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MAUPP

Belgian Science Policy Office
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Mapping intra-urban population densities using VHRRS data

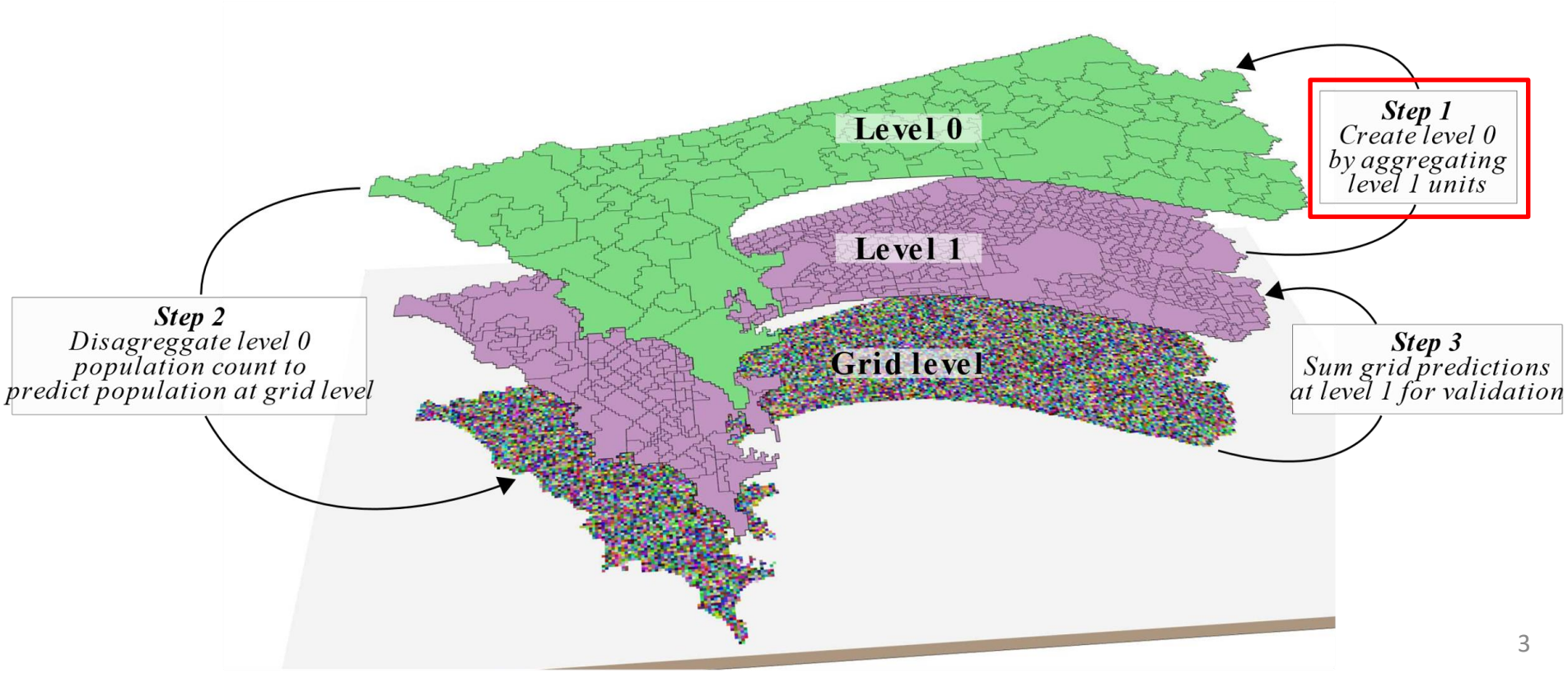
Dakar case study

- Take advantage of extremely detailed population dataset for validation purpose

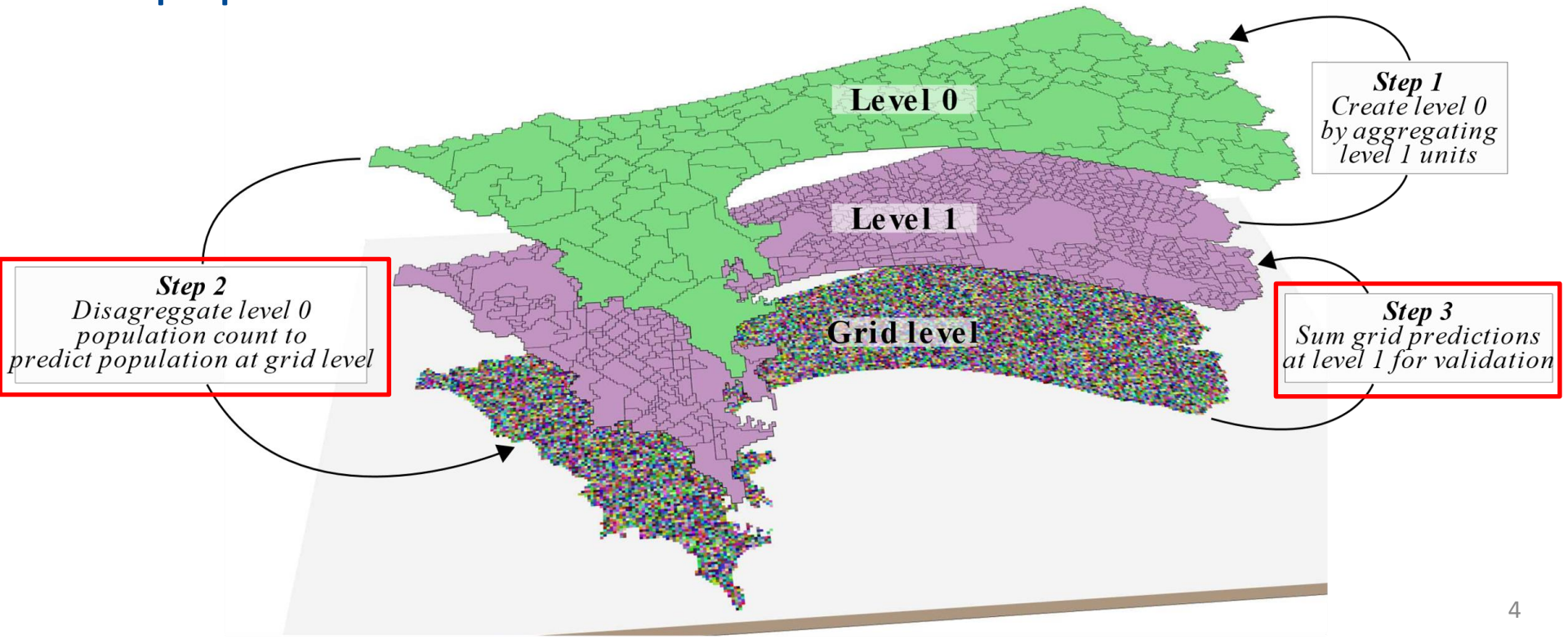
  ± 1200 units with polygon geometries at admin-5 level (“neighborhood”) for the AOI

