



**Development Research Group,
Development Economics,
World Bank**

ADePT

Version 2.0

Automated Mapping Tool

User's Guide

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Part 2

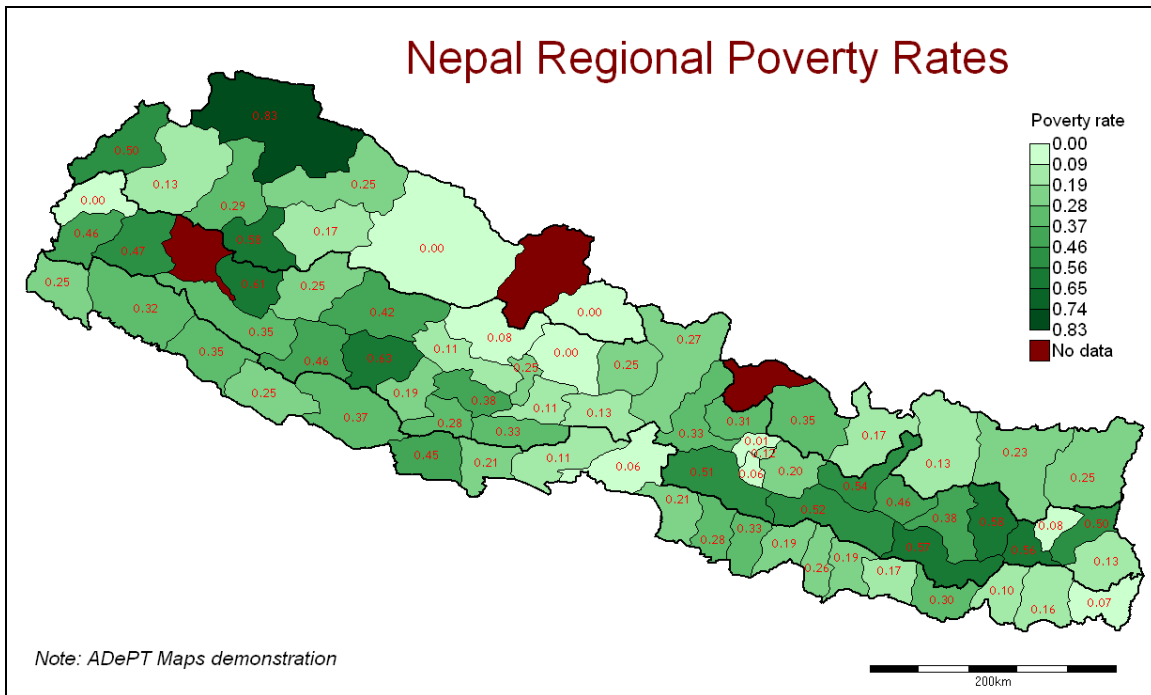
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Appendix I. Where to refer for maps/shapefiles?

Disclaimer

1.1 Introduction

ADePT Maps program is an interactive tool to assist users in building maps depicting statistical data by geographical regions or districts. Maps generated by the program can be inserted in reports, papers and other publications, or used online to illustrate data on the web pages:



ADePT Maps operates in Stata for Windows, works with Stata's native datasets and produces the resulting images in a graphic format commonly supported by office applications. The user can work with the program interactively or can specify the necessary parameters from the Stata command line or a .do-file. No experience with Stata programming is necessary to produce thematic maps.

A collection of maps is available for download from our server, but the program can also use maps in the standard GIS format (*ESRI¹ shapefiles*).

Installation package of ADePT Maps is located at:

http://siteresources.worldbank.org/INTPOVRES/Resources/ADePT_Map.exe

Note that installation will require administrative rights. The default installation directory is suitable for most users, but it can be changed if necessary to any other location on the disk where the user has write-access.

After installation is complete the user must inform Stata, where the program was installed by adding this directory to Stata's search path. This is done with the command:

```
adopath ++ "c:\ado\plus\ADePT_Map\"
```

¹ Environmental Systems Research Institute, Inc.

Here in quotes the directory where ADePT Maps was installed must be specified. It is convenient to include this command into the user's profile. do file (located in Stata's home directory) to make ADePT Maps is instantly available from the next Stata session.

This guide covers all the steps necessary to produce thematic maps like the one shown on the previous page, describes all the parameters of the program and potential error messages and solutions. However the creation of the map in essence can be reduced to the following simple process:

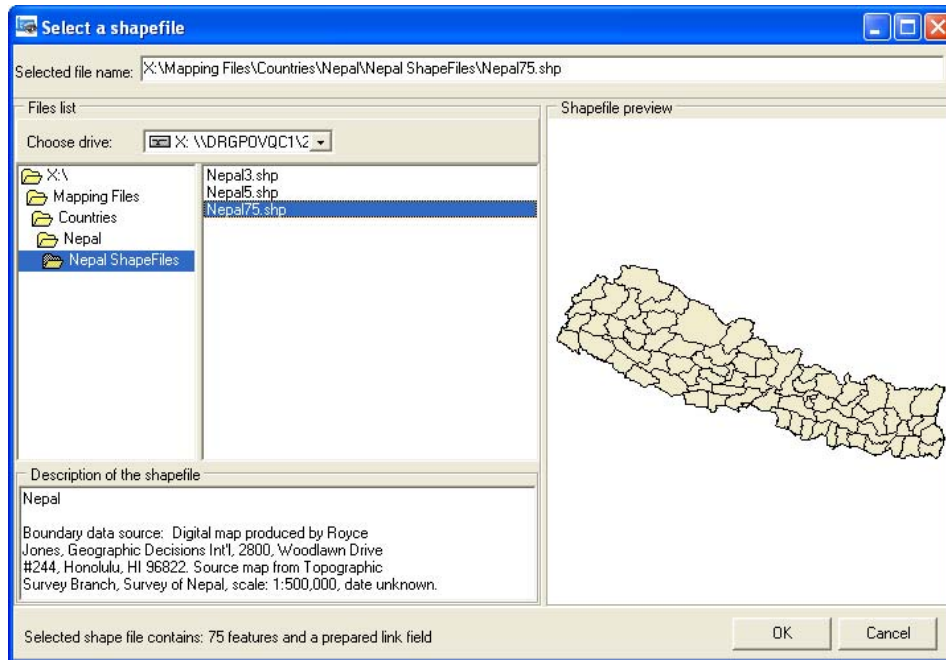
1. Load a Stata dataset
2. Start ADePT Maps
3. Select a shapefile (map)
4. Specify a regional variable in the data and the shapefile
5. Specify the variable of interest
6. Optionally specify weights and labels

This guide documents the entire process and describes additional features of the program. Particular windows may look differently on the user screen depending on the versions of the operating system, Stata and ADePT Maps¹.

