

**City of Ekurhuleni Revision of the Bioregional Plan
Critical Biodiversity Area Map
DRAFT version 1a**

Metadata Document

30 July 2020

Basic steps to develop the CBA map:

1. Land cover: Merge available land covers (LC2020_v3 from Mike merged with ESKOM buildings, ARC fields, SANBI NBA 2018 LC)
2. Wetlands: Merge available wetland layers (merge EBOSS hydrology with CBA2020 [Doug] wetland layer)
3. Protected Areas: Clean GDARD PA layer (1. update data table - delete columns, correct spelling, harmonise names, types and categories; 2. clean geometry and eliminate slivers)
4. Planning Units: Make terrestrial planning unit (PU) layer from land cover 2020 v4 and cadastral layer. For land cover only include area available for CBA map (i.e. exclude developed areas), and reclassify into three classes: 1 natural [natural and wetland classes], 2 secondary natural vegetation [secondary, alien and urban vegetation] and 3 croplands). For land parcels input = "active_parcel.shp"; select parcels >0.5 ha. Final PU layer n = 38 181 polygons.
NOTE: In draft v0 alien vegetation was grouped with natural and urban veg was excluded. See Table 1 for the land cover re-classification look-up table.
5. Link the following information to each polygon in the planning unit layer (CoE_CBA2020_DRAFTv1_20200630, see for a description of the data fields):
 - a. CBA2011 classification (original and updated based on current land cover)
 - b. Landscape context
 - c. Biodiversity species distribution and expert mapping information
 - d. Landscape connectivity based on nested buffers
 - e. Landscape connectivity based on a landscape connectivity algorithm using Circuitscape software (<http://circuitscape.org>)
6. Use the attached information above to classify planning units into CBA categories based on the ruleset (Table 3)
7. Final Layers making up CoE CBA2020 Draftv1:
 - a. Protected Areas and Conservation Areas (PAs_CoE_v1_SALO29)
 - b. CBA2020 Planning Units (CoE_CBA2020_DRAFTv1_20200630)
 - c. CBA2020 Wetland layer (Ekurhuleni_ALL_Wetlands_PES_FINALv2_20200620)

Note that in the final CBA map the protected area and planning unit layers will be merged. We are still debating if the wetland layer and the terrestrial PU layer should be merged in the final product.

The Draft v1 map needs some work especially with eliminating "false positive" areas such as gardens within the urban fabric. Below are some suggestions for refining the map to be implemented with DRAFTv2:

1. Clip natural buffers to CoE AOI so that area outside the metro does not reflect in the buffer land cover calculation, ELSE expand the land cover to include neighbouring areas.
2. Add additional de facto PAs from CoE (CoE to supply data).
3. Decide what species data to include/exclude? Do species get differential weighting?
4. Look at including EBOSS open space areas as possible linkages where there are none in the PU layer. Include EBOSS information in criteria table.
5. Manually add missing landscape connections where these are not reflected in the PU layer. Also possible to manually delete “false positive” or spurious PUs.
6. Decide if secondary natural areas must be mandatory CBA2 or can there be CBA1 secondary areas?
7. Explore other criteria that can be applied to exclude/include areas, e.g. sites already earmarked for development, better exclusion of sites within the urban/built (increase land parcel threshold to, for example, 2ha? Better exclude urban gardens from the “natural category” in the land cover.
8. Decide if the terrestrial PU and wetland layers should be merged in the final CBA map.
9. Incorporate SERVITUDE areas to help create better connectivity between sites.

Table 1 Land cover look-up table to reclassify areas into 4 basic land cover classes. In the planning unit layer only classes (gridcode) 1-3 are used.

Class2v2_Name	Gridcode¹	Class2v2_Name	Gridcode¹
Vegetation Natural	1	Water/Water Course	1
Urban Vegetation/Yard	2	Waste Water Treatment Works	2
Urban Residential	4	Pan	1
Vegetation Road	2	New Development	4
Roads	4	Canal	2
Wetland	1	Cemetery	2
Building	4	Institutional	4
Bare	2	Degraded	2
Woody Vegetation	1	Golf Estate/Course	2
Vegetation Secondary	2	Informal Settlement	4
Sportfields	4	Railway	4
Vegetation Alien	2	Airport	4
Mining	4	Commercial	4
Cultivation	3	Hostel	4
Industrial	4	Transport	4
Nfepa Wetlands	1	Urban	4
		NoData	NoData

¹ Gridcode values: 1= Natural, 2= Secondary natural, 3= Croplands, and 4= Developed

Table 2 Description of the data fields in the CBA2020 Planning Units shapefile (CoE_CBA2020_DRAFTv1a_20200730).

