

Response to comments

Paper #: essd-2021-285

Title: GISD30: global 30-m impervious surface dynamic dataset from 1985 to 2020 using time-series Landsat imagery on the Google Earth Engine platform

Journal: Earth System Science Data

Community Comment #1

Thanks for your contributions! I have several questions:

Great thanks for your comments. Each comment has been responded at below.

1. What projection is used for the generated products? Did you equal area to facilitate calculation of areas? If not equal area, which approach did you use to account for discrepancies in area of pixels?

Great thanks for the comment. The GISD30 dataset used the geographical projection for the convenience of users. Yes, when we calculated the impervious surface area at regional and continent scales, the dataset was reprojected to the sinusoidal equal area projection because there was serious **area deformation in the latitude direction** for geographical projection.

2. What approach did you use for calculating the area: directly from the map or from samples? The former is a pixel counting estimator which is biased. From confusion matrices, one can observe that PA and UA are not balanced, and therefore land cover area over/under-estimation can happen. For all area calculations, what are the uncertainties, since produced maps are not error-free?

Great thanks for the comment. All area statistics in the manuscript were derived from the map. Yes, based on the confusion metrics, the area statistics in current manuscript were biased. According to the suggestion, the uncertainties of the area calculations have been calculated.

Specifically, based on the work of Olofsson et al. (2013), the area uncertainties can be estimated as:

$$Uncertain = \pm 2 \times A \times \sqrt{\sum_{i=1}^q W_i^2 \frac{n_{ij}(1 - \frac{n_{ij}}{n_{i.}})}{n_{i.}-1}}, \quad W_i = A_{imp}/A$$

where A_{imp} and A is the mapped impervious area in this study and the total area of the map, q is the number of land-cover types, n_{ij} and $n_{i.}$ denotes the element in the confusion matrix.

Based on the confusion matrix in the Table 1 and the mapped impervious areas, the area uncertainties of impervious surfaces were calculated in 1985 and 2020 were: $\pm 4.502 \times 10^4 \text{ km}^2$ in 1985 and $\pm 4.455 \times 10^4 \text{ km}^2$ in 2020, respectively.

Olofsson, Pontus, et al. "Making better use of accuracy data in land change studies: Estimating accuracy and area and quantifying uncertainty using stratified estimation." Remote Sensing of Environment 129 (2013): 122-131.