

Displaying voter gains and losses: Local government elections of 2011 vs 2016

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Abstract: Every five years the South African population goes to polls to elect local government councilors. These elections are fought along political party lines, however it also allows for independents to participate. This paper looks at the change of voter behavior between two subsequent local government elections, namely the 2011 and 2016 local government elections. The percentage voter gains and losses for the top three political parties in South Africa are shown. The ruling ANC suffered its biggest losses since 1994. The DA showed a steady increase in the votes between the two elections and the kid on the political block, the EFF, showed its biggest gains in the regions of South Africa in the same areas where the ANC showed its largest losses. Three methodologies were used to show these behaviours, namely a cartogram, 3D maps and thematic cartogram. The latter was used to show both losses and gains in the same cartogram.

Keywords: Voters, cartogram, 3D maps, thematic maps, elections

1. Introduction

The author had the privilege to be involved in the national, provincial and local government elections since 2004. He is a member of the CSIR's election night forecasting team that forecasts the final results of an election when between five and ten percent of the voting districts have been declared. He witnessed firsthand how the fortunes of the political parties have changed after each election, most notably between the 2011 and 2016 local elections where the dominant African National Congress (ANC) lost more than eight percent of the vote from 62 percent in 2011 to 54 percent in 2016 at national level and lost three of the major metros to

the opposition. The biggest winners were the Democratic Alliance (DA) and the Economic Freedom Fighters (EFF). This paper describes through the use of maps how these three major parties lost and won the votes in these two elections. The rest of the paper is as follows: The next section discusses the mapping of election data in general. This is followed by the mapping methodology followed to map the change in political party fortunes. The mapping results are then discussed and this section is followed by the conclusions and future research.

2. Mapping political voting results

The mapping of political voting results in the USA dates back to 1880's when Scribner's Statistical Atlas of the United States was published showing various presidential elections and the 1880, 1884 and 1888 popular vote (Hewes and Gannet, c1883). It seems that the 1884 and 1888 popular vote have been inserted in later editions of the original 1883 publication since they are not listed in the table of contents of the atlas nor have they been given plate numbers. These two maps used different colours to denote Republicans (grey) and Democrats (red). The 1880 popular vote map is shown in Figure 1. Blue hue denotes percentage Republican vote per county and the red hue, Democrat vote percentage per county. The colour indicates 50 percent or more votes for the party in a county.

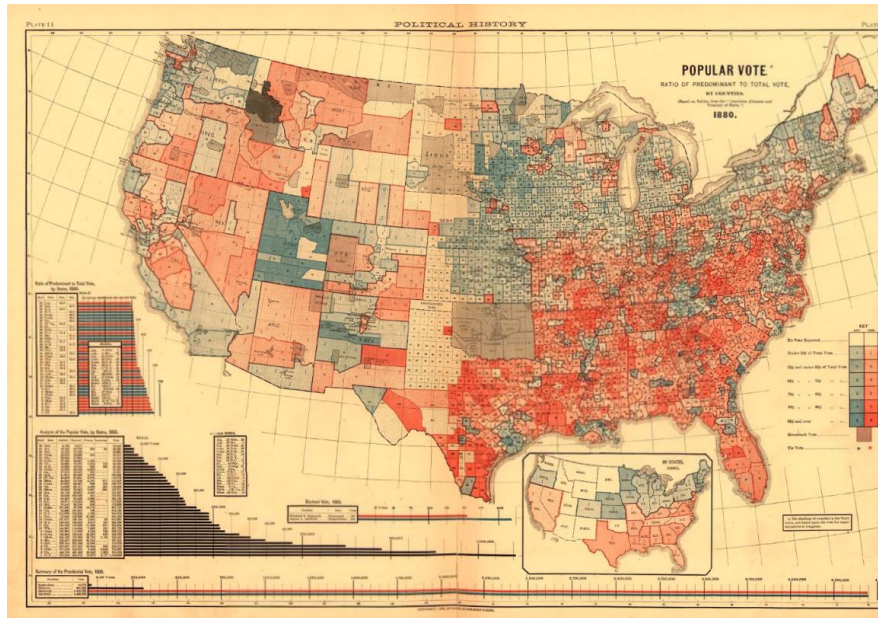


Fig. 1. The popular vote during the 1880 presidential elections. (Source: Plate 11, Hewes & Gannet, c1883)

Other scholars such as Turner and Libby were advocating studies of voting results to understand the voting behaviour in the USA in late 1800s (Bogue, 1968). Various methodologies besides the normal thematic map, as shown in Figure 2, showing the winning party have been utilised to represent voting results. Stoffel et al (2012) used a technique called gradient fill of polygons where the polygon is proportionally shrunk to illustrate the number of votes obtained. The winning party uses the original constituency polygon and the party that came second a smaller version of the same polygon and in a different colour to the winning party. The system can be applied to elections where two or more parties participate as shown in Figure 2.

