

FIELD COORDINATOR WORKSHOP

Manage Successful
Impact Evaluations

18 - 22 JUNE 2018
WASHINGTON, DC



Geospatial Data with [spmap]

Stata Track 2

Prepared by DIME Analytics

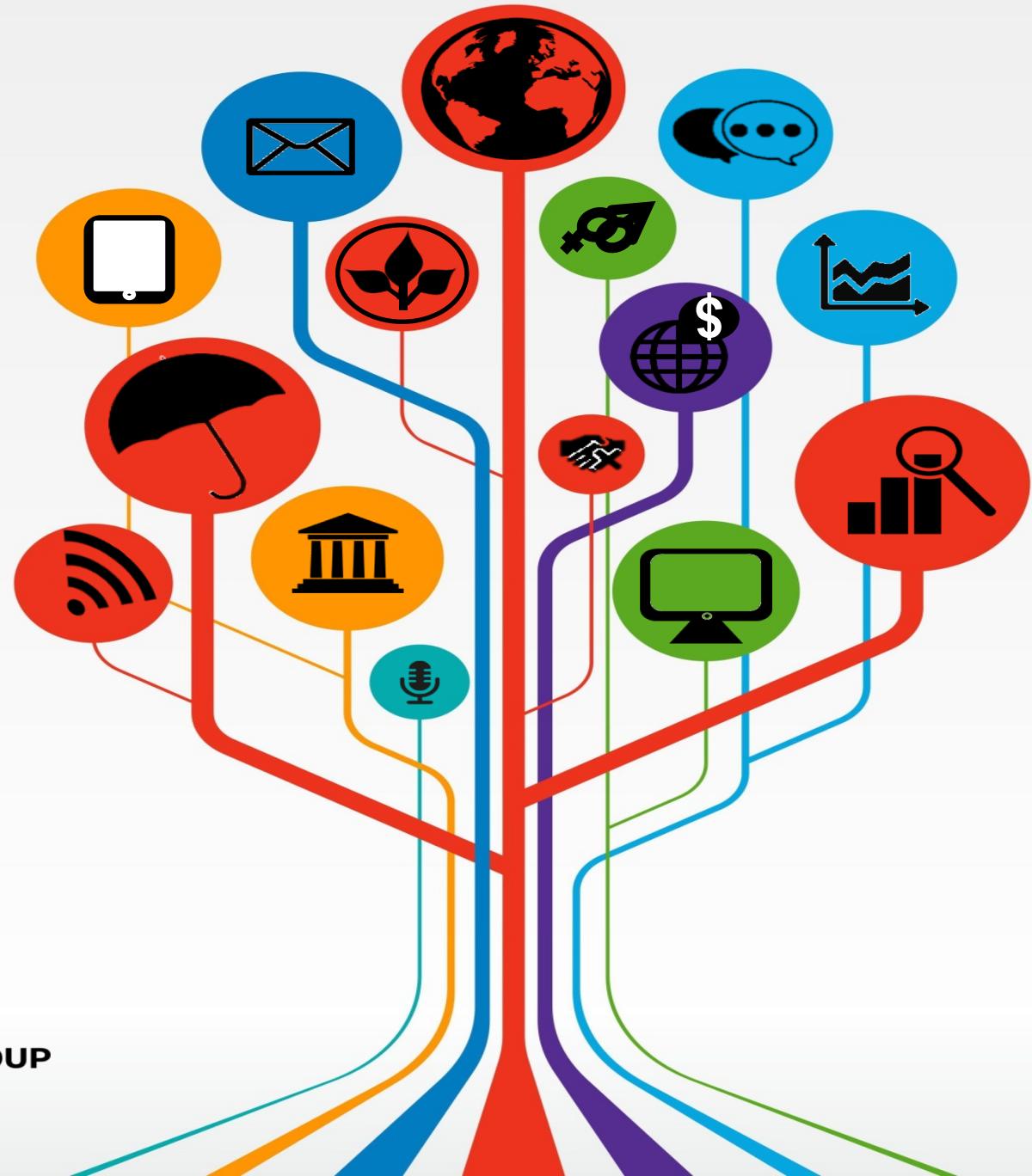
DIMEAnalytics Internal Use Only@worldbank.org

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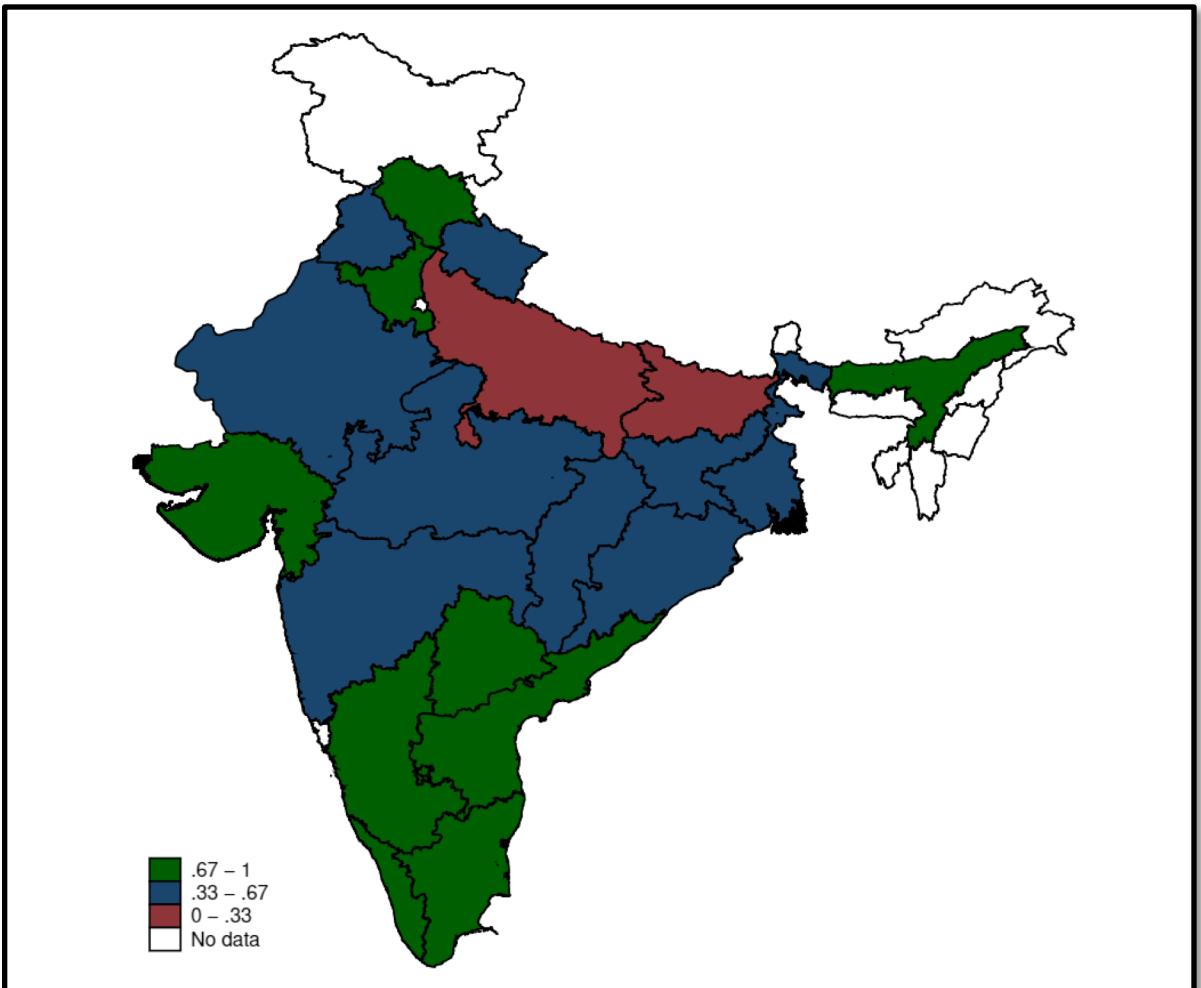
<http://www.worldbank.org/en/research/dime>

