**Supplementary Material**

Table S1. Reclassification of the reference and target dataset for accuracy assessment analysis. The reference (GLC-SHARE) and classified (LUH2) data were reclassified into four common classes: (1) forest, (2) crops, (3) open areas, and (4) urban. Classes absent in the focus dataset were masked-out.

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| --- | --- | --- |
| **original class code** | **original** **class name** | **code (name) after reclassification** |
| GLC-SHARE |
| 1 | Artificial surfaces | 4 (urban) |
| 2 | Cropland | 2 (crops) |
| 3 | Grassland | 3 (open areas) |
| 4 | Tree covered areas | 1 (forest) |
| 5 | Shrubs covered areas | 3 (open areas) |
| 6 | Herbaceous vegetation, aquatic or regularly flooded | 3 (open areas) |
| 7 | Mangroves | 3 (open areas) |
| 8 | Sparse vegetation | 3 (open areas) |
| 9 | Bare soil  | 3 (open areas) |
| 10 | Snow and glaciers | masked-out |
| 11 | Water bodies  | masked-out |
| LUH2 |
| 1 | C3 Annual Crops (c3ann)  | 2 (crops) |
| 2 | C3 Nitrogen-Fixing Crops (c3nfx) | 2 (crops) |
| 3 | C3 Perennial Crops (c3per) | 2 (crops) |
| 4 | C4 Annual Crops (c4ann) | 2 (crops) |
| 5 | C4 Perennial Crops (c4per) | 2 (crops) |
| 6 | Managed Pasture (pastr) | 3 (open areas) |
| 7 | Forested Primary Land (primnf) | 1 (forest) |
| 8 | Non-Forested Primary Land (primn) | 3 (open areas) |
| 9 | Rangeland (range) | 3 (open areas) |
| 10 | Potentially Forested Secondary Land (secdf) | 1 (forest) |
| 11 | Potentially Non-Forested Secondary Land (secdn) | 3 (open areas) |
| 12 | Urban Land (urban) | 4 (urban) |



Figure S1.Framework to generate land use and land cover states of Land-Use Harmonization (LUH2, Hurtt et al . 2020)



Figure S2.Workflow: 1) Extract every single state (state-files) per year from 850 to 2100, with two future scenarios (SSP2 and SSP5) from 2015 on; 2) Save every state-files (continuous data) in TIFF format; and  3\*) Create new categorical data (LULC-files) of land-use land-cover combining 12 state-files in TIFF format.