Thank you for the comments and suggestions. These comments are very helpful for revising this paper. We revised this paper and responded to the comments point by point.

Reviewer #1:

Comment 1: The authors have made a good effort to address previous concerns. But I have a few more concerns about this revision. One of my concerns is the definition of the urban area and the derived urban boundary. How did CLUD define the urban area and distinguish the urban areas from rural settlements and others (industrial and traffic lands)?

Response: Thanks for your comments and suggestion. I agreed with you that the separation of urban area from rural settlements and others is difficult if no extra information is used. Fortunately, in our case, we have the CLUD data and define the urban area based on visual interpretation on the Landsat images by support of field survey and satellite images, thus, we can make sure that we produce accurate urban area by excluding rural settlements and other possible areas that may not belong to urban area.

In CLUD dataset, the construction land was divided into three second-level classes – urban land, rural settlements, and others (See Figure 2 and Figure 3). Urban land was defined as a built-up area of the concentrated construction, i.e. buildings, roads, squares, green infrastructure and other lands for providing the living, industrial production, and ecosystem services for the dwellers of cities or towns (Kuang, 2020a). They can be megacities (more than 10 million population), megalopolis (5-10

million population), large cities (1-5 million population), medium cities (0.5-1 million population), small cities (0.2-0.5 million population), and towns (less than 0.2 million population).

In digital interpretation for producing CLUD, we built firstly the detailed image interpretation symbols for each second-level land use class from Landsat or similar resolution images. Usually, the polygons of urban lands exhibit larger sizes than rural settlements and others (industrial and traffic lands) in cinerous color ornamenting with white. The digitalized personnel can differentiate the urban land from rural settlements and others based on the established interpretation symbols and geo-knowledge from field investigation.

Changes of manuscript: We added texts to provide the definition of urban area in 4.1 The classification system and interpretation symbols (See L140-145).

We added an explanation on how to distinguish the urban areas from rural settlements and others in section (4.2 Land use and dynamic polygon interpretation) (See L150-160).

In Figure 12, it looks like the core built-up area is classified as an urban area, which also includes industrial and traffic lands. I understand that the vector polygons of urban boundaries were converted to raster data with 30 X 30 m cell size, but how about the uncertainty of vector polygons since the human-computer interaction may induce the errors.

Response: Indeed, the industrial and traffic lands located in built-up area are

contained in urban land. However, the industrial and traffic lands outside cities are excluded in the definition of urban land. We provided Figure 3 to show the polygons of both code 51 and code 53.

The urban vector boundaries were acquired from Landsat images or similar resolution images. Therefore, the vector polygons were converted to raster data with 30 m X 30 m resolution. The accuracy of vector polygons from the human-computer interaction were assessed. The users' accuracy of urban land type is relatively high with 93.67% in 2010, 92.65% in 2015, and 91.32% in 2018 (Table 2).

Changes of manuscript: We added texts to give explanations in section (4.1 The classification system and interpretation symbols).

We added a sentence in section (4.3 Retrieval of multitemporal urban boundaries) to explain the issue.

This paper aims to track the long-term UGS/UIS change in China therefore the validation of change maps is of great importance. It would be better to give more information on the UGS/UIS validation samples within the changing area every year, e.g. how many changed validation samples every five years? what is the accuracy of the change samples of UIS and UGS?

Response: Thank you for your comments. Yes, it is important to produce the urban change image and provide the accuracy of change results. We considered this condition to validate the UIS and UGS fraction utilizing the Google Earth images from corresponding period and acquired the validation samples with more than 30%

of total samples.

Therefore, 1070 validation samples of total 1869 samples were located in changed areas at an interval of three years or five years. The R and RMSE for the changed UIS are in 2000-2018 0.88 and 0.12, and for the changed UGS area in 2000-2018 are 0.88 and 0.12.

Changes of manuscript: We added the accuracy assessment for changed UIS and UGS (L250-255). We revised a sentence in section (6 Accuracy assessment of CLUD-urban product).

Figure 1. the text “China’s urban impervious surface area and green space fractions in 2000 2018” are enveloped by the cylinder.

Response: Thank you for identifying this problem. We modified it.

Figure 11. the captions didn’t match the text in the figures (i.e., northeastern, also in captions of Figure 9). China spelled as “Chian”. It would be better to give a map showing the different zones in China.

Response: Thank you for identifying this problem. The new caption is changed as Figure 11: The urban impervious surface (UIS) and urban green space (UGS) fractions at national and regional scales (coastal, central, eastern and western zones) in 2000 and 2018.

The wrong spelled word was corrected.

Figure 9: The spatial distribution of urban impervious surface (UIS) in selected cities

from 2000 to 2018. (DEM dataset was downloaded from SRTM 90 m Digital Elevation Data (http://srtm.csi.cgiar.org/))

Reviewer #2:

Comment 1: Fundamental revisions have been made, and as a pleasing result, the manuscript quality has greatly improved.

It is also suggested to use the dots to represent the sampling cities in Figure 5. However, it is up to the authors.

Response: Thank you for your comment. We revised Figure 5 using the dots as the sampling cities.