



Supplement of

**AGPC: an Annual 500 m Gridded Population (1990–2020)
for China incorporating 3D building volume dynamics**

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Table S1 Comparison among three machine learning approaches

Year	Model	<i>RMSE</i> (persons km ⁻²)		<i>R</i>		<i>rRMSE</i> (%)	
		Training	Validation	Training	Validation	Training	Validation
2010	XGBoost	1086.46	1610.11	0.9590	0.8915	0.12	0.21
	Random Forest	1419.70	1976.61	0.9496	0.8631	0.15	0.23
	SVR	1368.30	1669.778	0.9210	0.8769	0.15	0.19
2020	XGBoost	812.86	1305.03	0.9656	0.9022	0.10	0.16
	Random Forest	961.54	1327.51	0.9580	0.8892	0.12	0.16
	SVR	847.91	1691.96	0.9572	0.8793	0.11	0.21

Table S2 Summary of multi-temporal evaluations of grid population estimates at city level

Year	R	$RMSE$ ($\times 10^5$ persons)	$rRMSE$ (%)
1990	0.7844	13.67990	21.6
1995	0.8077	13.77777	21.3
2000	0.9102	11.75177	14.6
2005	0.9143	11.64968	13.9
2010	0.9967	2.07928	2.4
2015	0.9676	7.54615	8.0
2020	0.9992	1.40618	1.5

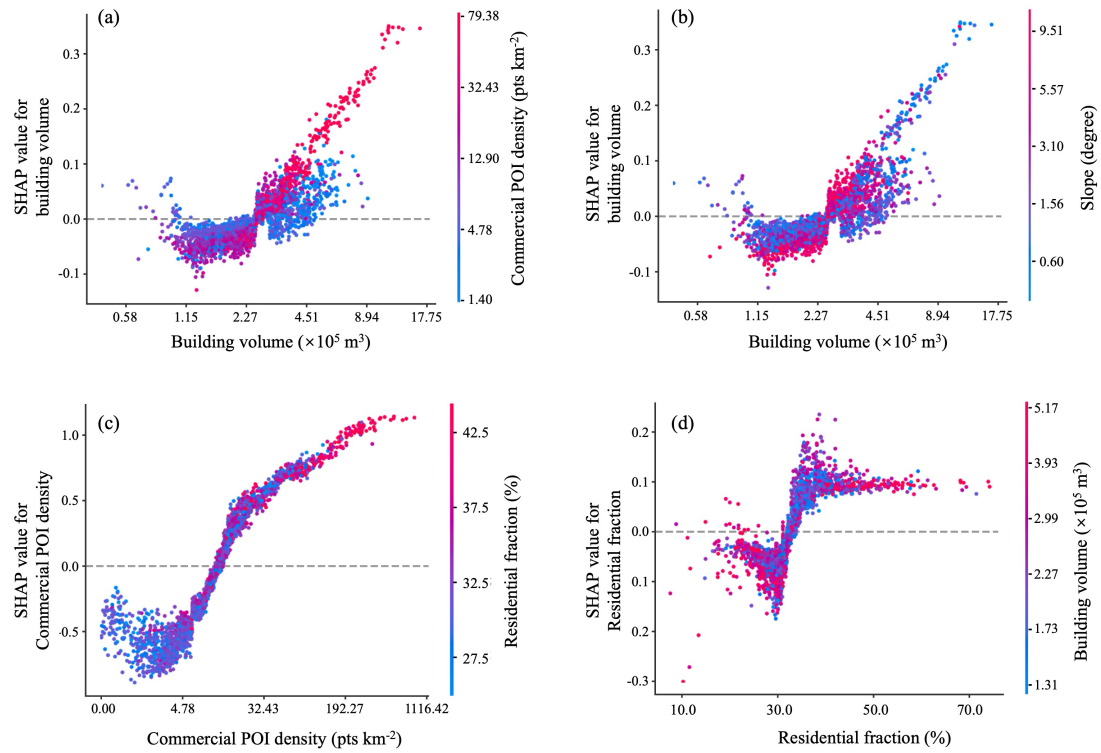


Fig. S1 Dependence plots of covariates identified by the SHAP summary analysis for 2020