Vanderbei (n.d.) uses a colour triangle to map US presidential voting patterns. Vanderbei (n.d.) used red to represent the republicans, blue for the democrats and green for any other minor party. The mixture of the various parties colour intensities indicates the amount votes garnered. Vanderbei (n.d.) indicates if a county voted 100% republican it appears red or blue if the county is a 100% democrat. If both garnered 50% of the vote in a county the county will have a purple colour. If the county is split in three ways then the colour is grey. Figure 3 shows an example of Vanderbei's maps for the various US presidential elections.

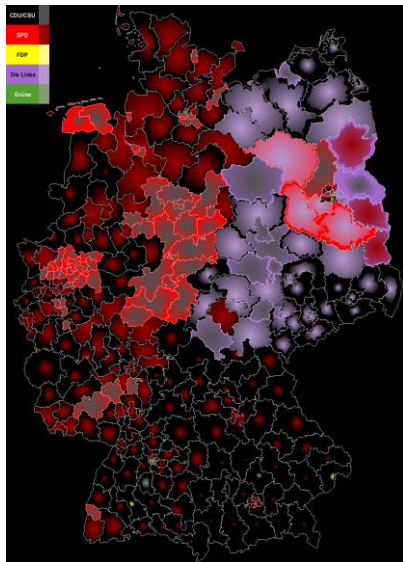


Fig. 2. German Bundestag elections in 2009. (Source: Stoffel et al. 2012,4)

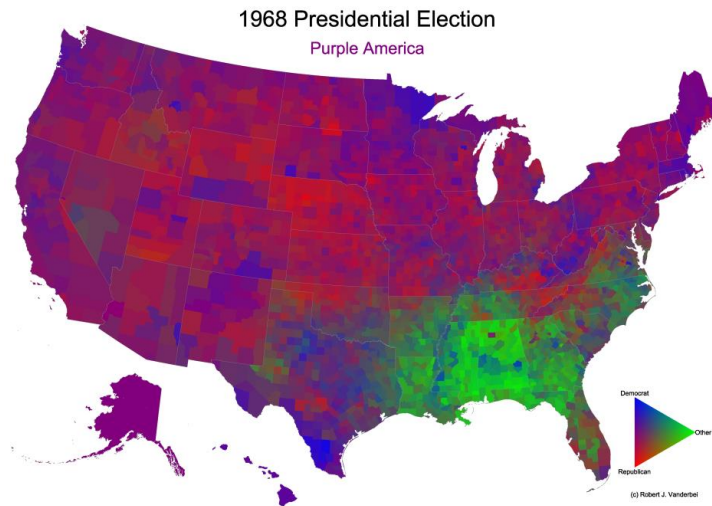


Fig. 3. The 1968 US presidential elections. (Source: Vanderbei n.d.,5)

Another form for displaying election results is the cartogram. A cartogram is a map where geographical regions such as states, provinces or wards are scaled to some statistic such as voting results, population and income (Nusrat and Kobourov, 2016 and Gastner et al. 2005). Figure 4 shows the 2004 US election results as a standard thematic map (on the left) and the results proportional the number of votes each state has in the Electoral College (Gastner et al. 2005)

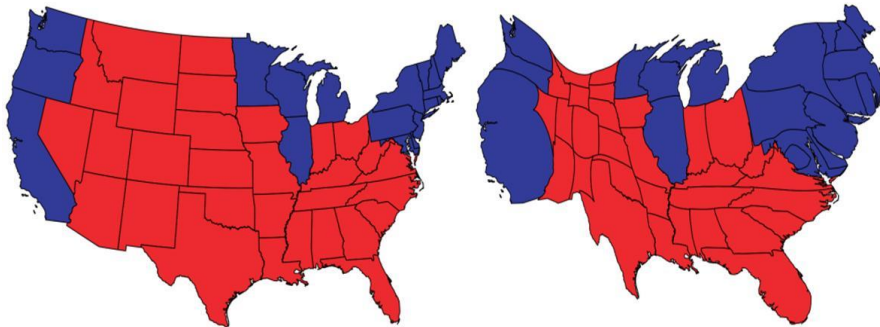


Fig. 4. Mapping the 2004 US presidential elections. (Source: Gastner et al. 2005,118 and 119)

