C. How to generate $NO_2$ columns, minimum $NO_2$ columns of each city, and the Euclidean distance at the resolution of 1 km x 1 km?

From the beginning:
CBd_centerBOPN_IC.shp - CBD points
FUA_extentBwithCentersOPN_IC.shp - FUA polygons with CBD coordinates
annualMeanTropoNO2Projected1000000Cliped_IC.tif - $NO_2$ raster at the resolution of 7 km x 7 km

C. 1) Use raster to point on annualMeanTropoNO2Projected1000000Cliped_IC.tif to get NO2rasterToPoint_IC.shp

C. 2) Use Kriging (spatial analyst) for NO2rasterToPoint_IC.shp, select NO2rasterToPoint_IC.shp for input point features, select grid_code for z value field, select GauKriRes1000.tif as the output raster, select 1000 for output cell size. Use Ordinary Kriging method. Select Gaussian for Semivariogram model. Keep others default.

C. 3) For FUA_extentBwithCentersOPN_IC.shp use buffer, select FUA_extentBwithCentersOPNBuf2000_ICKri.shp for output feature class, select 2000 meters for *distance*. Select All for dissolve type.

C. 4) Use *Extract by Mask*, select GauKriRes1000.tif for *input raster*, select FUA_extentBwithCentersOPNBuf2000_ICKri.shp for *input raster or feature mask data*, select extractGK1000.tif for *output raster.*

C. 5) Use *raster to point* on extractGK1000.tif to get extractGK1000Poi.shp

C. 6) Use *Clip (Analysis)*. Input features: extractGK1000Poi.shp, clip features: FUA_extentBwithCentersOPN_IC, output feature class: extractGK1000Poi_Clip.shp

C. 7) Intersect extractGK1000Poi_Clip.shp and FUA_extentBwithCentersOPN_IC.shp to get NO2cellPointRes1000GauKri.shp. Other keeps default.

C. 8) Add 2 new fields centrodX and centrodY in NO2cellPointRes1000GauKri.shp (type: double, scale:10, precision: 10). Use *calculate geometry* to get the centroids of NO2cellPointRes1000GauKri.shp

C. 9) Create a new field in NO2cellPointRes1000GauKri.shp named CBDPoiRs1k (type: double, scale=10, precision=10)

C. 10) Right click the field CBDPoiRs1k to choose *field calculator*, use
Sqr ( ([CBDX]- [centrodX])*([CBDX]- [centrodX])+ ([CBDY]- [centrodY])*([CBDY]- [centrodY]) )
Values of CBDPoiRs1k are the Euclidean distances from the centroid of cells to the city center at the resolution of 1 km x 1 km.

C. 11) Use *Split by Attributes* on NO2cellPointRes1000GauKri.shp, Input Table: NO2cellPointRes1000GauKri.shp, Split field: Cntry_name, target workspace: a certain file geodatabase

C. 12) For all the dataset in that file geodatabase, first use buffer 500m, other settings use default.

C. 13) Then, for those buffers, use Feature Envelope to Polygon.

C. 14) Merge all the results in C. 13) by using *Merge* in ArcGIS called MeCel1000GauKri and save it in the folder of NO2cellRes100GauKri_Merge, under a file geodatabase (it is not possible to save this data in the shapefile format due to its big size)

C. 15) We use Python to read the database table of MeCel1000GauKri.dbf for further analysis. (This table however is unable to convert to xls in ArcGIS because the input table exceeds the 65535 rows limit of the .xls file format). This result is the $NO_2$ columns of 378 cities at the resolution of 1 km x 1 km.

C. 16) Load MeCel1000GauKri in ArcGIS. Open this table, click *Select by Attributes*, select the attribute eFUA_ID and make sure the expression is "eFUA_ID" = 8 and export the selected records to the folder of ArcGISDbf378, repeat C. 16) so that all 378 cities are separately exported into the folder of ArcGISDbf378.

C. 17) We run CaculateminFUA_for1kmResolutionRaster_ALLCITIES.py to split the 378 cities into 378 csv for further use. The minimum $NO_2$ values of each city are also included in these csv files. The 378 csv files are in the folder of ProcessedMeCel1000TablewMinFUA.