- Implementation of the validation strategy proposed by the WorldPop project

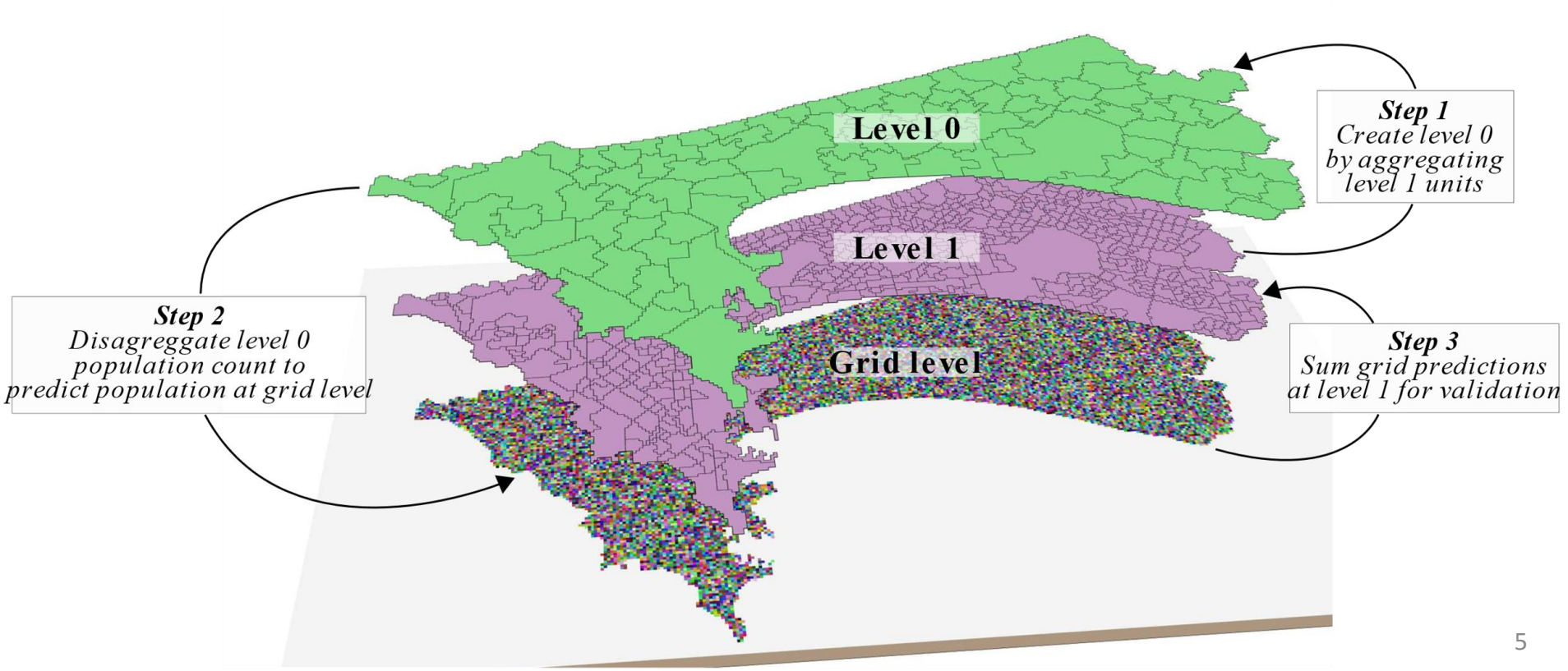
- Finest admin level (1) used for independent validation
- Creation of new level (0) by aggregating level 1 units