Field Name	Description	Values
gridcode	Planning Unit majority land cover based on CoE Lad Cover v4 (Figure 1). Note that the natural class includes terrestrial and freshwater habitats.	1=natural 2=secondary 3=cropland
BUILT	PU falls within the “build landscape”. This is defined here as land parcels <0.5ha. All land parcels >0.5ha are considered falling outside the built landscape. This threshold is only relevant to this analysis and the need to distinguish areas within the urban landscape vs not. This is illustrated in Figure 2	1= inside built landscape 0=not so.
PU_ID	Unique Planning Unit (PU) ID. Total number of polygons 31 181.	numeric
Planning Unit Landscape Context is defined by the proportion of other land uses in the 100m buffer around natural planning units only. This gives an indication if a natural site is surrounded by biodiversity compatible or incompatible land uses.		
NAT_BUFF	Secondary or cropping PU adjoins a natural PU. Defined as a secondary or cropping PU intersecting a 50m buffer around natural PUs.	0=site adjoins natural area 0=not so.
BUF_NAT	Proportion of 100m buffer around a natural PU that is natural	0-100 -99=no data
BUF_SEC	Proportion of 100m buffer around a natural PU that is secondary natural.	0-100 -99=no data
BUF_CROP	Proportion of 100m buffer around a natural PU that is cropland	0-100 -99=no data
BUF_DEV	Proportion of 100m buffer around a natural PU that is developed (i.e. none of the above)	0-100 -99=no data
Biodiversity Data. If a PU is flagged by any of the input biodiversity data, i.e. the PU intersects the model data or is within 100m of an observation point. Most species distribution data that was provided is used. Data is used as is. NOTE: Data for invertebrates is not used due to very limited data points.		
PLANT1	PLANT1: Site overlaps with one or more GDARD modelled ranges of plant	1=species occurrence 0=not so
MAMMAL1	Site overlaps with GDARD models for White-tailed rat and Spotted necked otter. No mammal observation data is used.	1=species occurrence 0=not so
BIRD1	Site overlaps with GDARD models and observation localities for bird species. All data used	1=species occurrence 0=not so
HERP1	Site overlaps with GDARD model for striped harlequin snake and point observations (buffered by 100m).	1=species occurrence 0=not so
CBA2011	PU assigned to the CBA2011 map category based on a 30% majority, IF PU is >30% CBA1 then CBA1, else IF PU>30% CBA2 then CBA2, etc...	CBA1 CBA2