Maps are currently used to show election results in various countries around the world. Sometimes innovative methods are utilized to show the results such as the Lego maps as illustrated in Figure 5 showing election results in the 2016 federal elections in Australia by Fairfax Media (Fairfax Media, 2016).



Fig. 5. Lego interactive maps during the 2016 Australian federal elections. (Source: Fairfax Media, 2016)

Since the 1999 national elections the IEC used maps on its election results board to show the winning party at various levels ranging from voting districts to the provinces. The author has been involved in South African elections since 2004 as part of the CSIR's election prediction team and has firsthand experience of the IEC's election result maps. Figure 6 shows an example of the IEC's result maps for the 2016 local government elections that could be accessed by the public on the IEC's website.

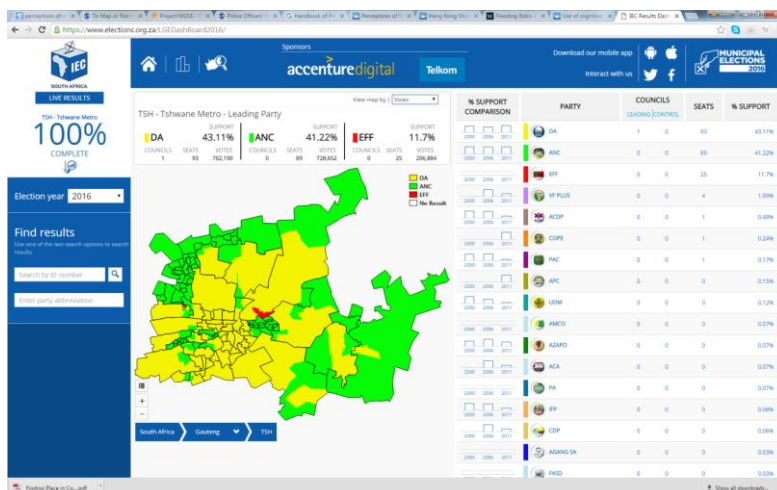


Fig. 6. LGE 2016 results for the City of Tshwane. (Source: IEC, 2016)

Figure 7 shows a map on the News 24 website for the 2016 local government elections where the purple colour shows the voter shift away from a political party and the green colours show the voter shift towards the political party (News 24, 2016). The aim of this paper is to demonstrate a few mapping methodologies apart from the general thematic map as illustrated in Figure 7 to illustrate the voter shifts in this election. Three methods will be discussed in the methodology section namely cartograms, 3D maps and thematic maps combined with a cartogram.

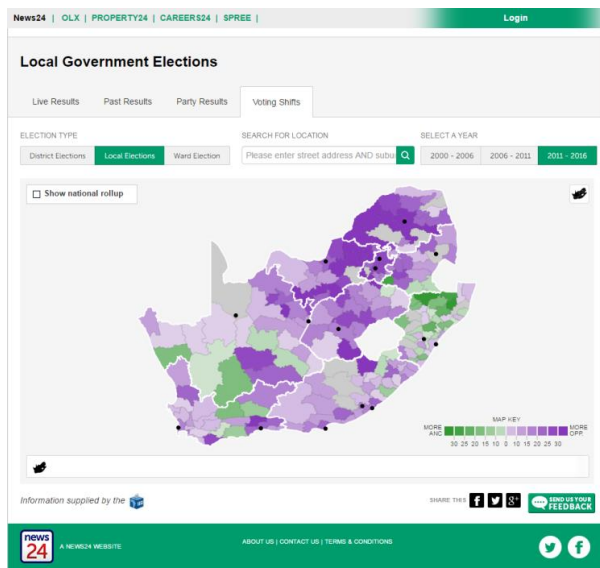


Fig. 7. Map showing voter shifts in the 2016 local elections. (Source: News 24, 2016)

3. Methodology

This paper looks at three methods to illustrate voter gains and losses between two successive local government elections, namely the 2011 and 2016 local government elections in South Africa. There are a myriad of methods to illustrate voter gains and losses, but it was decided to use cartograms and 3D mapping since both show magnitudinal changes. These changes also illustrate where the gains and losses were in South Africa as well as the magnitude thereof. Several maps show hues to illustrate voter gains and losses as illustrated in Figures 1, 2, 3 and 7. The three methodologies are: Cartograms, 3D maps and cartograms combined with thematic maps.

