Comment on “China’s solar expansion policy reduces bird diversity”

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Published in Science on 20 August 2026 [1], “China’s solar expansion policy reduces bird diversity” has garnered unusually swift and broad media coverage from Agence France-Presse [2] and Lianhe Zaobao [3] within days. While its Altmetric score of 412 at August 26, surpassing 99% of same-age papers, underscores the extraordinary level of immediate attention it has received. In July 2026, China’s 15th Five-Year Plan for Renewable Energy Development set a direction of “scale expansion, quality improvement and reliable substitution” [4] In this period, such a finding carries substantial implications and has already been politicized, and the magnitude of its central estimate has been publicly questioned. Under the Planetary Health framework, biodiversity loss and human health are inseparable, so verifying this estimate is a matter of consequence for health policy as well as for science.

Summary

The paper reports that the stringency of China’s solar-photovoltaic policy (PSI) significantly reduces county-level bird diversity (coefficient −0.0125, $p < 0.01$). In light of this finding, the authors themselves make a prescriptive recommendation: “Future photovoltaic development should be accompanied by strict biodiversity safeguards, especially in economically developed regions with high habitat complexity.” Complementing this policy call, the handling editor Sacha Vignieri offers a broader contextual note: “Solar energy represents one of the cleanest forms of renewables, but solar farms can greatly alter the environment.”

However, given that the underlying data are citizen-science bird observations, self-reported by amateur volunteers, one might suspect that solar farm developments could reduce site accessibility to birders from visiting those areas, thereby reducing observer presence and producing an observed decline in bird counts that does not necessarily reflect a genuine population decrease. Our analysis shows, however, that the PSI coefficient reported in the original study is driven not merely by potential access barriers but more fundamentally by an inadequate treatment of observer effort.

The Ornithological Branch of the China Zoological Society has already questioned the paper's conclusions from a data-quality standpoint [5]. We add independent, quantitative evidence from a specification standpoint: even accepting the data from citizen-science bird observations, once observer-hours and observer numbers are controlled separately rather than merged into a single ratio, the central estimate loses statistical significance. The two lines of evidence corroborate each other and jointly indicate that the reported negative effect is not established.

1. The paper controls observer effort with a merged, non-standard variable

The paper's treatment of observer effort is problematic. It controls for effort using a single composite measure, duration per observer, that combines observer hours and the number of observers into one ratio. This loses critical information, because more observers and longer hours affect bird records in fundamentally different ways: additional observers expand spatial coverage, while extra hours deepen sampling at a single site. Once these two components are separated and controlled individually, the reported negative effect of PV policy disappears. In our replication, observer numbers alone turn out to be a strong predictor of recorded diversity, and they correlate negatively with PV policy stringency within counties. This is not a marginal choice: established guidelines for citizen-science bird data, such as the eBird best-practices guide [6], explicitly recommend treating duration, distance, and observer numbers as separate controls—a practice the original paper does not follow.

2. Controlling observer effort separately renders the effect insignificant

We re-estimate the main specification on the full replication sample (N = 46,371), varying only how observer effort is controlled. Throughout, we retain the paper's fixed-effects structure (county and year-month effects) and county-clustered standard errors. All columns are estimated on the identical sample.

Tabel 1. Association between solar policy stringency and bird diversity under alternative observer-effort adjustments.

	(1)	(2)	(3)	(4)
	ShannonBD	ShannonBD	ShannonBD	ShannonBD
PI	-0.0125***	0.0010	0.0038	0.0040
	(0.0037)	(0.0032)	(0.0033)	(0.0033)
Duration	0.1638***	-0.3071***	0.1267***	0.2316***
	(0.0057)	(0.0102)	(0.0054)	(0.0250)
lnBT		0.3858***		-0.0925***
		(0.0089)		(0.0213)
lnBN			0.4766***	0.5785***
			(0.0108)	(0.0272)
Observations	46,371	46,371	46,371	46,371
Adj. R-squared	0.2999	0.3864	0.3990	0.3994
Year-month FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is the Shannon bird-diversity index (ShannonBD), and reported coefficients are for the solar-policy stringency index (PSI). All models include the paper's full control set (temperature, wind, population, Duration, carbon, water, green, farmland, and grassland cover) together with county and year–month fixed effects; standard errors are clustered at the county level. Duration = ln(BT/BN + 1), where BT is observer-hours and BN is the number of observers. Model (1) is the paper's specification. Models (2)–(4) additionally control for ln(observer-hours + 1), ln(number of observers + 1), or both, respectively, thereby restoring the observer-effort dimensions that the merged Duration variable discards. The sample is the full replication sample (N = 46,371) in every column.

The paper's specification yields a PSI coefficient of -0.0125 ($p < 0.01$). Yet adding either observer dimension alone is sufficient to render the coefficient statistically indistinguishable from zero: controlling only observer-hours (model 2) or only observer numbers (model 3) shifts the coefficient to +0.0010 ($p = 0.76$) and +0.0038 ($p = 0.25$), respectively. Controlling both (model 4) gives +0.0040 ($p = 0.22$). In every specification that controls observer effort in the standard practice, we do not observe a significant correlation between PSI and bird diversity. The central estimate is therefore not robust to a single, non-standard control choice, namely the merged “duration-per-observer” ratio.

A useful auxiliary check reinforces this reading. In the paper’s mechanism analysis, the only channel that survives the third step of a Baron-Kenny mediation test is nighttime light. But the nighttime-light coefficient falls from 0.0164 ($p < 0.001$) to 0.0044 ($p = 0.110$) once observer numbers are controlled, indicating that the apparent “nighttime light” channel is itself a proxy for observation propensity, not an ecological mechanism.

3. Discussion

The empirical conclusion that China’s solar photovoltaic policy significantly reduces bird diversity is not established, because it rests entirely on a non-standard and flawed control for observer effort; once the field’s standard practice is adopted, statistical significance dissipates immediately. Moreover, a complete ecological assessment of PV policy must also weigh the carbon-mitigation benefit against any local habitat cost, since global warming is itself a leading driver of bird biodiversity loss (e.g., a 25%-38% decline in tropical bird abundance attributed to heat-extreme intensification [7]). We therefore recommend that future work (i) control for observer effort (duration, distance, number of observers, and protocol type) as covariates in all regression models, and (ii) evaluate the policy’s net effect by jointly accounting for biodiversity and carbon outcomes. Automated acoustic and camera-based monitoring could in the longer term replace volunteer-reported observations and remove the reporting bias at its source.

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Conflict of interest statement

None.

Data, code, and materials availability

Our data, code, and materials, are publicly available on Github (https://github.com/wipen/China-s-solar-expansion-policy-reduces-bird-diversity).

Declaration of generative AI

During the preparation of this work, the author used DeepSeek V4 for two primary purposes:

(1) language polishing of the manuscript, including improving sentence clarity, enhancing paragraph transitions, and refining word choice to improve readability and precision; and

(2) assisting in the writing of data analysis code, including generating code skeletons and providing debugging suggestions.

All AI-generated or AI-suggested content was carefully reviewed, verified, and, where necessary, manually revised by the author. In particular, AI-generated code was independently tested and the results cross-checked to ensure accuracy. The author takes full responsibility for the final content of the published article.

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