# The Effect of Community-Based Programs on Elephant Populations in Africa

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# Motivation

1. The effect of allocation of property rights on resource appropriation.
   - Successful allocation should reduce over-extraction of common property resources (Ostrom, 1990).

2. Community-based natural resource management (CBNRM) programs seek devolution of rights to wildlife to local communities.
   - Many CBNRM programs involve sharing of benefits (park entry fees or hunting fees) with local communities.

3. Very little empirical evidence on effects of such programs on wildlife populations.

# Questions

1. How has CBNRM performed in terms of its goal of mitigating loss of wildlife?

2. How does the performance of CBNRM depend upon other policies related to wildlife and to social structure?

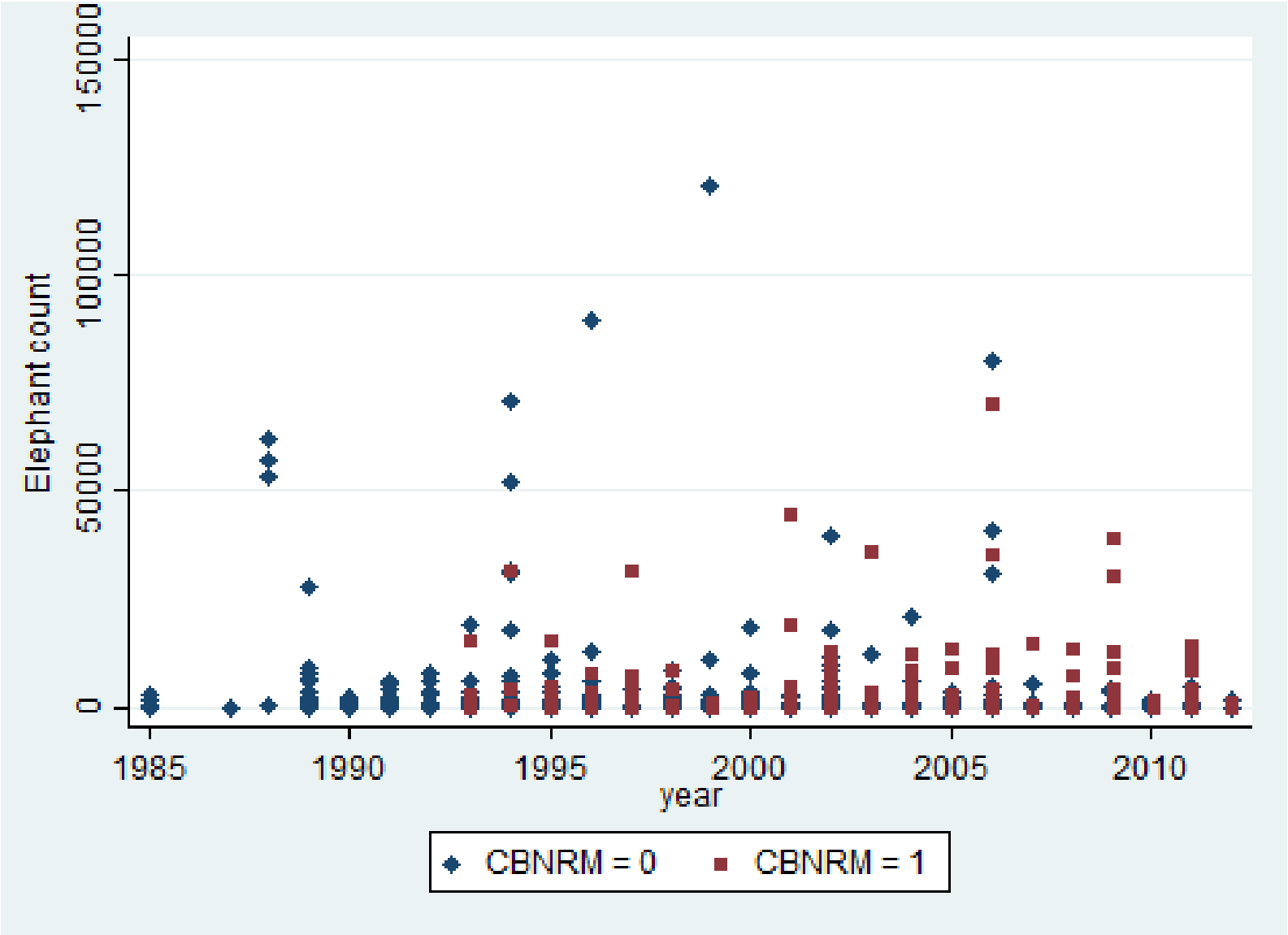
# Data

1. Elephant counts: African Elephant Database collects data on elephant counts at the "area" level from the year 1989 onwards, with gaps.

