



SECOND ADMINISTRATIVE LEVEL BOUNDARIES DATASET (SALB)

Editing Protocol for ArcView 3.X

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Editing protocols allowing the creation of an Administrative Boundaries Digital Map for the context of the SALB project

1 Introduction

This document has been created in order to insure that editing work on a country by country basis is consistent independently from the technician who receives the work. The protocol is based on the use of ArcView 3.2.

Each technician receives a "package" that contains all the necessary digital and non-digital documents to be used as follows:

1. **A shape file containing the international boundary** for the concerned country (decimal degrees, unprojected). Name of this file: *ISO3_int_2003.shp* (ex: USA_int_2003.shp).
2. **A shape file or JPEG file containing the delimitation of the administrative boundaries** (for more information, see point 2.2). Name of the shape file or JPEG file: *ISO3_input.shp* (ex: USA_input.shp) or *ISO3_input.jpg*.
3. **A word document** (called *ISO3_techform.doc*) containing information about the chosen shape file or jpeg file. It is essential that the technician operating on the map carefully indicates in this file all the procedures that have been applied on the source document (an example demonstrating how the fields should be filled is included).
4. **An excel table** containing the official names of the units of the 1st and 2nd administrative levels of the country as they were in January 2000 as well as the SALB code for each administrative unit.
5. **A word document** (called *ISO3_editing.doc*) containing the list of specific editing procedures that need to be applied in the context of the section 3.4
6. **A zip file containing ArcView Extensions (ESRI):** these extensions (**Xtools, Shapewarp and JPEG (JFIF) Image Support**) will be needed during the editing process. They can also be freely downloaded from the following URL: <http://arcscripts.esri.com/>. It is necessary to put the **.avx files** in the X:\ESRI\AV_GIS30\ARCVIEW\EXT32 folder. For Shapewarp the two following files have to also be placed in the right folder as follows:
 - avdlog.dll: to X:\...\ARCVIEW\BIN32
 - avdlog.dat: to X:\...\ARCVIEW\LIB32

The extensions must also be activated in Arc View:

- open a view in ArcView, go to *File/Extensions*
 - check the boxes in front of the line named: "Shapewarp 2.2", "Xtools Extension-Metric" and "JPEG(JFIF) Image Support".
7. Other information useful or necessary for the application of the methods might also be included in the package (text, other jpeg file, delimitation of water bodies..).

SALB editing protocol

Figure 1 illustrates the editing process and the chapters/sections in which the procedures are reported.

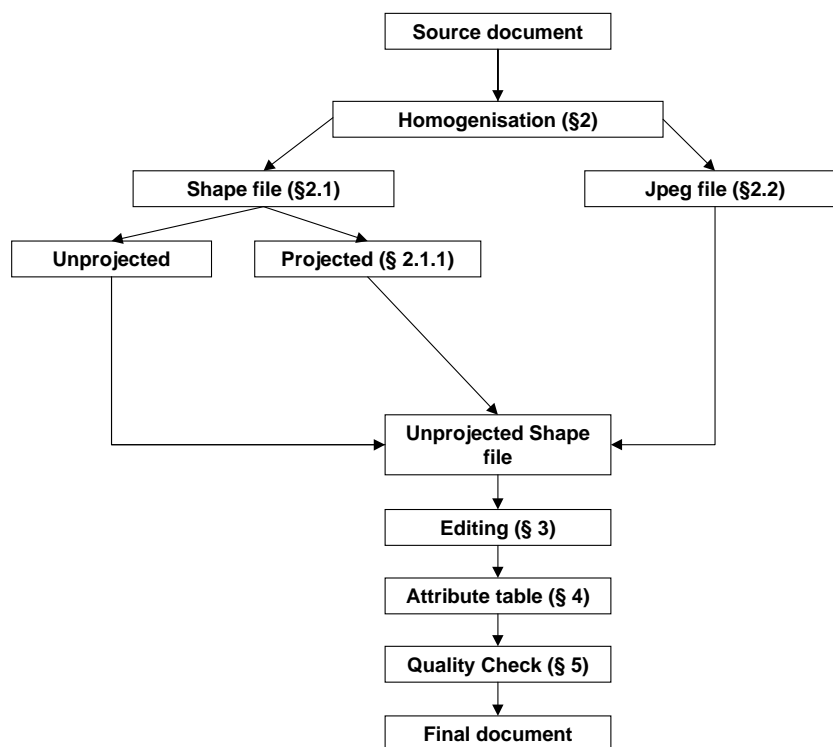


Figure 1 - Process followed in order to obtain the final digital map and its corresponding chapter and sections

If you are encountering any problem or if you find the present document incomplete or unclear please don't hesitate to contact Mr Yaniss Guigoz:

- email: guigozy@who.int
- phone: +41 22 791.45.84
- fax: +41 22 791.43.28

It is important to save the original source file as well as the files created at each step as they might be needed again.

Please also send the final shape file as well as the filled word file to the above email address

Thank you in advance for your work and precious help in the context of the SALB project.

2 Homogenization of the source documents


Depending on the format of the source map (shape file, jpeg file) specific procedures need to be applied first in order to homogenize the format and the projection of the map to be used. 4 different cases may occur:

- A) the shape file is **unprojected** (geographic projection). If this is the case go to chapter 3.
- B) the shape file is projected. We have tried different applications for unprojecting this kind of shape file and observed that most of them were too complicated to use or that we were often not having all the necessary information in order to use them correctly. We came to the conclusion that the best and least time consuming way to proceed was to use the ShapeWarp extension. The process to follow is described in the section 2.1.1
- C) the map is stored in a **jpeg file**. This map has to be digitized on screen in ArcView. The procedure to follow is reported in section 2.2

In some cases the source document will be a paper map that will need to be digitized using a digitizing table. The procedure to be followed is not described in this document as it depends on the hardware. These cases will be directly discussed with the institutions that are willing and able to do the digitizing.