Field Name	Description	Values																									
	This is an exact transcription of the 2011 CBA map and does not take into account the current land cover of a PU. Only areas that are no longer natural/secondary/crop (i.e. not included in the PU later) fall away.	ESA1 ESA2 Other																									
CBA2020	This CBA classification updates the 2011 CBA classification based on the current land cover of a PU using the following look-up table: <table border="1"> <thead> <tr> <th></th> <th colspan="4">CBA2011 classification of PU</th> </tr> <tr> <th>PU 2020 Land Cover Class</th> <th>CBA1</th> <th>CBA2</th> <th>ESA1</th> <th>ESA2</th> </tr> </thead> <tbody> <tr> <td><i>Natural</i></td> <td>CBA1</td> <td>CBA1</td> <td>CBA1</td> <td>CBA1</td> </tr> <tr> <td><i>Secondary</i></td> <td>CBA2</td> <td>CBA2</td> <td>ESA1</td> <td>ESA1</td> </tr> <tr> <td><i>Crop</i></td> <td>ESA2</td> <td>ESA2</td> <td>ESA2</td> <td>ESA2</td> </tr> </tbody> </table> <p>All "Other" category in CBA2011 that is natural = "Possible CBA1" All "Other" category in CBA2011 that is secondary = "Possible CBA2"</p>		CBA2011 classification of PU				PU 2020 Land Cover Class	CBA1	CBA2	ESA1	ESA2	<i>Natural</i>	CBA1	CBA1	CBA1	CBA1	<i>Secondary</i>	CBA2	CBA2	ESA1	ESA1	<i>Crop</i>	ESA2	ESA2	ESA2	ESA2	
	CBA2011 classification of PU																										
PU 2020 Land Cover Class	CBA1	CBA2	ESA1	ESA2																							
<i>Natural</i>	CBA1	CBA1	CBA1	CBA1																							
<i>Secondary</i>	CBA2	CBA2	ESA1	ESA1																							
<i>Crop</i>	ESA2	ESA2	ESA2	ESA2																							
gridcode_E	Planning Unit majority land cover based on expert assessment of current aerial imagery. In total, 5344 sites are expert classified out of 38 192 PU	1=natural 2=secondary																									
<p>Connectivity between sites is estimated using a series of nested buffers around natural areas. When combined, the nested buffers indicate how strongly a natural sites is connected to other natural sites. Secondary and cropland sites that fall within high connectivity zones can also indicate importance for maintaining ecological connectivity of landscapes. The buffers are illustrated in Figure 3</p>																											
CONN1	CONN1: Sites that intersect lowest connectivity buffer (broadest neighbourhood, any natural site at most 500m from another natural site), only connectivity area >100ha used to select PU, n=29 193.	0 = not in buffer 1 = in in buffer																									
CONN2	CONN2: Sites that intersect medium (intermediate) connectivity buffer area, only connectivity areas >100ha used to select PU, n=28 384.	0 = not in buffer 2 = in in buffer																									
CONN3	CONN3: Sites that intersect the core connectivity buffer area (closest neighbourhood, any natural site at most 200m from another natural site). Only connectivity areas >25ha used to select PU, n=23 540.	0 = not in buffer 3 = in in buffer																									
CONN_val	Sum of three connectivity indicators. The higher the value the more connect a site it.	0 to 6																									
CONN4	Planning Unit connectivity value based on a the Circuitscape landscape connectivity algorithm (Figure 4). Values are relative measure of how important a site is for maintaining land connectivity. High and Very High values can be considered as critical linkages.	0 = no connectivity <0.001 = very low <0.01 = low <0.03 = medium <0.05 = high >0.05 = very high																									
CBA2020_v1a	THIS IS THE DISPLAY FIELD (Figure 5) PUs classified into CBA categories based on the criteria described in Table 3. CBA map categories include: CBA1 and 2 = Critical Biodiversity Area 1 and 2 ESA1 and 2 = Ecological Support Area 1 and 2 ONA = Other Natural Areas OSA = Other secondary natural areas NN = Not Natural (i.e. croplands)	CBA1 CBA2 ESA1 ESA2 ONA OSA NN																									

Field Name	Description	Values
Shape_Leng	Polygon border length (m)	numeric
Shape_Area	Polygon area (m)	numeric

Table 3 Rules for assigning Planning Units to CBA categories based on the land cover, biodiversity and landscape context of planning units.

Rules for CBA1:
1. Site is confirmed natural by EXPERT, OR
2. Site is natural per land cover, AND
a. CBA2020 = CBA1, OR
b. Species of conservation concern recorded or modelled from site (=1), OR
c. Connectivity VALUE >=3 AND Conn4 > 0 AND Site AREA>1.5 ha
3. Remove from selection IF BUILT=1 (i.e. located within a land parcel <0.5ha) OR Area<0.5ha and BUILT=0 (i.e. outside of the built-up area).
Rules for CBA2:
1. Site is secondary per land cover, AND
a. CBA2020 = CBA2, OR
b. Species of conservation concern recorded or modelled from site, OR
c. Connectivity VALUE >=5 AND Site area >3ha AND Conn4 > 0
Rules for ESA1:
1. Site is secondary natural as per land cover, AND
a. Connectivity VALUE >=5 AND Site area <3 ha AND Conn4 > 0
Rules for ESA2:
1. Site is cropland per land cover, AND
a. Species of conservation concern recorded or modelled from site, OR
b. Connectivity VALUE >=6 AND Conn4 > 0
All remaining sites classified as:
ONA (other natural area) if gridcode=1
OSA (other secondary natural area) if gridcode=2
NN (no natural) is gridcode=3 (i.e. croplands)

Table 4 Summary of the total extent of CBA map categories within the CoE.