2. CBNRM: Various reports, maps and case studies from multilateral organizations and independent researchers on community management of wildlife resources.

3. Country level controls: World Bank data on GNI, forest rent, and protected area; Fraser Index of Economic Freedom; ethnic fractionalization (Alesina, 2003); Legalized trophy hunting policy statements.

# Area level elephant counts and CBNRM projects



# Summary statistics

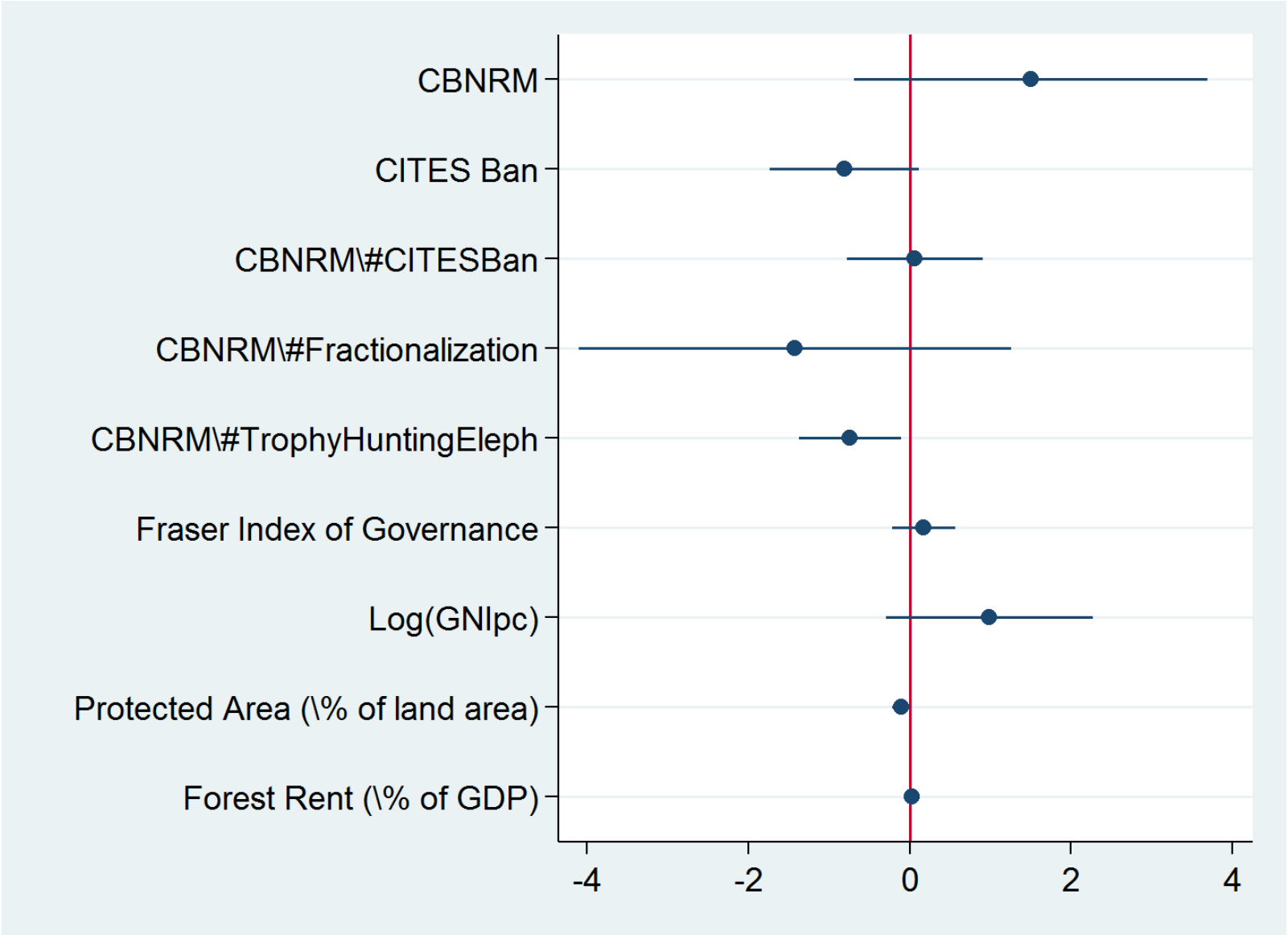
| | mean | sd | min | max |
|---|---|---|---|---|
| $\log(Eleph + 1)$ | 5.6720 | 2.5513 | 0 | 11.293 |
| $GNI_{pc}$ | 4626.6 | 4070.5 | 535.20 | 15300.9 |
| $\log GNI_{pc}$ | 8.0786 | 0.8359 | 6.2826 | 9.6357 |
| Forest Rent (%age of GDP) | 4.1147 | 4.0133 | 0.2790 | 34.247 |
| Protected Area (%age of land area) | 18.152 | 9.9925 | 5.8720 | 37.190 |
| Fraser Governance Indicator (1 - 10) | 6.1080 | 1.2110 | 2.9500 | 7.6400 |
| Ethnic Fractionalization Measure (0 - 1) | 0.7099 | 0.1575 | 0.3238 | 0.9302 |
| CITES Ban | Yes (220); No (130) | | | |
| CBNRM projects | Yes (217); No (133) | | | |
| Trophy Hunting of Elephants | Yes (265); No (85) | | | |
| $N$ | 350 | | | |