3.1 Cartograms

Cartograms have been around since 1870 and are maps where the regions are scaled proportionally to a selected statistic such as populations, party votes and income (Tobler, 2004 and Nusrat and Kobourov, 2016). Nusrat and Kobourov (2016) list several methodologies employed to draw cartograms ranging from the rubber map method, Dorling cartograms, and mosaic cartograms to diffusion-based cartograms. Diffusion-based cartograms have been developed by Gastner and Newman in 2004 (Gastner and Newman, 2004). Figure 4 shows an example of the Gastner and Newman method. The two authors subsequently developed an ArcGIS tool that can be used with ArcGIS to generate cartograms. This tool was used to generate the cartograms showing voter gains and losses for selected political parties in the South African 2016 local government elections. The selected parties are the African National Congress (ANC), Democratic Alliance (DA) and the Economic Freedom Fighters (EFF). The EFF only came in 2013 into existence and participated in 2014 national and provincial elections and the 2016 local government elections, thus only the voter gains will be shown in the cartograms and other maps. Tobler (2004) indicated that a standard map should be used as a companion to understand the cartogram using the “brushing technique” where by the map reader brushes (highlights) the area of interest on a standard map and it automatically high lights the same area on the cartogram. For this paper an inset consisting of a standard thematic map was used to guide the map reader to a certain extent in the cartogram that illustrates the voter shifts. The next section discusses 3D mapping

3.2 Three dimensional (3D) mapping

Three dimensional mapping has been in use in GIS since the early 1980’s (Raper and Kelk, 1991). The use of three dimensional mapping has a wide range of applications ranging from mapping noise levels in urban areas (Stoter et al. 2008); 3D buildings for the planning of telecommunication networks in a city (Coors, 2003) to creating 3D models from lidar data (Schwarz, 2010) and 3D terrain models (Raper and Kelk, 1991). Vanderbei (n.d.) made a 3D rendering of voting data of the 2004 US presidential election by combining it with the population density. The population is rendered in 3D and the voting data draped over it. In this paper the percentage voter gain or loss is presented in 3D using ESRI’s ArcScene software. The 3D maps are created for the ANC, DA and EFF.

3.3 Thematic map combined with cartogram

The Gastner and Newman cartogram uses absolute values, meaning only positive numbers. Losses, normally shown as a negative number, i.e. -13.4% had to be converted into positive numbers for use in cartograms. To combine both voter gains and losses into a single cartogram the negative values of voter losses were converted into positive values. The resultant cartogram was shown as a thematic map which showed the gains and losses. This similar to Gastner et al. (2005) example where the cartogram was created based on the population per state and the voter results of the 2004 US presidential elections a thematic map. The colour schemes for all the maps generated to indicate gains and losses were based on those given by Brewer (2016).

4. Discussions

As mentioned in the previous section it was decided to use cartograms to show the extent of voter gains and losses for the three main parties. Each cartogram, based on the Gastner and Newman (2004) method will be discussed in more detail. In this section the gains and losses were mapped separately to show the extent of the gains or losses. Figure 8 shows the ANC gains at municipal level between the two local government elections.

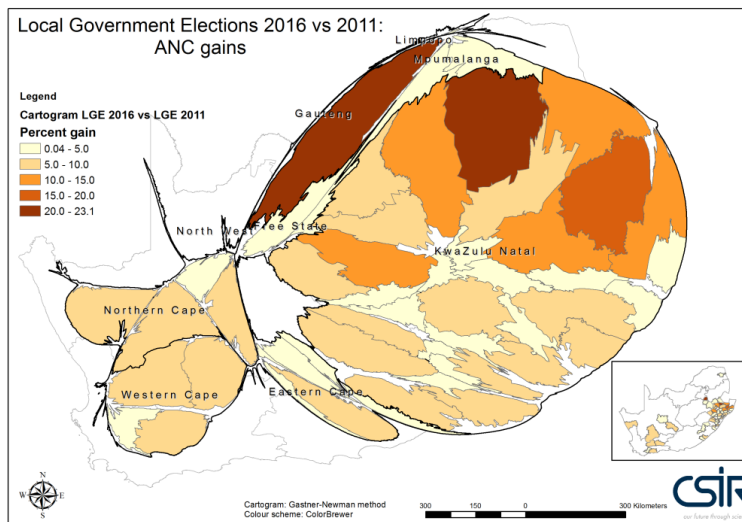


Fig. 8. Cartogram showing ANC gains.