¹ The maps present in this manual were built with the sole purpose of illustrating the features of the mapping program and are not intended for the use in policy analysis.

1.2 Creating the first map

ADePT Map can be launched by typing `amap` in the Stata command line.

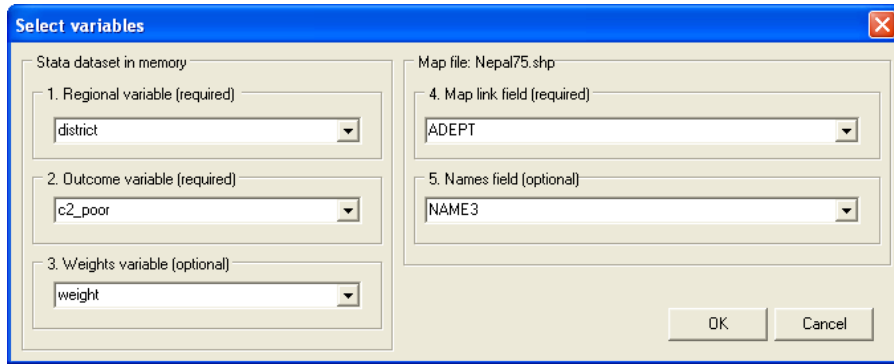


First, the program suggests the user to select a shapefile (map). These maps can be either downloaded from our collection or obtained from a number of internet resources listed in the Appendix I.

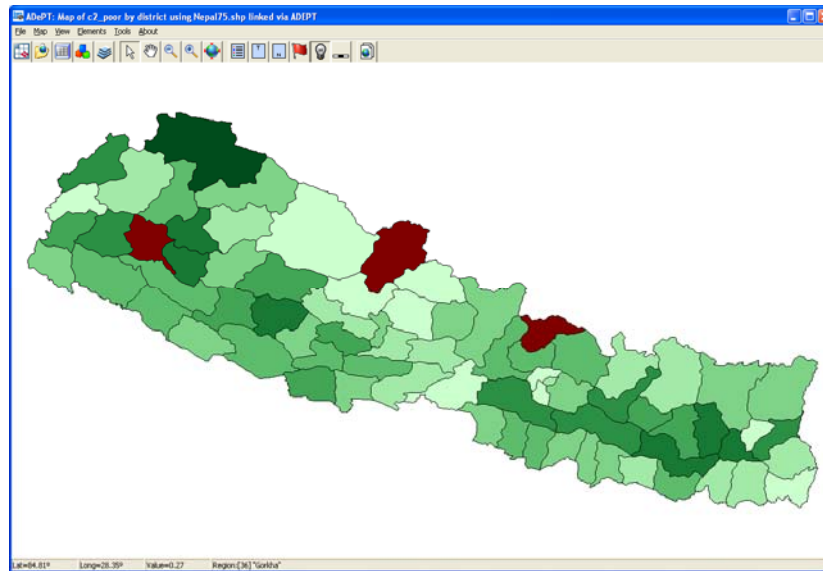
Select the drive first, and proceed through the directory list at the left. Individual shapefiles can be selected in the center files list. Once a file is clicked, the program shows a preview image of this map at the right. If there is a description available (a text file with the same name as the shapefile, but extension `.txt`) then its contents is shown in the lower-left corner of the screen. The status bar shows the number of features (map regions) and informs the user if a prepared link field (“*ADePT*”) is contained in the map.

A link field is a field containing numerical values (region codes) same as the ones used in the user’s dataset. Based on these codes ADePT Maps will associate data from the dataset located in Stata’s memory with particular geographic locations. These codes may differ across different datasets. For example, in one survey the codes could be assigned according to the alphabetical order of the districts’ names in the English notation, while in another survey for the same country the codes could be assigned according to the alphabetical order of the districts names in the native notation. There is no guarantee that the two coding systems are the same, and both could be stored in the same map file. ADePT Maps provides the user with a facility to create custom regional coding based on an existing shapefile. This is described in more detail in 2.7. Note that one map can have multiple link fields, and it can be used even if none of these fields is called “*ADePT*”.

Click “*OK*” to select a map and proceed to the next dialog to assign the variables their roles in the data.




At the very least, the user must select the regional variable and the outcome variable from the dataset and a link field from the map.




1.3 Exploring the map

The following buttons in the toolbar determine the interaction between the mouse and the map:



The first button  is a “no-interaction” button. Which means the mouse does not interact with the map, though it can still move around the elements like the legend or the scalebar. This is the default mode.

The second button  is a “pan” button. In the pan mode the mouse will move the map in the window. When the map is smaller than the window, this tool allows moving the map within the window. When the map is larger than the window this tool allows to scroll to a particular area.

The size of the map can be controlled with the “*zoom-out*”



and “*zoom-in*”



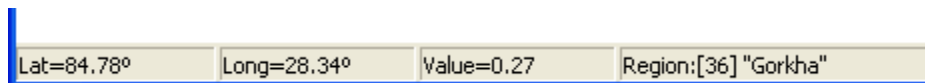
Only one of the buttons 1-4 can be selected at any time, and it remains selected (down) until another mode is selected.