June 22, 2018



People love maps!

- Maps add a chapter to a story that the reader already knows
- This presentation will walk you through how to create a simple map in Stata using publicly available data
- With more and more GPS points and polygons becoming available, many projects have useful extensions, including fieldwork

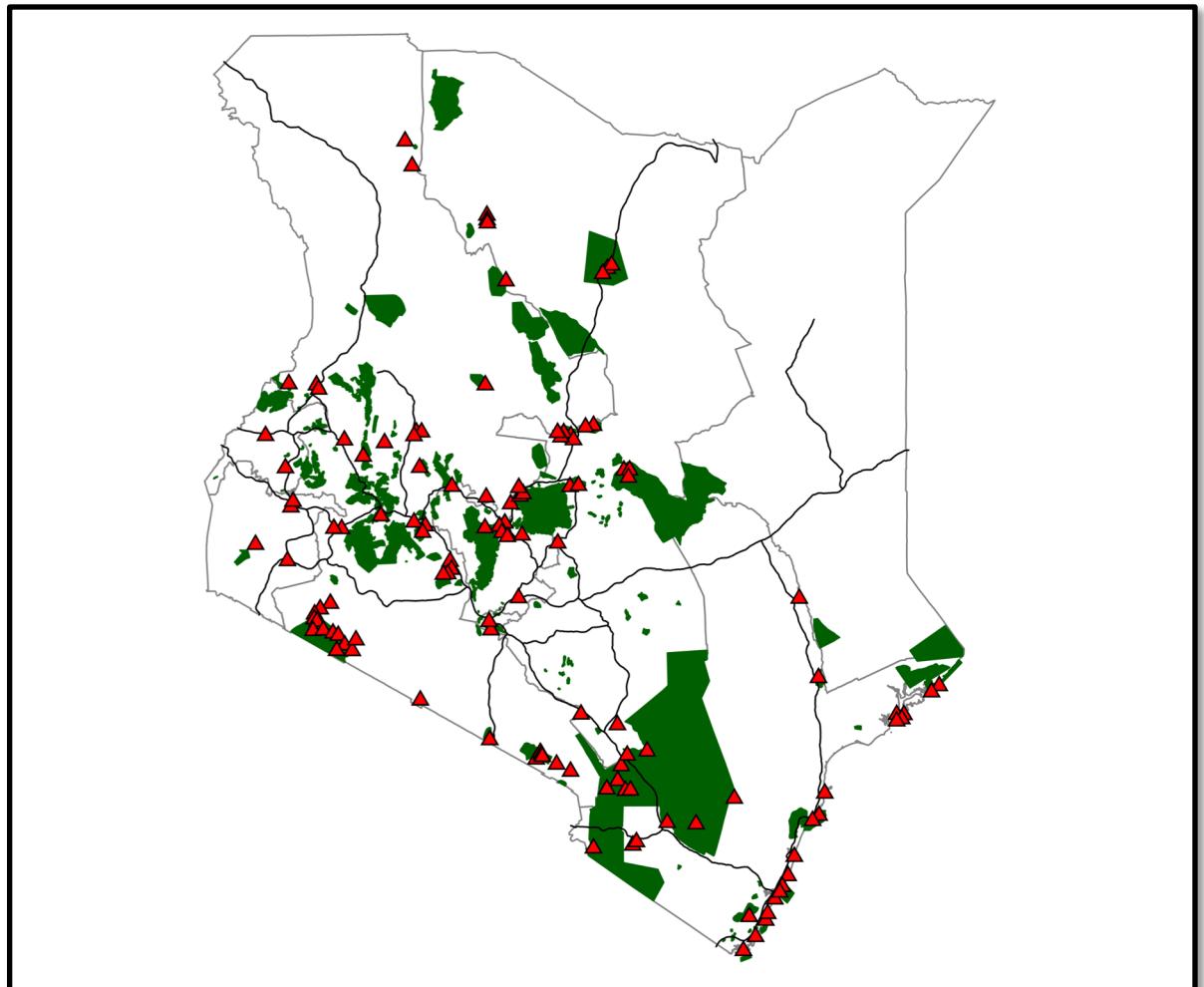


Why make maps?

- Look cool, also nice to include in reports
- Check for clustering of treatment and control households
- Check quality of GPS data, especially if it was collected not using the tablet
- Geospatial analysis

Let's make a map!

- By the end of this session, you should be able to create the following map using Stata with one click.
- There are lots of variations to go from here, including changing colors based on attributes, title, legend, etc.
- If we have time we can demo a bit of that at the end.