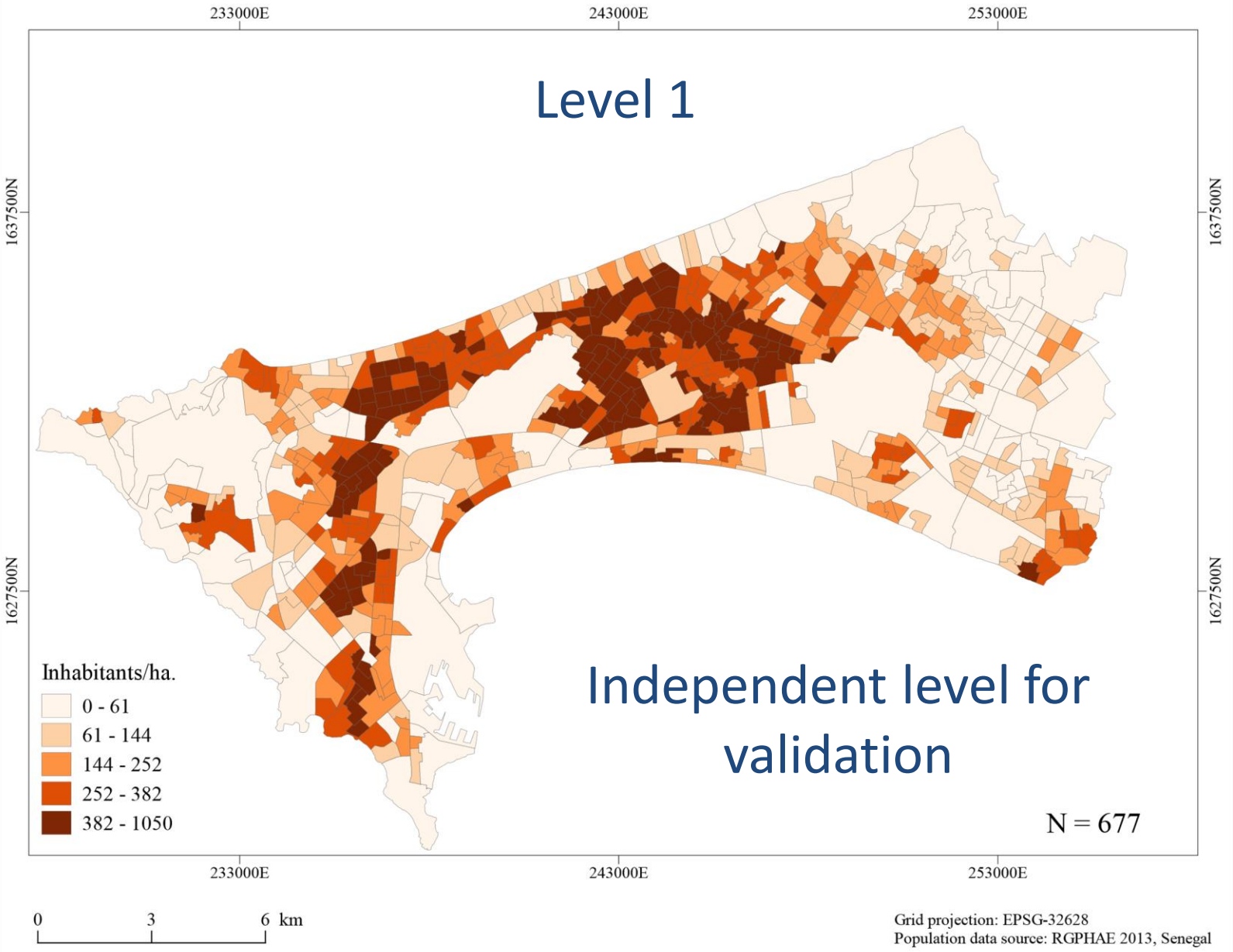


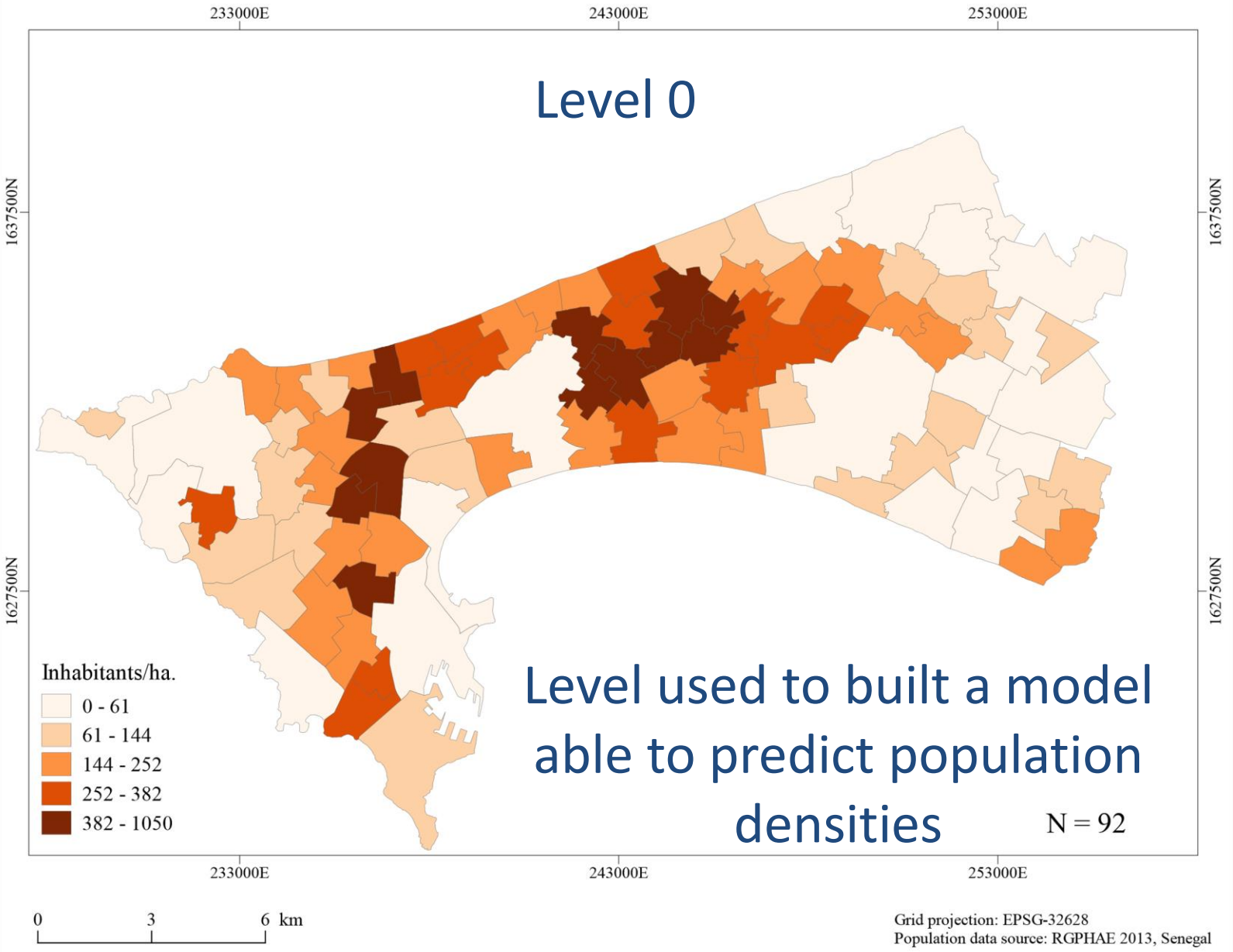
- RF model trained at level 0
- Prediction at grid level (100x100m)
- Aggregation (sum) of grid-cell predictions to get population estimates for each units at level 1



- Assessment of the population densities reallocation from Level 0 to Level 1
- No validation at grid level



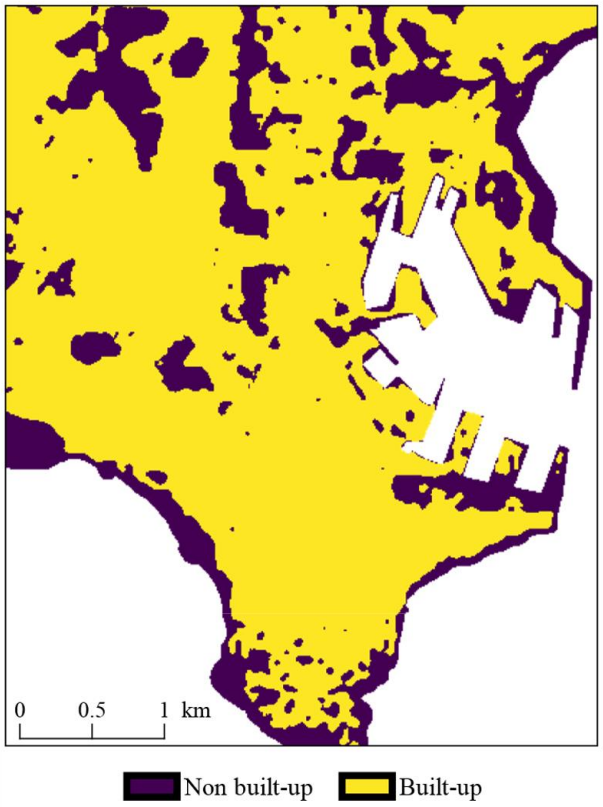

233000E
243000E
253000E
1637500N
1627500N
Level 1
Inhabitants/ha.
0 - 61
61 - 144
144 - 252
252 - 382
382 - 1050
Independent level for validation
N = 677
0
3
6 km
Grid projection: EPSG-32628
Population data source: RGPHAE 2013, Senegal