2.1 The source map is stored in an ArcView shape file

2.1.1 Unprojecting a shape file using the shapewarp extension (international border)

- 1) Make sure that the Shapewarp Extension is activated and that no theme is displayed in the View.
- 2) For using this extension, click on the icon containing the red diamond () in the project window.
- 3) A first box will ask you if you want to give a particular projection to the View named "TO" (this view will contain the theme that will be the reference theme; in your case, the international boundaries standard). It is better to answer "no".
- 4) In the next box, select the theme that has to be reprojected and that will be put in the view named "FROM" (the shape file containing the administrative boundaries)
- 5) In the next dialog box, select the theme for the "TO" view. The one that will be the reference (in your case, the international boundaries standard).
- 6) Then you will be asked if you want to use an existing table; answer no.
- 7) Enter the name for the new GPC table that will contain the list of the point of reference for the work.
- 8) In the big window (that corresponds to the "TO" view), zoom in on a place where you will put a first reference point on the international border of the country using the zoom tool located in the ShapeWarp 2.1 icon window. **All the reference points that you are going to add have to be drawn in recognizable areas (ex: sharp**

edges, indentations or any particular geographic features located on the international border of the country).







- 9) When this is done, zoom in on the same place in the "FROM" view (you can also zoom out and pan using the corresponding tool in the icon window)
- 10) Select the GCP pick tool () in the icon window and put a first point in the "TO" view at a place that will be the reference and indicate if you want to keep the point just entered in the next window
- 11) Put a point at the corresponding place in the "FROM" view
- 12) Do the same operation explained in points 8 to 11 for two other points.
- 13) Put a new point in the "TO" and then click the "FROM" button in the icon window in order to make the application located this point on the "FROM" view
- 14) Click on the GCP select tool () and using the pointer select the 4th point that has just been calculated by the computer in the "FROM" view
- 15) Select the "Move GCP tool" () and click at the place where the 4th point should have normally been located. This will move the 4th point to its correct location
- 16) Repeat operation 13 to 15 until you have a sufficient number of points on the map. A good result will depend on the shape of the country border. It is difficult to give exact rules but here are some indications:
 - the more points the better,
 - a minimal number of points is required in order to be able to perform the final calculation: 6 for a polynome of the second order and 10 for the third order which is the one giving the best result,
 - it is good to choose points that "envelope" (located at the extremities of country)
 - if the country has some islands that are divided into administrative division it is important to choose at least two points on islands,
 - if these islands are not divided into administrative divisions it is more important to concentrate on the continental part of the country as the attribution of these islands can be done later in the process
 - don't hesitate to zoom in before locating the points

Figure 2 shows one example of location of points in the case of Belize.

- 16) Once you think you have enough points, click on the "Calculate RMS" icon ()
And choose the 3rd order of calculation.
- 17) an INFO window is then giving you the RMS (root mean square) error in the Output map. The RMS error is often used as a measure of the accuracy of tic points when registering a map to a digitiser, indicating the discrepancy between known point locations and their digitised locations. The lower the RMS error, the more accurate the transformation. We actually don't have any indication to give to you about the maximal value that should have this RMS error and are therefore always making the quality check visually.
- 18) click on the go icon () for creating the new georeferenced theme.
- 19) For displaying the new georeferenced theme, quit the Shape warp extension () and add it in a normal view. It is recommended to change the name of the shape file in order to know to what country and operation it relates. In the context of this document we will call it: *ISO3_warp.shp*.
- 20) overlay the new shape file with the shape of reference (the international borders) in order to check the quality of the result. If the result is not good you will have to add

SALB editing protocol

more reference points and redo the calculation. For this you have to restart from point 1) but this time you will be able to use the table you have already created (under point 7) when you will be asked under point 6). It is then recommended to save the new table as well as the shape to be created under different names in case you have to come back to previous version of these documents.

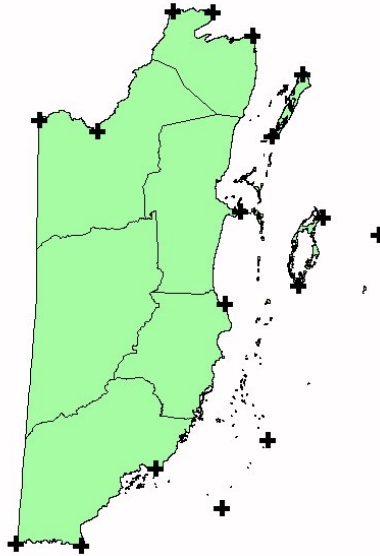



Figure 2 - Example of localization of the reference points for the case of Belize

In the case of a shape file presenting only a shift in terms of international border please proceed as follow:

- 1) Make a copy of the shape file and work on this copy.
- 2) Start Editing this copy.
- 3) Select all the polygons.
- 4) Move in one block all these polygons (!!!the select tool (pointer) should become a cross-arrow  !!!).
- 5) Shift this block of polygons to make it fit as best as possible to the international boundary.
- 6) Control if the international borders of the two shape files are matching. If there is a difference in the projection go to the section 2.1.1.
- 7) Unselect the polygons and save the edits.
- 8) Save this new shapefile to the name *ISO3_input_shift.shp*.

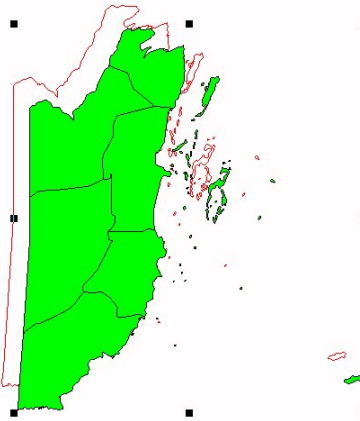


Figure 3 - example of a shift observed between the international borders shape file and the administrative boundaries one

2.2 *The source map is stored in a JPEG file*

In this case it is necessary to transform the JPEG file into a shape file. The following procedure can be applied:

- 1) create a project and don't forget to save it regularly.
- 2) make sure that the "JPEG (JFIF) Image support" and "XTools" extensions are active in the Extensions box of the file menu.
- 3) add the JPEG file in the view.
- 4) create a new polygon theme using the *new theme* function under the *View* menu
- 5) indicate the snapping tolerance (value dependent on the scale you are working with). The snapping tool allows you to overlay perfectly and automatically snap vertices to each other at the defined tolerance distance. It is important to use this tool so that there are no gaps or overlaps between polygons in your shape file. For using it, you need to activate it according to the following method:
 - a) in *theme/properties/editing* mark the box called "General" in the snapping window and indicating the tolerance distance (it is recommended to put a very small value, below 50 meters, in order to avoid any modifications that could be automatically operated by ArcView on other parts of the shape file presenting close distance between vertex without necessary needing to be snapped) or
 - b) in the view, click and hold the right button of the mouse and select "enable general snapping". A new icon will then appear in the menu. Click on it and draw the circle representing the snapping distance in the view.
- 6) manually digitize the outline of the different administrative units as well as the international border of the country
- 7) save the editing work