CBA Category	Area (ha)	% of CoE
CBA1	49511.5	25.1
CBA2	20119.6	10.2
ESA1	1897.2	1.0
ESA2	26788.6	13.6
ONA	2326.2	1.2
OSA	8258.2	4.2
NN		44.7
TOTAL AREA	197554.1	100.0



Figure 1 An example of the gridcode variable that indicates the majority land cover of planning units.

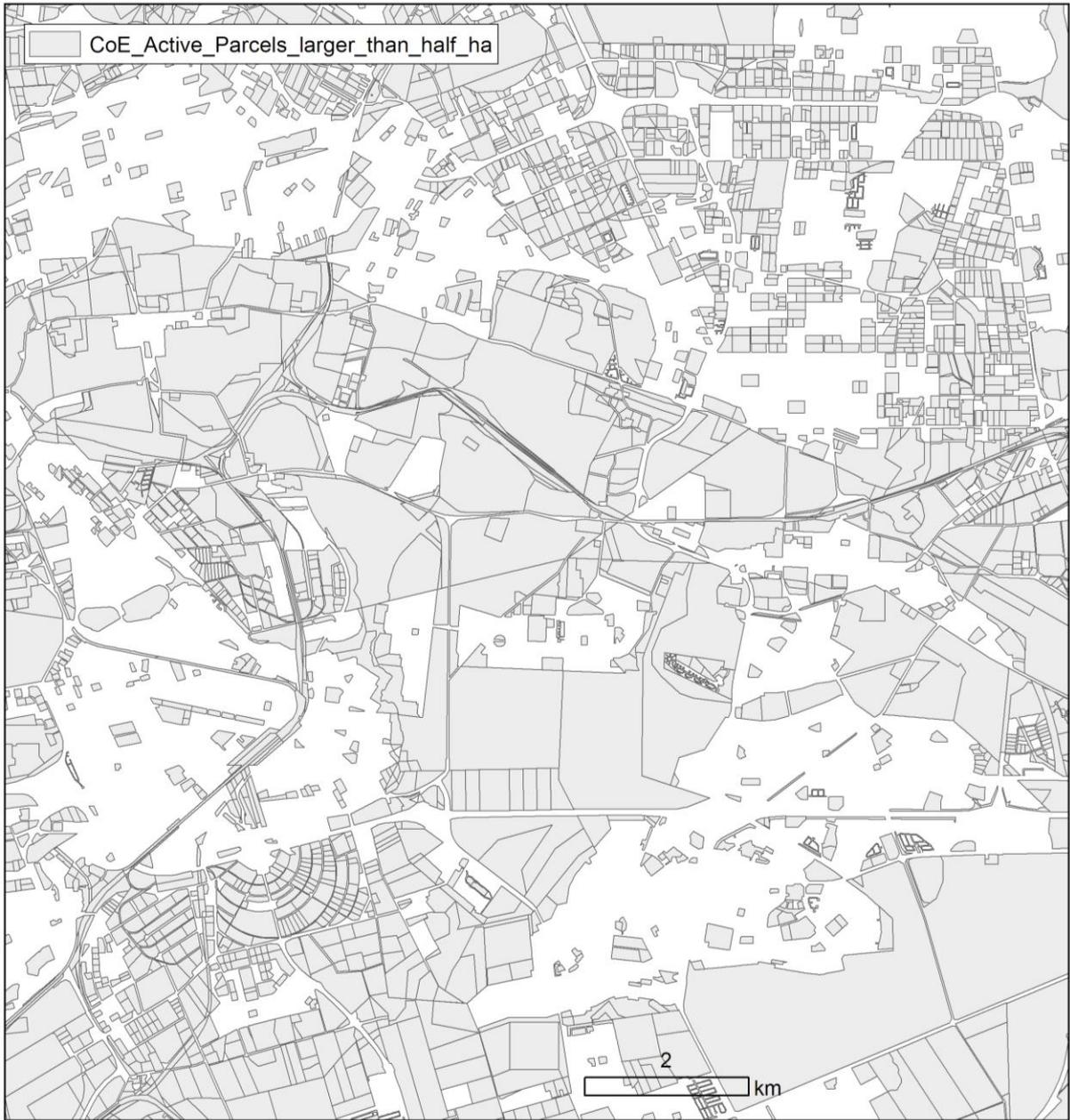


Figure 2 Land parcels greater than 0.5ha in size. This threshold was used to define "built" vs. less built or outside the built landscape.

