Design Ergonomics for Human Beings and Wild Animals in Densely Populated Cities: A Design Case in Hong Kong Country Parks

Kin Wai Michael Siu[1,*], Yi Lin Wong[1], Chi Hang Lo[1]

[1] School of Design, The Hong Kong Polytechnic University, Hunghom, Kowloon, Hong Kong
m.siu@polyu.edu.hk, yi-lin.wong@polyu.edu.hk, sdpaullo@polyu.edu.hk

Abstract. Country parks in Hong Kong are often located close to residential areas. The waste produced by people living in village houses has affected park wildlife, and animals such as wild boars (*Sus scrofa*; feral pigs, wild swine, wild pigs) have attacked people for food. Wild boars have destroyed waste management and collection points. Using Hong Kong as a case study, this paper examines the interaction between wild animals and humans in a country park and aims to develop a waste management system for both. Country parks in which wild boars were settled were investigated. Cleaning contractor staff, village lot residents, and policy makers were invited for interviews. Design perimeters and primary physical designs were then generated for testing.

Keywords: Coexistence · Waste management system · Wild animals · Nature · Densely populated cities

1 Introduction

The world is undergoing rapid and accelerated urbanization [1]. Country parks have become crucial elements of urbanized cities and countries in which nature is reserved and protected. They are also essential public spaces in densely populated cities because they serve as relaxation sites and offer fresh air for busy people during holidays and at weekends. Despite rumors that parts of country parks in Hong Kong will be removed and more public housing estates built [2], country parks are still of great importance, as such proposals are hard to implement. However, despite their importance, country parks and the wild animals that inhabit them are currently challenged by urbanization and the perpetual modification of the natural landscape [3-5].

In densely populated cities such as Hong Kong, country parks are often located close to residential areas. Recess areas (i.e., areas between country parks and residential areas) are often occupied by residents who visit nature frequently. Recess areas are subject to considerable human activity, with humans disturbing nature and wild animal habitats. In other words, human life frequently and rapidly invades nature. For instance, in Hong Kong, some village lots and country parks are separated by no more than a street. The waste produced by people living in village houses affects wildlife, and some animals, such as wild boars (*Sus scrofa*; feral pigs, wild swine, wild pigs),

attacked people, as they may interpret bags carried by humans as containing food. Villages are occasionally subject to wildlife raids [6]. In the conflict between wildlife and human life, wildlife occasionally adapts to urban environments [7].

Other countries have developed policies to manage the wild boar population [8]. However, Hong Kong cannot do so for legal reasons. Investigation and research have attempted to solve the issue. Using Hong Kong as a case study, this study examines the interaction between wild animals and humans in a country park and aims to develop a waste management system for both. Country parks in which wild boars are settled are investigated. Cleaning contractor staff, village lot residents, and policy makers were invited for interviews. Design perimeters and primary physical designs were then generated for testing. This paper suggests that city planning should not only consider human life in the city, but also scrutinize how human life and nature can coexist. Humans use not only the city but also nature.

2 Method

2.1 Field visits

Reports and complaints from villagers and other park users revealed the presence of wild boars in 56 country parks around Hong Kong. These wild boars moved in a group and had already found their dwelling places in these parks (Fig. 1. Wild boars in country parks.). All of the parks were visited. Their locations are shown in Fig. 2.

Fig. 1. Wild boars in country parks.

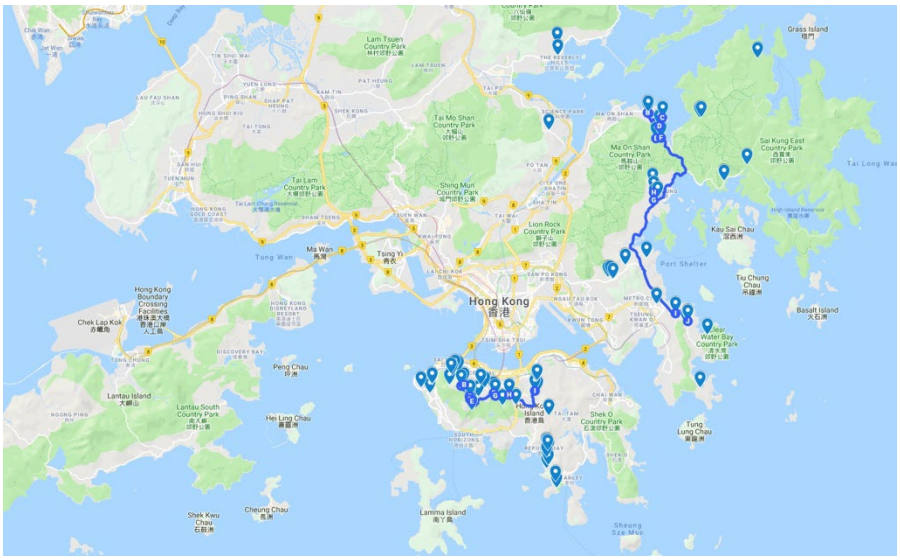

Fig. 2. Country parks in Hong Kong where wild boars were found (extracted from Google Map).

2.2 Interviews

Semi-structured interviews were conducted with the villagers, the cleaning staff of the waste management facilities, and government officers from the Agriculture, Fisheries, and Conservation Department (AFCD), the official department responsible for managing the country parks. The cleaning staff of the waste management facilities were interviewed because wildlife raids were often carried out at waste and recyclable collection points. The collection points were often located in the recess areas between the parks and village lots. In other words, it was easy for both villagers and wild animals to visit these areas. Fig. 3 shows the state of a facility in one of the country parks.