At this stage, you have created a vector shape file containing the administrative boundaries of the country in question. However, its coordinates and maybe projection are still wrong and you can't therefore overlay it on the international boundaries

standard (*ISO3_int_2003.shp*). For attributing the right coordinates to this shape file and overlaying *ISO3_int_2003.shp* it, you need to proceed with the following steps:

- 7) Convert the shape file you have just created to Graphic using the "Convert shape to Graphic" function in the Xtools Menu
- 8) Use the "select All Graphics" function in the edit menu in order to select all the lines
- 9) Use the "Group" function in the "Graphics" menu in order to have only one graphic element with all the lines.
- 10) Adjust the graphic element (change the size, pan,...) in order to make it fit to the extension and delimitation of the shape to be corrected.
- 11) Use the "convert Graphics to shape" function in the XTools menu and save the new shape file under the name *ISO3_input.shp*.
- 12) Control if the international borders of *ISO3_input.shp* are matching the ones from the international boundary standard (*ISO3_int_2003.shp*). If the two boundaries are matching (some differences in the level of detail may occur), go to chapter 3. If this is not the case (different projection) go to section 2.1.1.

3 Editing Process

After having homogenized the source document it is necessary to apply different editing procedures in order to clean the delimitation of the administrative units, make them fit to the international border standard, and prepare the attribute table.

It is essential that the technician fills out the word form and enumerates all the changes done during the editing part of the administrative boundaries including the homogenization process applied (e.g. unprojecting, cleanings, ...).

3.1 Preparation of the ArcView project

- 1) Create a folder in your computer.
- 2) Start ArcView and save the project in the folder created by using *File/Save project : country_name.apr*.
- 3) Make sure that the XTools extension is active.
- 4) Set the folder that you have created as the Working Directory using the "*Set Working Directory*" module in the *File* menu.
- 5) Display both themes *ISO3_int_2003.shp* and *ISO3_input.shp* (If you have used the ShapeWarp module during the last step of process the corresponding shape file would be: *ISO3_warp.shp*)
- 6) Change the *ISO3_int_2003.shp* legend in order to only see the outline of the polygon (i.e. make the 'fill' transparent).
- 7) Change the *ISO3_input.shp* foreground color in the legend (ex: light green) in order to make the theme visible.

3.2 Setting of the editing parameters

In order to perform some of the following steps it is important to set some of the editing parameters as follow:

- 1) Set the distance units to *meters* under *View/Properties /distance units*.
- 2) Indicate the snapping tolerance in *Theme/Properties/Editing* and put the general tolerance distance at 50 meters if the the working scale is 1:2500 (if a vertex is inside this tolerance distance compared to another vertex, both vertices will "snap" to each other (to come perfectly in between) and form only one vertex. This can also be set in the view by using the indication reported under point 5 in the section 2.2.

3.3 Specific editing work

Comments only for editing in Geneva: Check regarding possible shift or bad projection of the administrative boundaries should normally have taken place during the selection process of the map. As some element could have been missed please make a new visual test by overlaying the administrative boundaries shape file on the drain_l and drain_p shape files from the global Insight database.

If any problem are seen please refer to the person in charge of the map selection.

The digital maps found in the context of this project are very seldom representative of the situation observed in January 2000. In many cases the delimitation of some administrative units is missing and have to be added from an other source of information.

These specific editing procedures are indicated in the word document part of the package that has been provided to you. Please follow the step mentioned in this document before starting section 3.5.

Save the shape file resulting from these operations under the name *ISO3_input_edit.shp*

At this stage of the process the shape file should normally contain the delimitation of all the administrative units reported in the administrative unit names excel table provided in the package. If this is not the case and the information to make the necessary change is not included in the package please contact Yaniss Guigoz.

3.4 Preparation of the shape file for clipping

Before clipping the administrative boundaries to the international border standard it is essential to build the topology of the admin boundaries layer as it may never have been done for the shape file used during the editing process.

For this step you will have to use the Arc module of ArcInfo for workstation as the ArcTool box in Arc GIS is doing some automatic operations that may modify the layer when importing to coverage (if you don't have ArcInfo for workstation this step can be

SALB editing protocol

proceeded in Geneva, if this is the case please send the shape file resulting from the editing process to Yaniss Guigoz).

If you have ArcInfo proceed as follow:

- 1) put the final shape file (*ISO3_input_edit.shp*) in the ArcGIS workspade (generally: C:\arcgis\WorkSpace)
- 2) start the Arc module in the ArcInfo for work station menu.
- 3) change the precision to be double using the following command:
PRECISION DOUBLE DOUBLE
- 4) convert the shape file into a coverage using the following command:
SHAPEARC *ISO3_input_edit.shp* *ISO3_cov* POLY
- 5) Clean the coverage using the following command:
CLEAN *ISO3_cov* *ISO3_clean* 0 0.00000000001 POLY
(!!!!!! It is important to put at least 10 "0" for the fuzzy tolerance)
- 5) control in ArcMap or ArcView that the coverage is fine and that the attribute table kept all the records (the coverage will be multi-polygon because of the conversion from the shape file). Check each multi-polygons to be sure that there are no extra polygons that have been created by mistake.
- 6) Export the coverage into an Export Interchange file (.e00) using following command:
EXPORT COVER *ISO3_clean* *ISO3_exp*
- 6) Import the .e00 file into ArcView shape file format using the Import 71 module (name the new file *ISO3_clean.shp*)
- 7) display the *ISO3_clean.shp* shape in arcView

You may need to perform a summarise by zone in order have a unique record by administrative units as the cleaning process may have created multi polygons for each unit.

In order to be able to clip the administrative boundaries shape file to the international borders standard, the following steps have to be performed:

- 1) Save *ISO3_input_edit.shp* under *ISO3_work_input.shp*
- 2) Put *ISO3_work_input.shp* in editing mode using *Theme/Start Editing*.
- 3) Move all the vertices located on the international borders of the administrative boundaries shape called *ISO3_work_input.shp* outside the extension of the international borders from the file *ISO3_int_2003.shp* (in red in Figure 4). Particular attention should be put on **vertices that form the intersection between the country boundary and an administrative boundary**. Make sure that you move this type of vertices following the indication reported in annex 2.