Stata commands for GIS work

Install the following commands:

[*shp2dta*] – take shapefiles and convert for Stata

[*spmap*] – graph maps

[*spgrid*] – make evenly sized grids

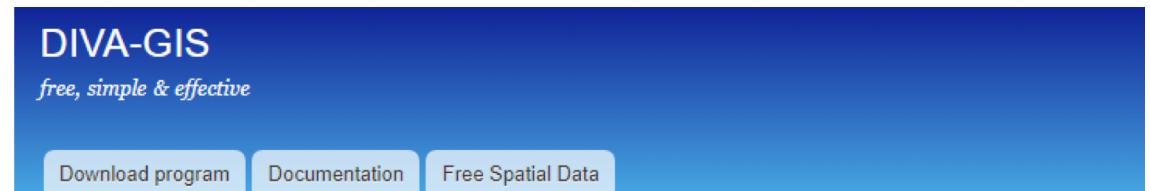
[*geodist*] – distance between two points

[*mergepoly*] – merge map polygons

[*geoinpoly*] – see if GPS point is inside a polygon

First step: GADM

- Diva-GIS has a good interface for accessing GADM data (Database of Global Administrative Areas)
 - <http://www.diva-gis.org/gdata>
- Let's go to Kenya!



Home

Download data by country

Select and download free geographic (GIS) data for any country in the world

Country

Kenya

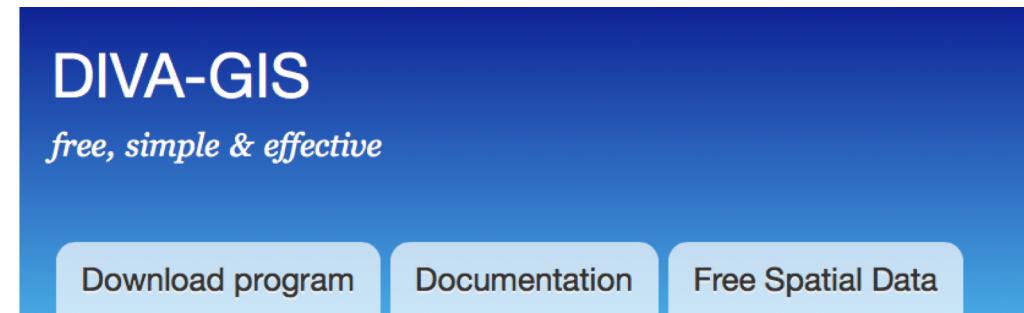
Subject

Administrative areas

OK

First step: GADM

- Diva-GIS has a good interface for accessing GADM data (Database of Global Administrative Areas)
 - <http://www.diva-gis.org/gdata>
- Let's go to Kenya!
- Ok, now we have administrative data...



Home

Spatial Data Download

Country: Kenya

Subject: Administrative areas (GADM)

[Download](#)

Converting shapefiles (.shp) to .dta

[*shp2dta*]

```
5 shp2dta ///
6   | using "${directory}/GIS/KEN_adm/KEN_adm0.shp" ///
7   , database("${directory}/data/KEN_adm0_database.dta") ///
8   | coordinates("${directory}/data/KEN_adm0_coordinates.dta") ///
9   | genid(ID) replace
```

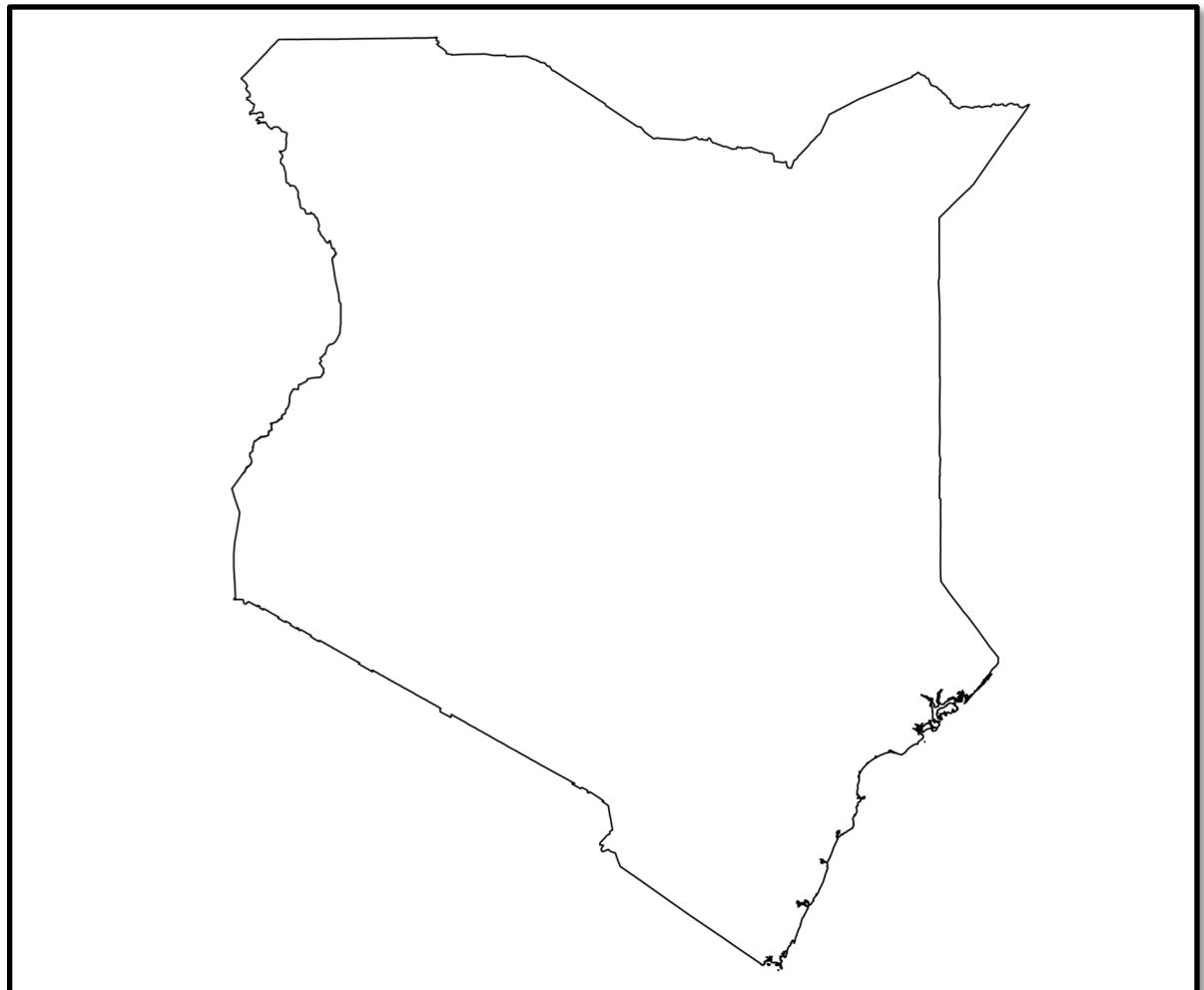
Displaying shapefiles as Stata graphs

[*spmap*]