The fifth button “*zoom to fit*” restores the zoom level so that the map fits into the window.


All of these functions can also be selected from the “*View*” submenu of the main menu.

The status bar at the bottom of the window displays the current location of the mouse (latitude/longitude) and if the mouse is over a region of the map the corresponding value of the region and the region’s name and code:

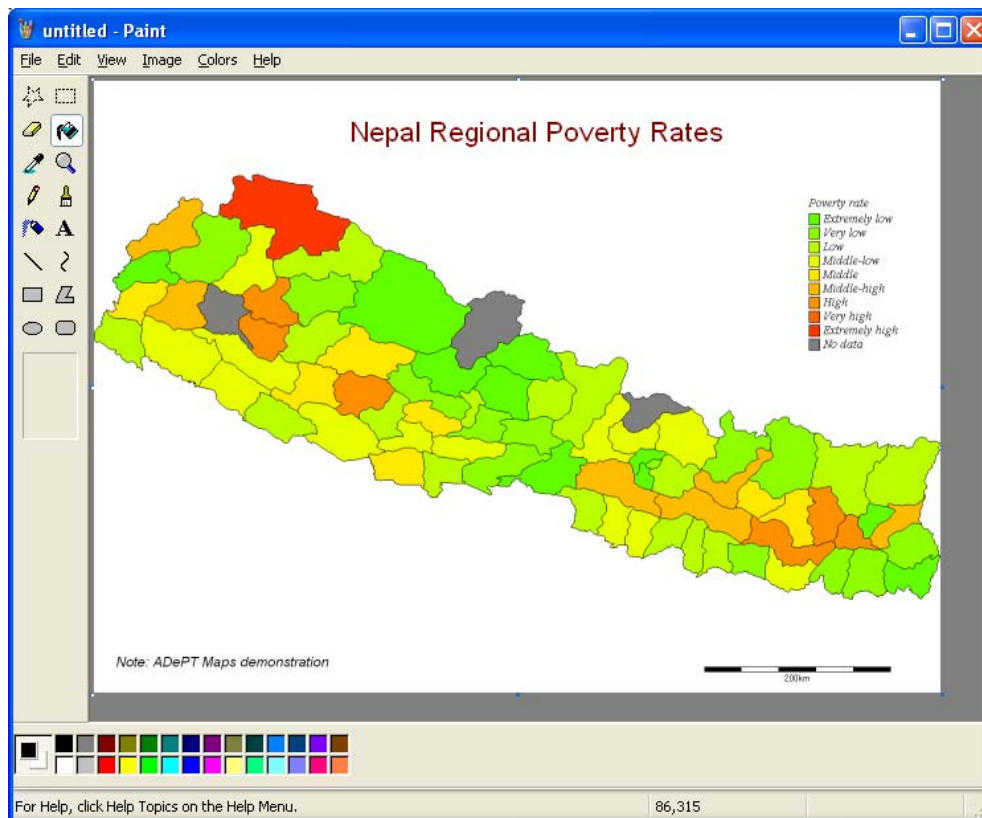


The code of the region (displayed in square brackets) corresponds to the coding of the regions in the user’s dataset.

1.4 Exporting the map

After the map is prepared it can be included into the user's documents. The easiest way to include the map as an illustration into a *Microsoft Word* document is to click the corresponding button in the taskbar , then open the document in the *Microsoft Word* program, put the cursor in the desired position in the document and press *Ctrl+V* (or select "*Edit*" → "*Paste*" from the main menu). Similarly it can be exported to *Microsoft PowerPoint*, *Excel* and other office applications.

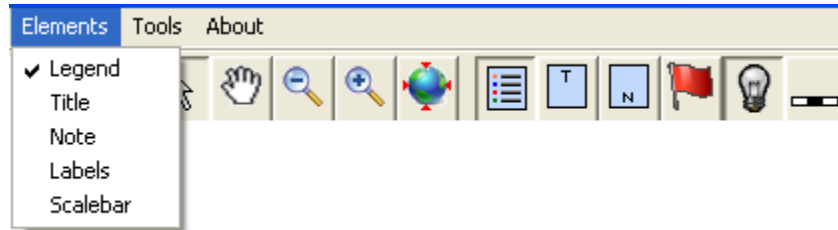
Additional editing can be performed in one of the many available graphics editors, e.g. the standard *MsPaint* program, which is shipped with *Microsoft Windows*:



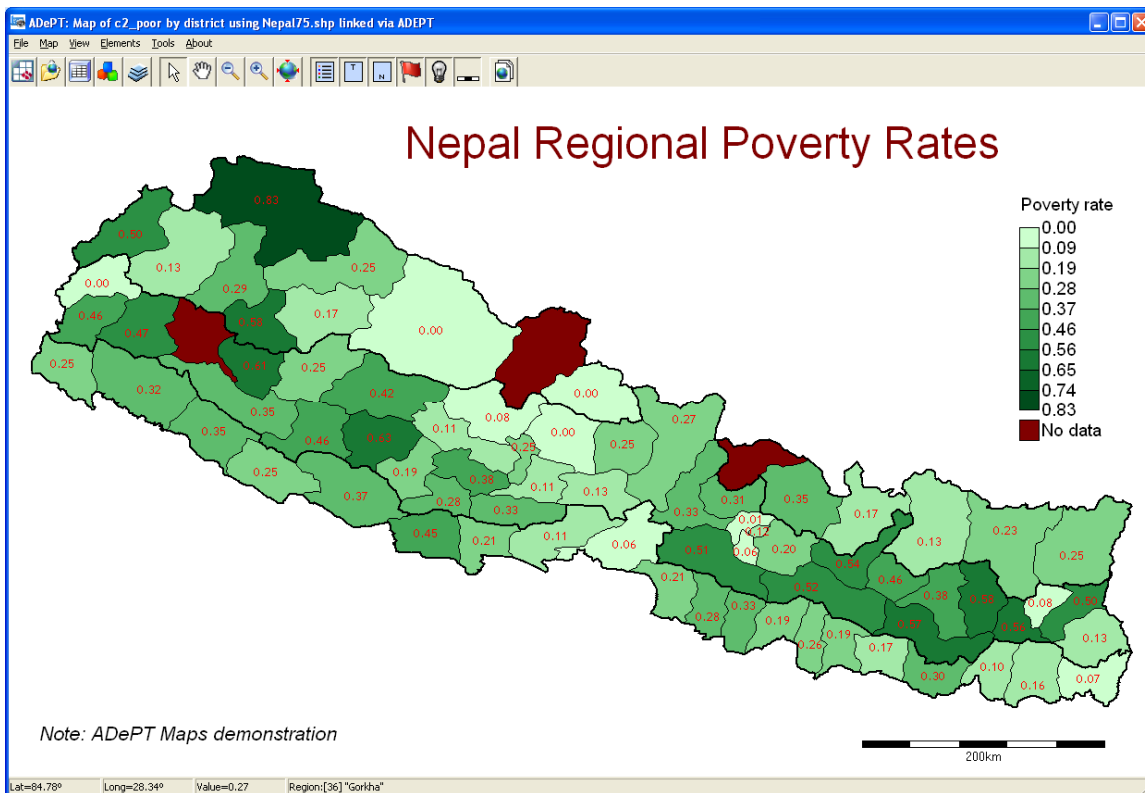
To save the map as a graphics file, select "*File*" → "*Save map to disk*" item from the main menu. The image is saved in the PNG ("*Portable Network Graphics*") format compatible with many modern applications and is particularly suitable for web pages.

For special needs (e.g. for high quality publications), the map can be exported with a higher than screen resolution. In this case only the map is saved without the additional elements. A *higher-resolution image of the legend and scalebar* can be obtained by right-clicking them and selecting "*copy to clipboard*" item in the pop-up menu.

2.1 Map elements



Several additional elements can be included in the map: legend, title, note, labels and scalebar. For each of these elements there is a corresponding item in the “*Elements*” submenu of the main menu and a button in the toolbar for quick access. The presence and parameters of these elements are saved in the *styles*, and can be restored later. The following sections describe each of the elements in more detail.

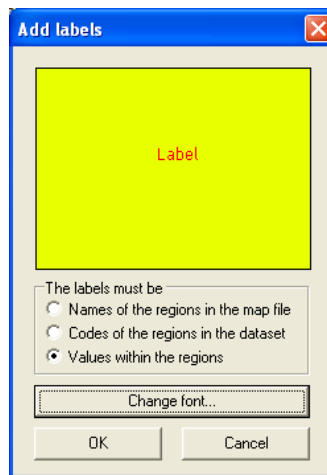


2.1.1 Title, note and labels

The user can add a title and a note to the map, and specify their content, location, size, color and font. By default the title appears at the top of the window and the note at the bottom. To turn the title/note on and off the user selects the corresponding item in the “*Elements*” submenu of the main menu or the corresponding button in the toolbar.

The text and the font of the title/note can be adjusted using the corresponding items in the pop-up menu, which appears when the title/note is right-clicked.

Maps may contain labels depicting the values, names or the codes of the corresponding regions. To add a label, select a corresponding item in the “*Elements*” menu or click the “*Legend*” button in the toolbar.




In this dialog one can select the labels size/color and content. A small preview shows how the label will look with the chosen settings. The background colors will loop through all the colors in the current palette. Note that all labels will have the same color.

Regions colored with no-data color will not have any label when the “values within the regions” are requested.

ADePT Maps tries to place the labels optimally within each region by looking for the part of the region where the label is most appropriate. This improves the label placement when regions have complex, irregular shape.

2.1.2 Scalebar

The scalebar is an additional element of the map which shows how large the regions depicted on the map really are. It can be turned on and off by selecting “*Elements*”→”*Scalebar*” in the main menu or clicking the corresponding button  in the toolbar.

The value shown near the scalebar corresponds to the whole length of the bar. E.g. below each black/white segment corresponds to 40km, and all five of them make 200km.



For small areas (under 20km) the scalebar will automatically switch to meters.

Scalebar accuracy and validity may be affected by the type of the shapefile being used. Simple scalebar may not be applicable to all map projections. Scalebar size/value are computed at the current location of the scalebar and are recomputed every time the scalebar is moved around. Hence, the scalebar is most accurate at its location.

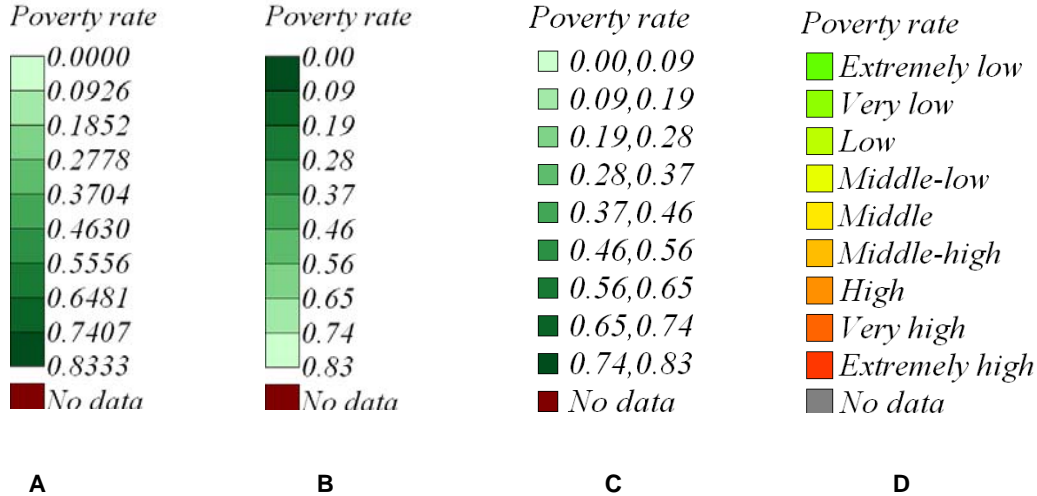
The scalebar can be placed to any position in the window by dragging it with the mouse.