Note: This sample includes 19 countries of which six do NOT have any recorded CBNRM projects in any area-year observation.

# Estimation

$$\begin{aligned}\log(Y_{ijt}+1) = \quad & \beta_1 + CBNRM_{ijt} * \beta_2 + CBNRM_{ijt} * CITES_{jt} * \beta_3 \\ & + CITES_{jt} * \beta_4 + CBNRM_{ijt} * Frac_j * \beta_5 \\ & + CBNRM_{ijt} * Trophy_j * \beta_6 \\ & + X_{jt} * \beta_7 + \lambda_t + \omega_i + \epsilon_{ijt}\end{aligned} \tag{1}$$

# Results


CBNRM
CITES Ban
CBNRM\#CITESBan
CBNRM\#Fractionalization
CBNRM\#TrophyHuntingEleph
Fraser Index of Governance
Log(GNIpc)
Protected Area (\% of land area)
Forest Rent (\% of GDP)
-4
-2
0
2
4

# Results: Joint Hypotheses Tests

| Interaction | $H_0$ | p-value | Net effect |
|---|---|---|---|
| CBNRM & Fractionalization | $\beta_2 + \beta_5 * 0.70 = 0$ | 0.0504 | $\uparrow$ 68% |
| CITES Ban & CBNRM | $\beta_3 + \beta_4 = 0$ | 0.0210 | $\downarrow$ 53% |
| CBNRM & Fract & Trophy | $\beta_2 + \beta_5 * 0.70 + \beta_6 = 0$ | 0.0663 | $\downarrow$ 21% |

# Related Literature

1. Countries which have national level resource management program have higher elephant counts (McPherson and Nieswiadomy, 2000)
2. Countries with regulated ivory markets have seen an increase in elephant counts, while civil war and corruption have negative effects (Lemieux and Clarke, 2009)
3. One-shot sale of ivory increases levels of poaching (Solomon and Sekar, 2016)
4. Greater heterogeneity in social structure increases transaction costs associated with negotiations (Lueck, 1994)
5. Countries with limited resources to devote to monitoring of "protected areas" would do better by limiting the size of such areas (Leader-Williams and Albon, 1988)