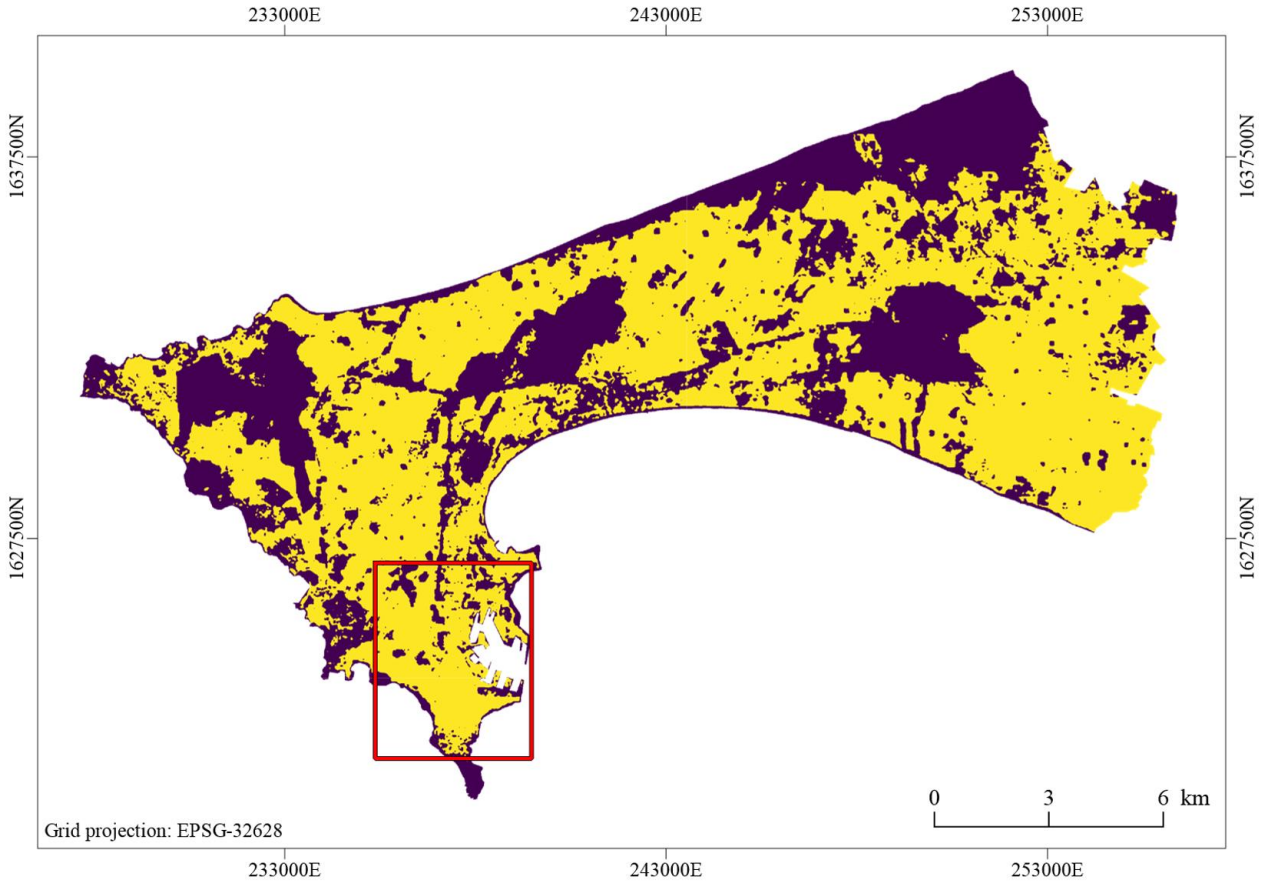

233000E
243000E
253000E
1637500N
1627500N
Level 0
Inhabitants/ha.
0 - 61
61 - 144
144 - 252
252 - 382
382 - 1050
Level used to built a model able to predict population densities
N = 92
0
3
6 km
Grid projection: EPSG-32628
Population data source: RGPHAE 2013, Senegal

VHR against HR

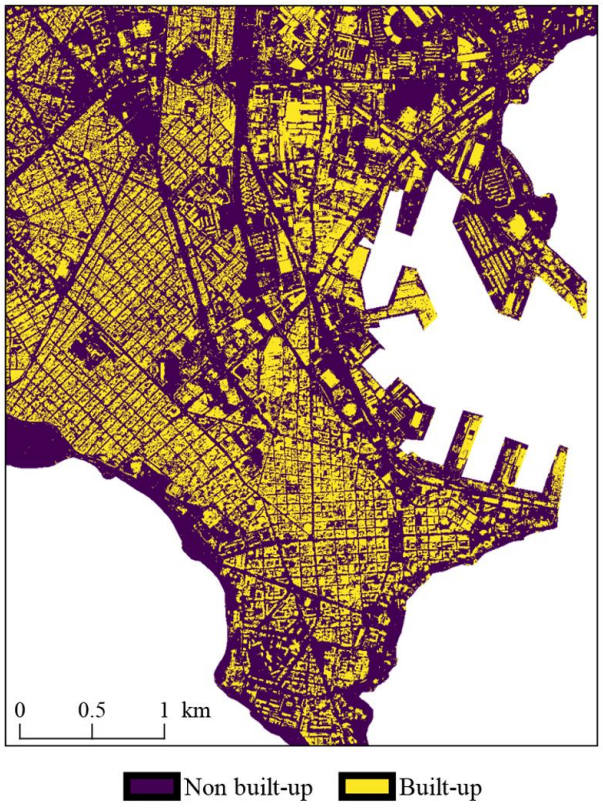
- Aim: Assessing the contribution of VHR-derived information to improve population estimates at intra-urban level.
- Comparison of gridded population products derived from VHR and HR
  - Built-up mask at 10m from WP1
  - Built-up mask, LC and LU at 0.5m from WP2