The size of the scalebar can be made larger or smaller (the value displayed will be recomputed automatically). These options are available in the context menu, which appears when the scalebar is right-clicked. Alternatively, the desired value can be specified directly, and then ADePT Maps will find the appropriate width of the scalebar.

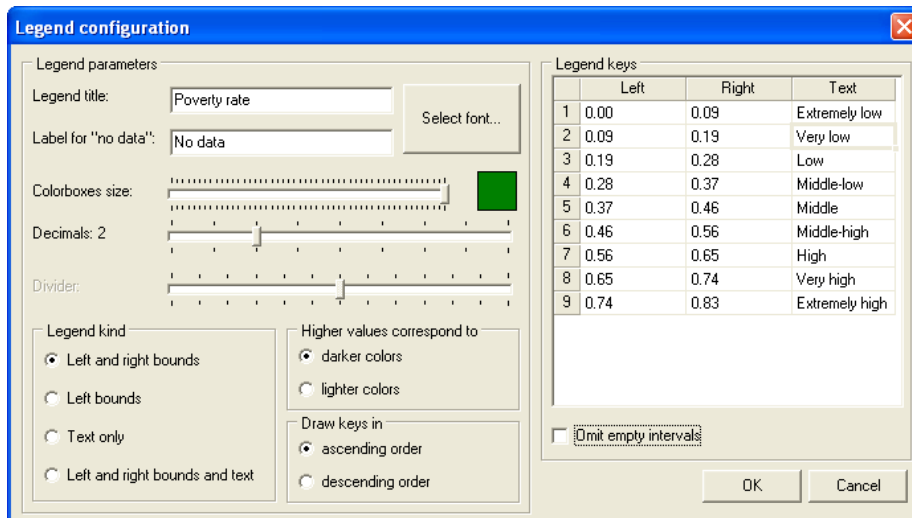
The scalebar reacts to the changes in the map: e.g. if the user zooms in, the scalebar is recomputed. Both the size of the scalebar and the depicted value may change, and the program will try to find a “nice” number automatically.

2.1.3 Legend

The legend explains what values of the variable of interest are associated with particular colors on the map. ADePT Maps provides some flexible customization features for legends, below are some examples:



The legend A) is a typical thermometer-like scale that shows the intervals in a compact form. The legend B) shows numbers with a different precision and coloring direction. Here the darker colors correspond to lower poverty rates, while in A) they correspond to higher poverty rates. The legend C) shows both left and right interval limits and changes the size of the colorboxes. The legend D) shows custom text and color assigned to each individual legend key. ADePT Maps comes with a set of color palettes of up to 99 different colors, and the user can create a custom palette of up to 9 colors. This is described in more detail in 2.6.



The legend's parameters are specified in the "Configure legend" dialog, which appears when the legend is turned on , or from the legend's pop-up menu when the legend is visible. Here the style and content of the legend can be customized: text associated with

each legend key, font color, font size, font style, direction in which the keys are drawn, size of the colorboxes, number of digits for fractions, etc.

Changing the direction of the colors in the palette can be useful to properly reflect the variable that is being plotted. For example, if poverty is being plotted, one might want to attract attention to particularly problematic areas (with high levels of poverty) by choosing that the darker colors correspond to higher values. Alternative setting would be helpful, if incomes were plotted, then the poor areas would be those with smaller values of incomes and the direction of coloring can be reversed.

Note that “*darker colors*” refers to colors with higher values in the palettes. Some palettes have colors varying in hue rather than intensity, e.g. the “*Acid*” palette varies from green through yellow to red, and the user can specify arbitrary colors in her custom palettes.

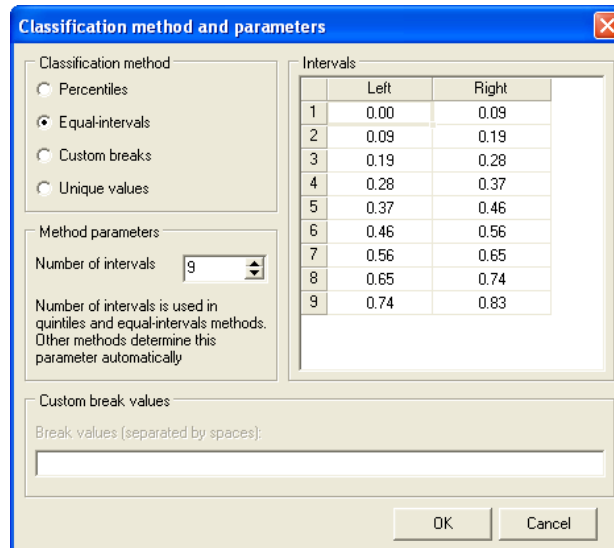
In the rightmost part of the dialog all intervals corresponding to the chosen grouping method are listed. They can not be changed in this dialog, but a custom text can be associated with them. To change the number of intervals and their limits, “*Select grouping parameters*” dialog must be used (see 2.2).

The overall size of the legend depends on the number of keys and selected font size for legend text. The legend can be moved to any position in the window by dragging it to the desired location with a mouse.

When the legend is visible, the corresponding button in the toolbar remains pressed down and the corresponding item in the “*Elements*” submenu of the main menu remains checked. To remove the legend simply click the “*Legend*” button again to depress it, or click the legend item in the “*Elements*” submenu again to uncheck it.

2.2 Classification method and parameters

The settings of this dialogue determine how the values of different geographic regions are grouped together in a class that will be associated with a particular color. To adjust the settings in this dialogue select “*Select grouping parameters*” item from the “*Map*” submenu of the main menu.