If the number of vertices is very high it is possible to delete many at one time to speed up the process. This method is explained in Annex 1.

SALB editing protocol

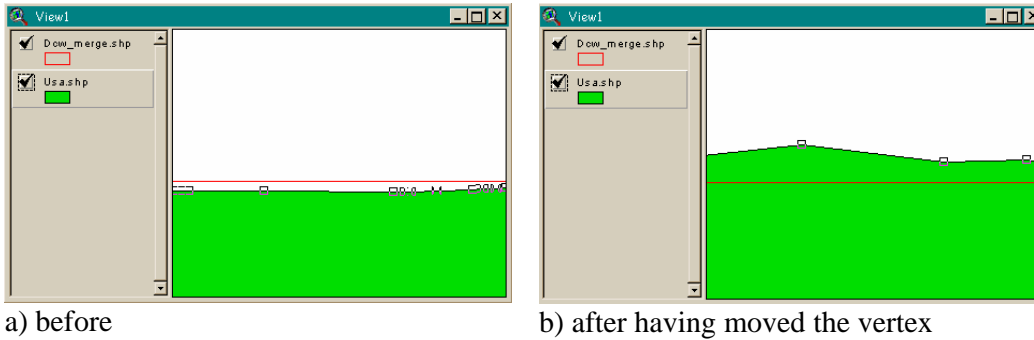


Figure 4a and 4b - Figures showing the moving of the vertex outside the extension of the international borders standard shape file

- 4) Do not forget to save regularly !!!!
- 5) Make a last visual check to be that all the vertices have been moved outside the extension of the international boundaries standard (as in Figure 4b),

During this operation special cases may appear that requires specific decision. This concerns:

- Boundaries between different administrative units
- Lakes
- Coast lines
- Islands
- Bad position of the administrative boundary

Explanations of these cases are reported in Annex 2.

3.5 Clip of the administrative boundaries shape file on the international borders standard

After having moved all the vertices as mentioned in section 3.5 it is possible to clip the administrative boundaries on the international boundaries standard following these steps

- 1) In ArcView make sure that the Xtools extension is activated
- 2) Add the following themes in the view:
 - [ISO3_work_input.shp](#)
 - [ISO3_int_2003.shp](#)
- 3) Open the Clip with polygon (s) module from the Xtools
- 4) Precise [ISO3_work_input.shp](#) as being the "theme that contains features that you wish to clip" and [ISO3_int_2003.shp](#) as being "the polygon theme that contains the polygons that will be used to clip features from the previous theme" in the next two windows
- 5) Specify the name [ISO3_2adm_clip.shp](#) (ex: [USA_2adm_clip.shp](#)) for the new shape file to be created

3.6 *Quality Check of the section 3.5 to 3.6*

In order to verify that all the vertices of the polygons have been moved properly, do the following:

- 1) Merge *ISO3_2adm_clip.shp* with *ISO3_int_2003.shp* (international border standard) by using *Xtools/Merge Themes*
- 2) save the result under the name *ISO3_merge.shp*.
- 3) Put the *ISO3_merge.shp* theme in Edit mode(*Theme/Start Edit*)
- 4) Select all the polygons of *ISO3_merge.shp*.
- 5) Use the *Edit/Combine Features* command

If the international limits of *ISO3_2adm_clip.shp* fit properly to the international boundaries standard (*ISO3_int_2003.shp*) the screen should become white. If this is the case, go to point 4.

Otherwise new polygons will appear. In this case stop the editing of *ISO3_merge.shp* and follow section 3.7.

3.7 *Correction of mistakes found under point 3.7*

If the test performed under point 3.6 revealed some mistakes (creation of polygon by the test) here are the steps to be followed in order to correct them:

- 1) Create single polygons of the *ISO3_merge.shp* shape file by using the *Xtools/Convert Multipart Shapes to Single Part* module.
- 2) Save the result under *ISO3_merg_multi.shp*
- 3) Overlay *ISO3_merg_multi.shp* (with transparent foreground and red outline) on *ISO3_2adm_clip.shp* in order to locate in the view the areas that need to be corrected.
- 4) Select each records of *ISO3_merg_multi.shp* in the attribute table and correct the corresponding error on *ISO3_2adm_clip.shp* by following the method reported in section 3.5 and repeat section 3.6 to 3.8 until all the errors are corrected.

4 Homogenisation of the attribute table

In order to obtain an homogeneous data set the final attribute tables of each shape file should only contain the following fields:

- Cntry_name: Country name
- Cntry_code: ISO3 code of the country,
- Adm1_name: names of the administrative units at the 1st level,
- Adm1_code: administrative unit SALB code at the 1st level,
- Adm2_name: names of the administrative units at the 2nd level,
- Adm2_code: administrative unit SALB code at the 2nd level,

In order to obtain this, different procedures have to be applied. These procedures are described in the following section.

4.1 Cleaning of the source attribute table

- Open the attribute table of *ISO3_2adm_clip.shp*.
- In ArcView, start editing the attribute table of *ISO3_2adm_clip.shp* by using *Table/Start Editing*.
- Prepare the attribute table to contain the above fields:
 - Deleting all the fields that are not part of this list (select the column concerned and press on *Edit/Delete Field*)
 - Creating the missing fields (see chapter 4 and Table 1 for the field names) setting up the "Field Definition" window as follows:
 - Name: depending on the field
 - Type: string
 - Width: 50
 - Decimal Places: 0
- Add and/or correct the names of the administrative units and put the codes in the attribute table according to the Excel table provided in the package.

At the end of this operation, the table should look like Table 1. When it is done, save the resulting shape file under *ISO3_2adm_att.shp*.

Cntry_name	Cntry_code	Adm1_name	Adm1_code	Adm2_name	Adm2_code
Germany	DEU	Baden-Wurtemberg		Freiburg	
Germany	DEU	Baden-Wurtemberg		Karlsruhe	
Germany	DEU	Baden-Wurtemberg		Stuttgart	
Germany	DEU	Baden-Wurtemberg		Tubingen	
Germany	DEU	Bayern		Mittelfranken	

Table 1 - Example of what the attribute table should look like when point 4.1 is completed.