Figure 8 indicates that the ANC had the most gains KwaZulu Natal province followed by a few municipalities in the Eastern Cape, Northern Cape and Western Cape. But suffered voter losses in the other local government areas in South Africa as shown in Figure 9. The largest losses suffered by the ANC were in Limpopo province, North West province and Gauteng. The cartogram shows the largest distortions in these provinces. The province with the smallest number of losses is KwaZulu Natal where the ANC had the most successes in gaining votes from the voter population. Although the ANC lost votes in most of the local governments the party managed to keep most of these. However in some these the losses were significant and the party had to form a coalition to keep three of the local governments in 2016. The losses of local governments to the opposition in 2016 are three metropolitan municipalities namely Nelson Mandela Bay (Port Elizabeth), Tshwane (Pretoria) and the City of Johannesburg and 21 local governments (municipalities).

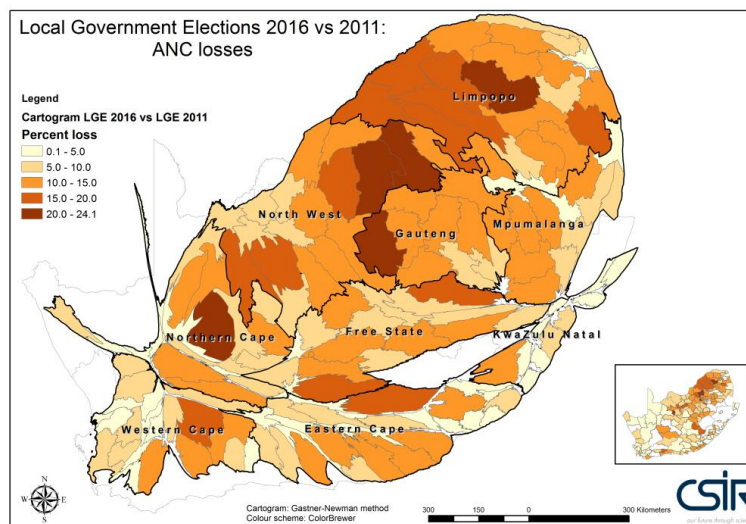


Fig. 9. ANC losses in 2016 local government elections.

The 3D maps show the above trends from a different perspective; the main difference is that the distortion is volumetric keeping the geographical shape of the local government intact and not area wise as with the cartograms but still it shows where the most dramatic shifts in voter behaviour occurred in South Africa. Figure 10 shows the ANC gains and losses.

The biggest drawback in using the cartograms based on the Gastner and Newman (2004) method is that it cannot process negative numbers, which in this example was used to show percentage voter losses. If the data is split into two separate datasets, all the negative values will be changed to zero to only the gains and

similar with the losses. This approach distorts the zero value municipalities in a minute polygons and leads to the distortions as shown in Figures 8 and 9. To overcome this problem, the voter losses have been converted into absolute values with a tag indicating that these represent voter losses and the others are voter gains. Fortunately the Gastner and Newman (2004) method retains the attributes of the original shape file and this it is possible to combine thematic mapping with the cartogram showing the gains and losses in one cartogram as illustrated in Figure 11.

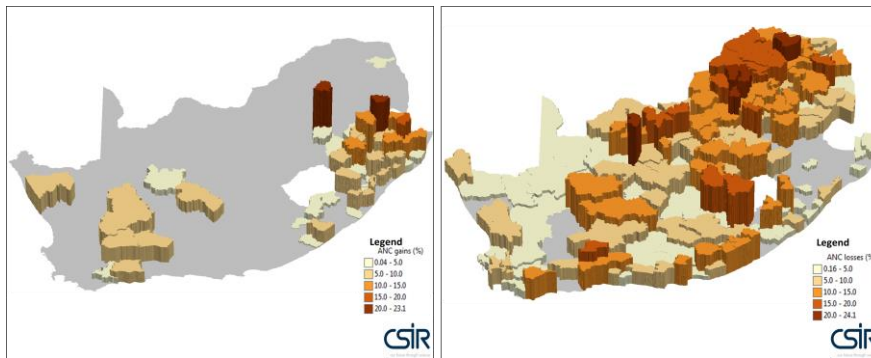


Fig. 10. 3D map showing ANC gains and losses in the 2016 local government elections.

