

# **Mapping urban land cover changes for 6 European and Chinese Urban Living Labs**

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Land use and land cover changes as urban driver with impact on ecosystems and their services.

Historical urbanisation developments explain direction, velocity and intensity of change. This knowledge is vital to understand which ecosystem and related services has been ousted owing to corresponding urbanisation processes. Urban land cover products GAIA (global artificial impervious area) (Gong et al. 2020) and GAUD (global annual urban dynamics (Liu et al. 2020) support the land cover analysis of the REGREEN Urban Living Labs.

To detect the urbanisation extent, annual time series are mapped between 1985 and 2018. This monitoring is carried out at 30 m ground resolution, thus relating to the Landsat satellite sensor system. The consistent database is generated on the platform Google Earth Engine (GEE). All information is aggregated to a spatial resolution of 100m to ease visual illustration.

The monitoring results differ strongly between the European and Chinese urban development patterns. Chinese ULLs show a much more intensive urban growth in terms of velocity of change and coverage of land take.

Figures A-F illustrate the dynamic urban expansion of the 3 Urban Living Labs in Europe and 3 Urban Living Labs in China:

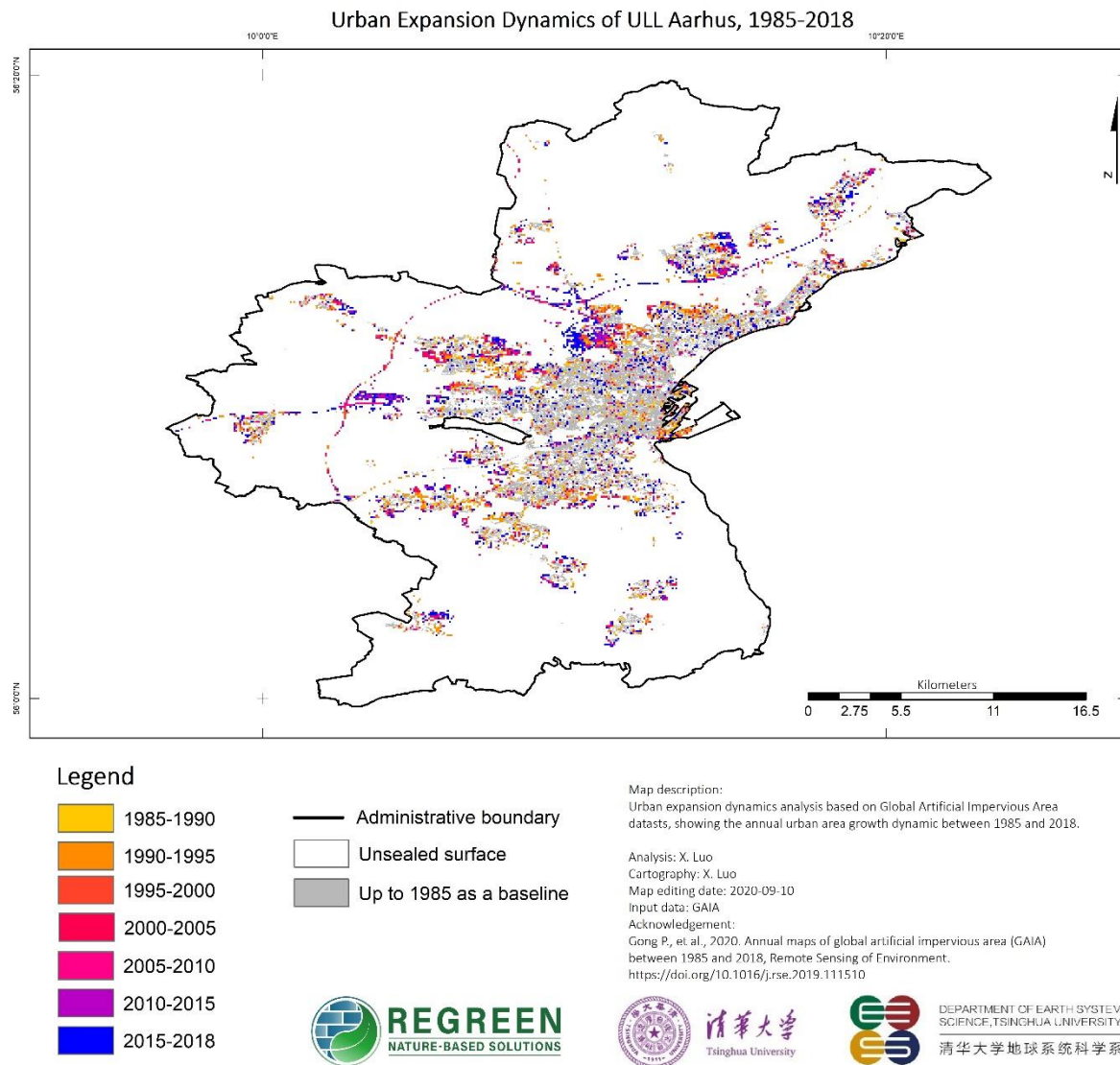


Figure A. Dynamic urban land cover expansion of the ULL Aarhus, Denmark, between 1985 and 2018. Slow urban growth pattern occurs mainly in the western and northern part of the city.

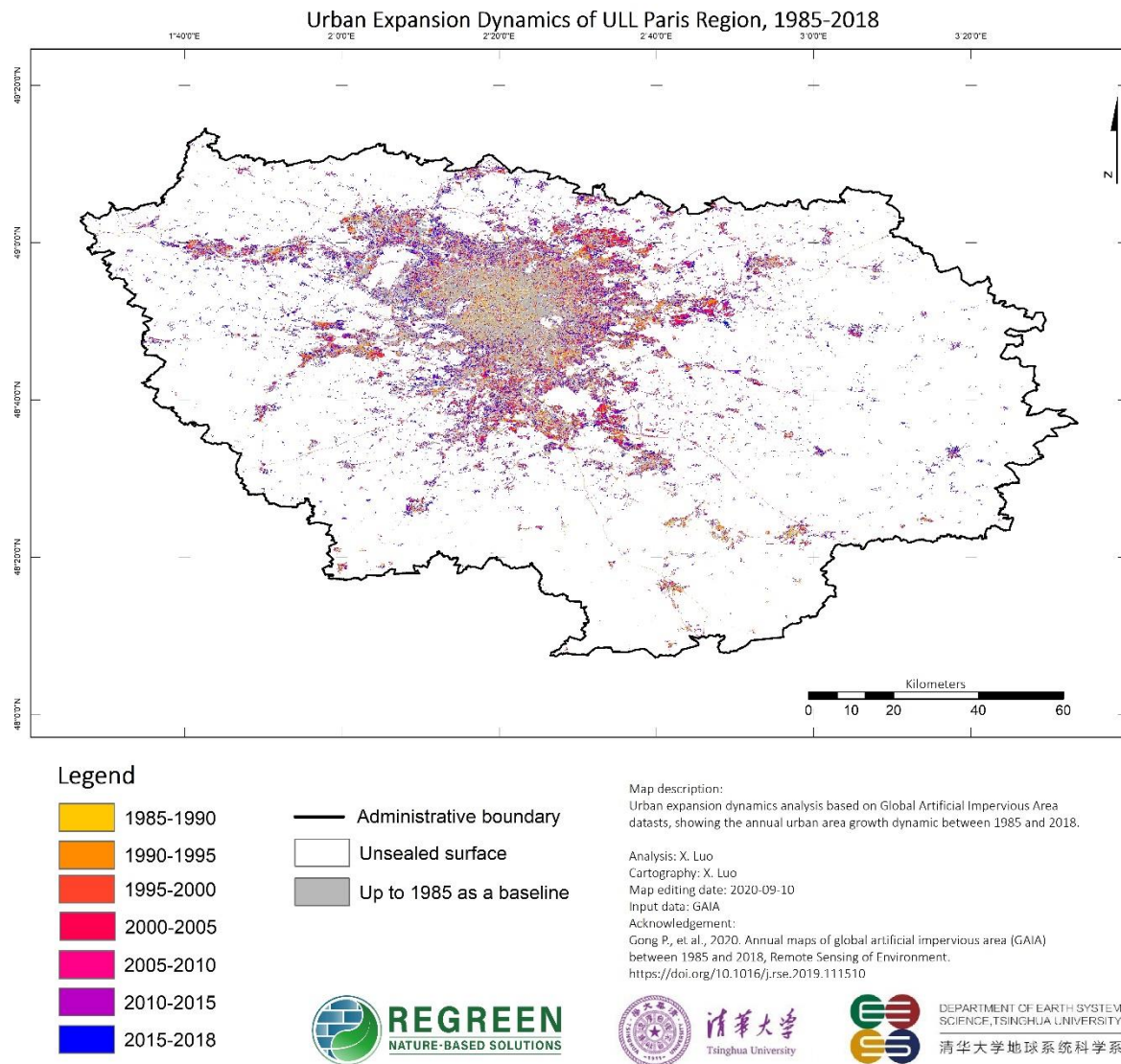


Figure B. Dynamic urban land cover expansion of the ULL Paris Region, France, between 1985 and 2018. A radial urban dynamics following the lines of transport infrastructure reaches far into the surrounding rural area of Paris Region.

