

## Comments on ESSD-2026-131

This manuscript presents AGPC, an annual 500 m gridded population dataset for mainland China covering 1990–2020. By incorporating time-varying 3D building information together with building functional attributes, the dataset provides an improved representation of population distribution in vertically developed urban environments. The long temporal coverage and nationwide consistency make the dataset valuable for studies of urbanization, environmental change, and human–environment interactions. Overall, the topic is interesting and the manuscript is well organized, and the dataset represents a useful contribution to the ESSD community. However, several minor comments should be addressed before reconsideration for publication. These comments are attached below.

1. The Introduction mentions that previous studies have rarely incorporated building height or volume information into gridded population mapping. However, several recent studies closely related to this topic are not discussed, for example, Lei et al. (2024, [doi.org/10.3390/ijgi13090335](https://doi.org/10.3390/ijgi13090335)) and Tu et al. (2026, [doi.org/10.3389/feart.2026.1748599](https://doi.org/10.3389/feart.2026.1748599)). Although these studies focus on either a single year or limited regions, citing and briefly discussing them in the Introduction would provide a more comprehensive review of the current state of the field and better position AGPC relative to existing work.
2. The description of the model training and validation procedure is currently not sufficiently clear and may lead to confusion. Lines 133–137 state that five-fold cross-validation was performed and that “in each fold, the data were randomly split into 70% for model training and 30% for validation.” In contrast, Lines 410–415 describe a fixed 70/30 training–validation split, followed by five-fold GridSearchCV performed on the training subset. Please clarify the exact workflow and revise the corresponding description to avoid misunderstanding.
3. The manuscript states that separate baseline models were developed for 2010 and 2020, and then subsequently extended to other years. However, it is unclear how these models were applied to each five-year time point. Please specify which baseline model was used for each historical year (1990, 1995, 2000, 2005, 2015, etc.), or explain the criteria used to determine the temporal transfer strategy.
4. The finest-level validation data (township-level census records) appear to represent only a subset of townships rather than complete national coverage. As shown in Fig. 1, the spatial distribution of these samples is uneven, with some regions being sparsely represented. If additional township-level census records are available, it would be beneficial to include more validation samples from these underrepresented regions to improve the geographical representativeness of the evaluation.
5. The comparison with existing gridded population datasets is currently limited to statistical metrics. Adding several representative map comparisons with existing datasets (e.g., WorldPop or other widely used products) would provide a more intuitive evaluation of the dataset. Visual comparisons over typical urban and rural regions would help readers better understand the spatial differences among the datasets and more clearly demonstrate the advantages of AGPC, particularly in densely built urban areas where the incorporation of dynamic 3D building information is expected to provide greater improvements.

6. Lines 459–460 state that “six five-year intervals between 1990 and 2020 were systematically validated.” This wording is potentially ambiguous because the study actually validates seven time points separated by six five-year intervals.

7. The caption of Fig. 9 should be population counts per grid rather than population density

8. Correct editorial inconsistencies throughout the manuscript.

- “Grided” should be corrected to “Gridded” throughout the manuscript.
- Line 445: delete “on”.
- Line 514: “that” → “than”.
- Line 338: remove the extra period following Section 3.5.
- The last column of Table 5 under rRMSE (%) should be labelled “Validation” instead of “Training”.
- Line 660: “3D built-up coverage” should be “2D built-up coverage”.
- Line 701: “conventional 3D population products” should be “conventional 2D population products”.
- In Fig. 11, “dependency” should be “dependence”.
- Eq. (8) appears to contain a notational error, where an unnecessary subscript  $i$  is included and should be removed.