversity.

Challenges & Opportunities

- Accurate counting and monitoring of swift populations
- Park design prioritize human aesthetic and comfort over wildlife needs

Tongji University
Associate Professor of Design

Wenqing Yang



Picture source: Wenqing Yang

The "Insight of Experience" design concept, which connects design with value through understanding needs.

Challenges & Opportunities

- Enhancing product sustainability, fostering a sense of belonging are crucial aspects.
- Integrating green spaces and considering bird populations in urban planning is crucial for biodiversity conservation.

Nanjing Forestry University
Ph.D., Department of Resource Ecology

Yong Zhang



Picture source: Yong Zhang

Birds are indicators of environmental quality and can influence habitat selection and community dynamics.

Challenges & Opportunities

- Biodiversity has a positive impact on human health and disease prevention.
- Conducting landscape analysis to enhance connectivity and ecological networks.

Shanghai Jiao Tong University,
Postdoctoral Fellow, Department of Geography

Caiyan Wu



Picture source: Caiyan Wu

urbanization while adding complexity to urban and regional scale landscapes, also exacerbates the fragmentation of natural landscapes, reducing connectivity.

Challenges & Opportunities

- Emphasis on the functional benefits of planting vegetation, rather than its ecological contribution to biodiversity
- Lacking barrier-free platforms to promote green concepts or biodiversity.

Potential Protection Area

Beijing swifts live in ancient buildings



Picture source: Xiaolian Zhang



Picture source: Xiaolian Zhang



Picture source: Xiaolian Zhang



Picture source: Yaqi Cui



Picture source: Google Map



Picture source: Xiaohongshu User @Tiehexijiedong



Beijing swifts live in modern buildings



Picture source: Ming Ma
<https://wap.sciencenet.cn/blog-2048045-1293275.html?mobile=1>

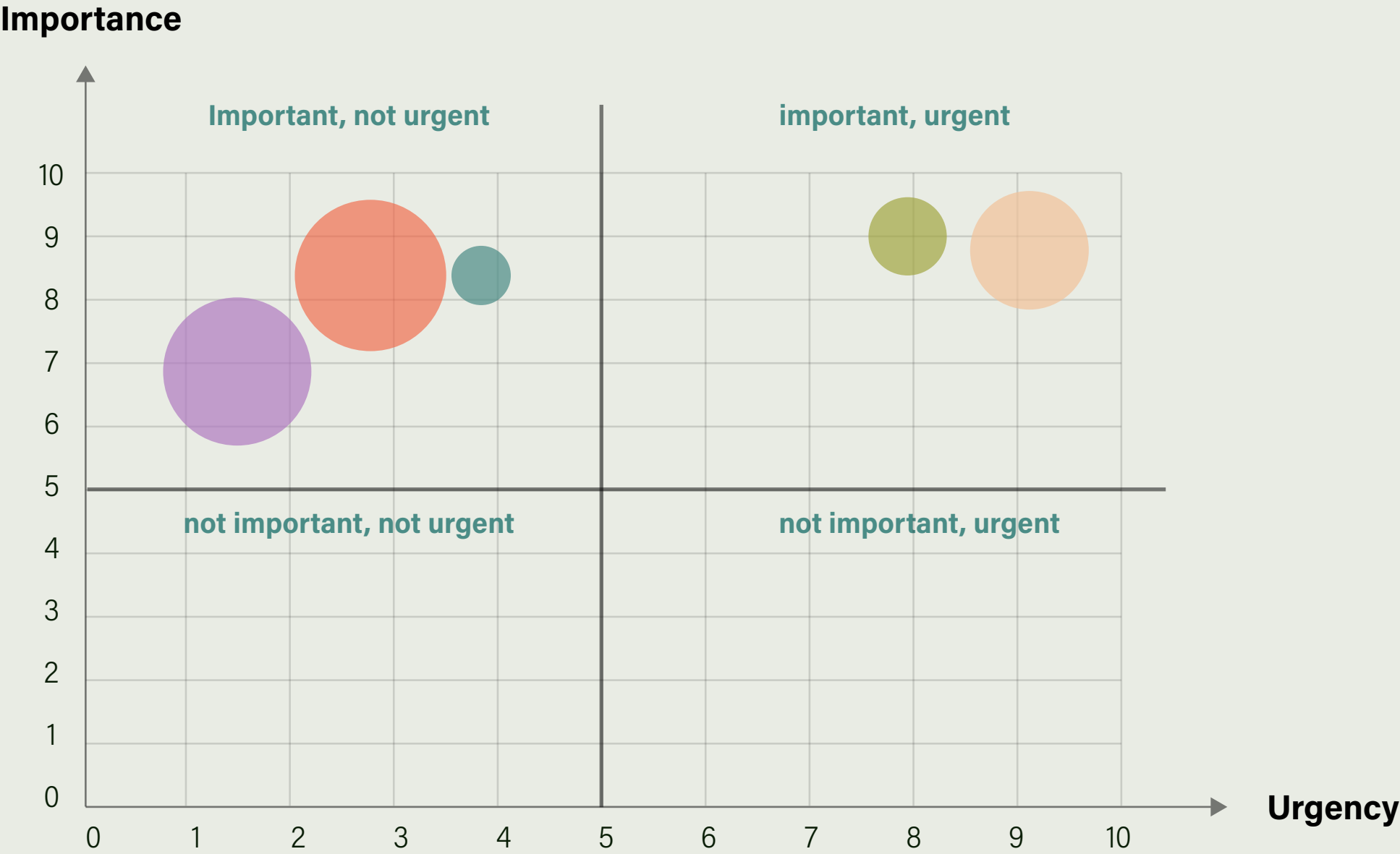


Protection area for swifts live



Potentially protected area swifts live

User Needs and Challenges Analysis



- Breeding Ground:**
- Loss of habitat
 - Human intervention

- Foraging Area**
- Few food resources
 - Pesticide use

- Regional Connectivity**
- Habitat fragmentation

- Living Area:**
- Urban Environment Changes
 - Light Pollution

- Interactive Space**
- Human activity interference

- Cost**
- 1 - 10 million RMB
 - 10 - million RMB
 - More than 100 million RMB

103 DKK \approx 100RMB

Core Problem



Surface-level problems of human

- Lack of awareness about scientific observation methods
- Insufficient awareness of biodiversity among citizens and governments
- Landscape fragmentation forme urbanization
- The actual number of people participating in the protection of swifts in Beijing is low