At this stage of the procedure, the attribute table should contain the names of all the administrative units reported in the excel table provided in the package. If this is not the case the next section should normally correct this/these errors. The codes specific columns (Admin1_code and Admin2_code) will be filled later in the process.

4.2 Checking of the attribution of every polygon


When arriving at this stage of the process it may appear that the shape file contains non-attributed polygons. This can be due because:

- some polygons were not attributed in the original shape file
- the operation performed in the process has created new polygons or deleted the information contained .

It is important to attribute these polygons following this procedure:

- 1) Open the attribute table of *ISO3_2adm_att.shp* and sort the records alphabetically using the column that contains the names of the 2nd administrative level (Admin2_name).
- 2) In the same column check that every record is attributed to a 2nd administrative unit name listed in the excel file provided in the package. If this is not the case, the name of the administrative unit corresponding to this record has to be found using the information contained in the package. If it has not been possible to find the necessary information please contact Yaniss Guigoz (guigozy@who.int) including a map indicating the location of the non attributed polygon in your email.
- 3) Once you have the necessary information edit the attribute table and make the necessary correction.
- 4) Redo steps 1 to 3 until all the polygons are attributed at the second administrative level.
- 5) then apply the same methodology for the first administrative level using the column named "Admin1_name" in the attribute table.

If it appears that many small polygons (e.g. islands) belong to the same unit merge them using the following procedure in order to reduce the amount of work:

- 1) start editing *ISO3_2adm_att.shp*
- 2) With the select tool () , select all the non attributed polygons that belongs to the same administrative unit
- 3) Merge them by clicking on *Edit/Union Features*
- 4) Stop Editing *ISO3_2adm_att.shp* and save your edits
- 5) make the necessary attribution in the attribute table



After this operation it is important to check the spelling of each administrative units reported in the attribute table and make the necessary changes in order to obtain the correspondence with the names reported in the excel file provided in the package.

4.3 Union of the multiple polygons that correspond to the same administrative unit using the attribute table

At this stage of the process it is important to group the multi polygon into single ones using the attribute table.

It is important to make sure that they are "real" multi part polygons as in some countries it happens that several units of the second level have the same name but are in fact located in different 1st admin level units (this is often the case in Latin America for example).

The following method allows to operate the union avoiding the trap (!!! It is crucial to have made the spelling check mentioned at the end of section 4.2 before starting this process !!!!):

- 1) Start editing the theme *ISO3_2adm_att.shp*
- 2) Open its attribute table and add a new field (*Edit/Add Field*) with the following characteristics: name = test, type = string, width = 150
- 3) Select this new "test" column and click on the "calculate" icon (); the "field calculator" box opens and it is already written "[test] =". Double click on the field "Adm2_name", then double-click on "+", then double click on the field "Adm1_name" and finally click on OK. Your "test" column should be filled with a concatenation of the names of the 2nd and 1st administrative levels units.
- 4) Summarize this new column by selecting it and clicking on the "summarize" icon (). When you click on the icon, a new dialog box appears:
 - specify *ISO3_2adm_sum.dbf* for the name of the new dbf file and
 - add all the fields listed in the window below, click on OK
 - add the result to view
- 5) Open the attribute table of *ISO3_2adm_sum.shp* and note the number of records. This number should normally be the same than the number of administrative unit reported at the 2nd level in the excel table provided in the package.

If this is not the case this means that there is still an error in the attribute table (spelling mistake, wrong attribution of an 2nd level administrative unit and the process must be restarted from section 4.2

5 Check of the final shape file

It may happen that a boundary between two administrative units has been wrongly digitized creating gaps or overlaps in the shape file. This kind of error must be cleaned in order to insure the quality of the editing work.

5.1 Check of the presence of gaps and overlaps

1) Make a copy of the theme *ISO3_2adm_sum.shp* with *File/Manage Data Sources* and name the new shape file *copy_ISO3_2adm.shp* (e.g. Figure 5).

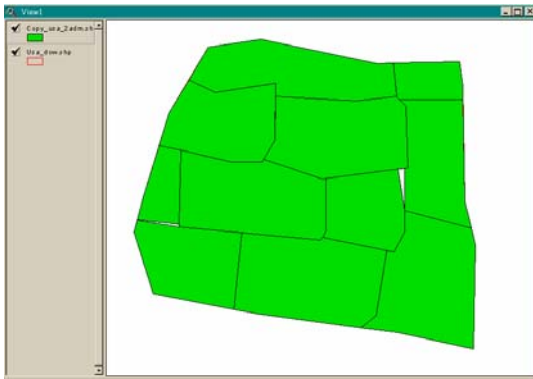


Figure 5 - Example of *copy_ISO3_2adm.shp* showing gaps and overlaps

- 2) Start Editing *copy_ISO3_2adm.shp* by using *Theme/Start Editing*.
- 3) Select all the polygons
- 4) Click on *Edit/Combine Features*
- 5) Save the results under *combi_ISO3_2adm.shp*
- 6) If gaps and/or overlaps were existing in the shape you will obtain a polygon with holes like the one reported in Figure 6. It may happen that the holes are so small that they are not visible. Point 7 to 10 have therefore to be applied in any case and the section 5.2 processed if necessary.

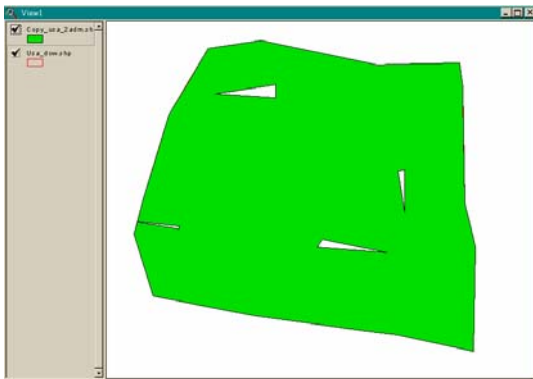


Figure 6 - Example of the polygons of *combi_ISO3_2adm.shp* showing gaps and overlaps

7) in order to visualise the errors as polygons union *combi_ISO3_2adm.shp* and *ISO3_int_2003.shp* by using *Xtools/Union Polygon Themes*. Save the new theme under *ISO3_union.shp*.