1. [use] the *database.dta* file you created with [*shp2dta*]
2. [*spmap using*] the *coordinates.dta* file you created with [*shp2dta*]

```
13 * Map Kenya outline
14
15 use "${directory}/data/KEN_adm0_database.dta" , clear
16
17 spmap ///
18 | using "${directory}/data/KEN_adm0_coordinates.dta" ///
19 , id(ID)
20
21 graph export ///
22 | "${directory}/outputs/KEN_adm0.png" ///
23 , replace width(2000)
```

Et voila! We have a Kenya!



In [spmap], this is the “basemap”

- The shapes you draw in the basemap can be colored or have other representations based on the attributes in the *database.dta*.
- On top of these, you can layer polygons, lines, and points, as well as other advanced stuff.
- Let’s stack these up one at a time.

```
help spmap                                         Version 1.2.0
-----
Title
spmap -- Visualization of spatial data

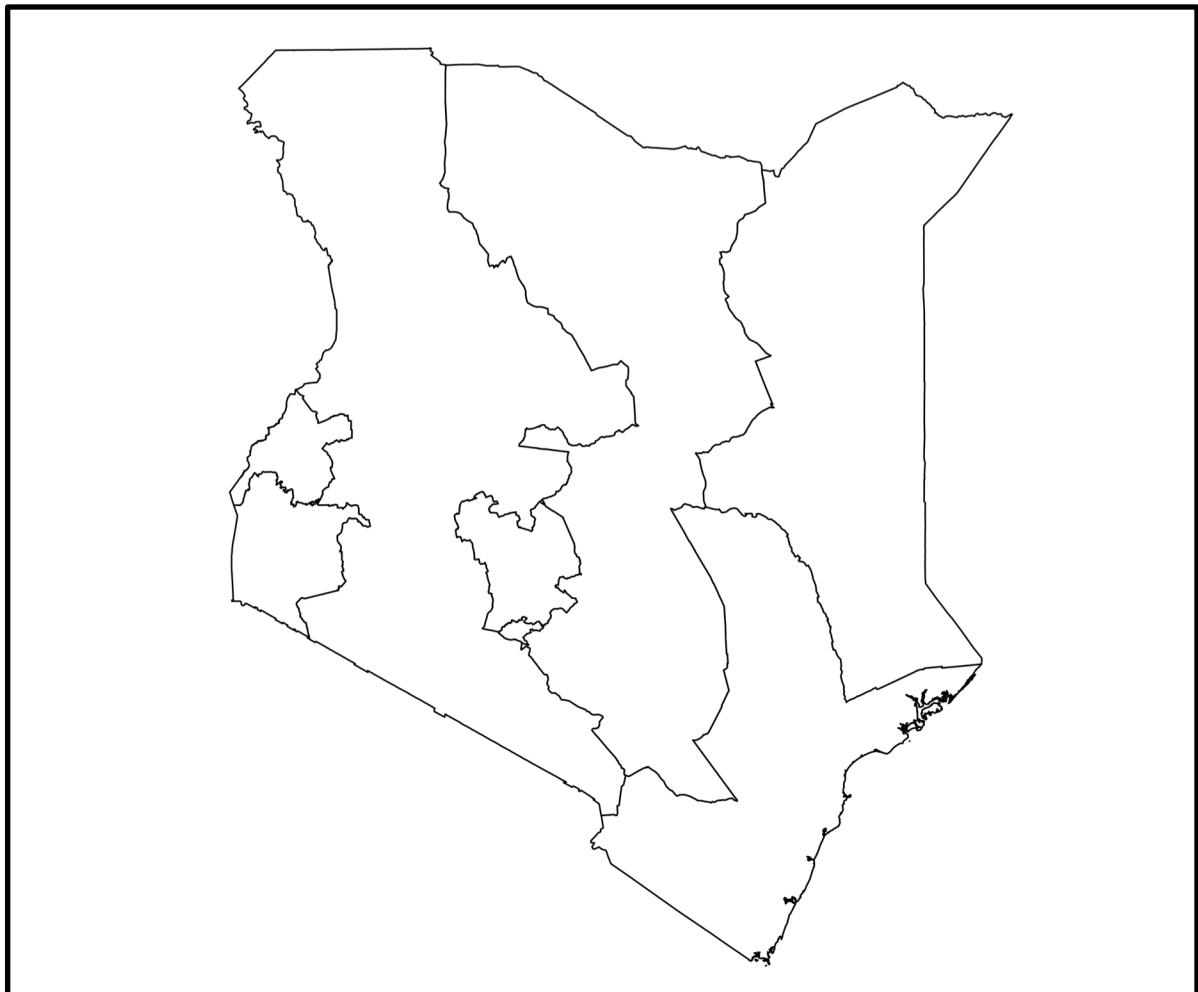
Syntax
spmap [attribute] [if] [in] using basemap [,  
       basemap_options  
       polygon(polygon_suboptions)  
       line(line_suboptions)  
       point(point_suboptions)  
       diagram(diagram_suboptions)  
       arrow(arrow_suboptions)  
       label(label_suboptions)  
       scalebar(scalebar_suboptions)  
       graph_options]
```

First, let's make the basemap more interesting

Instead of graphing all of Kenya as one unit, let's look at its regions (ADM-1).