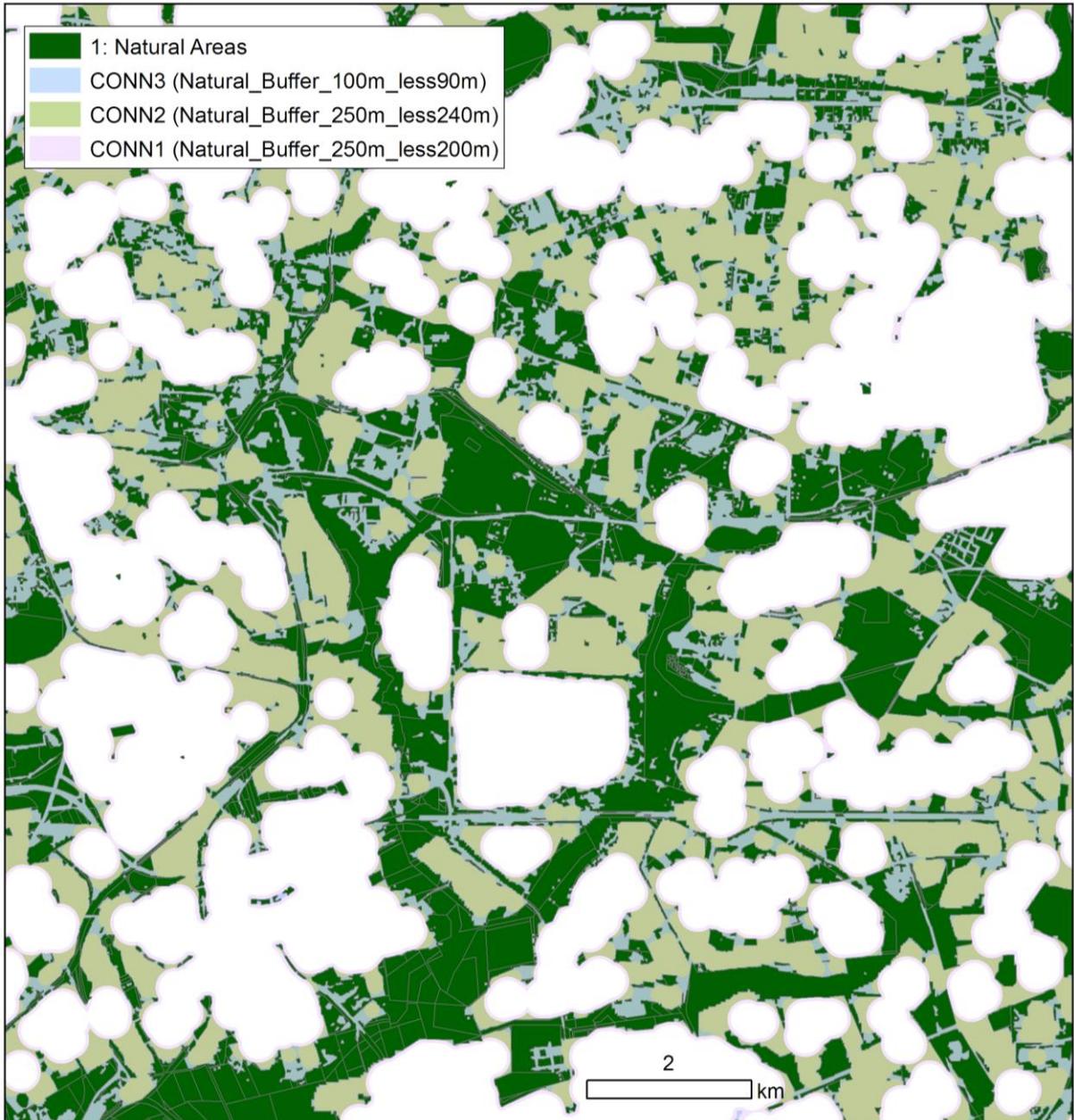


Figure 3 Nested buffers are used to determine the importance of sites for maintaining ecological connectivity within the metro.

