GreenUP Green Space Detector

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Generate satellite image

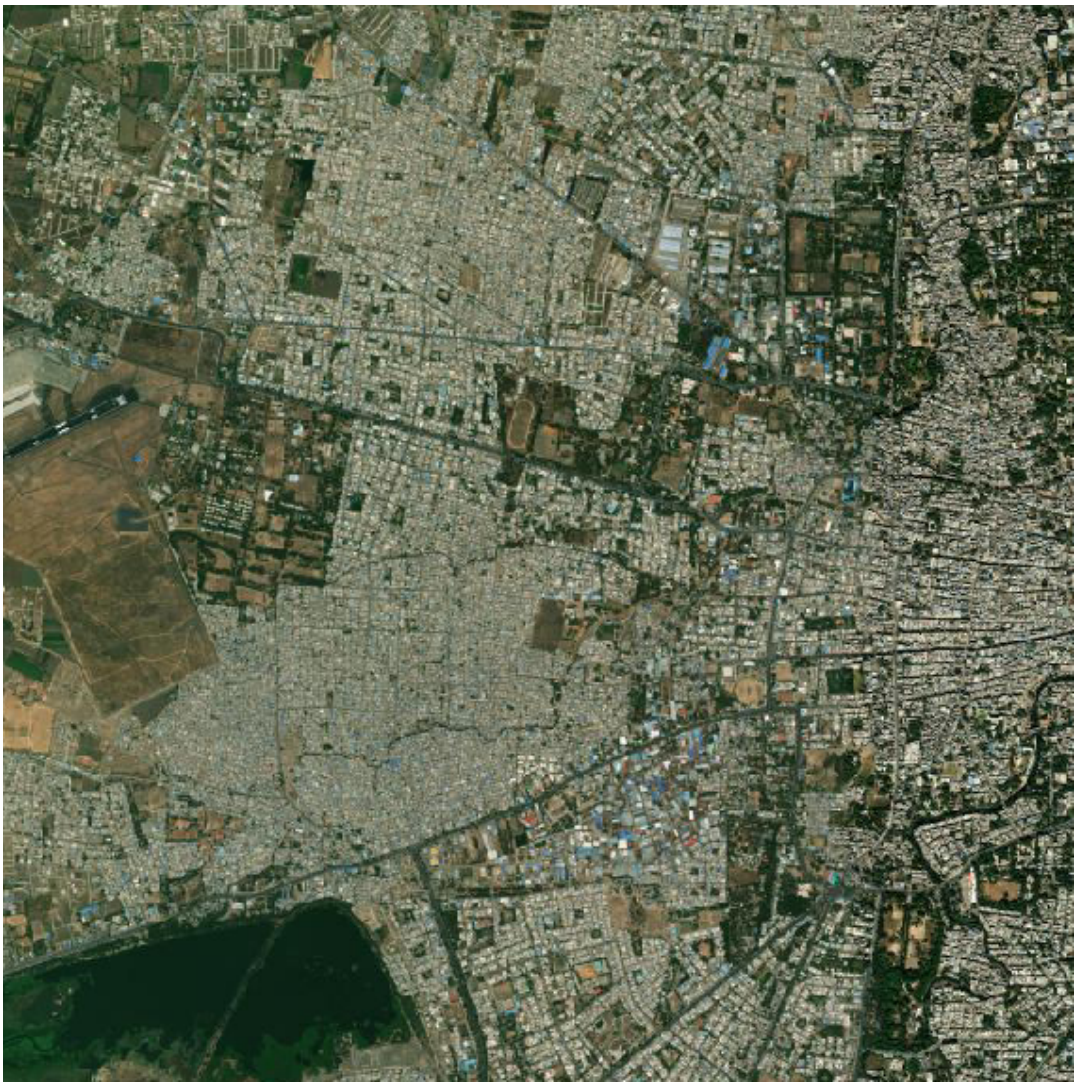
In[ ]:=
```
createmap[place_, radius_] :=
 map = GeoImage[GeoRange → Quantity[radius, "kilometers"], GeoCenter → place]
```

In[ ]:=
```
delhimap = createmap[Entity["City", Delhi], 2.5]
```

GeoGraphics: Unable to obtain location information for Entity[City, Delhi].

GeoImage: Entity[City, Delhi] is not a valid GeoCenter specification.