1. Convert this .shp to .dta
2. Draw the empty basemap

```
25 * Convert Kenya regions to dta
26
27 shp2dta ///
28   | using "${directory}/GIS/KEN_adm/KEN_adm1.shp" ///
29   , database("${directory}/data/KEN_adm1_database.dta") ///
30   | coordinates("${directory}/data/KEN_adm1_coordinates.dta") ///
31   | genid(ID) replace
32
33 * Map Kenya with regions
34
35 use "${directory}/data/KEN_adm1_database.dta" , clear
36
37 spmap ///
38   | using "${directory}/data/KEN_adm1_coordinates.dta" ///
39   , id(ID)
40
41 graph export ///
42   | "${directory}/outputs/KEN_adm1.png" ///
43   , replace width(2000)
```



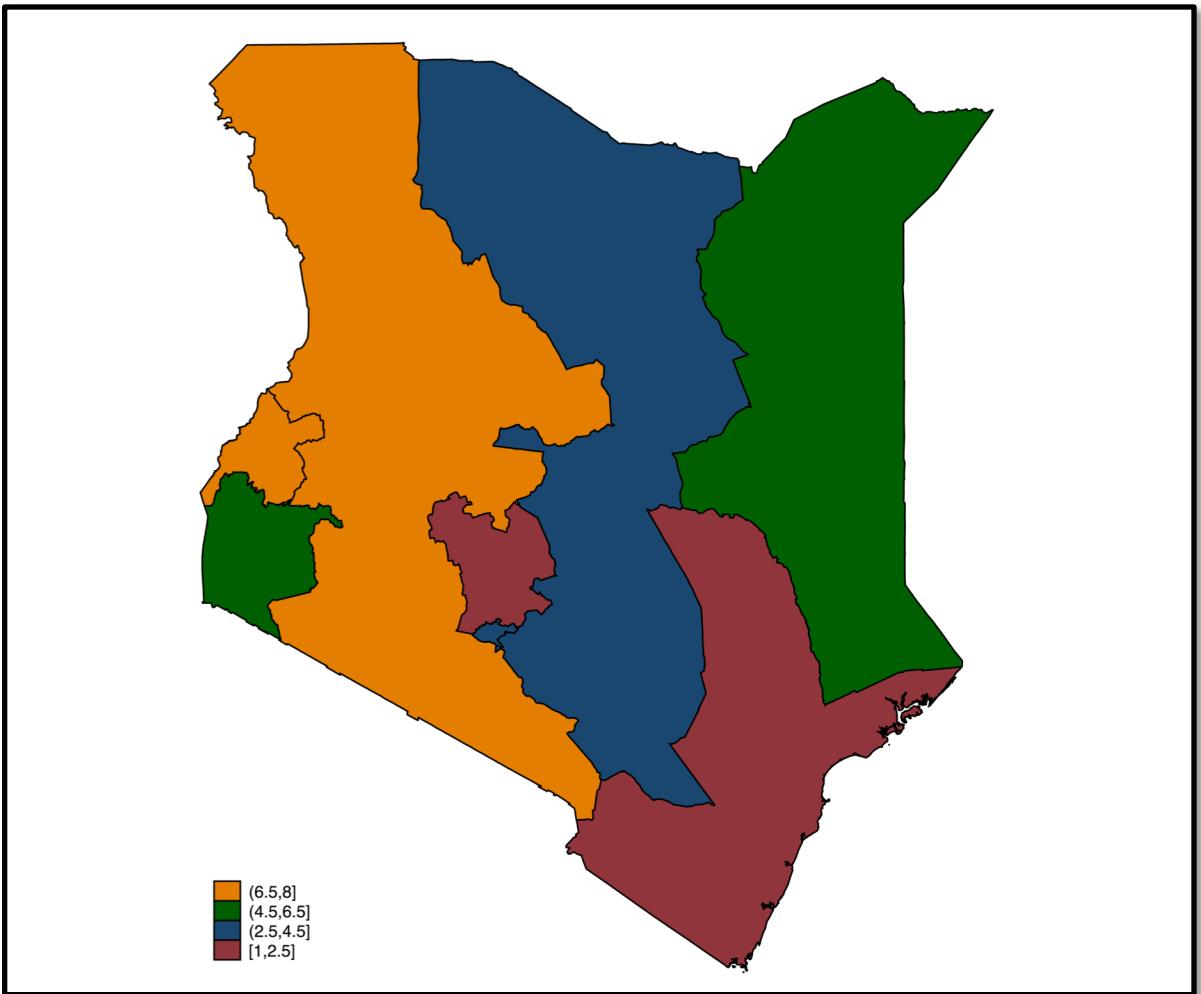
What to display

- You can calculate things you want displayed at the polygon level and merge onto the basemap “database” dataset (ex. cluster level poverty). These can be used to color in polygons or displayed over polygons
- Individual objects that you want to map can be stored in a separate dataset. (ex. Longitude and latitude of households in your survey) These can be displayed as dots, or labels. (ex. point for each house)