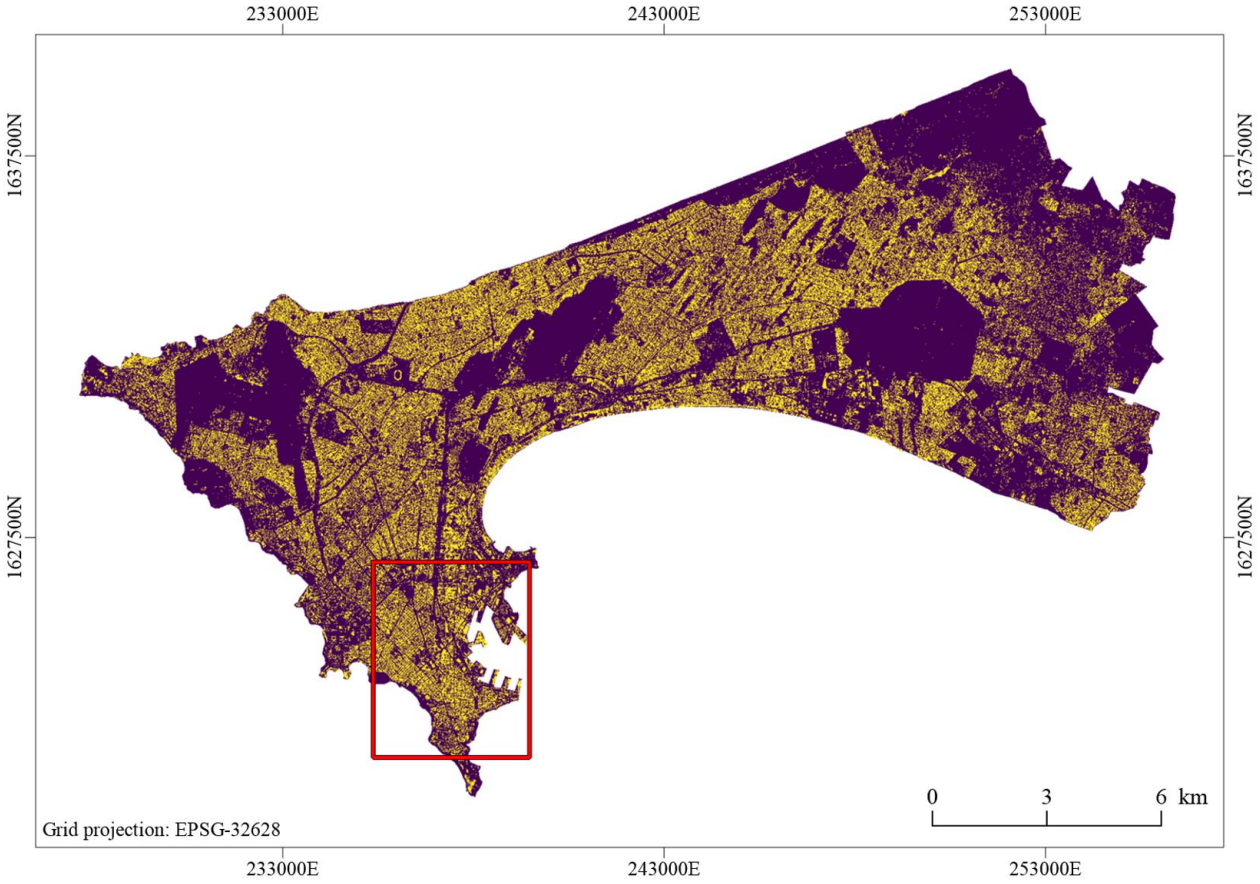
HR built-up mask



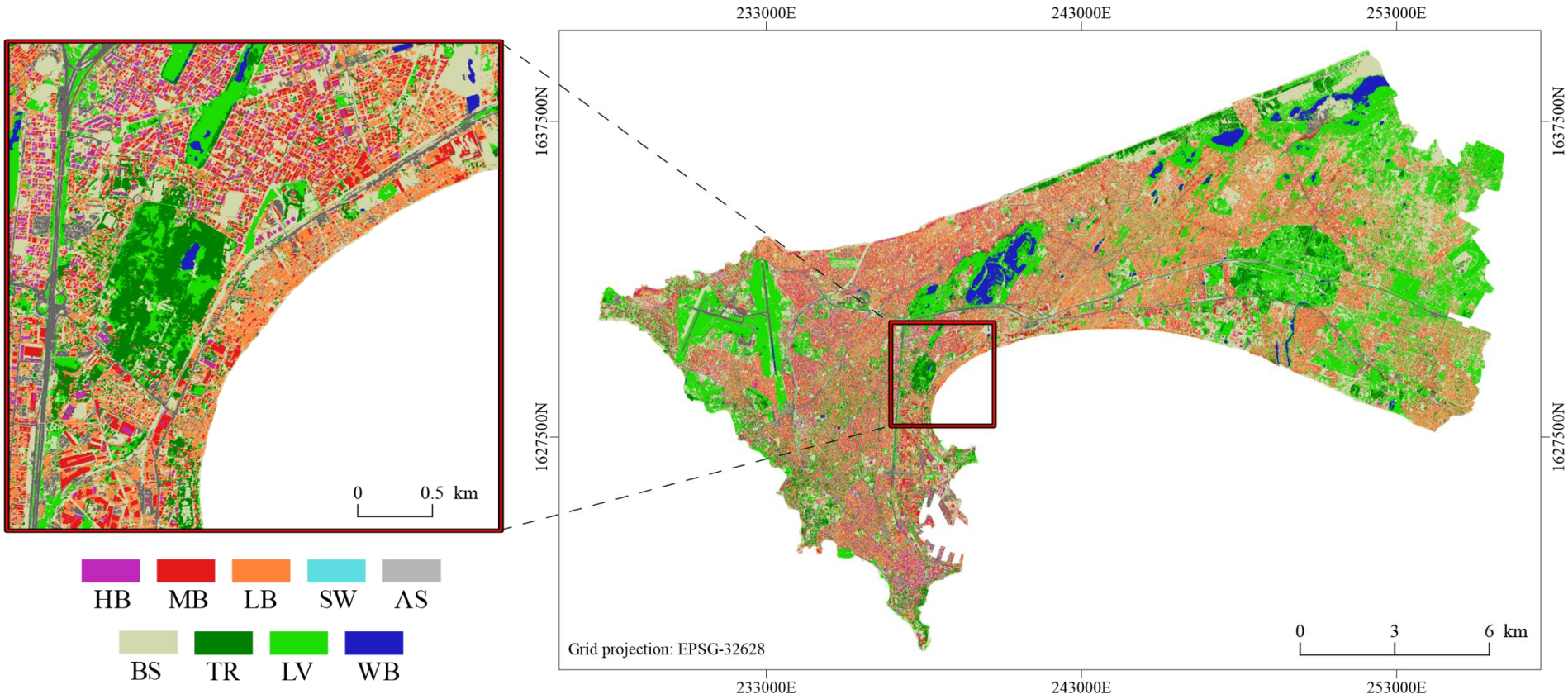


VHR built-up mask

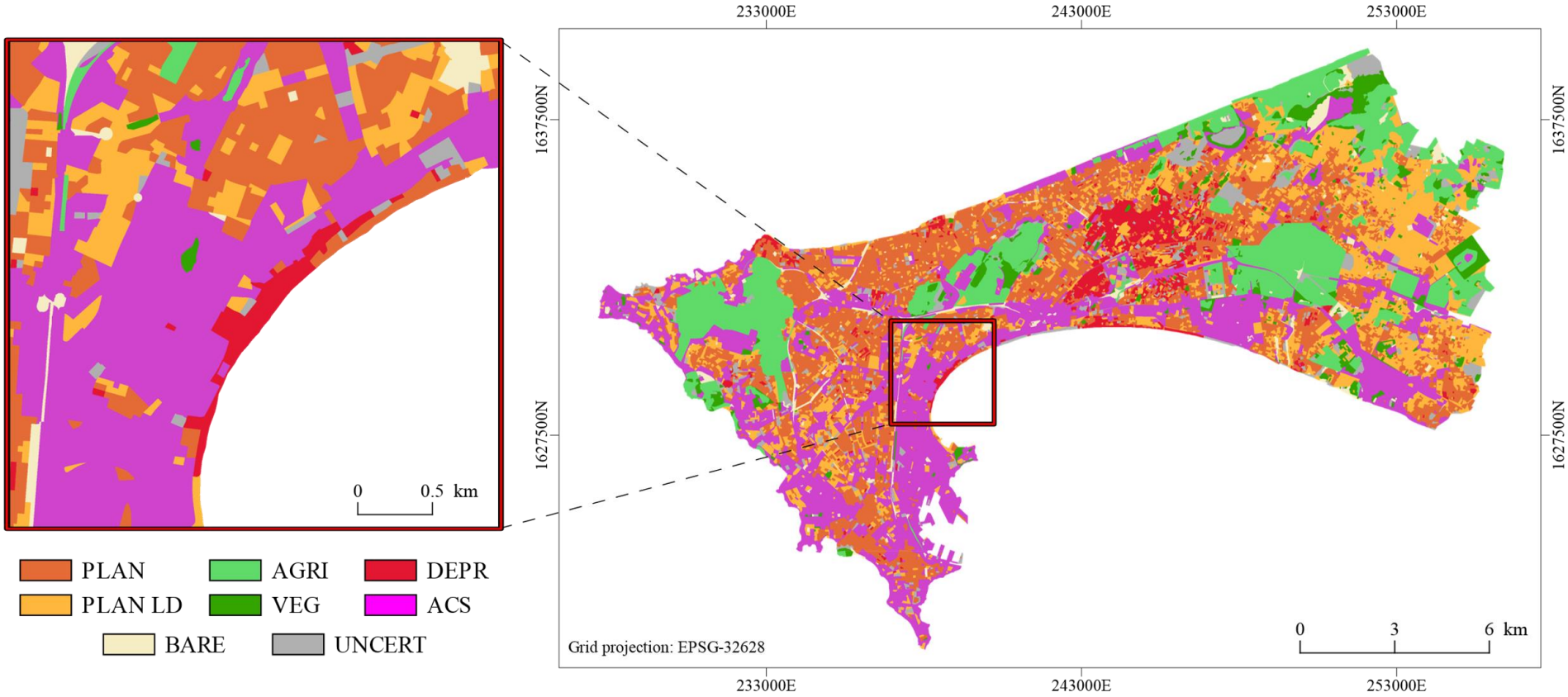




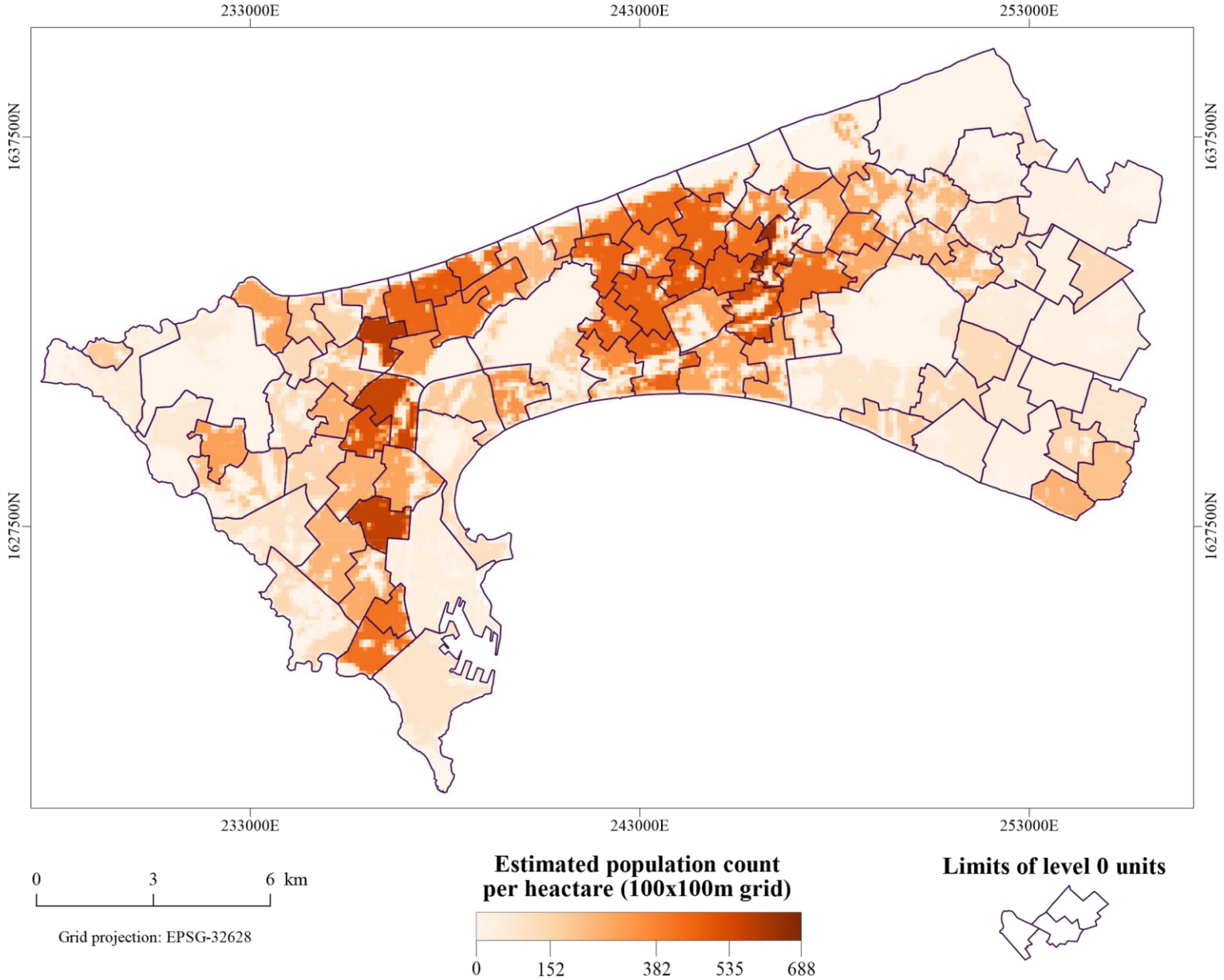
VHR Land cover map



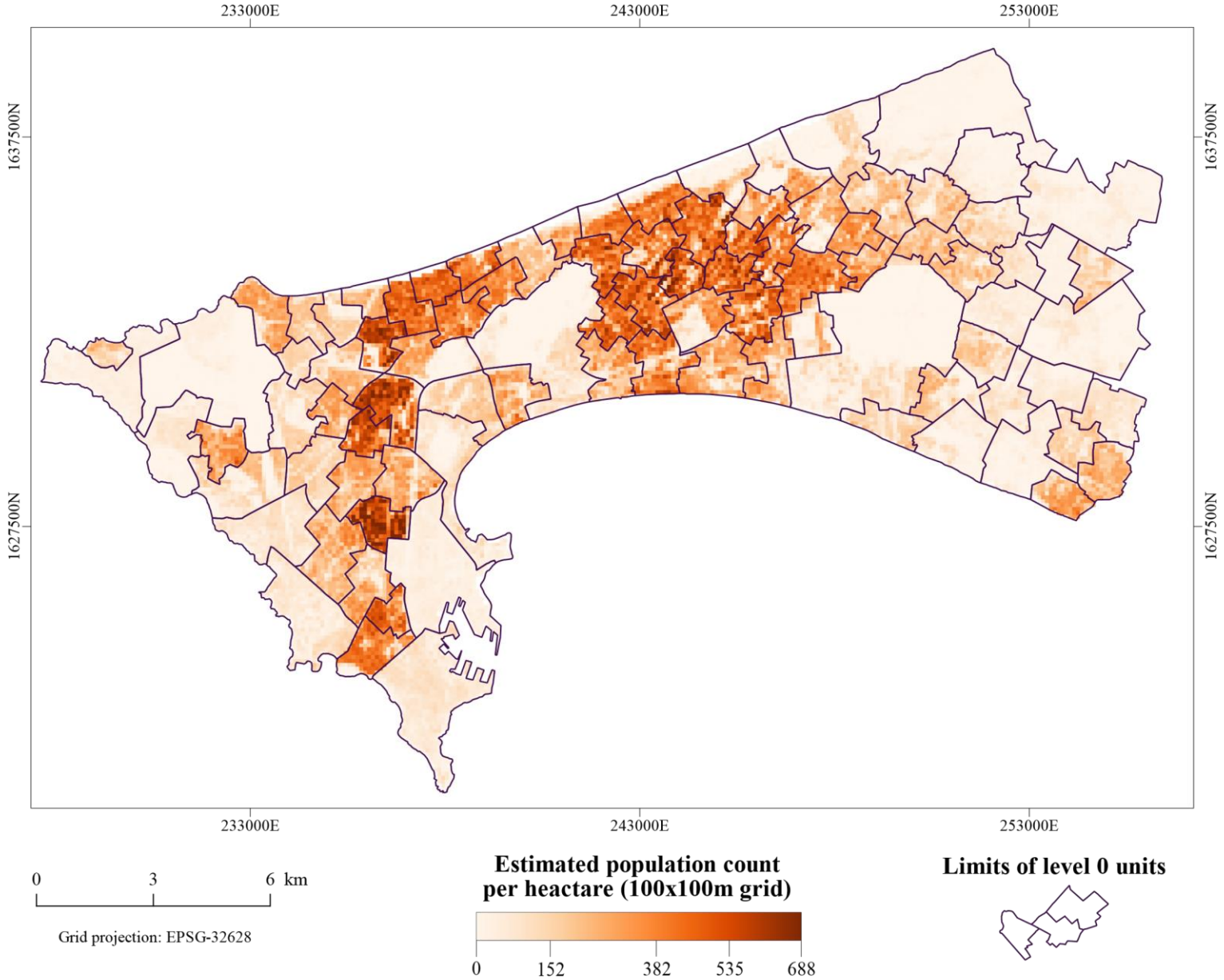
VHR Land use map



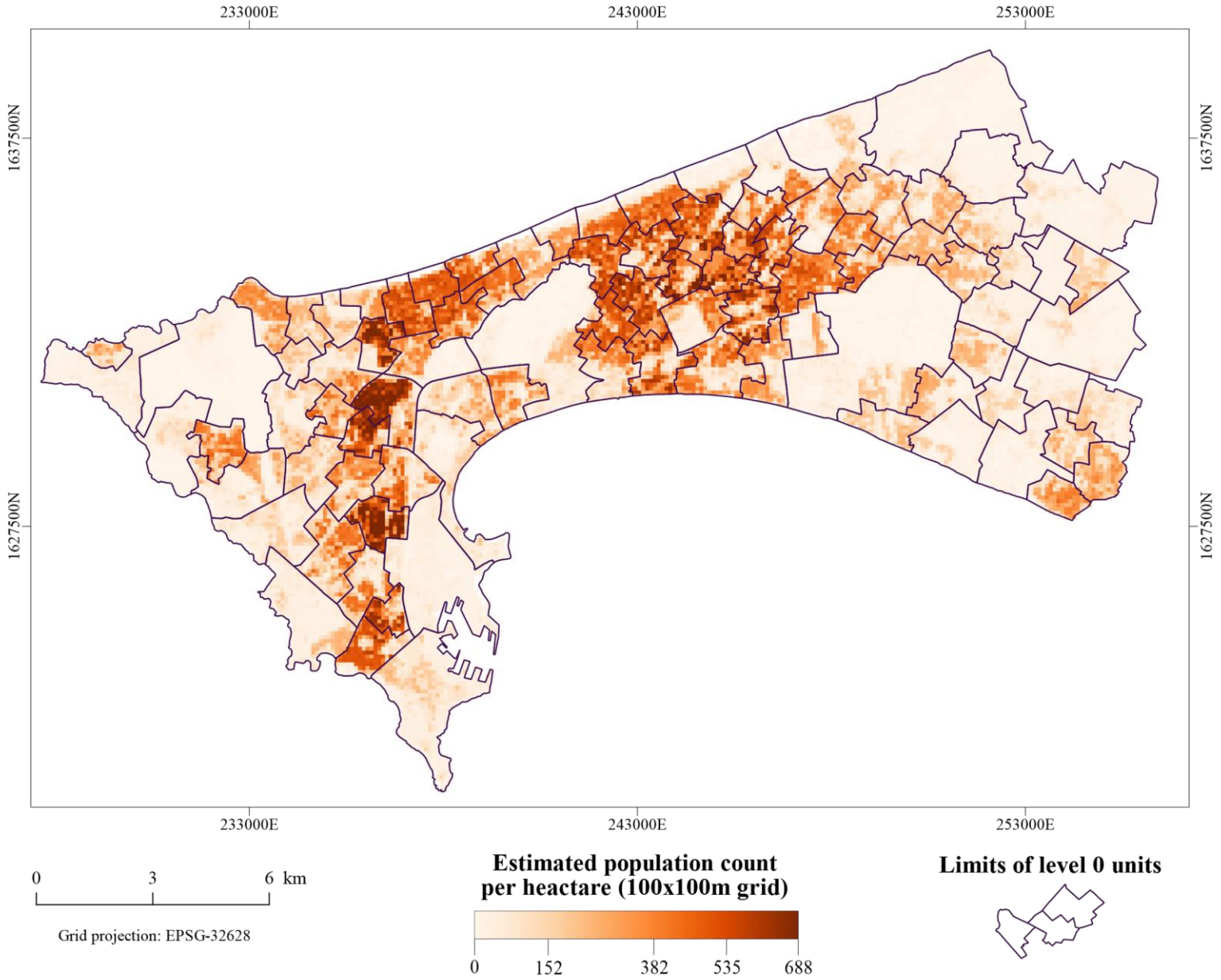
Population estimates using HR built-up