Out[ ]=

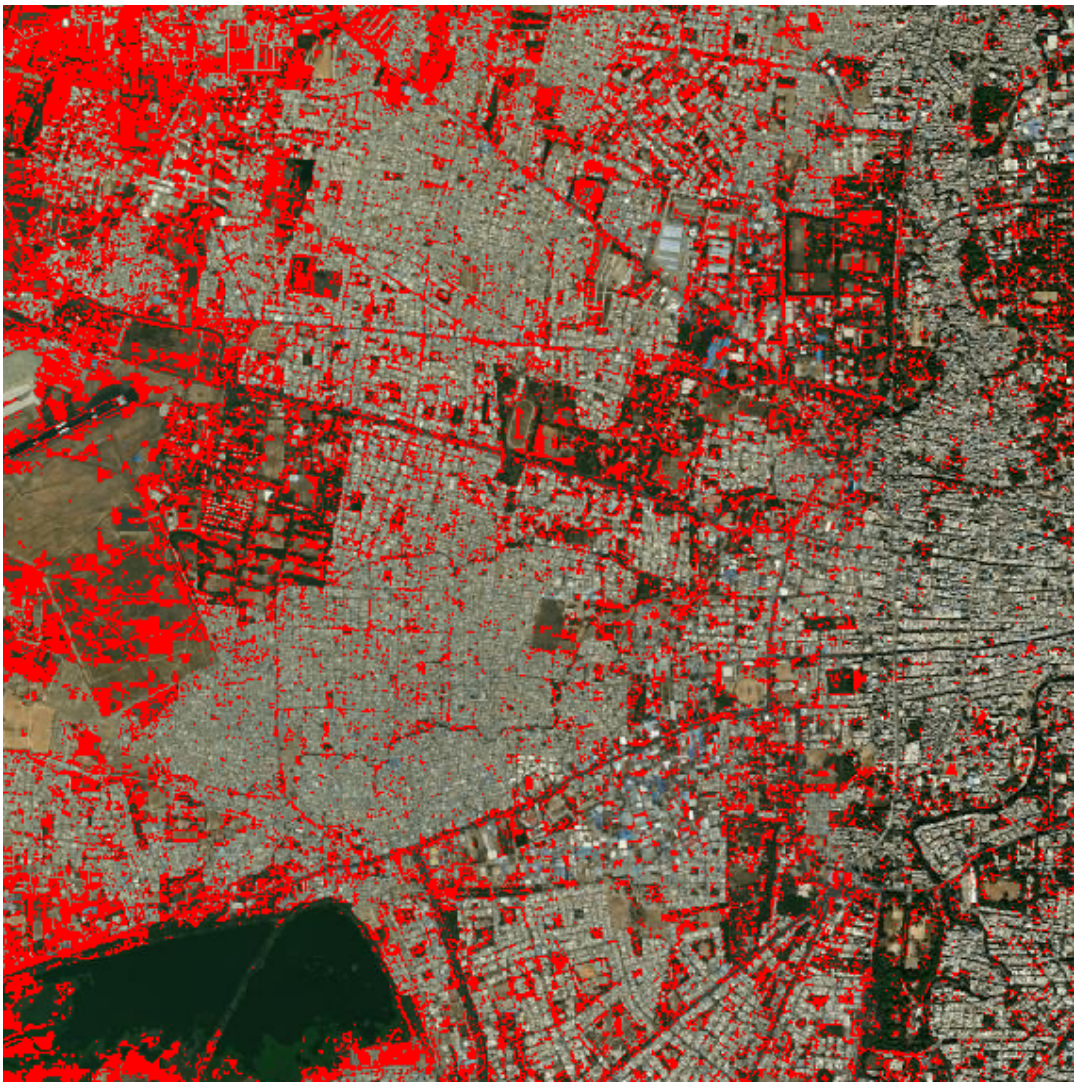


Replace green pixels with red

In[ ]:=
```
gmap[map_] := map2 = ColorReplace[map, Green → Red, .26]
```

In[ ]:=
```
delhimap2 = gmap[delhimap]
```

Out[ ]=



Count the number of red pixels from the new map

In[ ]:=
```
gpixelcalc[map2_] := greenpixel = Length@PixelValuePositions[map2, Red, .1]
```

In[ ]:=
```
delhipixel = gpixelcalc[delhimap2]
```

Out[ ]= 71 459

Calculate the proportion of green pixels out of the total pixels

In[ ]:=
```
pixelratios[greenpixel_, map2_] :=
 pixelratio = 1.0 * greenpixel / (Times @@ ImageDimensions[map2])
```

In[ ]:=
```
delhiratio = pixelratios[delhipixel, delhimap2]
```

Out[ ]= 0.220329

Multiply the proportion by the real-life area (distance squared)

In[ ]:=
```
areacalc[pixelratio_, distance_] :=
 area = Quantity[(2 * distance)^2, "kilometers squared"] * pixelratio
```

```
In[•]:= delhiarea = areacalc[delhiratio, 2.5]
```

```
Out[•]= 5.50824 km^2
```