Invisible problems of human

- No emotional attachment
- Lack of awareness and access to urban biodiversity

Picture source: Xing Yen Chew



Surface-level problems of Beijing swift

- Lack of food resources: Insect populations are decreasing due to urbanization and pesticide use
- Lack of living space: The problem between the Beijing Swift and the building in need of repair
- Habitat loss: Urbanization leads to the demolition of ancient buildings and the reduction of traditional breeding grounds

Invisible problems of Beijing swift

- Habitat loss

Picture source: Visual China

Swift Protection Analysis

Swifts & House Martin Nest Boxes by Schwegler

<https://www.nhbs.com/9a-schwegler-house-martin-nest>



Picture source: www.nhbs.com

Swifts & House Martin Nest Boxes by Schwegler

<https://bigsee.eu/b-e-n-the-modular-nest-box/>



Picture source: www.bigsee.eu

Eco-Friendly Swift Brick by Action for Swifts

<https://www.actionforswifts.com/>



Picture source: www.actionforswifts.com

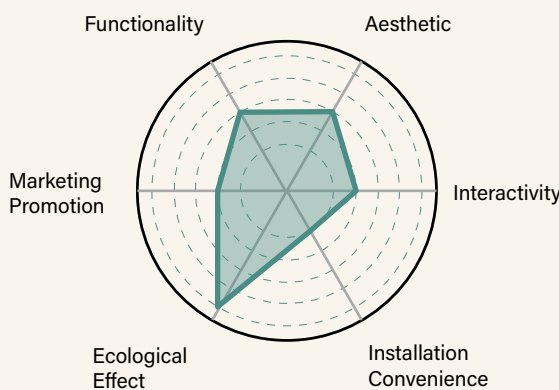
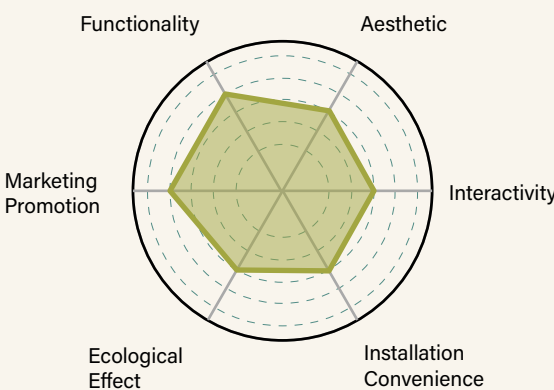
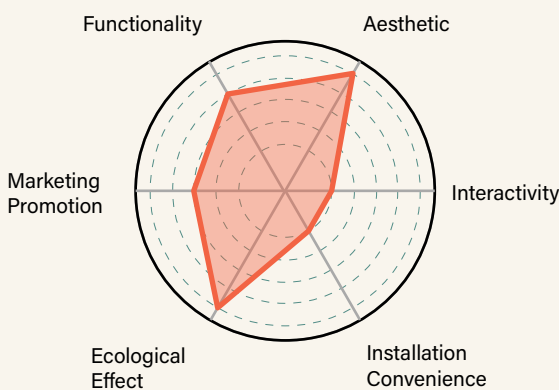
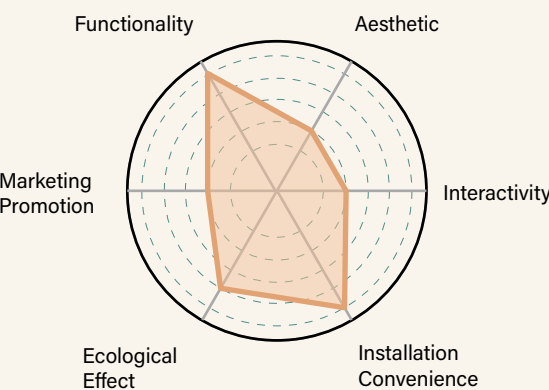
Swifts Tower by Swift Conservation

<https://swift-conservation.org/Swift%20Towers.pdf>



Picture source: www.swift-conservation.org

The comparison is conducted from six dimensions: **functionality, aesthetics, interactivity, installation convenience, ecological effect, and marketing promotion.**



Conclution

- Schwegler:** performs excellently in functionality and ease of installation, but has weaker interactive and aesthetic features, and there is also room for market promotion improvement.
- Action for Swifts:** emphasizes ecological effects and environmental friendliness, but lacks in interactive features, and the installation process is relatively complex.
- Nestbox Company:** has flexible modular design that is suitable for various bird species, but there are shortcomings in optimization and aesthetic design specifically for swift
- Swift Conservation:** has outstanding ecological effects, but due to its design that occupies more space, there are limitations in terms of applicability and ease of installation.

Suggstion



Functional enhancement: New products can incorporate smart technologies (such as sensors, monitoring devices) and interactive features (such as light projection, real-time data display) to enhance the user experience.



Beauty and architecture blend: The design can reference a minimalist modern design style and integrate the nest box with architectural decoration, making it both a habitat for swift and a decorative part of the building.



User Engagement Boost: Increase the interactive features of the product through APPs, websites, and even community projects to enhance public participation and awareness of the swift.

Case Study

WWF Adopt-an-Animal



Picture source: WWF

Copenhagen, green roofs



Picture source: Agroalimentando.com

Tracking Bracelet



Picture source: www.fahlo.com

4Ocean bracelet



Picture source: www.4ocean.com



Urban biodiversity projects are available for government & corporate funding



Users are willing to pay for real-time ecological data



Users can build long-term engagement through Explore + Community



The emotional connection between humans and animals can translate into stable gains



Environmental protection + social fission = high communication value

Business Model

Key partners

- Government and environmental organizations: Support advocacy and promotion.
- China Bird Watching Society**
- Schools and communities: pilot product applications.

Value Propositions

- Swift-centered**
- Modularity and sustainability**
- Ecological education and public engagement**
- Emotional arousal and participation in protection**

Channels

- Offline channels:** Work with environmental organizations to promote signage and nest box installation solutions through ecological education activities.
- Online channels:** Sell simplified nest boxes and related accessories through e-commerce platforms.

Key activities

- Organization and implementation of online and offline education promotion activities.
- Nest box production and after-sales service.

Customer relationships

- Simple installation guide and regular maintenance service are provided.
- Online interactive community to enhance user stickiness.
- Provide offline swift protection, observation, science popularization and other activities.