8) Open the attribute table of *ISO3_union.shp* and check if there is one or several rows. If it contains only one row, that corresponds to the whole country, it means that the shapefile is correct and that points 9 and 10 are not necessary. If the attribute table of *ISO3_union.shp*, contains more than one row, you have to select the row(s) that corresponds to holes and overlaps like shown in Figure 7 and go to points 9 and 10.

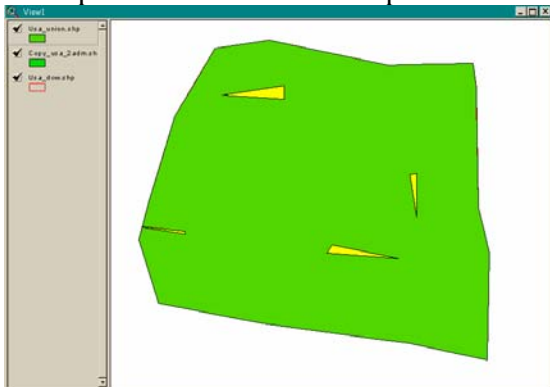


Figure 7 - Selection of the polygon with holes and overlaps

9) Split the single polygon selected into several polygons by using *Xtools/Convert Multipart Shapes to Single Part*
10) Save this new theme under *ISO3_multi.shp* (figure 8).

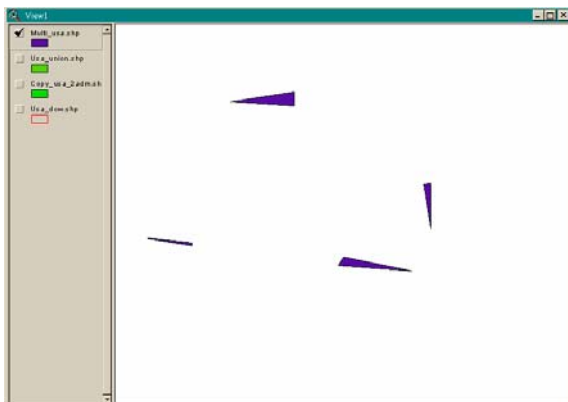


Figure 8 - *ISO3_multi.shp*

5.2 Correction of the gaps and overlaps

Using the shape created under section 5.1 it is then possible to correct the gaps and overlaps identified:

- 1) Overlay *ISO3_multi.shp* (put its foreground in red) on *ISO3_2adm_sum.shp* (foreground transparent and outline black) in order to find the places to be edited (figure 9).

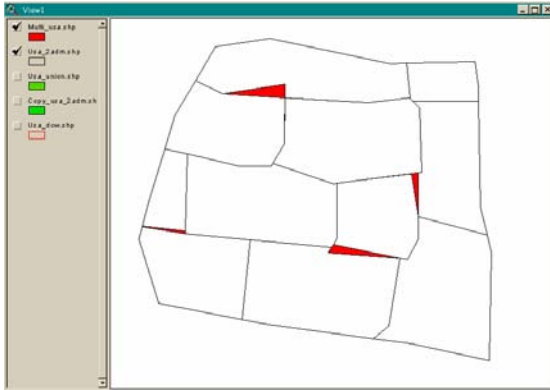



Figure 9 - overlay of *ISO3_multi.shp* on *ISO3_2adm_sum.shp*

- 2) select one of the records in the attribute table of *ISO3_multi.shp* and zoom on it in the view
- 3) Make sure that the view properties is setup to meters for the distance unit
- 4) Measure the maximale distance between the two lines (example on figure 10) using the distance tool  as the type of correction to be applied will depend on it.

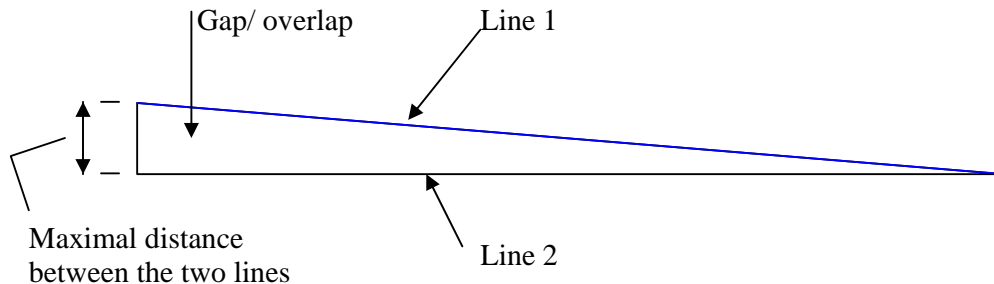



Figure 10 - the maximal distance between the two lines forming a gap

- 5) start editing *ISO3_2adm_sum.shp*.
- 6) apply the following correction according to the distance found
 - **Less than 50 meters:**
 - use the 'snapping' function with each of the vertex to shift:
 - right-click on the mouse and select *Enable General Snapping*,
 - press on the icon  and draw in the view a circle representing the distance of tolerance of 50 meters of diameter.
 - Shift one vertex so that all vertices inside the distance of tolerance should overlay each other perfectly and automatically.
 - **More than 50 meters):**
 - Check the exact boundary tracing with existing documents
 - Correct the tracing of the concerned boundary by using the "snapping" method.

- 7) save the editing work done on *ISO3_2adm_sum.shp* as *ISO3_2adm_gaps.shp*
- 8) repeat step 2 to 6 on each of the polygons reported in the shape *ISO3_multi.shp*

5.3 Final check of international border editing work

In order to be sure that the international border didn't moved during the operation described in section 3.7 and 5.2 it is important to apply the following procedure again:

- 1) Merge *ISO3_2adm_gaps.shp* with *ISO3_int_2003.shp* (international border standard provided in the package) by using *Xtools/Merge Themes*
- 2) Save the result under the name *ISO3_merge.shp*.
- 3) Start editing this new theme *ISO3_merge.shp*.
- 4) Select all the polygons of *ISO3_merge.shp*
- 5) Use the *Edit/Combine Features* command.
- 6) If the international limits of *ISO3_2adm_gaps.shp* fit properly to the international boundaries standard (*ISO3_int_2003.shp*) the screen should become white.

If this is the case the last operation to be done is the codification of the attribute table using the codes provided for each administrative unit in the excel table given in the package. Once this is done you have reached the end of the editing work and you can send this final shape back to Yaniss Guigoz after having filled out the word document.

If new polygons appear, redo the procedure from section 3.8.