Create the grading letter graphics with color

```
In[•]:= lettergen[{letter_, color_}] :=
 Rasterize[Overlay[{Graphics[{color, Disk[]}, ImageSize → Tiny], Style[letter, 40]},
   Alignment → Center], RasterSize → 200]
```

```
In[•]:= lettergen[{"A", Darker@Green}]
```

```
Out[•]=
```

Use the proportion and assign it a grade

```
In[•]:= grade[ratio_] := Which[0 ≤ ratio < .05, lettergen[{"F", Red}],
   .05 ≤ ratio < .1, lettergen[{"D", Orange}], .1 ≤ ratio < .15,
   lettergen[{"C", RGBColor[1., 0.82, 0.21]}], .15 ≤ ratio < .2,
   lettergen[{"B", Darker@Yellow}], .2 ≤ ratio ≤ 1, lettergen[{"A", Darker@Green}]]
```

```
In[•]:= grade[chicagoratio]
```

```
Out[•]=
```

Create visual indicating distance to green space

```
In[•]:= gmap2[map_] := Show[{map,
    SetAlphaChannel[DistanceTransform@ColorNegate@Binarize[ColorReplace[ColorReplace[
          map, White → Black, .2], Green → White, .26], .7] // ImageAdjust, 0.6]}]
```

In[ ]:=
```
gmap2[delhimap]
```

Out[ ]=

Create a graphic for the grade scale

In[ ]:=
```
Rasterize[Row[Map[lettergen[#] &, {{"A", Darker@Green}, {"B", Darker@Yellow},
    {"C", RGBColor[1., 0.82, 0.21]}, {"D", Orange}, {"F", Red}}]], RasterSize → 700]
```

Out[ ]=

Cloud deploy a form allowing an input of location and distance

```
In[ ]:= CloudDeploy[FormPage[{"location" → "Location", "distance" → "Number"},
  Grid[{{"Satellite Image", "Red Pixels Pinpoint Detected Green Spaces"},
     {createmap[#location, #distance], gmap[map]},
     {"Total Number of Green Pixels", gpixelcalc[map2]},
     {"Ratio of green pixels to total pixels", pixelratios[greenpixel, map2]},
     {"Estimated area of green space", areacalc[pixelratio, #distance]},
     {"Total area in map", Quantity[(2 * #distance)^2, "kilometers squared"]},
     {"Greeness grade for this community", grade[pixelratio]},
     {"Distance from greenspace map (White/Bright areas indicate
        furthest distance from greenspace)", gmap2[map]}}] &,
  AppearanceRules → <|"Title" →
```


```
    "Description" → "In the location box, type in a city name, street address, or
       other location name. This will be the center point of the satellite
       image. In the distance box, type a number in kilometers which will
       be the radius of the area around the center point in the satellite
       image; it is recommended to choose a value between 1-5, to ensure
       that the green can be detected. Press submit to view results."|>,
  PageTheme → "White"], Permissions → "Public"]
```

```
Out[ ]= CloudObject[https://www.wolframcloud.com/obj/ed5a9e64-20f3-477d-b44e-ece33a8fb720]
```

Cloud deploy a form asking for permission to use location and allowing an input of current location and distance

In[ ]:=
```
CloudDeploy[
 FormPage[{EmbeddedHTML@StringJoin["<script>function initYourPosition( position
       ) { document.getElementsByName('yourPosition')[0].value =
       ''+position.coords.latitude+','+position.coords.longitude;}</script>",
     "<script>navigator.geolocation.getCurrentPosition(initYourPosition)</script>"],
   "yourPosition" → "Location", "distance" → "Number"},
  Grid[{{"Satellite Image", "Red Pixels Pinpoint Detected Green Spaces"},
     {createmap["navigator.geolocation", #distance], gmap[map]},
     {"Total Number of Green Pixels", gpixelcalc[map2]},
     {"Ratio of green pixels to total pixels", pixelratios[greenpixel, map2]},
     {"Estimated area of green space", areacalc[pixelratio, #distance]},
     {"Total area in map", Quantity[(2 * #distance)^2, "kilometers squared"]},
     {"Greeness grade for this community", grade[pixelratio]},
     {"Distance from greenspace map (White/Bright areas indicate
        furthest distance from greenspace)", gmap2[map]}}] &,
  AppearanceRules → <|"Title" → 

,
   "Description" → "Your web browser will prompt you for permission to use your
      location, coordinates will automatically be inputted into the
      yourPosition box. In the distance box, type a number in kilometers
      which will be the radius of the area around the center point in the
      satellite image; it is recommended to choose a value between 1-5, to
      ensure that the green can be detected. Press submit to view results."|>,
  PageTheme → "White"], CreateUUID["temp/"], Permissions →
  "Public"]
```

Out[ ]=
```
CloudObject[
 https://www.wolframcloud.com/obj/amandewatnitrr/temp/560ed4cd-63a8-4911-b313-
   cc7ad287cde7]
```