Cost Structure

- Product design and research and development costs.
- Nest box manufacturing and maintenance costs.
- Cost of education and extension activities.

Key resources

- Team of ecology and design experts.
- Online content development team.
- Production supply chain and community education resources.

Customer segments

- Core users:** Bird lovers, including children and students (under 25 years old) and senior citizens (over 60 years old).
- Extended users:** Eco-organizations, schools and community developers.

Revenue Streams

- Swift nest box sales revenue.
- Paid subscription function for education APP.
- Benefits from projects with eco-housing developers.

Stakeholder



Picture source: China Bird Watching Society

China Bird Watching Society

Promote the concept of "**scientific bird watching, respecting nature**", and guide the healthy development of public bird watching. **Popularize the knowledge of birds and biodiversity**, pay attention to the achievements of bird scientific research, carry out **bird surveys and related ecological protection work**.

Animal Research scholars

Through interviews with them, I have provided more scientific insights and data on the design, and provided guidance and effective protection strategies for my final design. It helped me to have a deeper understanding of the current problems and difficulties in urban biodiversity protection



Picture source: China Bird Watching Society

DESIGN POSITION

Design Concept

This project follows an “**animal-centered**” approach in nest design, prioritizing the needs of the Beijing Swift. By using the protection of swifts as an entry point, the design **raises public awareness and participation** in conservation efforts, ultimately **fostering urban biodiversity**.

Main Functions

Specially designed nest box tailored to the living habits and behaviors of swifts.

Real-time monitoring of swift nests via an integrated sensor system.

Interactive lighting projection indicating swift occupancy.

Mobile app for tracking nests, learning about swifts, and participating in conservation efforts.

Opportunities for users to name swifts and contribute to their protection efforts.



Design Purpose

The design of the Swift Nest Box aims to promote urban biodiversity conservation, specifically focusing on **protecting the Beijing Swift**. By integrating modern design with interactive features, the project encourages public engagement in wildlife protection and **raises awareness about biodiversity** loss in megacities.

Service

Mmobile Application

- Track nesting activities
- Monitor environmental conditions
- Engage with conservation efforts

Swift Nest Box

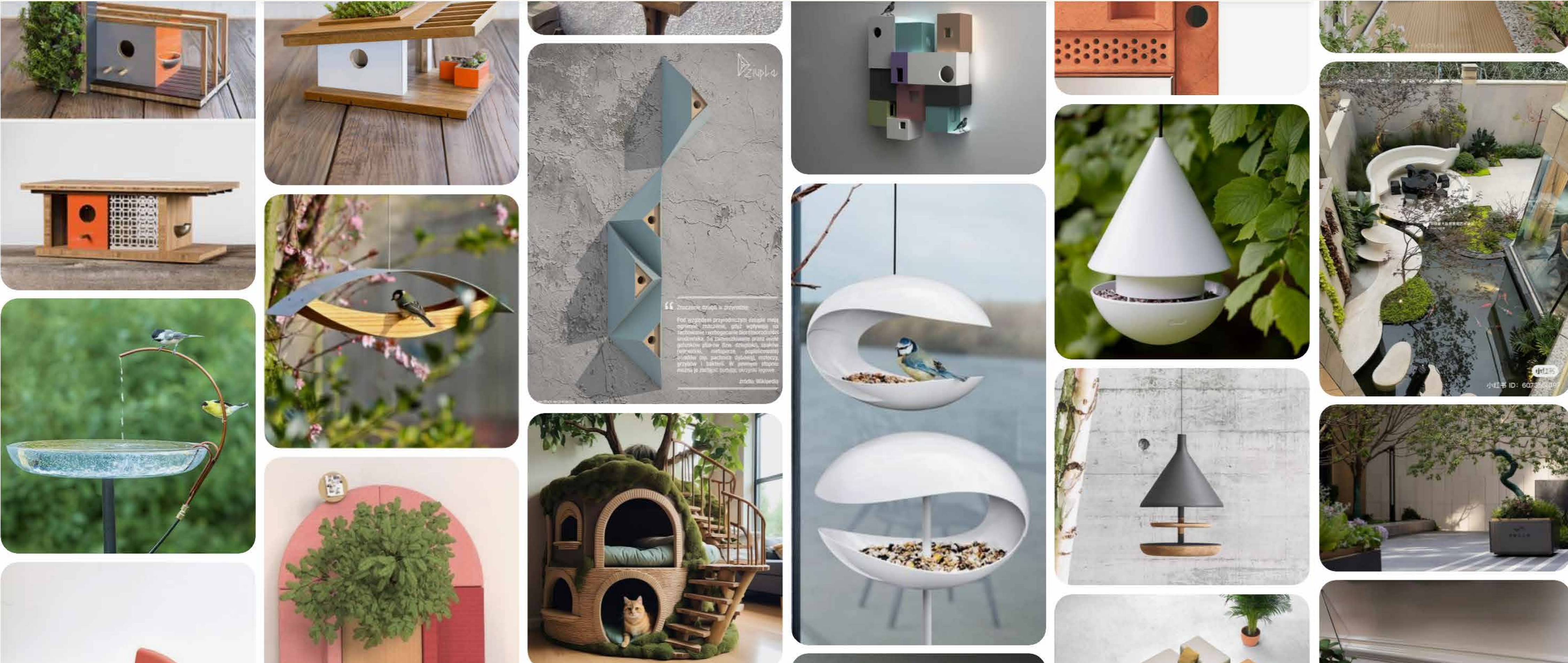
- Provides a safe and sustainable habitat for swifts