The interviewees were asked questions related to their first-hand experience and observations of wildlife raids and the upkeep of the waste management facilities. All of the interviews were recorded and coded.

Fig. 3. Waste management facility and recyclable collection point where wildlife raids took place.

3 Findings

3.1 Current issues

Fifty-six country parks were visited. The facility design was inadequate to cater to the needs of villagers. The following issues were identified.

- Not all of the waste management facilities were in good locations. Some of them were located next to wildlife.
- The facilities were sometimes broken and did not function well.
- Some of the villages were larger, produced more waste, and lacked sufficient space to store it (Fig. 4). The villagers had to dispose of waste outside the villages next to the wildlife.
- Garbage bins for storing waste bags were kept open at all times. Although this made it easier for the villagers to dispose of their waste, it also made it easy for wild boars to find food (Fig. 5).

Fig. 4. Overloaded waste management facility with waste bags on the road.

Fig. 5. Waste management facilities were kept open at all times for people to dispose of waste easily. However, this also helped wild boars to find food.

There was an apparent mismatch between the disposal habits of the villagers and the available facilities. This discrepancy encouraged wild boars to find food in the garbage bins and hence attack the villagers for more food. The management of the waste facilities was unsatisfactory.

3.2 Interviews

Interviews were conducted to investigate the behavior of the villagers, the difficulties of the cleaning staff, and the factors considered by the policymakers. Table 1 summarizes their responses.

Table 1. Findings from the interviews with the villagers, the cleaning staff at the waste and recyclable management facilities, and government officers from the AFCD.

Interviewees	Issues/considerations
Villagers	• Most of the household waste comprised food waste. Therefore, wild boars bit through the plastic bags that households threw out. When the boars saw people holding large plastic bags, they expected the bags to contain food and thus attacked the people to obtain it. • At broken facilities, some of the villagers threw their waste on the road carelessly. The wild boars bit through the plastic bags and made a mess. • Some elderly people fed the wild boars. Doing so was considered a charitable action and a virtue according to Chinese traditional values.
Cleaning staff	• It was dangerous to clean due to the frequent appearance of the wild boars. • More workers were needed to clean the facilities and waste management areas because the wild boars messed up the areas after finding food. • In the past, the staff had managed to clean up five locations a day. However, due to their increased workload, the staff now managed to clean up only two locations a day. Their work became less efficient, and the hygiene situation worsened. Hence, the staff complained more often.
AFCD officers	• The AFCD officers' major concern was to balance the natural ecology. • Raids occurred between the natural (i.e., country park) and living areas. This was not easy for AFCD to manage. The officers had to negotiate with different government departments. • According to Hong Kong law, the AFCD could not kill the boars, only take preventative measures. They could play only a passive role. Therefore, they found it hard to control and manage the situation. • The AFCD ran many public education programs, such as educating the public not to feed the boars. However, Chinese traditional values made the outcomes unsatisfactory.

In view of the interview findings, apart from educating the villagers to develop a good habit of disposing waste using educational programs and notices, it was deemed necessary to redesign and develop the waste management facilities to change the villagers' behavior. Design can be used proactively to educate and reshape behavior. In this case, the design is required to prevent wild boars from finding food in garbage bins.

3.3 Proposed Design Solution

Some design suggestions are listed below. These suggestions would help to prevent wild animals from finding food and reshape the behavior of garbage bin users.

1. A small opening should be installed to prevent oversized rubbish from being thrown into the garbage bins.
2. A dome-shaped, slippery opening would prevent rain from entering the bins and wild animals (wild boars and other animals) from climbing onto the bin roofs.
3. A foot pedal could be installed to open the bin. This would make it more difficult for the animals to open the bins.
4. A dual opening (one small and one large) could be installed for easier garbage disposal and removal.
5. A metal fence with the pavilion design of the bins should be installed to create a solid shield against wild boar attacks.
6. The edges of the bins could be made of cylindrical roller fencing to prevent wild animals from climbing onto the rubbish bins by grasping the edges.
7. Locks should be installed to prevent the bins from moving away from the fence and to help cleaners to move the bins.
8. All parts of the bins and fence should be easy to install and replace for maintenance.

All of these suggestions are meant to (1) prevent wild boars (and other wild animals) from getting food from the garbage bins, (2) help cleaners to use the bins more effectively, (3) allow users to use the bins easily so that waste can be disposed of properly, and (4) facilitate management and maintenance. The suggestions may be applied not in a single design but in several designs. In other words, designers may mix and match these suggestions according to the situation. A more useful and effective design may be generated to resolve any issues.

4 Conclusions

Based on the data collected from the field studies, wild animals, villagers, and facilities have subtle relationships. Although population management measures cannot be imposed on wild animals and educational programs for villagers have been unsuccessful, new designs of waste management facilities can be generated to address the problems.

In short, humans' misunderstanding causes the imbalance between wildlife and the urban living style. A new design should be generated and manufactured for pilot testing in different country parks in Hong Kong. Other animals, such as monkeys, cause different kinds of problems, such as stealing food and messing up garbage bins in country parks on mountains in Hong Kong. Similar measures have been adopted to improve the situation. Success has been achieved, and the new design for wild boars should represent a breakthrough in waste management systems.

City planning should not only consider human life in the city but also scrutinize how human life and wildlife can coexist. Both humans and wild animals use nature.

Land planners, designers, and policy makers must consider both to achieve and maintain harmony and thereby conserve wildlife in an urban landscape [9].

Acknowledgments

The authors wish to acknowledge the support provided by the AFCD of Hong Kong for the data collection and preparation of the paper. The authors thank The Hong Kong Polytechnic University for its manpower support for the research. The Eric C. Yim Endowed Professorship provided financial support for the data analysis.

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