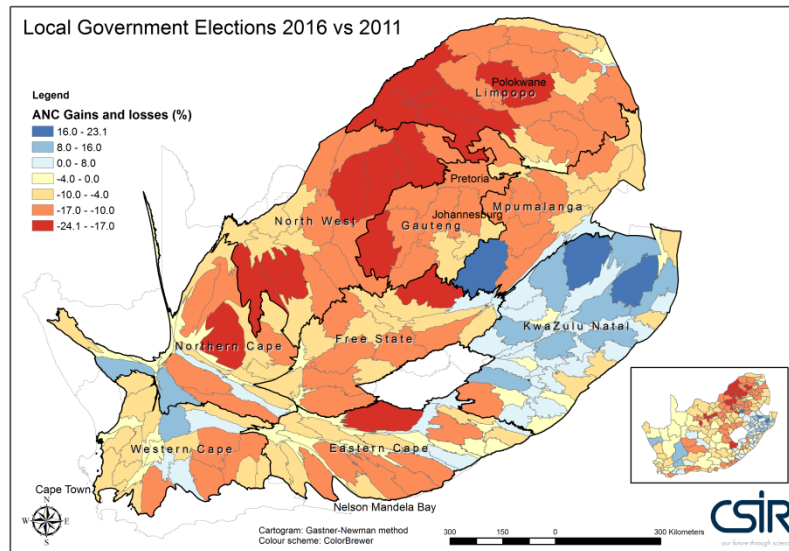


Fig. 11. Cartogram indicating both voter gains and losses by the ANC.

Figure 12 shows the gains made by the Democratic Alliance (DA) which is currently the largest opposition political party in South Africa. The DA strengthened its hold on the Western Cape Province since the previous local government elections in 2011 as illustrated in Figure 12.

The DA made the most significant gains in the metropolitan areas albeit with a small percentage but good enough to enable them to take control of three metros, namely Nelson Mandela Bay, Tshwane and Johannesburg and forcing the ANC into coalitions to keep control of Ekurhuleni. The last three metros are in Gauteng, the economic heartland of South Africa.

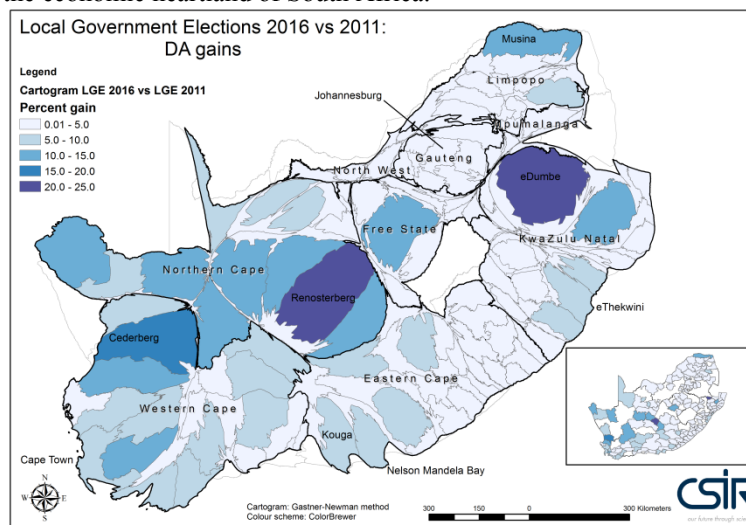


Fig. 12. DA percentage voter gains in the 2016 local government elections.

Surprise increase in the DA voter gains was Musina in the north of South Africa as well as some other rural areas. The DA consolidated its hold over Cape Town by increasing its voter numbers. In general the DA's increases were prominent in the south-eastern, southern and western areas of South Africa.