In “*Percentiles*” method the minimum and maximum values among all the regions are determined, and then the whole range is divided into the specified number of intervals so that each interval contains approximately the same number of regions. This method is useful when the goal is to show ranking of individual regions among all regions. This is the default method. The default number of intervals is 9, and it cannot be larger than the number of regions.

“*Equal intervals*” method has one parameter (number of intervals), but in contrast to “*percentiles*” method, the range between the minimum and maximum is divided to the specified number of equal-size intervals. When this method is used standard color palettes like “*greens99*” or “*blues99*” are recommended, because visually the change in color intensity would be proportional to the change in the value of the variable being plotted. With this method some of the intervals may have no observations in them, and the colors associated with them will not be used on the map (for example in cases when there is high inequality between the regions and some regions are poor, some are rich and there is none in between). The keys for these intervals can be suppressed in the legend by selecting the corresponding option in “*configure legend*” dialog.


“*Custom breaks*” allows users to directly specify what the intervals limits are desired. This method requires that “break values” field is filled in (separated by spaces any non-numeric characters in the input will be ignored). ADePT Maps will automatically sort the break values in ascending order and divide the axis with these break values. The values may be lower than the actual minimum or higher than the actual maximum present in the data. If the user specifies no breaks, ADePT Maps will operate with one interval [-inf; +inf], where the value of 1.0E+300 is selected to represent the infinitely large value (one with 300 zeroes). The first break value B_1 that the user enters separates the axis into

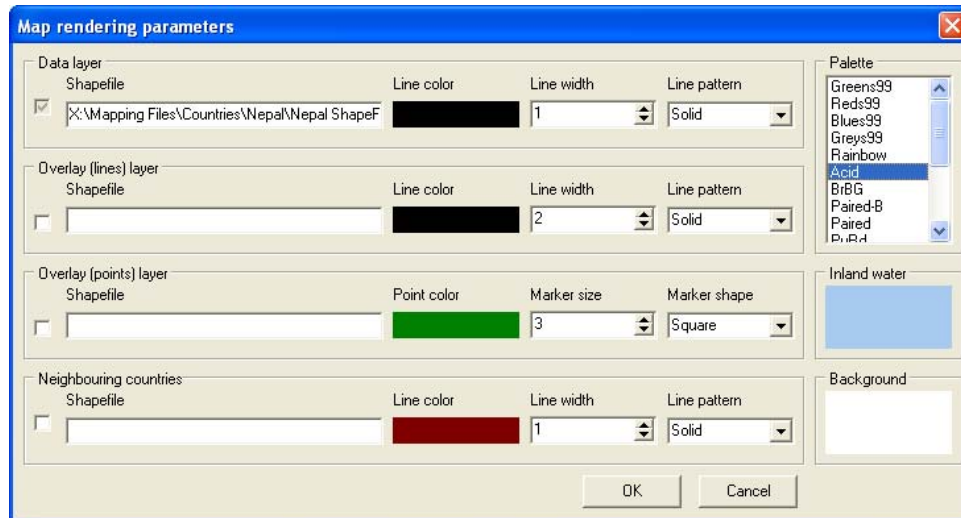
two intervals $[-\infty; B_1)$ and $[B_1; +\infty]$. Here the square brackets show that the limit itself is included in the interval, while parenthesis show that the limit is not included. With the second break value B_2 there will be three intervals $[-\infty; B_1)$, $[B_1; B_2)$ and $[B_2; +\infty]$, etc.

“*Unique values*” method has no parameters and proceeds as follows: first all the unique values among all the regions are determined. Second they are sorted in ascending order and a palette of a proper size is chosen. Each unique value is then associated with a single color from the palette. Note that this is not the same as to say that each region will receive a unique color, because there might be multiple regions with the same value of the outcome variable. This is also not related to the number of unique values that the original variable might have. E.g. unemployment status might have only two values: 1 “Unemployed” and 0 “Not unemployed”, but the number of unique values of unemployment rates by region might vary widely, e.g. 0, 0.02, 0.05, 0.075 etc.

The number of distinct colors to be used may not be determined in advance in case of “*custom breaks*” or “*unique values*” methods. If the number of required colors overshoots the maximum colors available in the current palette (9) the program will switch to one of the built-in palettes of larger size (99).

2.3 Map layers

ADePT Maps supports several layers ( button or a corresponding item in the “Map” submenu of the main menu) to incorporate information of different nature. Up to four layers are supported in the current version:



First is the main layer, which plots the outcome variable from the Stata dataset. This layer is always present on any map and must be a polygon-type shapefile. Second is an overlay layer, which is plotted on top of the main map and may contain boundaries of administrative division of another level, disputed boundaries, etc. It must be a polygon- or a polyline-type shapefile. Third layer is the points layer, which can depict cities, locations where observations were made, or other similar information. This layer must be a point-type layer. Finally, neighboring countries layer is a layer that contains administrative boundaries of the neighboring countries to produce situational maps.

By default no other layer except the data layer is activated. To activate a layer, tick the corresponding checkbox on the left and select a shapefile to be loaded into this layer.

Line (point) color, line width (marker size) and line pattern (marker shape) can be specified independently for each layer. Line pattern is available only when line width is set to 1.

Inland water is a color selector for water reservoirs, lakes, etc located within the country being plotted. Depending on the color palette this color may need to be adjusted. However, since it does not appear in the legend, it is advisable to keep it to the default intuitive “blue” color and change the palette to other than blue colors, when there are inland water bodies present in the country¹.

Available palettes for the data layer are listed in the right. Palettes that have fewer colors than needed for the current map are automatically excluded from the list. Clicking on any palette will immediately apply its colors to the current map. Other parameters may take effect after clicking “**OK**”.

¹ Inland water bodies must be appropriately coded in the shapefile used in the data layer with the code [negative 888].

2.4 Styles

Styles specify locations and properties of optional elements described above as well as the rendering properties of the map layers. One style can be applied to different maps and one map can be subjected to different styles. Styles are particularly useful when maps are created from Stata's command line. In this case style's name can be mentioned as an option, and the map will be formatted appropriately before being exported to an image file.