# Thank you!

# Results

| | (1) Log(Eleph+1) | (2) Log(Eleph+1) | (3) Log(Eleph+1) | (4) Log(Eleph+1) |
|---|---|---|---|---|
| CBNRM | 1.685 | 1.685 | 1.500 | 1.500 |
| | (1.348) | (1.134) | (1.112) | (1.121) |
| CBNRM#CITESBan | -0.122 | -0.122 | 0.0630 | 0.0630 |
| | (0.424) | (0.427) | (0.427) | (0.431) |
| CBNRM#Fractionalization | -1.504 | -1.504 | -1.422 | -1.422 |
| | (1.667) | (1.375) | (1.361) | (1.371) |
| CBNRM#TrophyHuntingEleph | -0.693 | -0.693** | -0.739** | -0.739** |
| | (0.514) | (0.312) | (0.324) | (0.326) |
| Fraser Index of Governance | 0.0624 | 0.0624 | 0.171 | 0.171 |
| | (0.228) | (0.191) | (0.198) | (0.199) |
| Log(GNIpc) | 1.232 | 1.232** | 0.987 | 0.987 |
| | (0.932) | (0.623) | (0.650) | (0.655) |
| Protected Area (% of land area) | -0.0999 | -0.0999* | -0.105* | -0.105* |
| | (0.0661) | (0.0562) | (0.0547) | (0.0551) |
| Forest Rent (% of GDP) | 0.0618 | 0.0618** | 0.0262 | 0.0262 |
| | (0.0418) | (0.0289) | (0.0254) | (0.0256) |
| CITES Ban | | | -0.810* | -0.810* |
| | | | (0.468) | (0.471) |
| Constant | -3.544 | -3.544 | -0.994 | -0.766 |
| | (7.917) | (5.500) | (5.847) | (5.867) |
| Observations | 350 | 350 | 350 | 292 |
| Adjusted $R^2$ | -1.486 | 0.174 | 0.181 | 0.170 |

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; All specifications include year dummies and Area FEs

# Controls

1. Fractionalization: This is a measure of how heterogeneous a country is in terms of ethno-linguistic categories. For country j, fractionalization is calculated as $Frac_j = 1 - \sum_{i=1}^{N} s_{ij}^2$, where $s_{ij}$ is the share of ethno-linguistic group i in the population of country j. Thus, $Frac_j \in [0, 1)$ and it increases with greater heterogeneity. This measure does not vary with time and, hence, the effect is identified through the interaction.
2. Fraser Index of Governance: A summary index which measures the degree of economic freedom in five broad areas: (1) size of government: expenditures, taxes, and enterprises; (2) legal structure and security of property rights; (3) access to sound money; (4) freedom to trade internationally; and (5) regulation of credit, labor, and business. The overall measure is a simple average of scores between 0 and 10 across the 5 categories for country j in year t.

# Controls

1. GNI per capita: GNI per capita based on purchasing power parity (PPP). PPP GNI is gross national income (GNI) converted to international dollars using purchasing power parity rates. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. Data are in current international dollars based on the 2011 ICP round.
2. Protected Area: Totally or partially protected areas of at least 1,000 hectares that are designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use. This is expressed as a percentage of total land acreage of a country. Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.