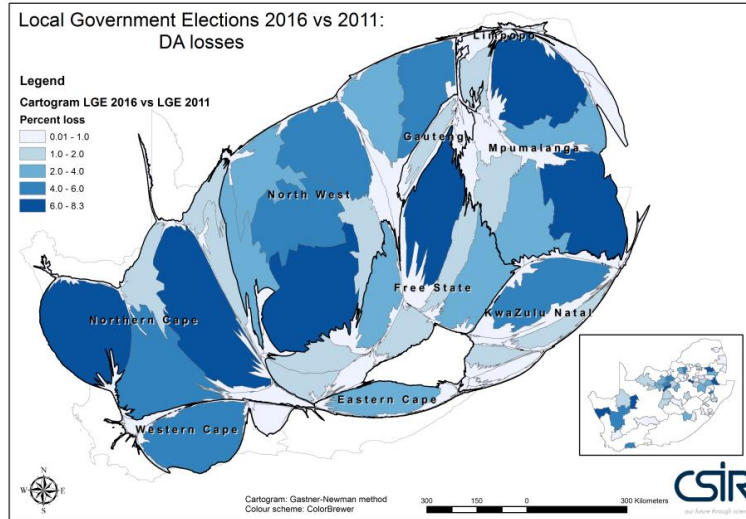


Fig. 13. Percent DA voter losses in the 2016 local government elections.

Figure 13 shows the percent DA voter losses. Figure 13 clearly indicates the losses of voters in the more rural provinces in South Africa with the exception of the Eastern Cape, KwaZulu Natal and Limpopo Province. These provinces are Northern Cape, North West and Mpumalanga. The voter gains and losses are also clearly indicated by the 3D maps in Figure 14.

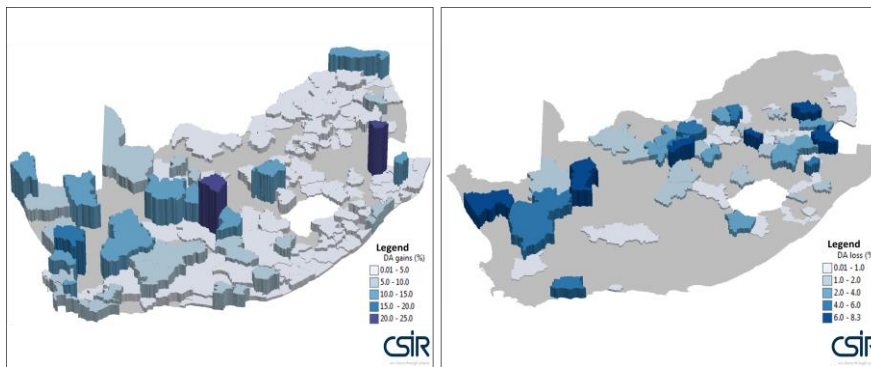


Fig. 14. Percent DA voter losses in the 2016 local government elections.

Figure 15 shows the thematic cartogram of the DA’s voter gains and losses in the 2016 local government elections. From Figures 13 and 14 it clear that the DA in general gained voters in more local governments than losing voters, which is opposite to the ANC is illustrated in Figures 8 to 11.

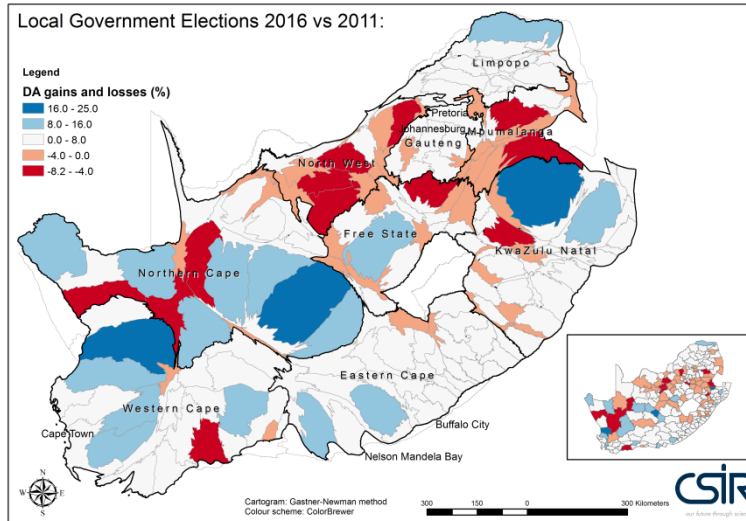


Fig. 15. Thematic cartogram showing DA voter gains and losses.