You can use attributes to color the basemap

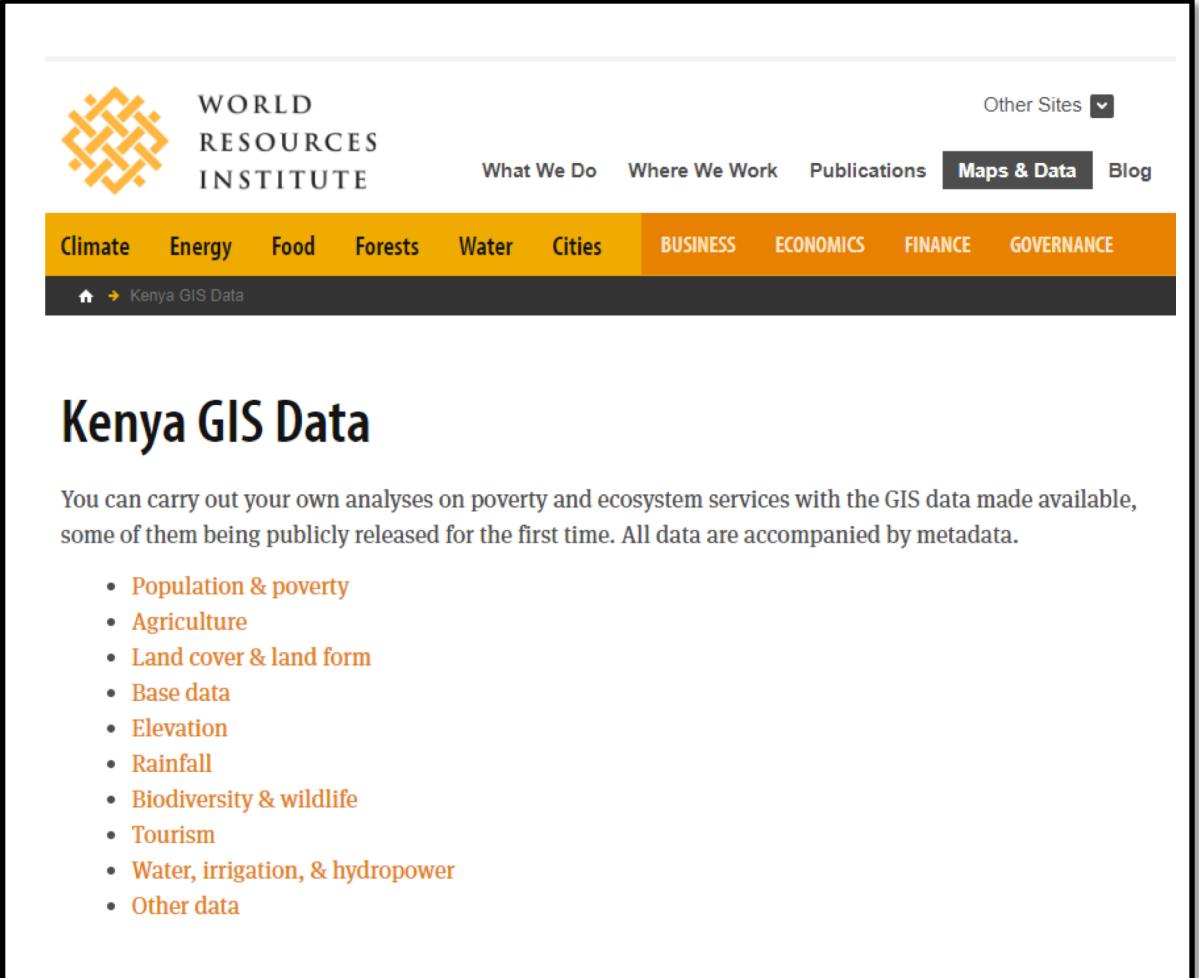
- This can be based on any attribute you have in the data, by merging it on.
- You have a lot of control over the breaks, the coloring and legend, and so on.

```
45 * Map Kenya with arbitrary color
46
47 use "${directory}/data/KEN_adm1_database.dta" , clear
48
49 clonevar fakeattribute = ID
50
51 spmap fakeattribute ///
52 | using "${directory}/data/KEN_adm1_coordinates.dta" ///
53 , id(ID) fcolor(maroon navy dkgreen dkorange)
54
55 graph export ///
56 | "${directory}/outputs/KEN_adm1_color.png" ///
57 , replace width(2000)
```



Next, let's add some features

- WRI:
<https://www.wri.org/resources/datasets/kenya-gis-data>
- Three datasets:
 - Protected areas (polygons)
 - Major roads (lines)
 - Tourist campsites (points)
- With these data we can create a map that is hopefully interesting!



The screenshot shows the homepage of the World Resources Institute (WRI). The header includes the WRI logo, navigation links for "What We Do", "Where We Work", "Publications", "Maps & Data" (which is highlighted in dark blue), and "Blog". Below the header is a navigation bar with categories: Climate, Energy, Food, Forests, Water, Cities, BUSINESS, ECONOMICS, FINANCE, and GOVERNANCE. The main content area is titled "Kenya GIS Data". It features a sub-headline: "You can carry out your own analyses on poverty and ecosystem services with the GIS data made available, some of them being publicly released for the first time. All data are accompanied by metadata." A bulleted list of data types follows:

- Population & poverty
- Agriculture
- Land cover & land form
- Base data
- Elevation
- Rainfall
- Biodiversity & wildlife
- Tourism
- Water, irrigation, & hydropower
- Other data