# Controls

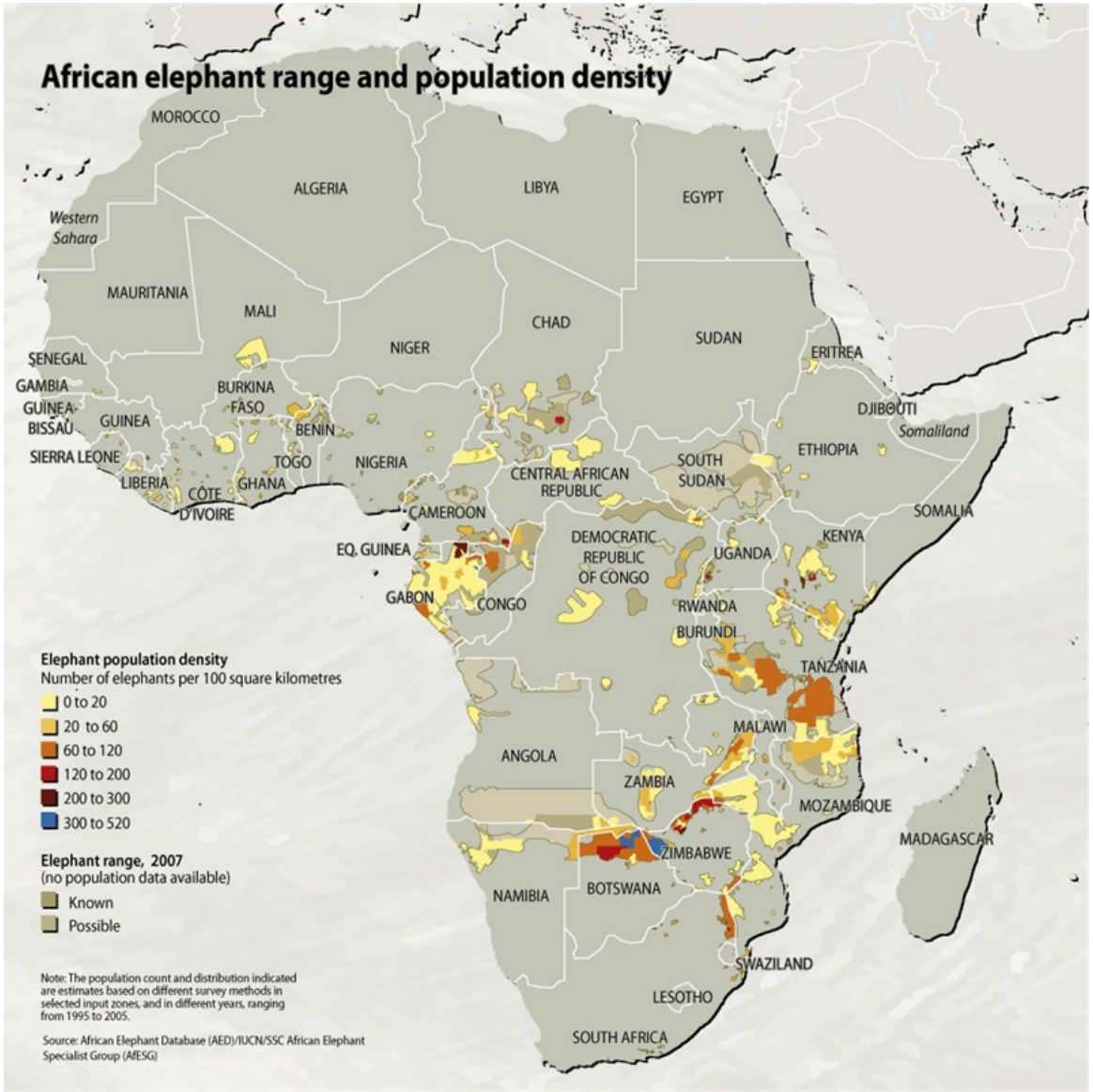
1. Forest Rent: Round-wood harvest times the product of average prices and a region-specific rental rate. The estimates of rents are calculated by estimating the world price of units of round-wood and subtracting estimates of average unit costs of extraction or harvesting cost. These unit rents are then multiplied by the physical quantities countries extract or harvest to determine the rents for each commodity as a share of GDP.

