

Bird-friendly buildings for China's cities

China's rapid urbanization has resulted in the proliferation of glass buildings, as has been the case elsewhere in the world. Bird collisions with glass buildings are now an important global factor in bird mortality (1). To prevent bird deaths in a country that hosts numerous vulnerable species, China should invest in research on bird-friendly building design and update building codes and regulations accordingly.

During the day, birds fail to perceive transparent windows as solid surfaces because the glass reflects images of the sky or local habitat (2). At night, artificial light can disorient and attract birds, leading to more collisions (3). In the United States, such collisions kill as many as 365 million to 988 million birds annually (4).

Three major migratory bird flyways (East-Asia Australasian, West Pacific, and Central Asian) cross China, covering almost the entire country (5). Tens of millions of migrating birds fly across China each year, with more than 400 bird species using the East-Asia Australasian flyway alone (6). The growth of tall buildings now poses a severe collision risk to birds. In 2020, 106 buildings exceeding 200 m in height were completed globally; more than half of them were in China (7), but little attention has been given to collision threats. Preliminary data from a citizen science project suggest that most collisions occur in rapidly urbanizing provinces such as Guangdong, Shanghai, and Zhejiang (8). Of the birds that were observed striking buildings, 78% died from their injuries (8).

China and other countries with substantial numbers of glass buildings should work to minimize bird collisions. Films or netting applied to the outside of windows are most effective (9). New building regulations should require glass that is less reflective, translucent, or opaque, and windows should be angled or have smaller panes (10). Green building standards already require energy efficiency and the use of recyclable building materials (11). Architectural green credentials should be expanded to include features that mitigate bird collisions with buildings.

Hong Yang^{1,2*}, Xianjin Huang², Julian R. Thompson³, Roger J. Flower³

¹School of Geography and Ocean Science, Nanjing University, Nanjing, 210023, China. ²Department of Geography and Environmental Science, University of Reading, Reading, RG6 6AB, UK.

³Department of Geography, University College London, London, WC1E 6BT, UK.

Corresponding author. Email: hongyanghy@gmail.com

REFERENCES AND NOTES

1. S. R. Loss, T. Will, P. Marra, *Annu. Rev. Ecol. Evol. Syst.* 46, 99 (2015).
2. C. S. Machtans, C. H. R. Wedeles, E. M. Bayne, *Avian Conserv. Ecol.* 8, 6 (2013).
3. M. Rebke et al., *Biol. Conserv.* 233, 220 (2019).
4. US Fish & Wildlife Service, "Threats to birds: Migratory bird mortality—questions and answers" (2021); www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.
5. D. L. Yong et al., *Front. Ecol. Evol.* 10.3389/fevo.2021.613172 (2021).
6. Y. J. Xu et al., *Landsc. Ecol.* 34, 243 (2019).
7. Council on Tall Buildings and Urban Habitat, "CTBUH year in review: Tall trends of 2020" (2021); www.skyscrapercenter.com/research/CTBUH_ResearchReport_2020YearInReview.pdf.

8. "123 bird-window collisions in three months" (2021); www.163.com/dy/article/GDTUQH420512RQI0.html [in Chinese].
9. N. Ocampo-Penuela et al., *PeerJ* 4, e1652 (2016).
10. D. Klem et al., *Wilson Bull.* 116, 69 (2004).
11. World Green Building Council, "What is green building?" (2021); www.worldgbc.org/what-green-building.