Signboard

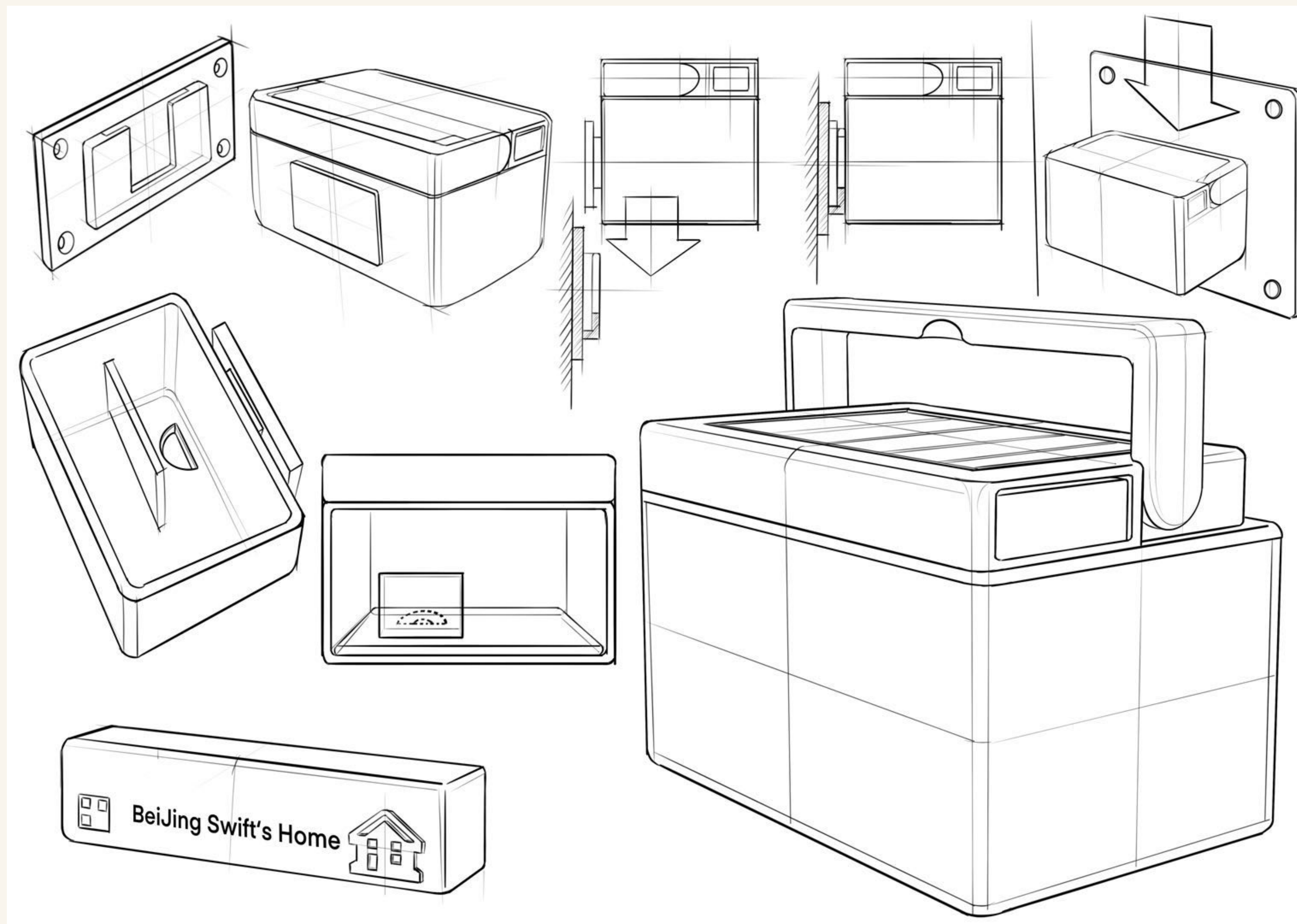
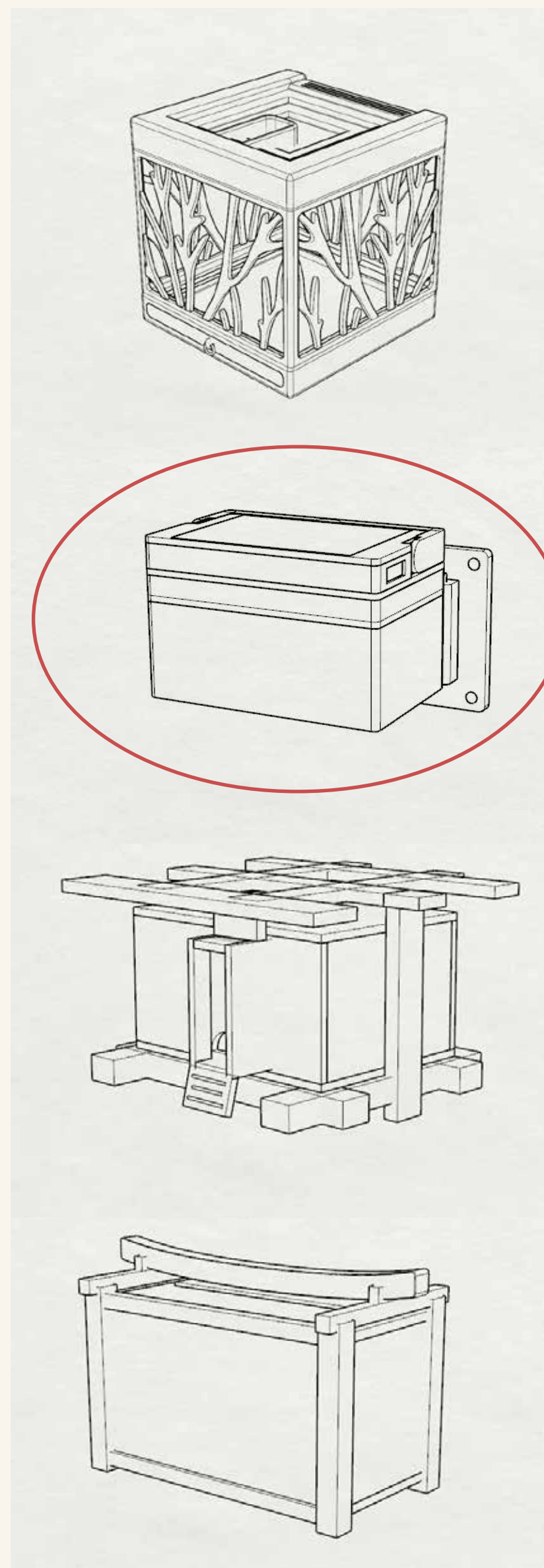
- Placed along the roadside or in the greenbelt attract curiosity