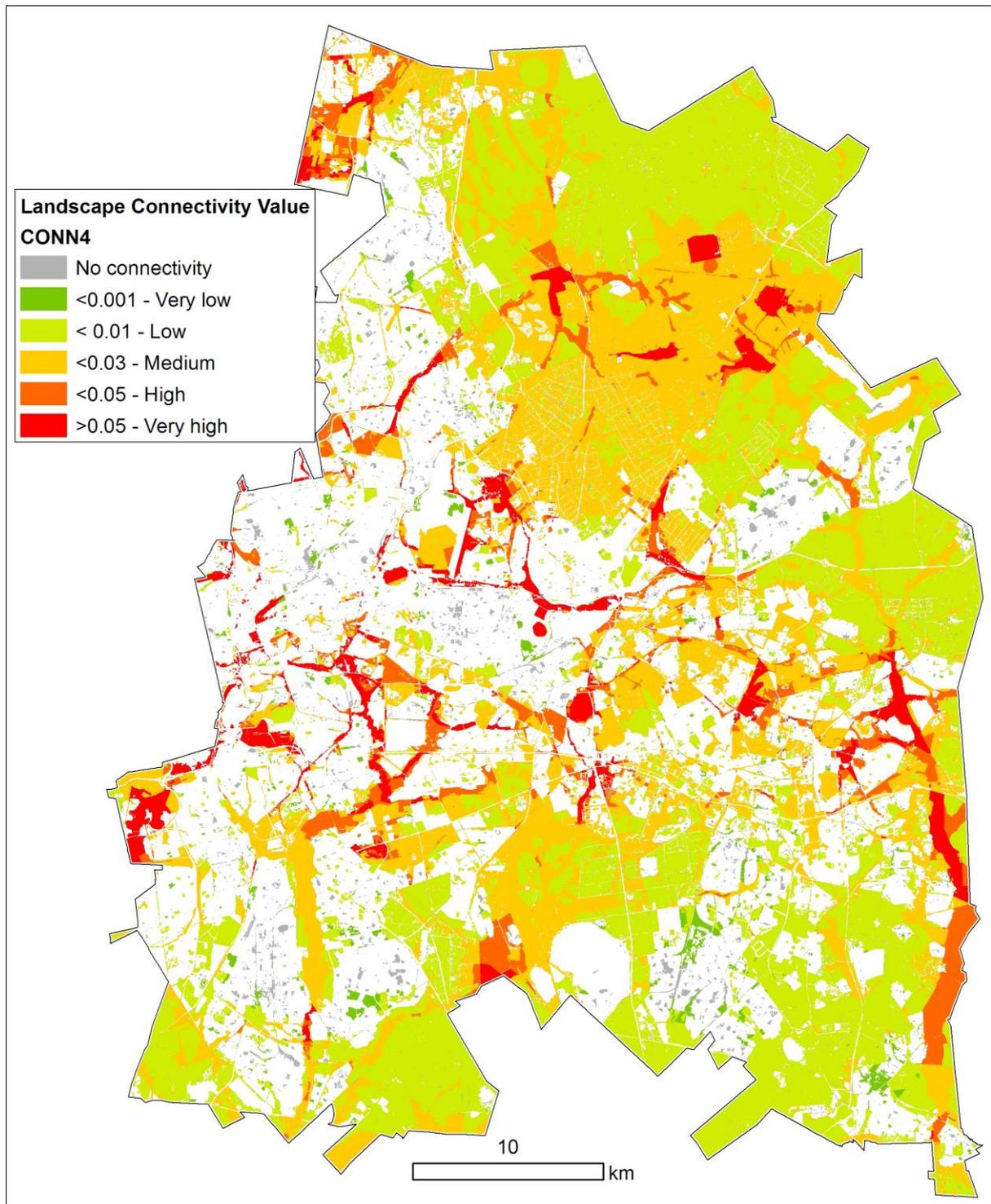


Figure 4. Algorithm-based planning unit landscape connectivity value calculated using Circuitscape software.