6 Clean of the final shape file

When the shapefile is completely correct, it is still necessary to clean it. In order to do that, it is necessary to use ArcInfo as follows:

- 1) make a copy of the final shape file (ISO3_salb.shp) to C:\arcgis\WorkSpace
- 2) open MSDOS (start/programs/accessories/command prompt) and change the directory into C:\arcgis\WorkSpace with the commands "cd"
- 3) when you are in the folder C:\arcgis\WorkSpace, type "arc" in order to launch Arcinfo
- 4) change the precision to be double using the following command:

```
PRECISION DOUBLE DOUBLE
```

- 5) convert the shape file into a coverage using the following command:

```
SHAPEARC ISO3_SALB.shp ISO3_cov POLY
```

- 6) type *arctools* in order to open the arctools
- 7) In the window that opens, click on *edit tools*
- 8) In the window *edit tools*, click on *tools/command tools* and in the new window *command tools* that opens click on *Edit/Topology/Build features* and fill the *Coverage topology* window as follows:
 - coverage: enter the name of the coverage
 - feature class: select *POLY*
 - check the "clean" option button
 - output coverage: enter the name of the output coverage (ISO3_built)
 - Dangle length: 0
 - Fuzzy tolerance: 0.000000001

And click on "apply"

- 9) It is still needed to build the topology. To proceed, do the following:
In the window *edit tools*, click on *tools/command tools* and in the new window *command tools* that opens click on *Edit/Topology/Build features* and fill the *Coverage topology* window as follows:
 - coverage: enter the name of the coverage cleaned
 - feature class: select *POLY*
 - check the "build" option button






And click on "apply", which will build the topology of the coverage cleaned.

- 10) The last step consists in converting this cleaned coverage to shapefile again. Therefore, the easiest solution is to display the coverage ISO3_clean in ArcView and to click on *Theme/Convert to shapefile* and saving the file under a new location and name. Edit the attribute table in order to delete all the useless columns that have been created during this process.

Annex 1

Reduction of the number of vertices

In order to be able to clip the administrative boundaries shape file to the international border standard, all the vertices of each polygon must first be moved outside the international boundaries standard (see section 3.5). This could take a lot of time if the polygon contains too many vertices along the international border. The following method deletes a large number of vertices at one time:

- 1) Start editing the theme containing the administrative boundaries (in this case, *ISO3_work_input.shp*)
- 2) Zoom in on the polygon you want to edit and select it with the transparent arrow . The polygon should then look like Figure A1a
- 3) Scroll down the "Arcview's drawing tools" (represented by the icon ) and select the "draw line to split polygon" tool ()
- 4) Do the following using the mouse pointer in the view:
 - left-click a first time outside the polygon (in the white area),
 - make several other left-clicks inside the polygon in order to create a kind of polygon that will be erased in point 5.
 - For the last point of this polygon, double left click in the white area, which will close your figure. At this stage the screen should look like Figure A1b.
- 4) Using the select tool () , select the polygon that you just drew careful that this new polygon drawn is the only polygon selected as shown in figure A1c.
- 5) Erase it by clicking on *Delete* on your keyboard. It should become like figure A1d.
- 6) select the polygon that has been cut with the transparent arrow tool () and move the few remaining vertices outside the international boundary (like shown in figure 4b in the section 3.5)

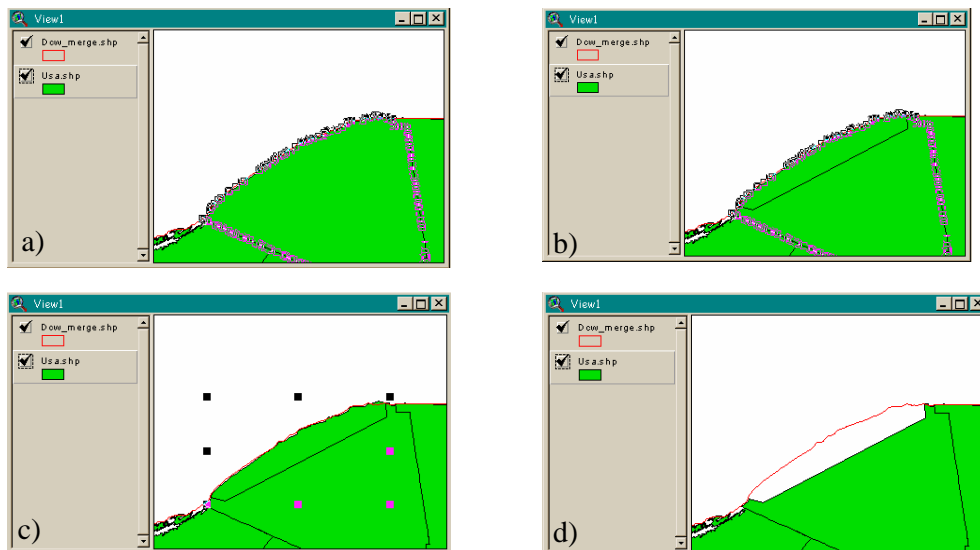


Figure A1 - illustration of the different steps mentioned in the Annex 1

Annex 2

1. Particular cases encountered during editing work

The application of the present editing protocol on a first set of countries allowed us to identify some particular cases that needed to be further explained in this Annex.

Comment: - figures in this annex always shows the international border of the country in red and the administrative boundaries in black.
- If you have any problems or encounter a case that is not listed in this document please contact Yaniss Guigoz (guigozy@who.int)

1.1 The Boundary between 2 administrative units does not extend to the international border standard

This case is illustrated by figure A2a.

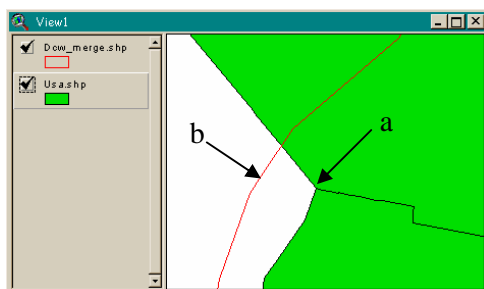


Figure A2a - boundary between 2 administrative units without extension to the international border standard (in red).