Picture source: Emily Roussel

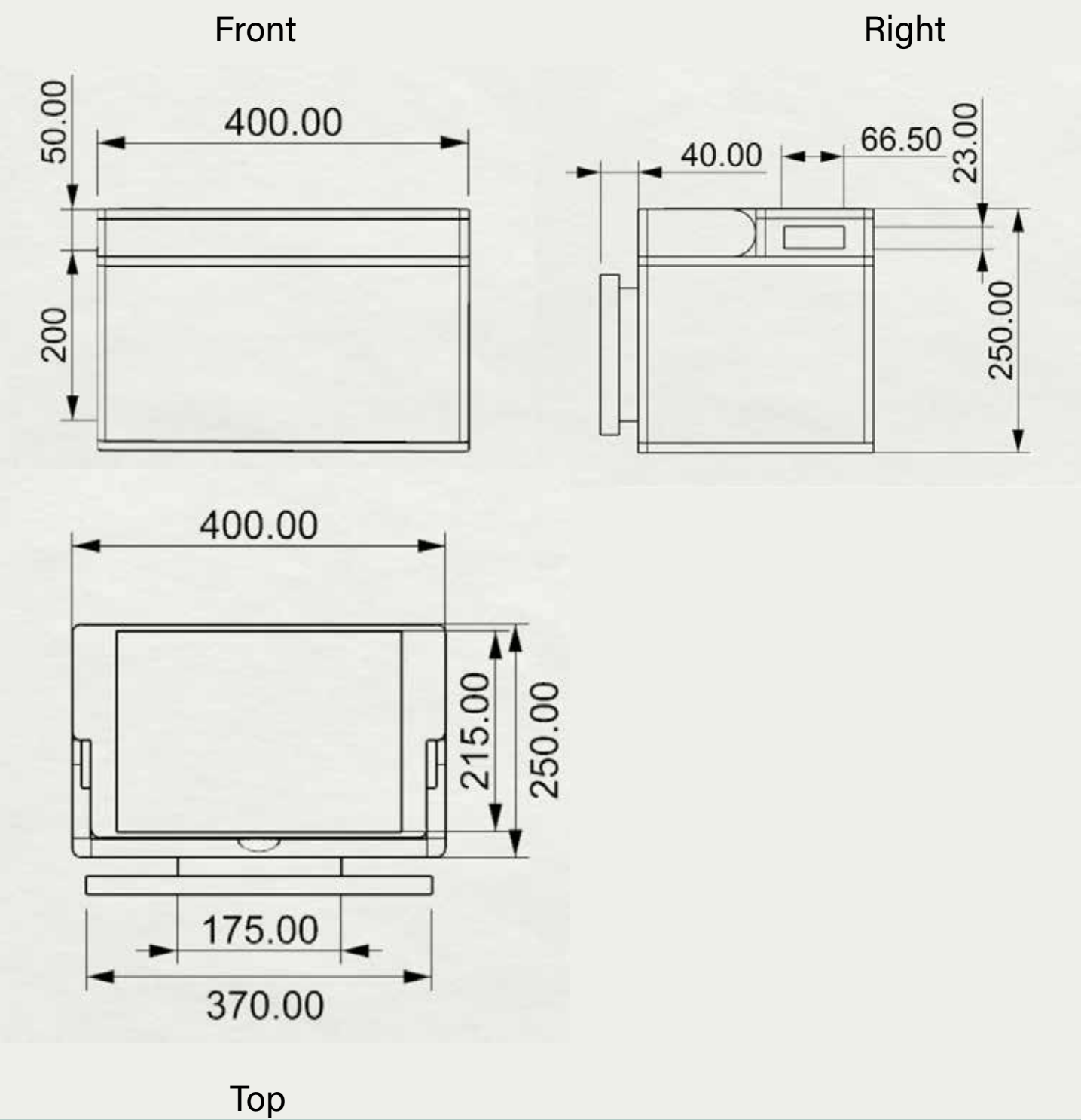
Mood Board



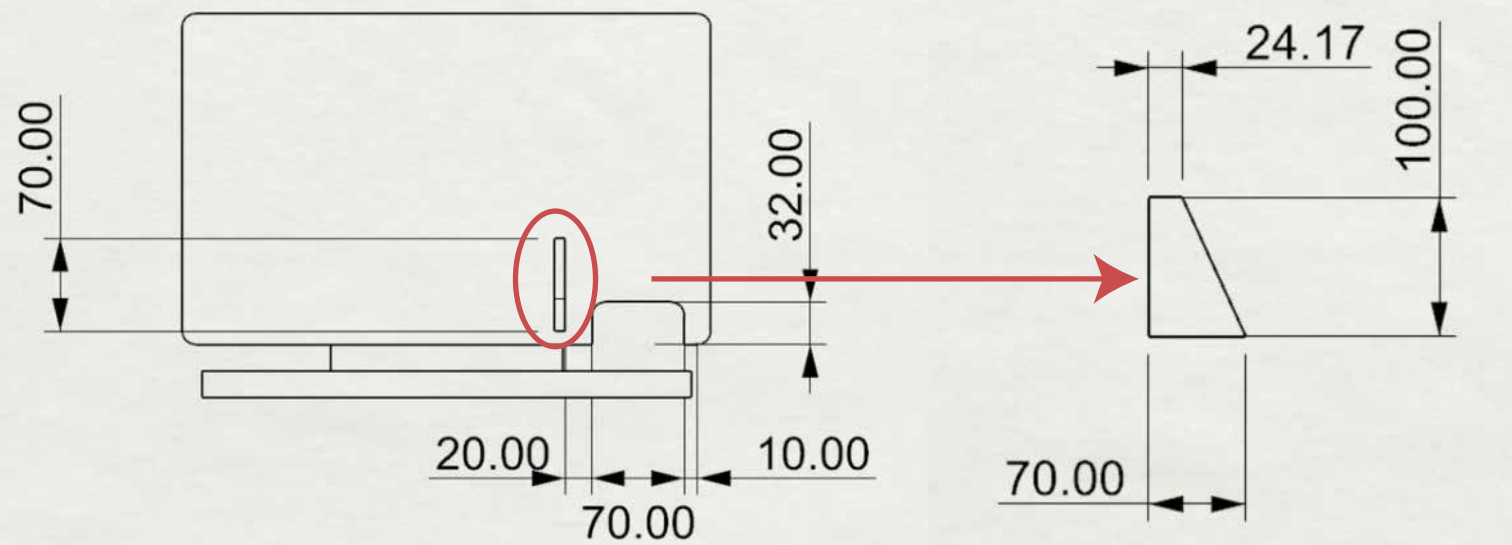
Sketch



Exterior of the swift nest box



Inside of a swift nest box



Material Choose

	Plywood	Recycled Water Pipe	Western Red Cedar	Wood-Plastic Composites (WPC)
				
Water resistance				
Insulation				
Weight				
Environmental protection				
Price				



Wood-Plastic Composites (WPC)



- Excellent water and weather resistance, suitable for long-term outdoor environments.
- Good insulation performance, can provide a comfortable nest environment for swifts.
- The material is strong and easy to process, enabling complex designs.