The following information is saved to a style file:

- window location and size
- palette name
- color of inland water
- color of the background
- visibility and location of the legend, legend's font properties.
- visibility and location of the scalebar, scalebar's font properties
- visibility and location of the title, its font properties.
- visibility and location of the note, its font properties.
- visibility of labels, what information they represent (names, values, or codes) their font properties.
- whether the regions with "no-data" status must be shown
- rendering properties of each layer

To save the current style, select "**File**" → "**Save style**" from the main menu, specify a new style name. The file is saved with an .ini extension.

To load and apply style to the current map select "**File**" → "**Load style**" from the main menu and select an existing style file (.ini extension). To apply a style from the command line, use option *style*, see more on command line options in section 2.5.

2.5 Command line syntax

The main information that ADePT Maps needs to create a basic map can also be specified in the Stata command line. This can save time and also allows using the program in .do files to create the maps in user programs.

The syntax is as follows:

```

amap outcomevar using shapefilename.shp [w=weightvar] if (condition)
data_region(region_var) map_region(region_field) map_names(names_field)
method(method_name) classes(num_classes) breaks(breaks_list) title(title_string)
note(note_string) o_file(oshapefilename.shp) p_file(pshapefilename.shp)
n_file(nshapefilename.shp) style(style_file) saving(imagefilename.png)

```

Syntax part	Meaning	Required or optional?
<i>amap</i>	Command name	Required
<i>outcomevar</i>	Name of the variable in the currently loaded dataset to be taken as the variable of interest	Required
<i>shapefilename.shp</i>	Full name of the shapefile containing the map	Required
<i>weightvar</i>	Name of the variable in the currently loaded dataset to be taken as the weights to compute weighted averages of the outcome variable within each region.	Optional
<i>condition</i>	Standard if-condition to restrict processing to a subset of the current dataset.	Optional
<i>region_var</i>	Name of the variable in the currently loaded dataset that holds the regional codes	Required
<i>region_field</i>	Name of the field in the shapefile (in the dbf file accompanying the shapefile) that holds the regional codes, corresponding to the codes in the data (the link field).	Required
<i>names_field</i>	Name of the field in the shapefile (in the dbf file accompanying the shapefile) that holds the names of the regions.	Optional, required for labels
<i>method_name</i>	One of the words: “ <i>quint</i> ”, “ <i>equal</i> ”, “ <i>custom</i> ”, “ <i>unique</i> ” that will determine the method to use to group the regions into classes.	Optional, default if not specified is “ <i>quint</i> ”
<i>num_classes</i>	Number of classes parameter for “ <i>quint</i> ” and “ <i>equal</i> ” methods.	Optional, default is 9 if not specified
<i>breaks_list</i>	List of user-defined break values for “ <i>custom</i> ” method	Optional, required for “ <i>custom</i> ” method
<i>title_string</i>	Text to be displayed in the title field	Optional
<i>note_string</i>	Text to be displayed in the note field	Optional
<i>oshapefilename.shp</i>	Name of the shapefile to be used for overlay	Optional
<i>pshapefilename.shp</i>	Name of the shapefile to be used for points layer	Optional
<i>nshapefilename.shp</i>	Name of the shapefile to be used for neighbouring countries layer	Optional

<i>style_file.ini</i>	The full filename of the file containing the style to be applied to the map	Optional
<i>image_filename.png</i>	Full name of the file where the resulting image must be saved. If specified the program will save the image and close without the user involvement.	Optional

Examples:

```
amap wage using "C:\Maps\Nepal.shp", data_region(district_id) map_region(ADePT)
```

Plot the average *wage* by districts of Nepal. District identifier in the dataset is *district_id*, and in the map is *ADePT*.

```
amap wage using "C:\Maps\Nepal.shp" [w=pers_weight] if (male==1),
data_region(district_id) map_region(ADePT)
```

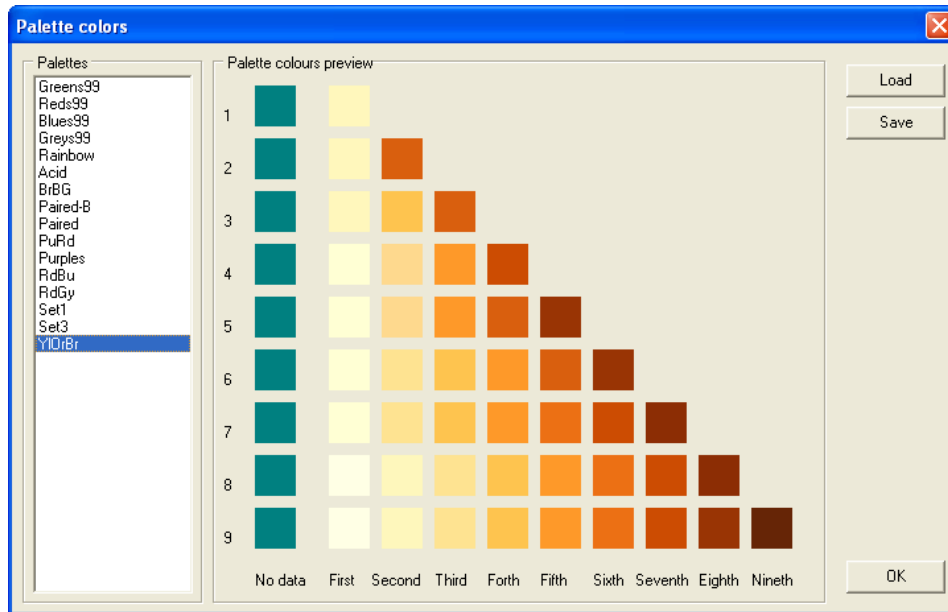
Same, but taking into account personal weights *pers_weight* and for males (variable *male* is equal to 1) only.

```
amap wage using "C:\Maps\Nepal.shp" [w=pers_weight] if (male==1),
data_region(district_id) map_region(ADePT) style("C:\Maps\Styles\Nepal.ini")
saving("L:\article1\wage_distr.png")
```