The EFF is a young political party on the South African political scene and garnered 8.3% percent of the vote at a national level (IEC, 2016). The cartogram in Figure 16 clearly shows the voter percentages for the EFF. The cartogram shows similarities to voter losses of the ANC in Figure 8. Figure 17 shows the 3D map of voter gains for the EFF. It is true that the EFF did take the votes from the ANC, than the DA did, but it should be kept in mind that a significant number of voters did not go to the polls in the traditional ANC areas as a protest to ANC’s political conduct over the last few years (Kimmie, 2016).

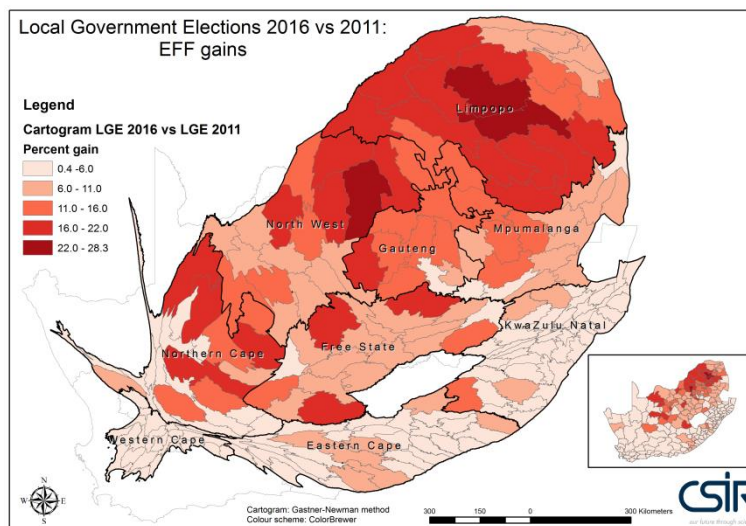


Fig. 16. EFF voter gains in the 2016 local government elections.

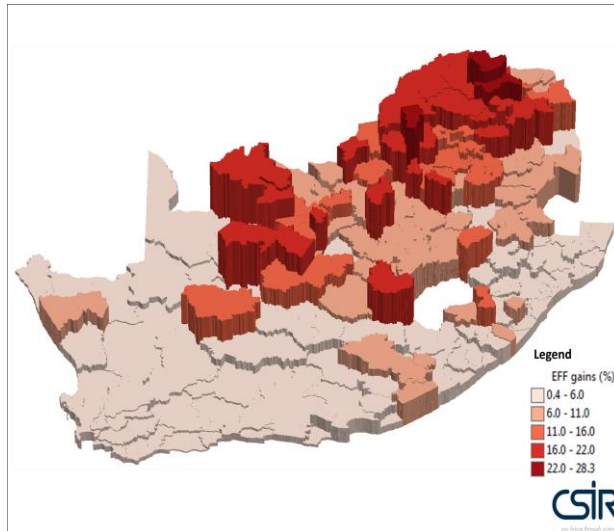


Fig. 17. 3D representation of EFF voter gains in the 2016 local government elections.

5. Conclusions

This paper looked at three possible methods to display voter gains and losses between two local government elections. The three methods were cartograms, 3D maps and thematic cartograms. The latter was used to show both percentage voter gains and losses.

Both cartogram methods guides the map reader with respect to the size of the loss and not just only a colour code to show the magnitude as in a normal thematic map. However, the cartogram may confuse the map reader with regards to location of a municipality in South Africa and it is necessary to include a small map to guide the reader. This is based on Tobler's (2004) idea to have a standard map that can be "brushed" to indicate the map reader which is the corresponding polygon in the cartogram. The cartogram however shows a novel way to represent voting behaviour.

The 3D map shows the changes volumetric as to the area in the cartogram. A 3D map may be more intuitive to a map reader since it keeps the original shape of the polygon. It requires less "training" of the map reader to read and understand the map as it would be when reading a cartogram.

It would be interesting to sample a general population to determine how they would react to these maps, which is a recommended future research emanating from this paper. The research should look at a “before training” and “after training” scenario to determine whether a cartogram or a 3D map will be the preferred map to display voter change. To conclude, all three these methods discussed in this paper clearly indicate where the major changes in voting behavior occurred between the two elections.

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