Population estimates using VHR built-up

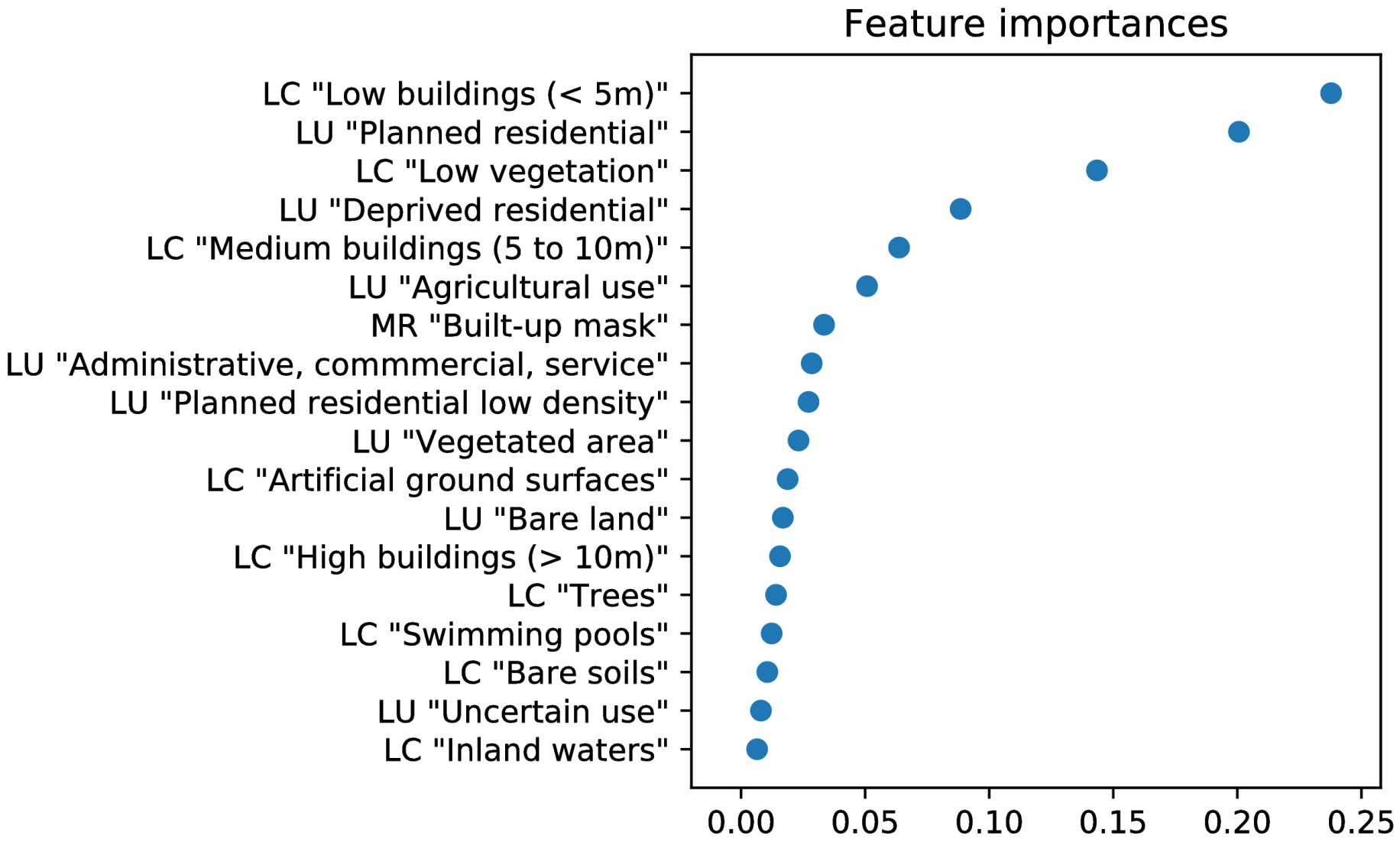


Population estimates using HR + VHR data



Different tests performed

Test	Input Data	RF Internal OOB Score		External Validation		
		Level 0	Level 1	%RMSE	RTAE	
A	MR-BU	NA	NA	61.00	36.7	
B	VHR-BU	NA	NA	54.54	31.7	**-13%**
C	VHR-3BU	0.767	0.715	52.22	33.9	
D	VHR-LC	0.759	0.759	49.31	30.8	**-16%**
E	VHR-LU	0.789	0.757	54.37	33.5	
F	MR-BU, VHR-LU	0.808	0.766	47.59	29.7	**-19%**
G	VHR-BU, VHR-LU	0.842	0.768	46.21	28.2	
H	VHR-3BU, VHR-LU	**0.850**	0.802	45.22	28.8	
I	VHR-LC, VHR-LU	0.833	**0.815**	45.24	28.4	**-23%**
J	MR-BU, VHR-LC, VHR-LU	0.836	0.813	**44.40**	**27.9**	**-24%**


Feature importances
LC "Low buildings (< 5m)"
LU "Planned residential"
LC "Low vegetation"
LU "Deprived residential"
LC "Medium buildings (5 to 10m)"
LU "Agricultural use"
MR "Built-up mask"
LU "Administrative, commmercial, service"
LU "Planned residential low density"
LU "Vegetated area"
LC "Artificial ground surfaces"
LU "Bare land"
LC "High buildings (> 10m)"
LC "Trees"
LC "Swimming pools"
LC "Bare soils"
LU "Uncertain use"
LC "Inland waters"
0.00
0.05
0.10
0.15
0.20
0.25

THANKS – QUESTION ?