- Strong environmental protection, the use of recycled materials, in line with the needs of sustainable development.
- Medium cost, high cost performance.

Product Detail

Lifting handle
It is convenient for maintenance personnel to repair and replace the nest box

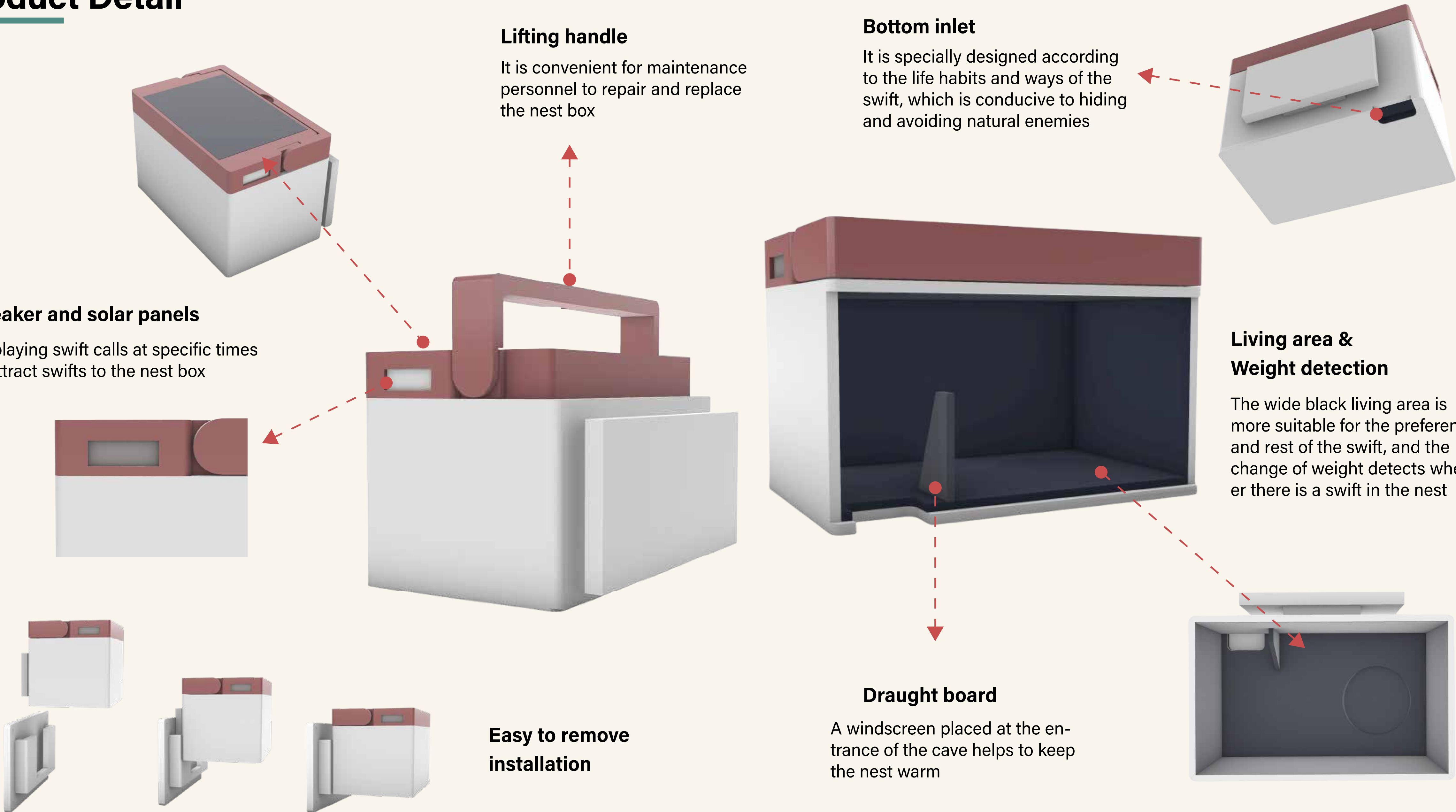
Bottom inlet
It is specially designed according to the life habits and ways of the swift, which is conducive to hiding and avoiding natural enemies

Speaker and solar panels
By playing swift calls at specific times to attract swifts to the nest box

Living area & Weight detection
The wide black living area is more suitable for the preferences and rest of the swift, and the change of weight detects whether there is a swift in the nest

Draught board
A windscreen placed at the entrance of the cave helps to keep the nest warm