Get these into .dta format

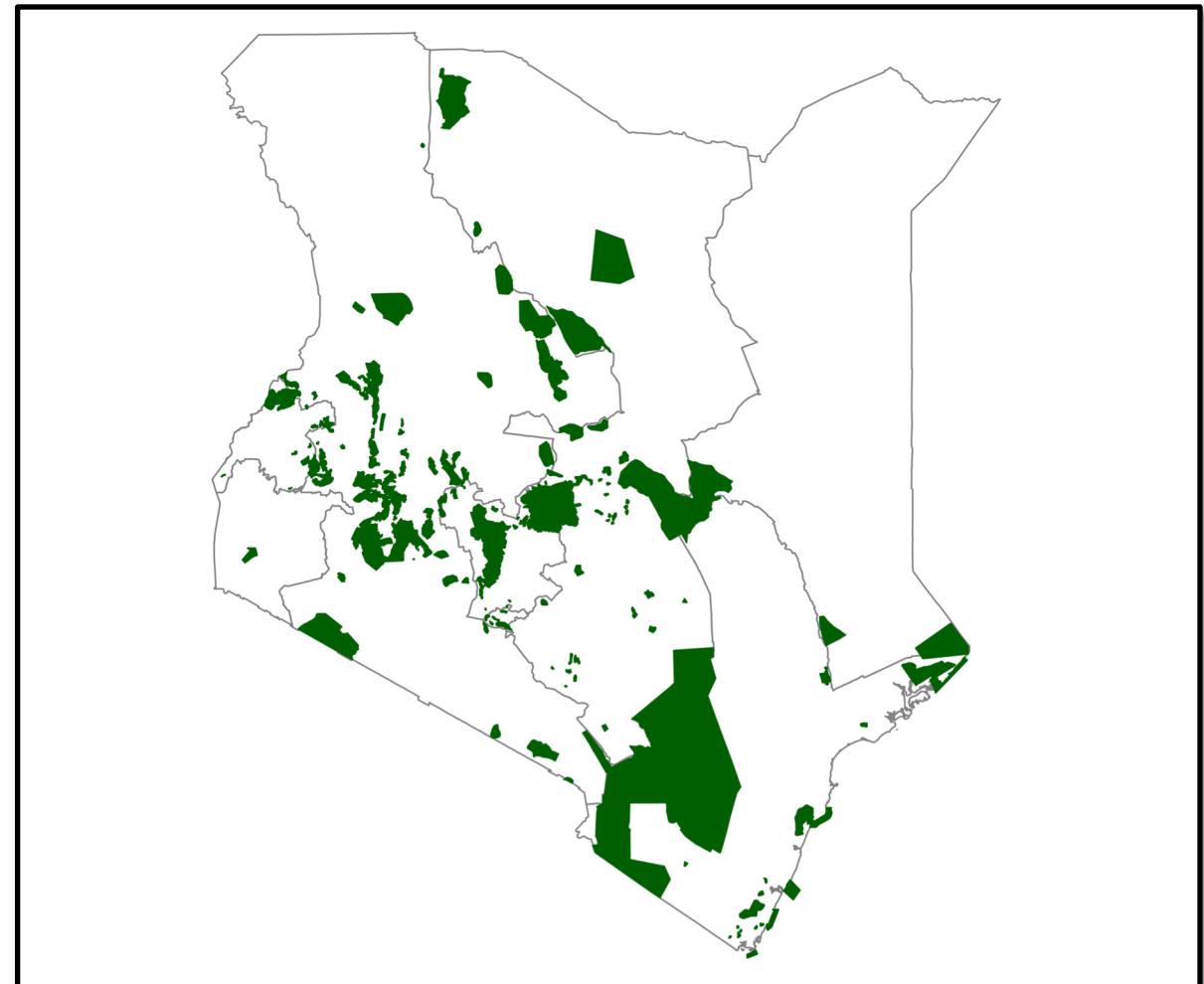
Tip: Good naming conventions are essential!

```
59 * Convert features to .dta
60
61 shp2dta ///
62   | using "${directory}/GIS/ke_major-roads/ke_major-roads.shp" ///
63   , database("${directory}/data/ke_major-roads_database.dta") ///
64   | coordinates("${directory}/data/ke_major-roads_coordinates.dta") ///
65   | genid(ID) replace
66
67 shp2dta ///
68   | using "${directory}/GIS/ke_protected-areas/ke_protected-areas.shp" ///
69   , database("${directory}/data/ke_protected-areas_database.dta") ///
70   | coordinates("${directory}/data/ke_protected-areas_coordinates.dta") ///
71   | genid(ID) replace
72
73 shp2dta ///
74   | using "${directory}/GIS/ke_hotels-lodges-campsites/ke_hotels-lodges-campsites.shp" ///
75   , database("${directory}/data/ke_hotels-lodges-campsites_database.dta") ///
76   | coordinates("${directory}/data/ke_hotels-lodges-campsites_coordinates.dta") ///
77   | genid(ID) replace
```

Protected areas

- Plotting the polygons on top of the basemap shows the locations very well (although accuracy of different sources is not perfect).
- Styling options start making this look good!

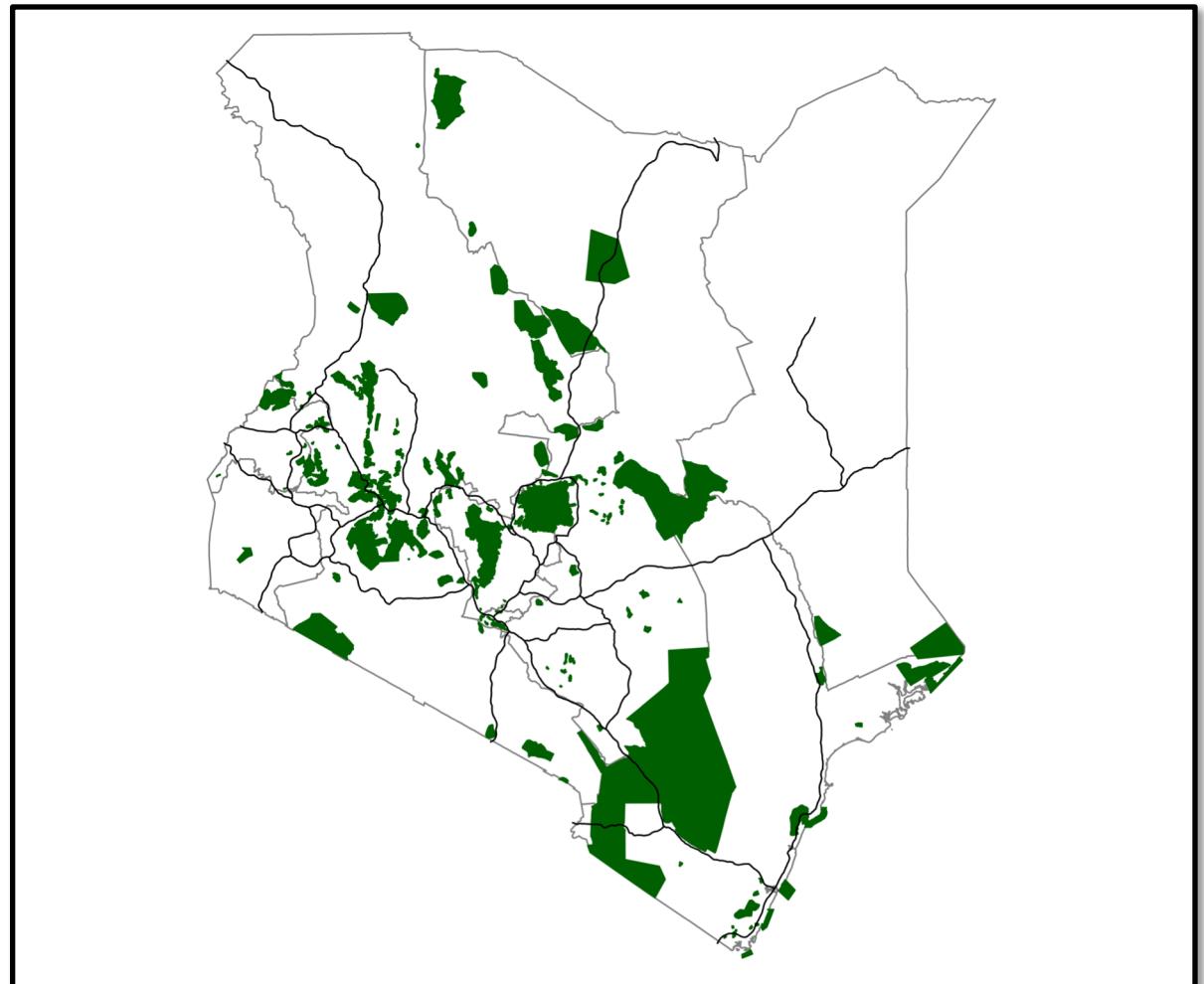
```
79 * Add protected areas
80
81 use "${directory}/data/KEN_adm1_database.dta" , clear
82
83 spmap ///
84     | | using "${directory}/data/KEN_adm1_coordinates.dta" ///
85     | | , id(ID) oc(gray) ///
86     | | polygon( ///
87     | |     | data("${directory}/data/ke_protected-areas_coordinates.dta") ///
88     | |     | fc(dkgreen) oc(none))
89
90 graph export ///
91     | | "${directory}/outputs/KEN_adm1_areas.png" ///
92     | | , replace width(2000)
```



Major roads

- We should be getting the hang of this by now!

