Creation of the light dataset

This document explains the steps involved in creating the dataset providing the mean and median nighttime light observed, at different points in time, in the areas around the Afrobarometer clusters, using ArcGIS version 10.3. In Table 1 we show the different light datasets used.

TABLE 1: The satellites

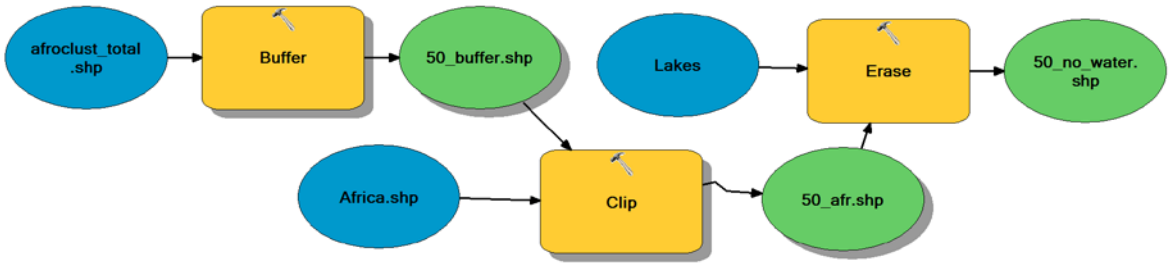
Average Visible, Stable Light, & Cloud-free Coverage						
Year\Sat.	**F10**	**F12**	**F14**	**F15**	**F16**	**F18**
1992	F101992	——	——	——	——	——
1993	F101993	——	——	——	——	——
1994	F101994	F121994	——	——	——	——
1995	——	F121995	——	——	——	——
1996	——	F121996	——	——	——	——
1997	——	F121997	F141997	——	——	——
1998	——	F121998	F141998	——	——	——
1999	——	F121999	F141999	——	——	——
2000	——	——	F142000	F152000	——	——
2001	——	——	F142001	F152001	——	——
2002	——	——	F142002	F152002	——	——
2003	——	——	F142003	F152003	——	——
2004	——	——	——	F152004	F162004	——
2005	——	——	——	F152005	F162005	——
2006	——	——	——	F152006	F162006	——
2007	——	——	——	F152007	F162007	——
2008	——	——	——	——	F162008	——
2009	——	——	——	——	F162009	——
2010	——	——	——	——	——	F182010

Note: This table displays the name of the six satellites we used and the years each satellite provided data coverage.

The following procedure is followed in creating the dataset: First, using the GPS coordinates for the Afrobarometer clusters we create concentric circle polygons of 50 kilometers around each survey cluster. We then clip the resulting buffers to the landmass corresponding to the

African continent in order to remove areas that are in the sea.[1] We also want to remove areas that are on inland water, and to this end we use the "Erase tool" to erase lakes and inland water bodies. The resulting buffer zones are saved in one file. Figure 1 below shows the workflow in a model from the ArcGIS model builder.

Figure 1: Creating buffer zones without water.



The next step is to add the mean and median light per satellite-year to all the buffer zones around the clusters. We do this by using the tool "Zonal Statistics as Table" in ArcGIS.

A complication arises in this setting since we have overlapping polygons. When there are overlapping polygons we have to create a table for each of the polygons individually. This is done by using the "Iterate Feature Selection" iterator so that each of the overlapping polygons is passed into the zonal tool individually. This creates one dataset for each cluster that can be merged together.

[1] Note that one may have to split the dataset into parts before clipping, as the resulting file may become too large for GIS to handle. In that case, one must do the entire process in Figure 1 in different parts and then merge the datasets together at the end to create a total file with all clipped cluster polygons.

Figure 2 illustrates the process for one specific dataset (year 2010 and satellite 18). Note that this process has to be followed for each satellite-year combination of the data, and that this is very time consuming.

Figure 2: Creating zonal statistics for each cluster using iteration.