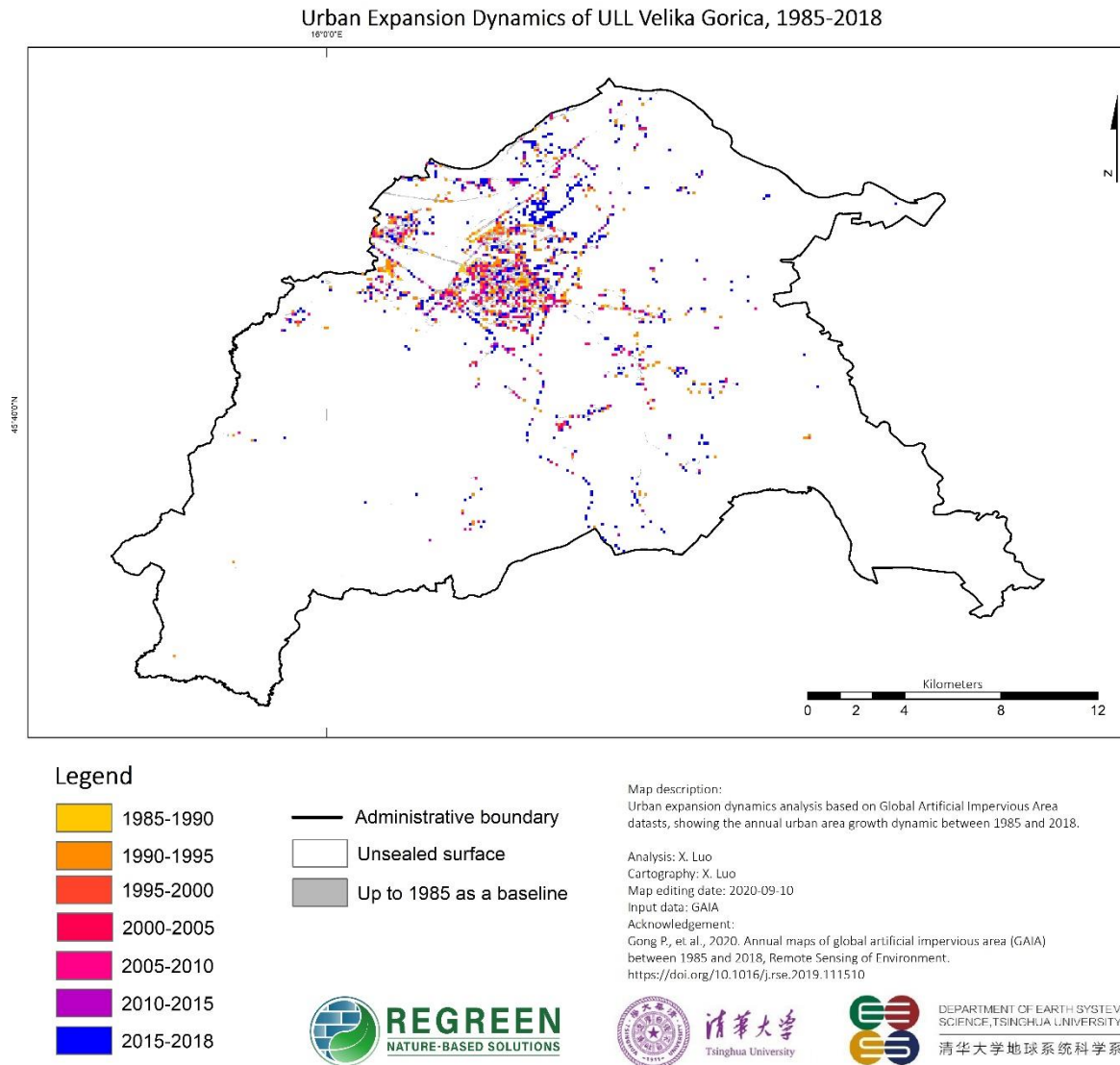


Figure C. Dynamic urban land cover expansion of the ULL Velika Gorica, Croatia, between 1985 and 2018. The urban land cover expands the urban core area, further extends towards the Zagreb airport in the north, and along the main transport lines.