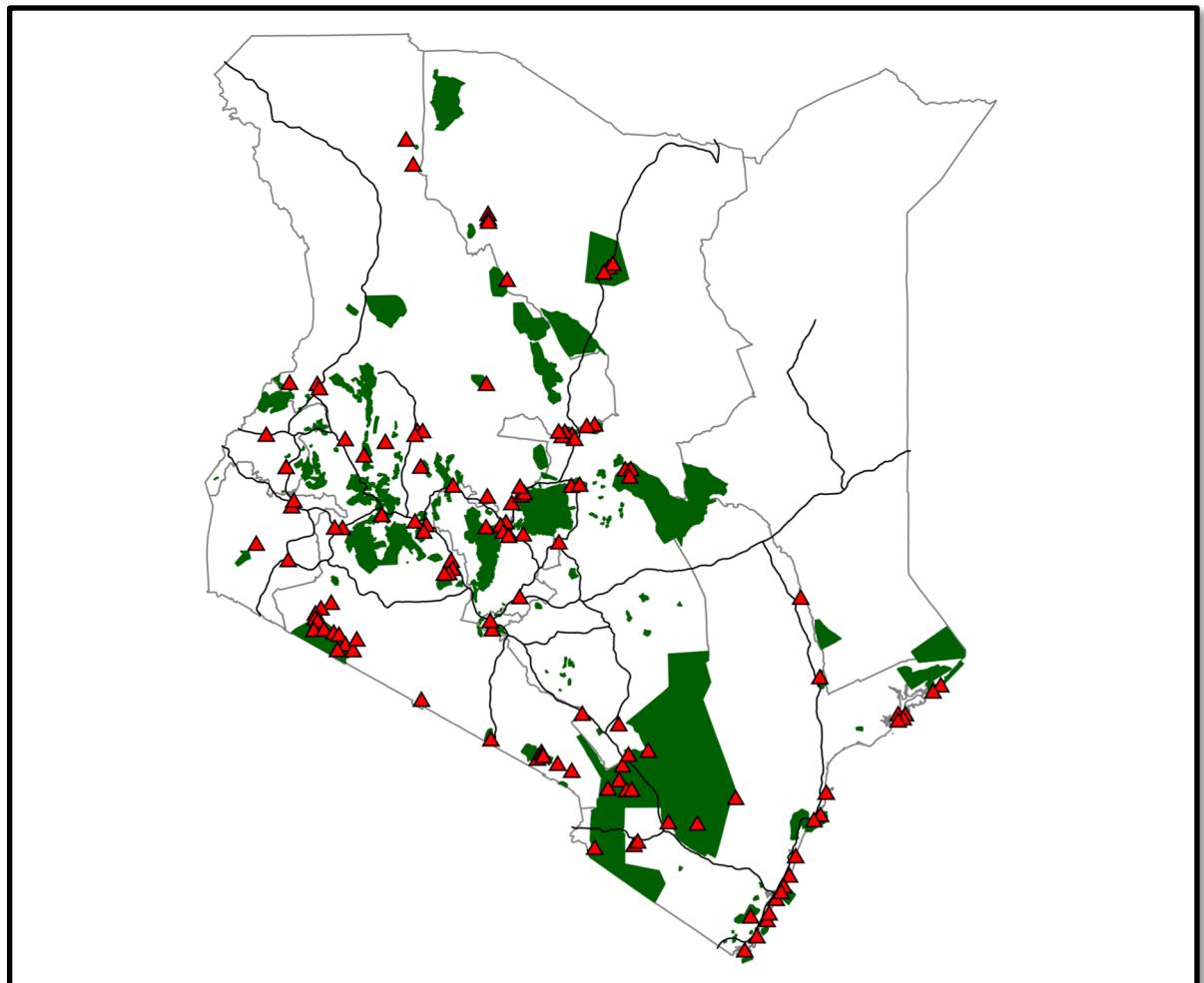
```
94 * Add roads
95
96 use "${directory}/data/KEN_adm1_database.dta" , clear
97
98 spmap ///
99 | using "${directory}/data/KEN_adm1_coordinates.dta" ///
100 , id(ID) oc(gray) ///
101 polygon( ///
102 | data("${directory}/data/ke_protected-areas_coordinates.dta") ///
103 | fc(dkgreen) oc(None)) ///
104 line( ///
105 | data("${directory}/data/ke_major-roads_coordinates.dta") ///
106 )
107
108 graph export ///
109 | "${directory}/outputs/KEN_adm1_roads.png" ///
110 , replace width(2000)
```



Tourist campsites

- Points are a bit pickier but also have lots of styling options.

```
112 * Add campsites
113
114 use "${directory}/data/KEN_adm1_database.dta" , clear
115
116 spmap ///
117   | using "${directory}/data/KEN_adm1_coordinates.dta" ///
118   , id(ID) oc(gray) ///
119   | polygon ///
120   | data("${directory}/data/ke_protected-areas_coordinates.dta") ///
121   | fc(dkgreen) oc(none) ///
122   ) ///
123   | line( ///
124   | data("${directory}/data/ke_major-roads_coordinates.dta") ///
125   ) ///
126   | point( ///
127   | data("${directory}/data/ke_hotels-lodges-campsites_coordinates.dta") ///
128   | x(_X) y(_Y) size(medium) shape(t) fc(red) oc(black) ///
129   )
130
131 graph export ///
132   | "${directory}/outputs/KEN_adm1_sites.png" ///
133   , replace width(2000)
```



Thank you!