# Distinct Area-Year Observations

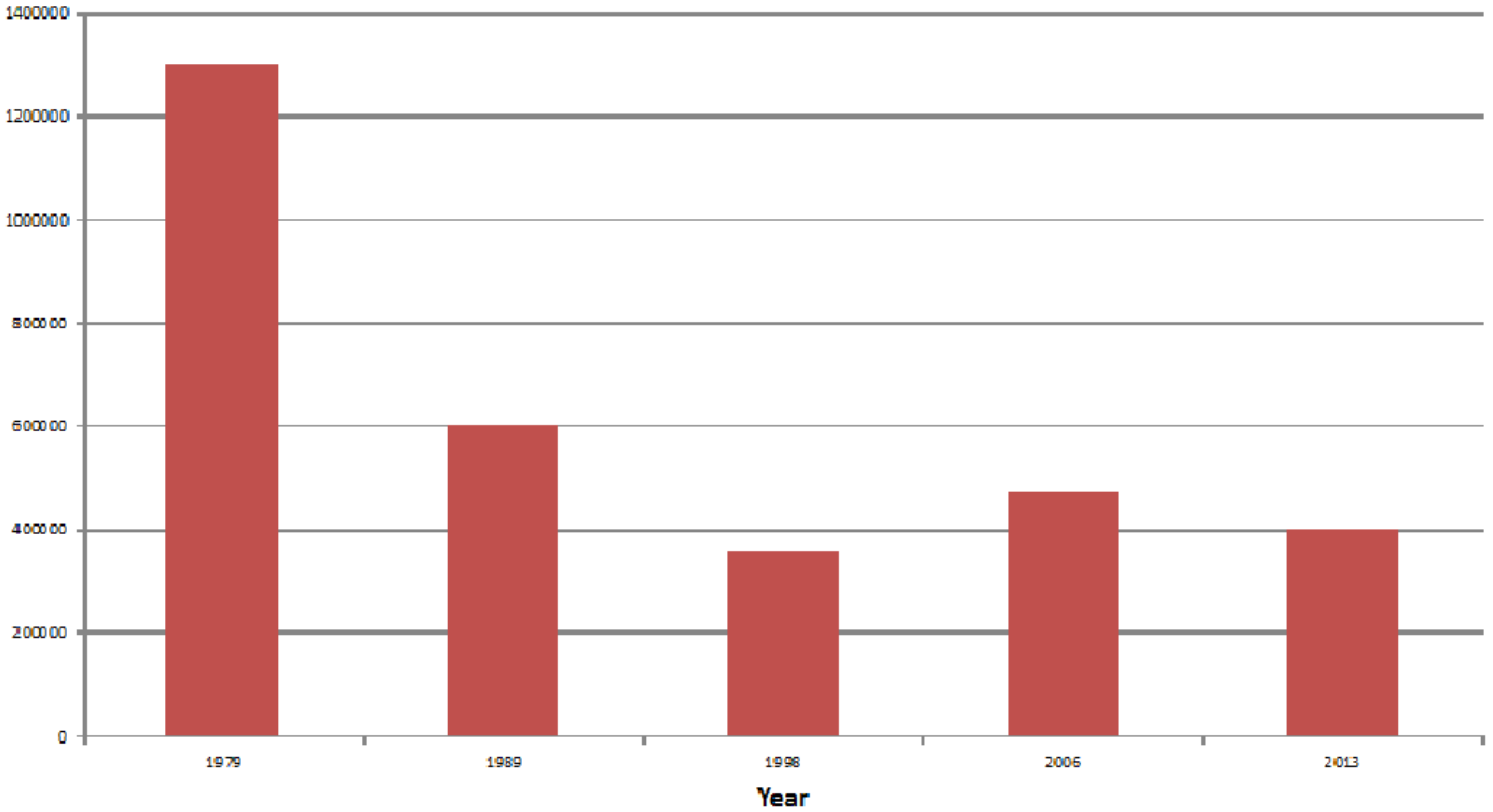
Table: Frequency of distinct area-year observations for restricted sample used in analysis

| # of areas | %age of total # of areas | # of annual obs. for each |
|---|---|---|
| 126 | 57.27 | 1 |
| 65 | 29.55 | 2 |
| 22 | 10.00 | 3 |
| 7 | 3.18 | 4 |
| 220 | 100 | 350 |