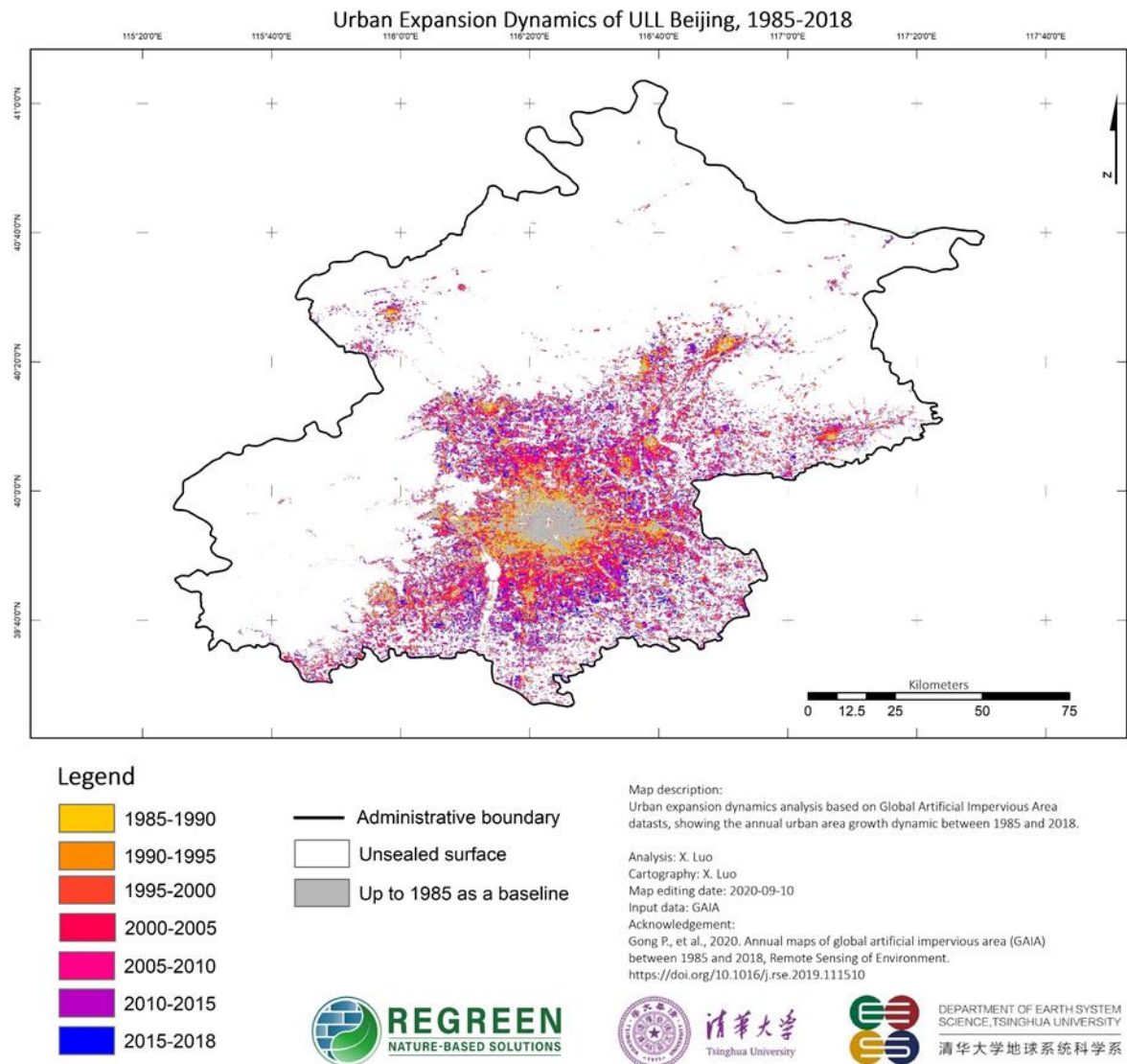


Figure D. Dynamic urban land cover expansion of the ULL Beijing, China, between 1985 and 2018. Beijing expands intensively from the core area (baseline 1985). Due to its geo-topography with mountainous ranges from west to north and northeast no urban growth takes places in those directions. Instead, further land cover extent shows a dispersal pattern severely occupying the plains towards the southwest and southern region.