If this case is encountered the following procedure should be followed:

- 1) make sure that in the view properties (*View/Properties*) the *map units* are in *decimal degrees* and the *distance units* in *meters* .
- 2) Measure the distance between the extremity of the line dividing the 2 administrative units (point a on figure A2a) and the international border (point b)

From that point we consider two cases:

- a) this distance is smaller than 1 km. In this case we consider that the administrative boundary can be extended straight like presented on figure A2b
- b) this distance is bigger than 1 km. In this case you will have to refer to the other document included in the package in order to know how to extend the concerned administrative boundary

If this information is not available, contact Yaniss.

SALB editing protocol

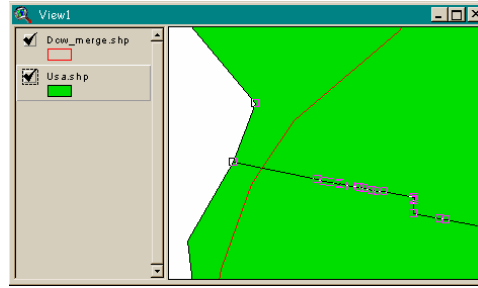


Figure A2b - case of straight extension of an administrative boundary

Once you have the information you can extend the boundary between the two administrative units. It is recommended to use the snapping tool for completing the work properly in order to insure the two concerned polygons to be corrected simultaneously. To activate this tool:

- right-click with the mouse in the view,
- choose "enable general snapping",
- draw the circle representing the snapping distance in the view

1.2 Lakes or an important water bodies

In order to homogenise representation of inland water bodies, it has been decided to apply the following rule:

- As much as possible the final shape file part of the SALB data set must be mono thematic meaning that it only contains the delimitation of administrative boundaries and therefore not the one of water bodies
- When possible, and in agreement with the NMA, the delimitation of administrative units adjacent to an inland water body should be extended into it.
- When the inland water body in question is located on the border between two countries, the concerned administrative units have to be extended until the international borders of the concerned country.
- If the extension of the boundaries is not defined into the lake the country might consider that the lake needs to be treated as an "Area under National Administration". In this case, this status should be reflected in the attribute table and the lake considered as an administrative unit remaining as is on the map.

Normally, the necessary information for extending the administrative boundaries into the inland water body is already provided in the editing package.

However, in case you identify a case that we would have missed while prepare the package please send an email to Yaniss illustrating the case with an image looking like the ones reported in figure A2c.

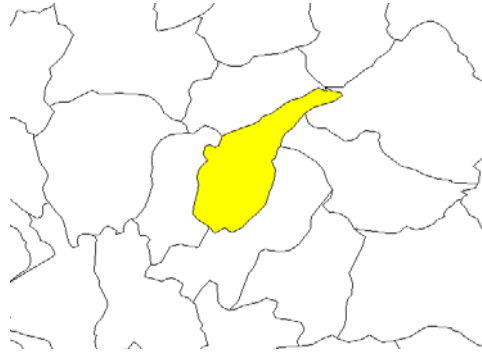


Figure A2c - Example of screen shoot to indicate an inland water body that we would have missed while preparing the editing package

1.3 Coastlines

For coastline many cases can be observed. They are documented here below.

1.3.1 the international border in the shape file containing the administrative boundaries is more detailed than the one reported in the international boundaries standard

You may find that the shape file of the administrative boundaries is more detailed than the international border standard provide in the package (examples are reported on the figure A2d).



Figure A2d - Cases where the coastline is more detailed on the shape containing the administrative boundaries

If you encounter this kind of situation please send an email to Yaniss Guigoz illustrating the case with an image looking like the ones reported in figure A2d. He will come back to you with the decision finally taken regarding the treatment of this case.

1.3.2 The shape of the international boundaries is more detailed than the shape of the subnational boundaries

It may happen that the coastline is more detailed on the shape of the international boundaries like illustrated on Figure A2e.

In this case, the shape containing the administrative boundaries will have to be clipped to the standard without any modification. If a boundary between two units is crossing the coastline reported in the standard (like for example on figure A2e) it will be necessary to look at other sources of information in order to locate correctly the connection between the administrative boundary and the coastline at this place.



Figure A2e - Case where the coastline is more detailed on the shape of the international boundaries

1.4 Islands

The case where the shape file containing the administrative boundaries is more detailed than the international border standard provided (example on figure A2f) could have been grouped with the coastline under section 1.3.1 and the same procedure should be followed in this case.

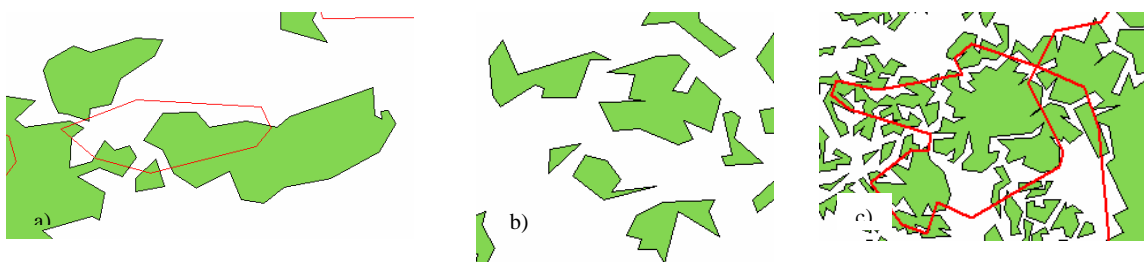


Figure A2f - Various examples where the tracing of the coastline of the islands is more detailed on the sub national shape file (a) and b): the island of the international boundary shape overlaps several islands of the sub national shape; c): islands existing only in the sub national shape.

The only difference with the section on coastlines concerns the case where the shape of the international boundaries contains more islands than the one of the sub national boundaries (example on figure A2g)

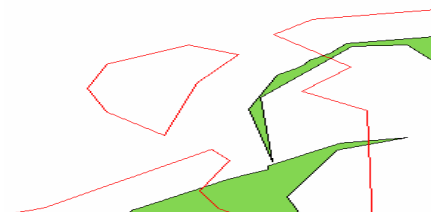


Figure A2g - Case of an island represented only in the international border standard shape file

SALB editing protocol

In this case there are different steps that need to be followed:

- 1) find the name of the island and the administrative unit to which it belongs in the documents provided in the package. If this information can't be found a mail should be send to Yaniss Guigoz.
- 2) extend the polygon delimiting the corresponding administrative unit in order to cover the island. It will then be possible to clip the administrative boundaries shape file to the international border standard.