# African elephant range: A snapshot

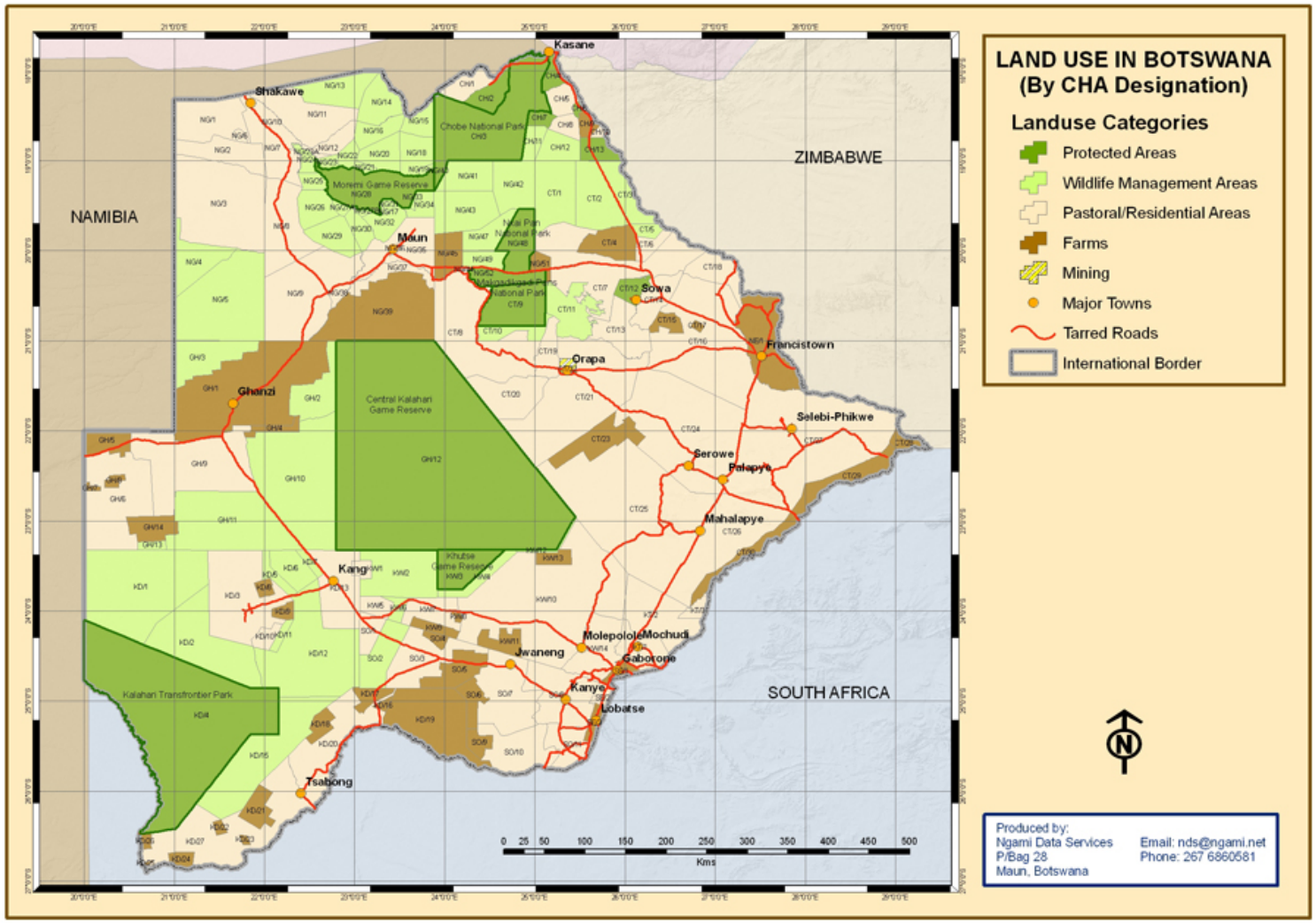


# Trend in African Elephant Population

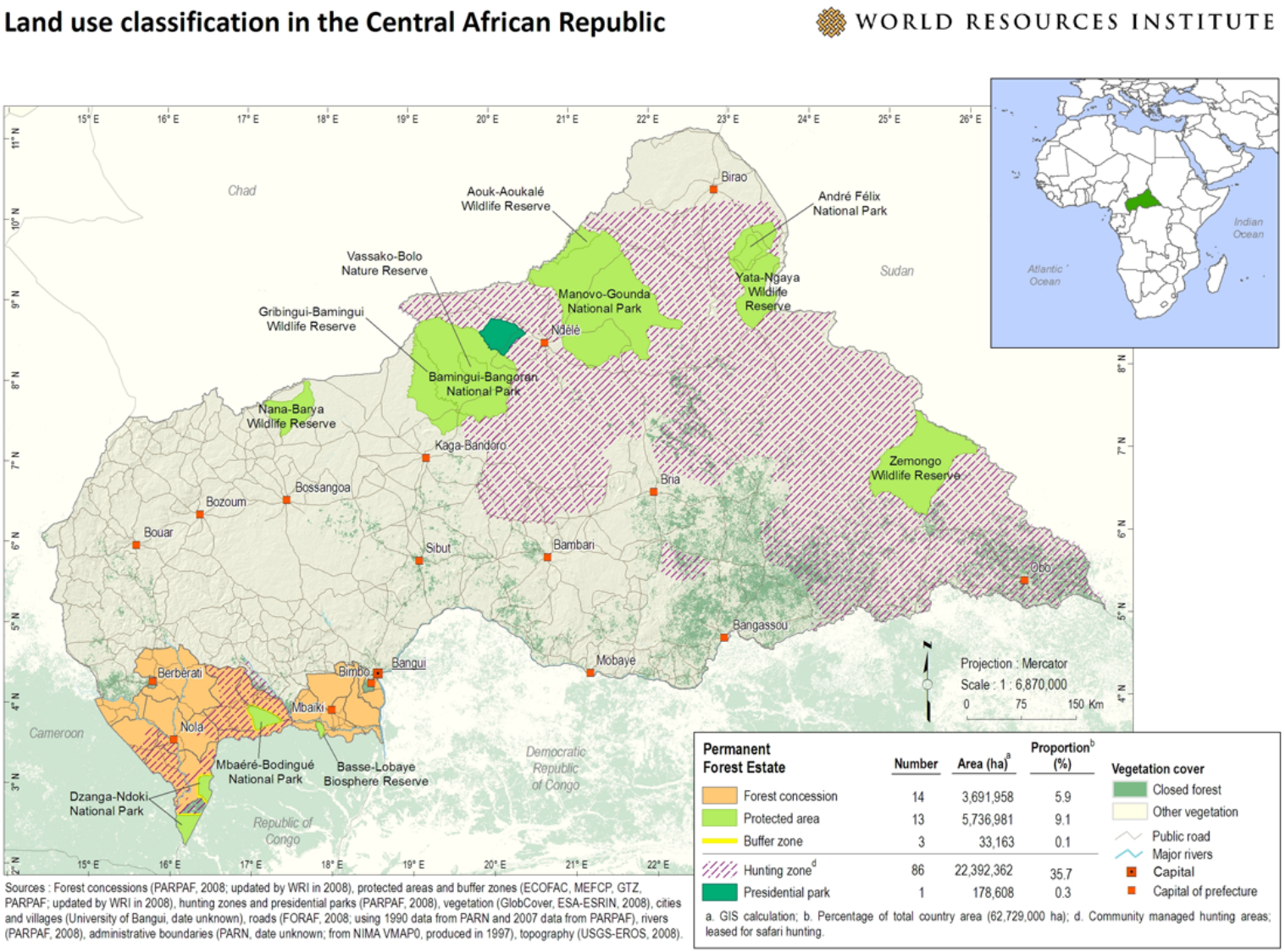