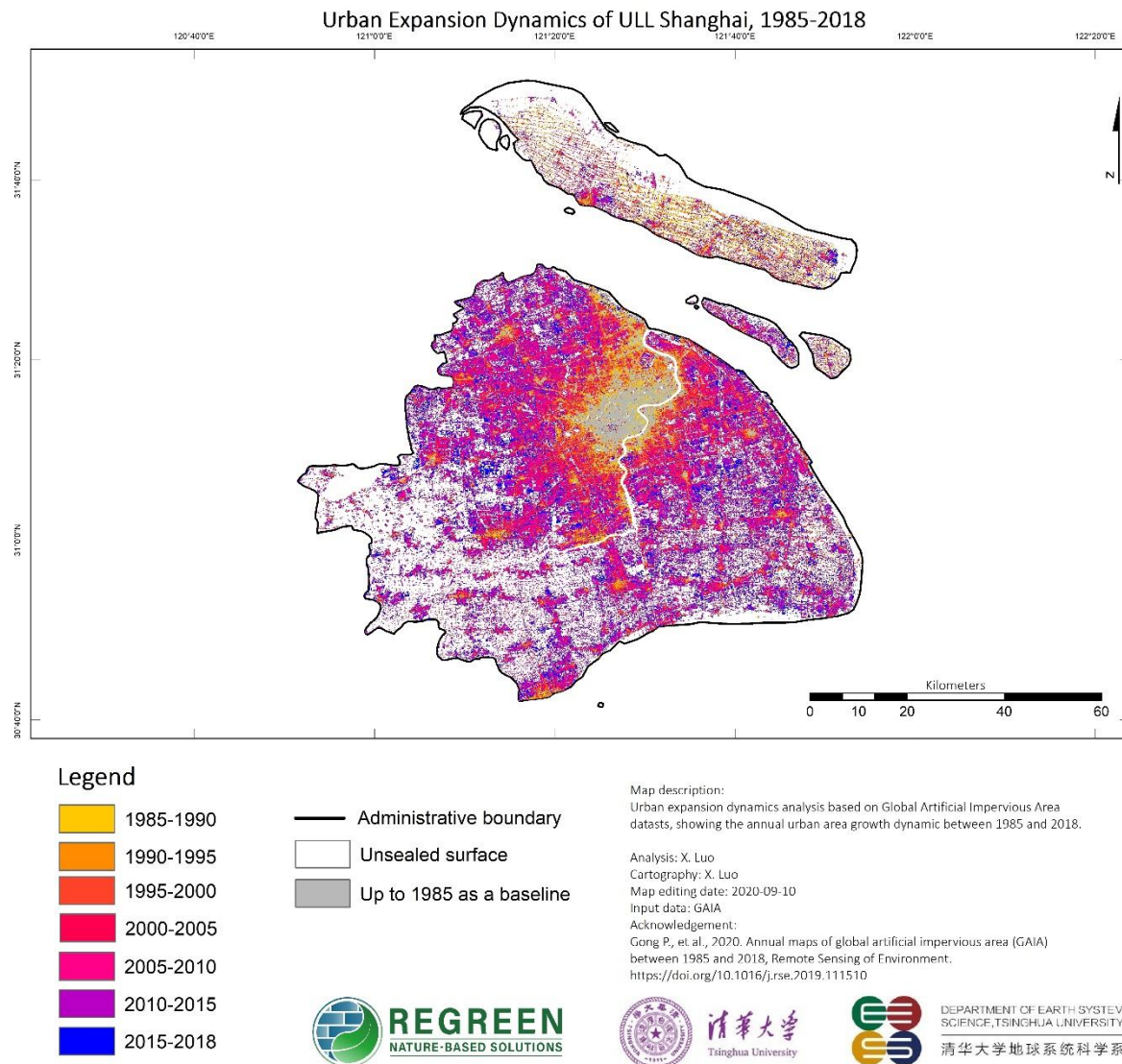


Figure E. Dynamic urban land cover expansion of the ULL Shanghai, China, between 1985 and 2018. The utmost urbanisation processes of the 6 Urban Living Labs is monitored for Shanghai. It shows very densely development patterns. Urban dynamics now reach into the distant Chongming Island.