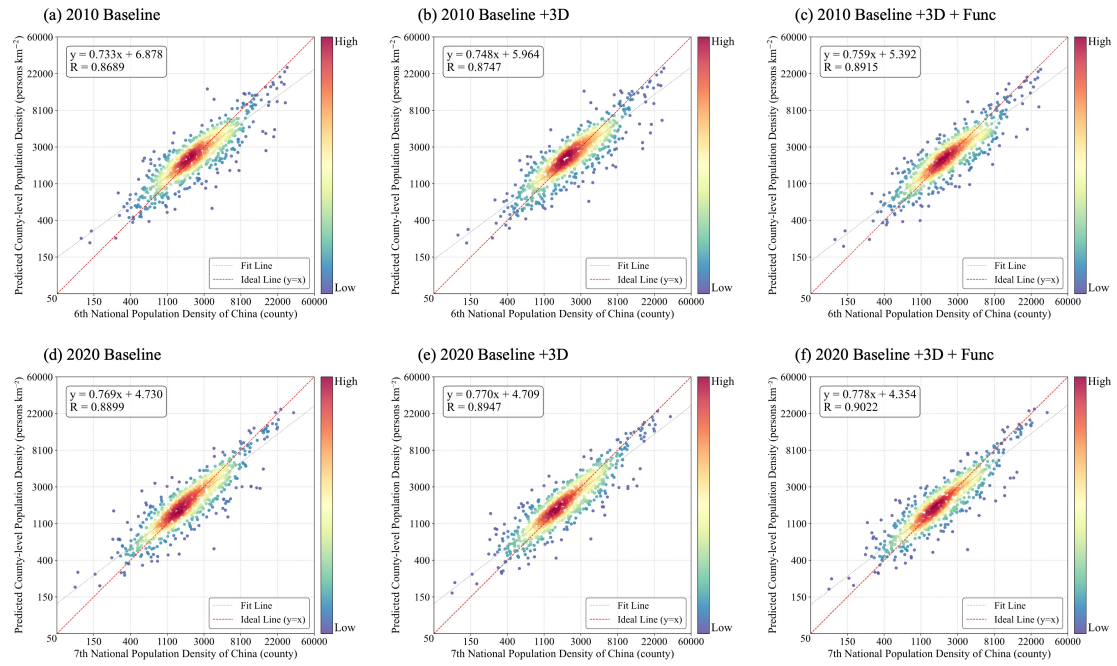
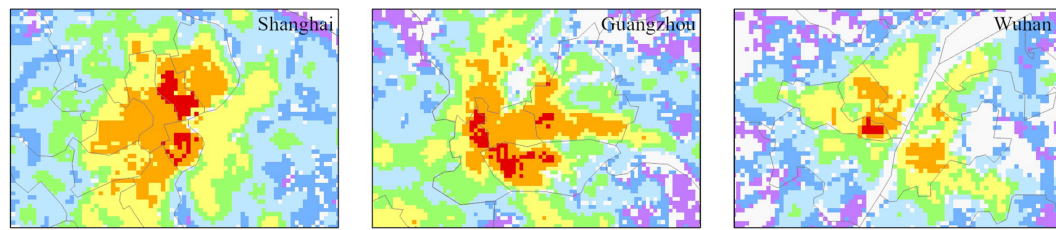
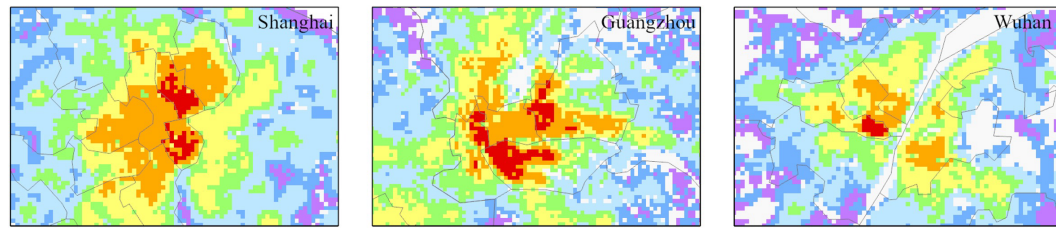


Fig. S2 Model comparisons when incorporating 3D urban environment and building function variables

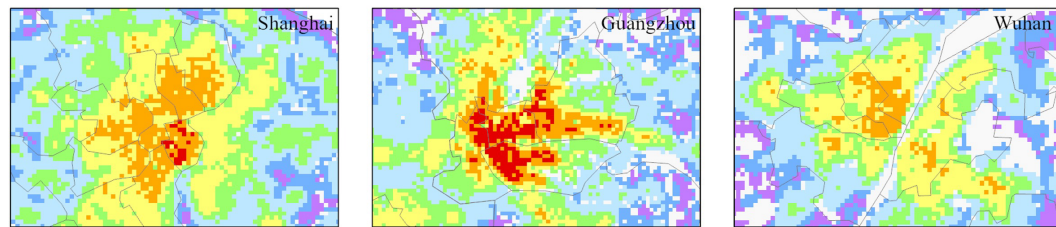
(a) Baseline



(b) Baseline + 3D



(c) Baseline + 3D + Func



0 15 30 km

0 300 700 2,000 4,000 6,000 8,000 (Persons per grid)

Fig. S3 Comparison of population distribution when incorporating 3D urban environment and building function variables