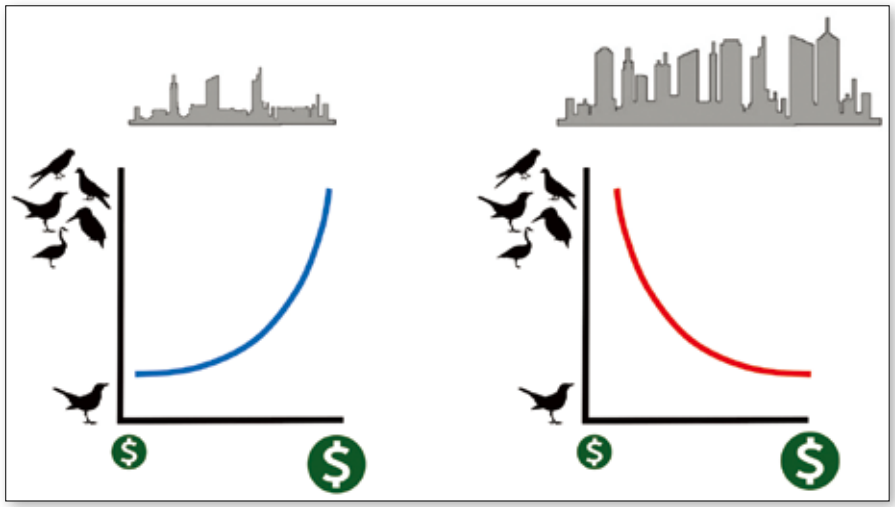
# cities' limits



Urbanisation represents one of the most severe and irreversible forms of human impact on the planet. The expansion of urban infrastructure generally has negative consequences for biodiversity. However, within urban areas there is evidence that biodiversity correlates with improved socio-economic status. This has been termed the 'luxury effect', which suggests that in urban landscapes specifically, areas of greater wealth have relatively enhanced biodiversity compared to poorer ones.

The 'luxury effect' is well documented for single large cities within developed countries. However, no studies have considered animal biodiversity in relation to socio-economic gradients in Africa, despite it having the highest levels of people living in poverty. This led a team of researchers from the University of Turin and the FitzPatrick Institute of African Ornithology to undertake the first ever analysis of the 'luxury effect' for African cityscapes. The researchers made use of the second South African Bird Atlas Project (SABAP2) to determine bird species richness across 22 metropolitan areas in South Africa. The incredible spatial coverage of SABAP2, in combination with income data derived from the South African National Population Census and remotely sensed data on urban land cover, allowed for an in-depth analysis of how bird diversity changes in relation to socio-economic status and urban development at a national level.

The study, published recently in *Global Change Biology* (*https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.14682*), was based on four years of SABAP2 data that were carefully chosen to match the temporal range of both the urban land cover and census data. A rigorous analysis allowed the researchers to accurately determine species richness per pentad and to test how this richness varied in relation to the median annual household income and percentage cover of urban infrastructure in the same pentad. The result was clear: for relatively low-density urban landscapes in South Africa, rich areas have a greater diversity of bird species than poor areas. Critically, the researchers were able to show that as landscapes become more urbanised, bird diversity of rich areas declines. This suggests that improving the socio-economic status of the poorer inhabitants of South Africa's cities will initially present a win-win for biodiversity and human well-being, but that there is a threshold of urban development beyond which biodiversity starts to decrease. The research suggests that maintaining green spaces in at least an equal proportion to the built environment is likely to provide a development strategy that will enhance urban biodiversity and bring with it lifestyle benefits for urban dwellers.

Once again, SABAP2 has provided researchers with critical data to tackle novel, broad-scale questions that are relevant for policymakers. Even though pentad-level data could be considered relatively coarse grained for the usually short gradients associated with studies of urban landscapes, the SABAP2 data proved invaluable in providing a first glance into urban sustainability challenges in the developing world. Thanks to the outstanding efforts of the SABAP2 citizen scientists, this research forms a key contribution to a wider strategy to expand urban settlements in a sustainable way to provide for the growing urban population in South Africa, including addressing imbalances in environmental justice.

CHEVONNE REYNOLDS

*By analysing the relationship between bird species richness and income level of urban dwellers in South Africa, we tested the 'luxury effect', which posits a positive correlation between wealth and biodiversity. We found that the relationship between species richness and income differed across an urbanisation gradient. The 'luxury effect' was evident in areas of lower urbanisation, while the opposite pattern was found in more urbanised areas.*