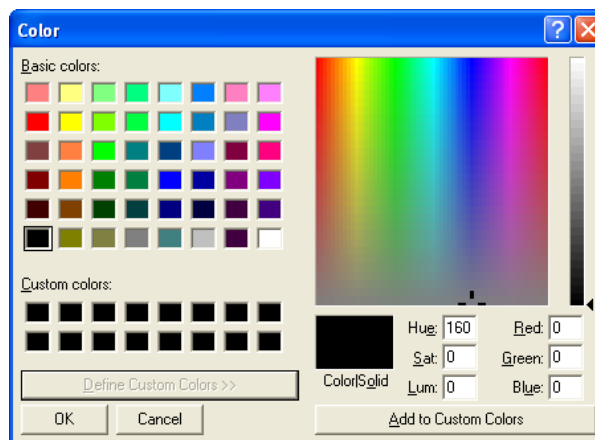
Same, but will apply the style saved in “C:\Maps\Styles\Nepal.ini”, export the resulting image to the file “L:\article1\wage_distr.png” and return to Stata.

2.6 Creating custom palettes

The users can create any number of custom palettes to be used with the program by selecting “**Tools**” → “**Manage Palettes**”. Each of these palettes can contain up to 9 distinct colors plus a color to represent missing values and must be defined for 9 sizes (from 1 to 9 colors). This means that, say the first color in the palette may vary depending on whether there are 3 or 9 colors to be used, allowing adjustment of colors with the palette size. A typical palette is shown below:



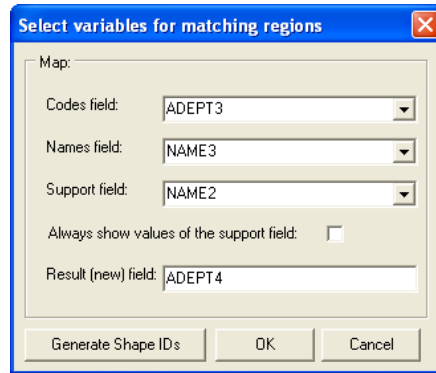
Each row represents an instance of the palette conditional on the size of the palette, shown in the left (1..9). Each instance starts with the color for the “*no data*” regions and then lists the colors for each sequential color. To change any of these colors, the user can click the corresponding color box and select a proper color value using standard Windows color selection dialog:



Standard (large, 99 color) palettes may not be modified with this tool, but can serve as a starting point for user-customized palettes. To create a new palette, click one of the existing palettes in the list, select appropriate colors and save the resulting palette in a .pal file in the directory, where the program is installed.

2.7 Creating custom regional codes

When the codes used in the data differ from the codes available in the map file, the maps may not be produced right away. Instead, a new coding scheme, corresponding to the coding scheme used in the data set must be created. ADePT Maps comes with a user-friendly tool for doing just that. To start this tool, select “*Tools*” → “*Match regions*” from the main menu:



Codes field is an existing field¹ in the current map, that holds regional codes and *names field* is a field with the corresponding region names. *Support field* is an optional field that is helpful when there are regions with same names located in different regions of higher level (e.g. districts with same names located in different provinces). If this is the case, values from this field will be added to the values from the *names field* for distinction. A checkmark in the checkbox below will force the *support field* values to be displayed always, regardless of whether there is any ambiguity in the names. *Result field* must be a new field name (this field must not exist in the current map) which will contain the results of matching after it is completed. The “*OK*” button is disabled if the result field contains a field name that is already contained in the map file.

Matching of the regions is a simple process of setting a correspondence between the regions in the dataset and the regions in the map file.

In the next dialog the program lists all the regions in the map file (left) and all the regions in the data file². The user can assign one or more map regions to each of the data regions, but not the other way around. Because of this, the map must be sufficiently detailed to contain all the data regions. To make an assignment, the user clicks a region on the map side, a corresponding region on the data side and clicks the “*Match*” button. The region is removed from the map side and is relocated to the data side into the corresponding region. Subsequent regions can be added in a similar manner. If a pair is formed by mistake, it can be dissolved by clicking the “*Remove*” button.

Some regions on the map may remain unmatched, e.g. if their territories were not surveyed, and hence no codes for them were created in the data. ADePT Maps will automatically assign them “No data” codes: [negative 9999].

¹ All the shapefiles that we supply contain one or more numerical codes fields that can be used as a starting point for creating custom codes. If the user shapefile does not contain any numerical variable, it can be created with the corresponding button in this dialogue.

² According to the labels defined for the regional variable.



The custom codes can be created manually by directly editing the .dbf file accompanying the .shp shapefile in any compatible application, e.g. *Microsoft Excel*¹.

It is also possible to create custom or modify existing regional codes in the .dbf file from Stata by writing an appropriate .do file. Import/export of .dbf files to Stata is facilitated via the `odbc` commands. See more details in the Stata manuals [D] `odbc`.

¹ Note that Microsoft removed .DBF files editing capability from Excel 2007, but it is present in all major earlier releases, including Excel 2003.

Appendix I. Where to refer for maps/shapefiles:

There is a number of collections of the maps in the internet, which might be used with the ADePT Maps program. The following are just a few examples:

<http://biogeo.berkeley.edu/bgm/gdata.php>

<http://www.maplibrary.org/index.php>

http://www.who.int/whosis/database/gis/salb/salb_home.htm

<http://earlywarning.usgs.gov/adds/mapdata.php>

<ftp://ftpserver.ciesin.org/>

<http://www.worldwildlife.org/science/data/item1875.html>

<http://ergodd.zoo.ox.ac.uk/igadweb/tiki-index.php?page=Country+Data>

Disclaimer:

The boundaries, colors, denominations and any other information shown on the maps generated with this program do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Map clearance for official publications must be requested from the Map Design Unit (phone: 31482).