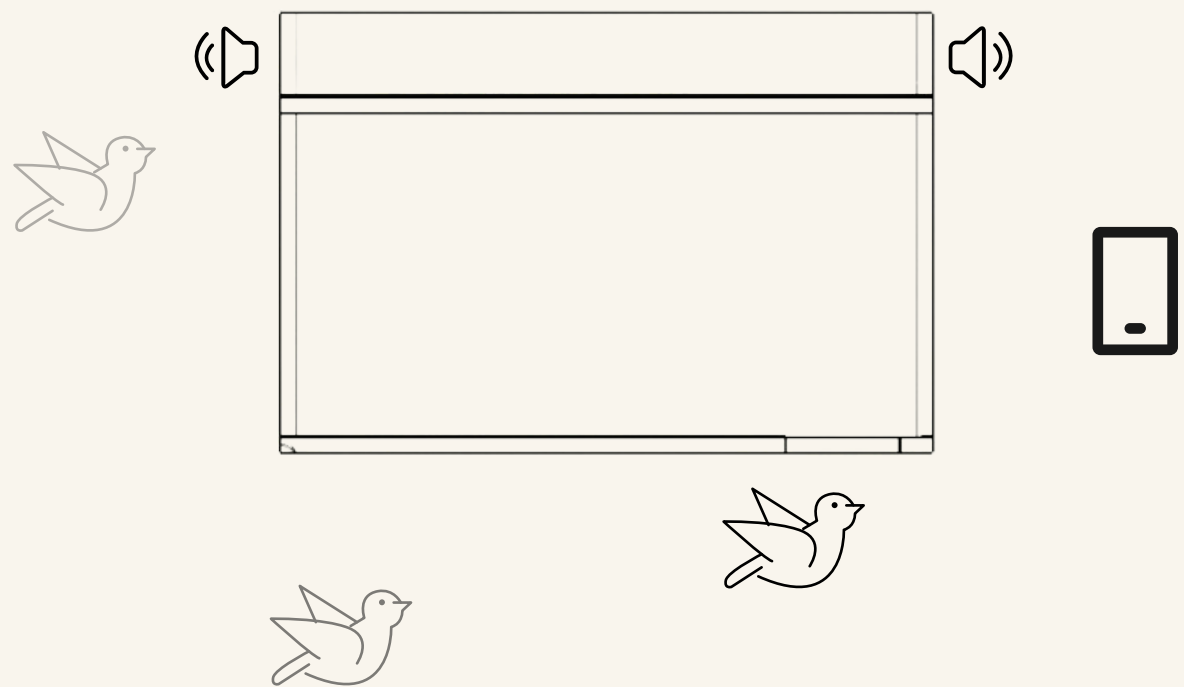
Easy to remove installation



Color matching

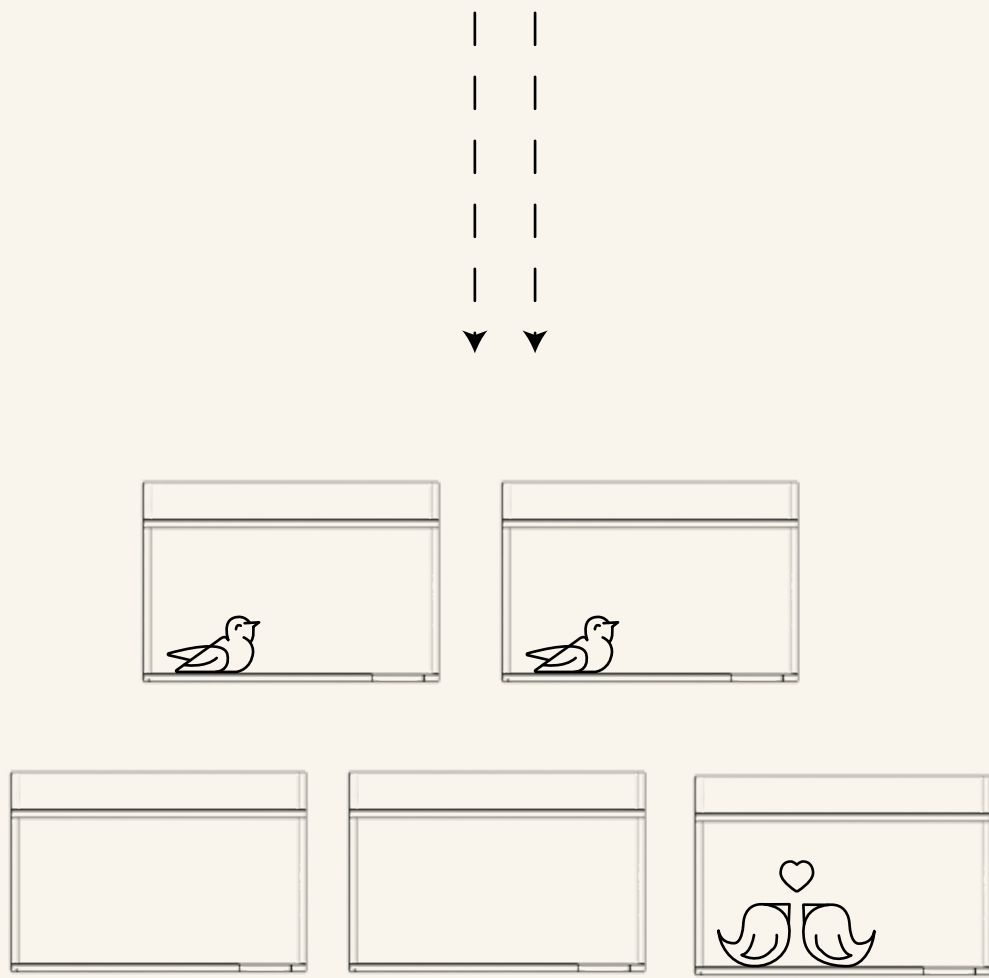


Product Use



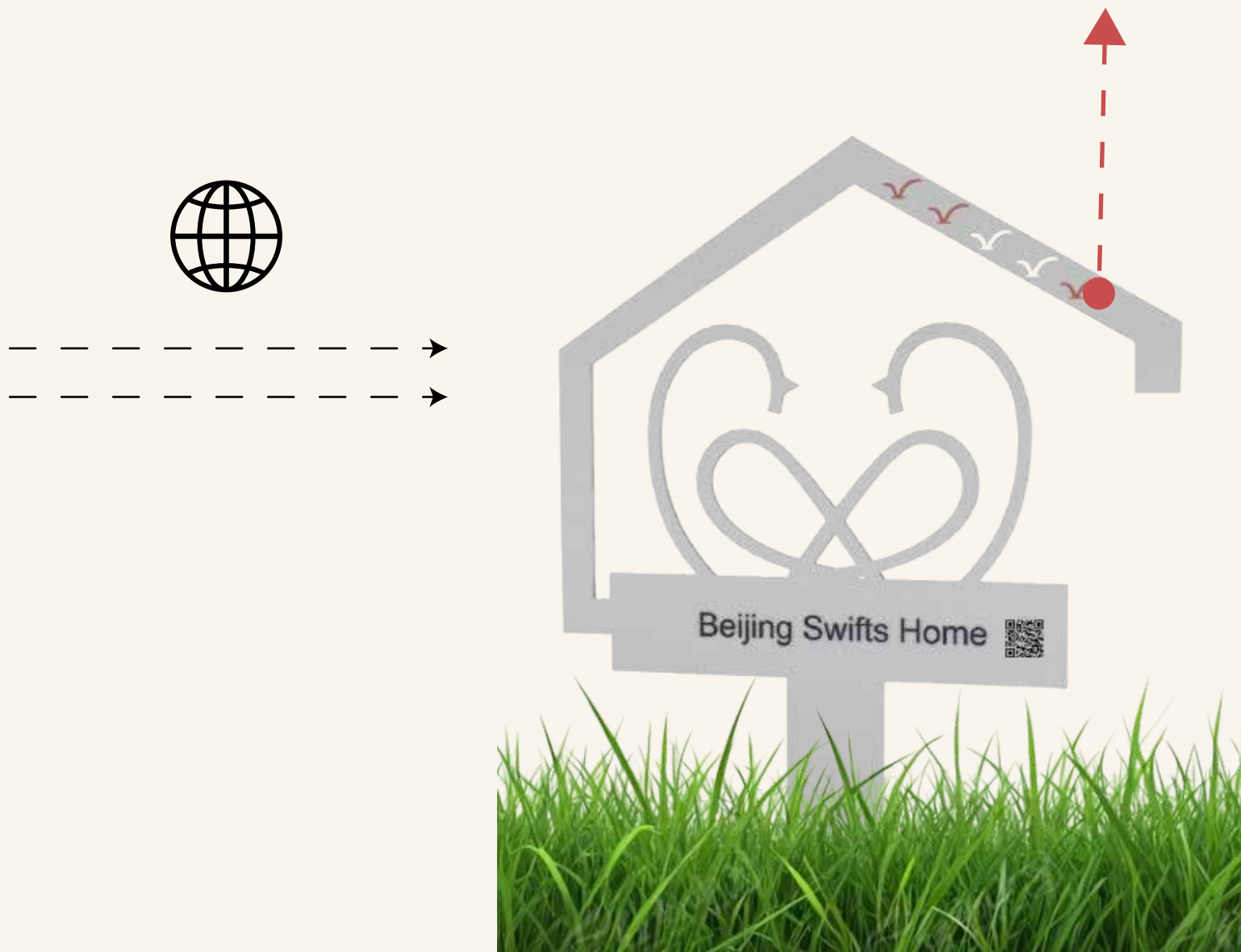
Use swift calls to attract swifts

At the end of March each year, users can control the nest box from their phones to play the high-fidelity calls of swifts in the morning and evening to attract swifts to stay.



Signboard

When a swift is detected moving into the nest box, the corresponding light on the sign will come on. One signboard corresponds to five swift nest boxes