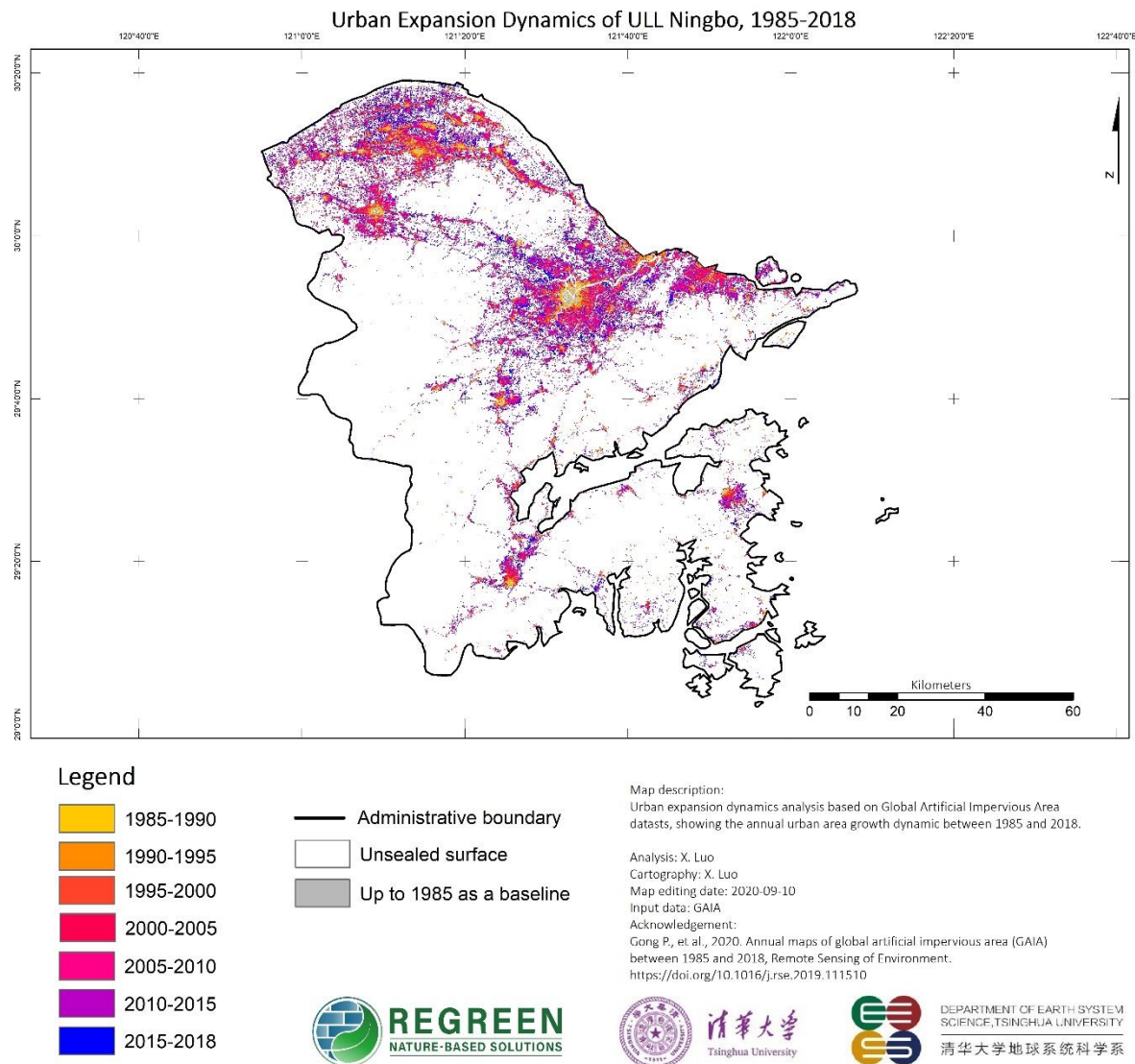


Figure F. Dynamic urban land cover expansion of the ULL Ningbo, China, between 1985 and 2018. Obviously, the urbanised area has extended into the region expressing a networking character. Land take is shaped towards a connection with the neighbouring cities.

## References

- Gong, P., Li, X., Wang, J., Bai, Y., Chen, B., Hu, T., Liu, X., Xu, B., Yang, J., Zhang, W., Zhou, Y. 2020. Annual maps of global artificial impervious area (GAIA) between 1985 and 2018. Remote Sensing of Environment, 236, 111510. <https://doi.org/10.1016/j.rse.2019.111510>.
- Liu, X., Huang, Y., Xu, X. et al. 2020. High-spatiotemporal-resolution mapping of global urban change from 1985 to 2015. Nat Sustain 3, 564–570. <https://doi.org/10.1038/s41893-020-0521-x>.