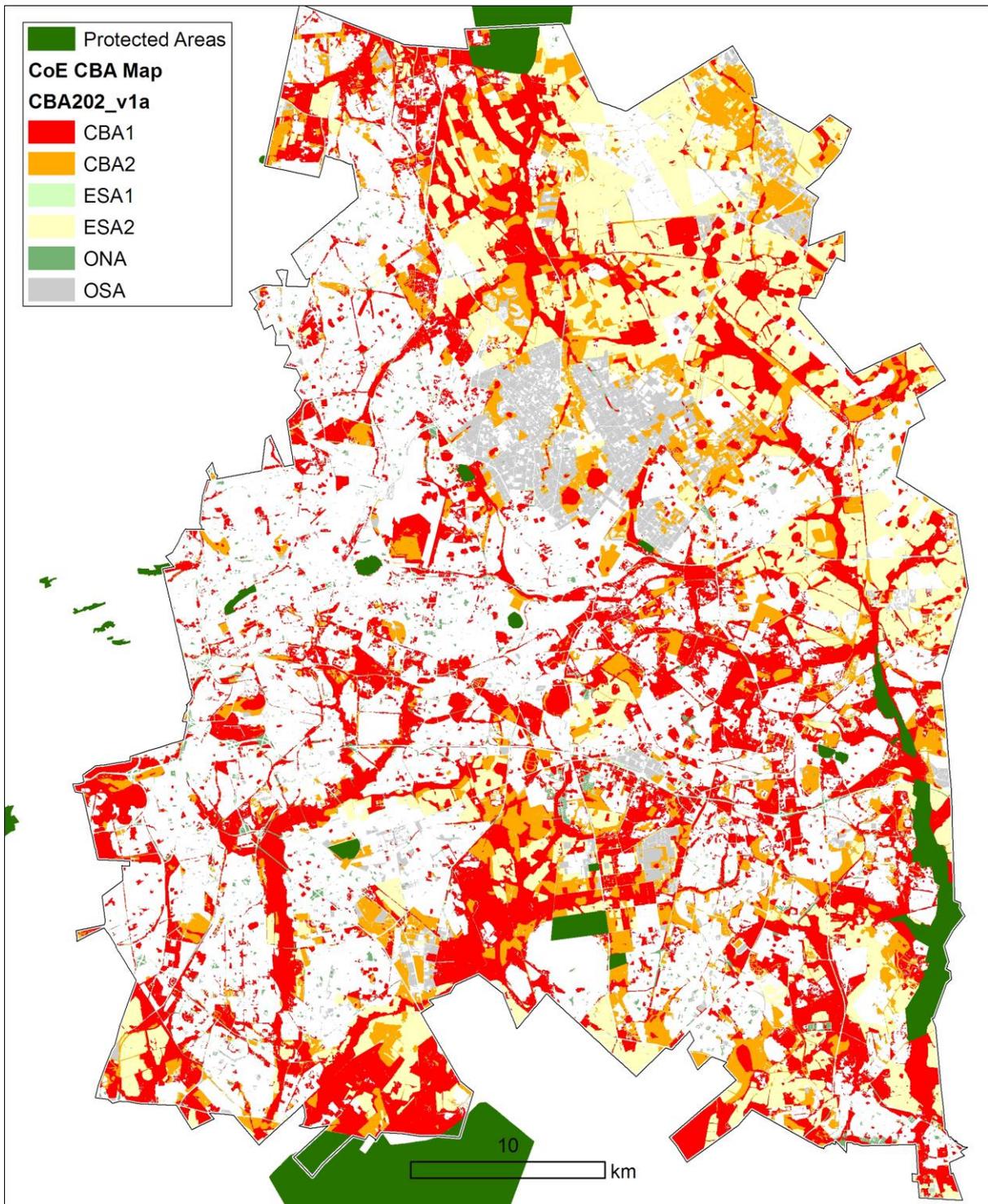


Figure 5 The final Draft v1 CBA map (display field = CBA2020_v1).