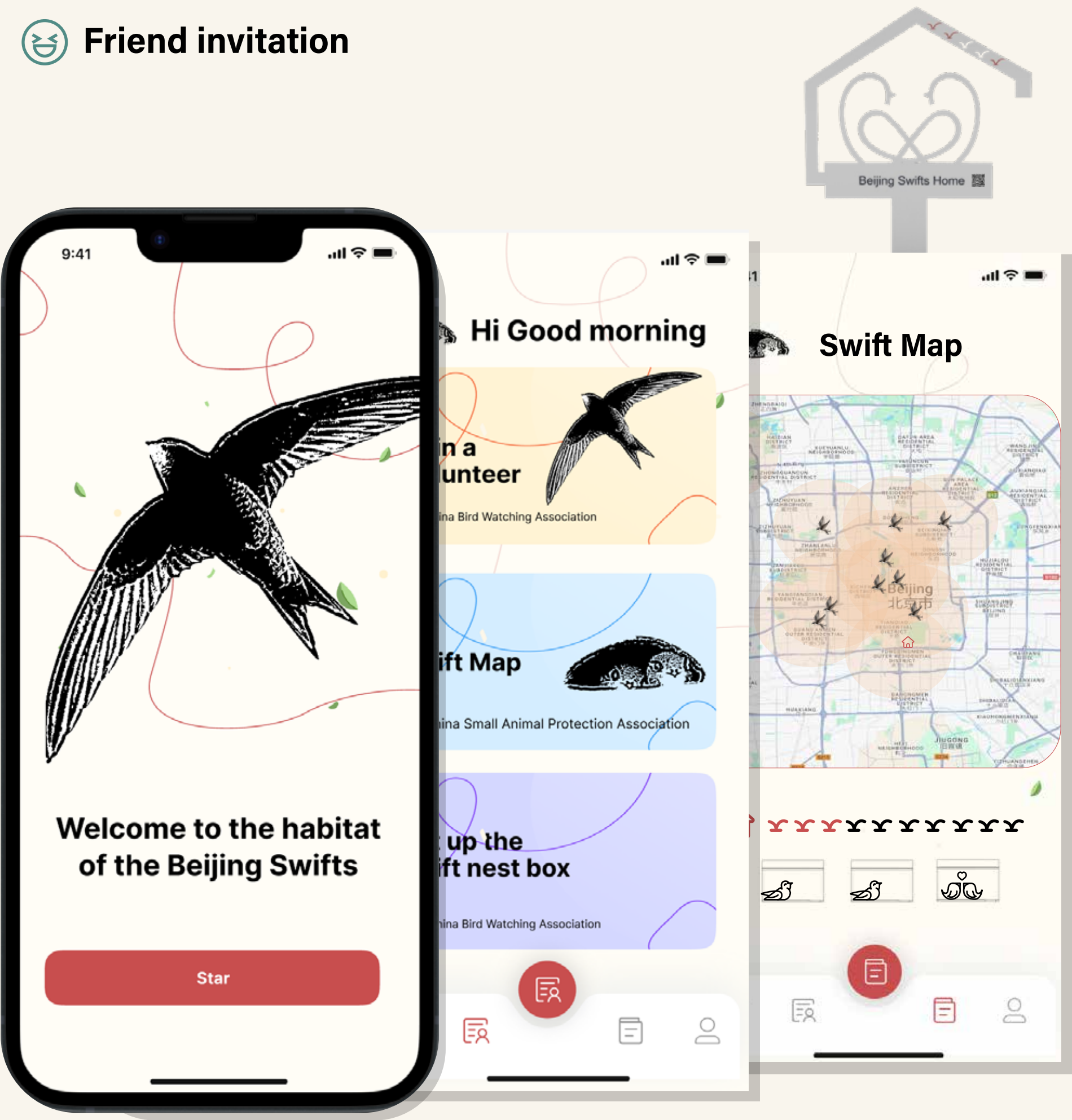
Weight detection swift check in

The change in weight determines whether the swifts are moving in, and how many swifts there are

APP Introduction

Only for people interested in swift conservation

- ☺ Scan the QR code on the street signboard
- ☺ Friend invitation



Structure of Swift Net Box App

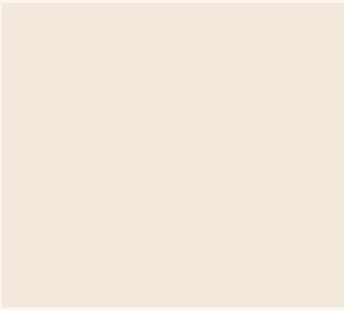




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