Sources: Data for 1979 and 1989 from Lemieuex and Clarke (2009); Data for 1998, 2006 and 2013 from African Elephant Database.

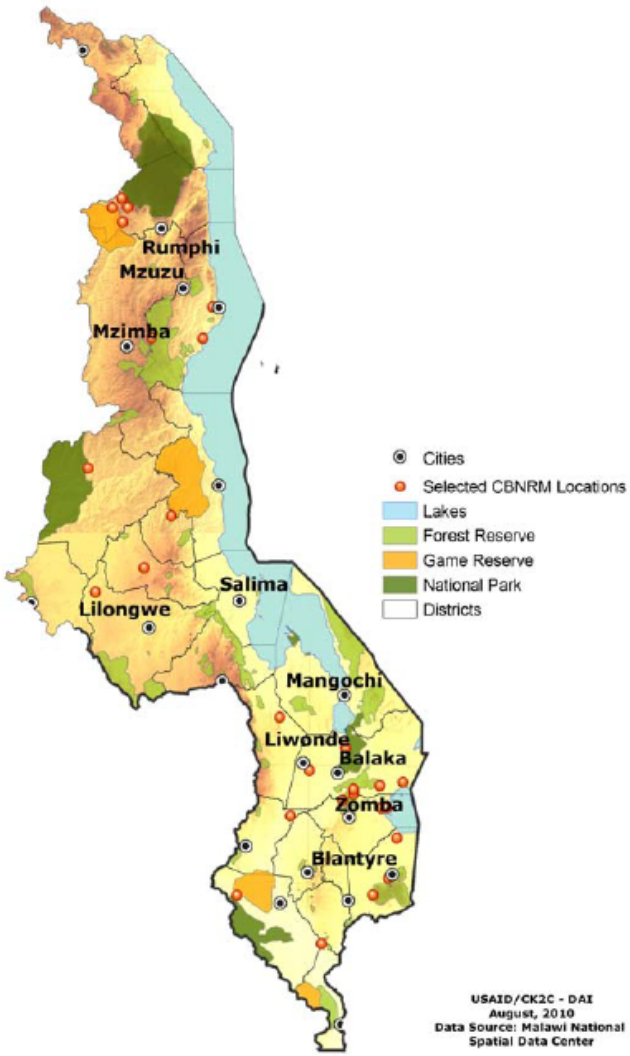
# Community lands map: Botswana



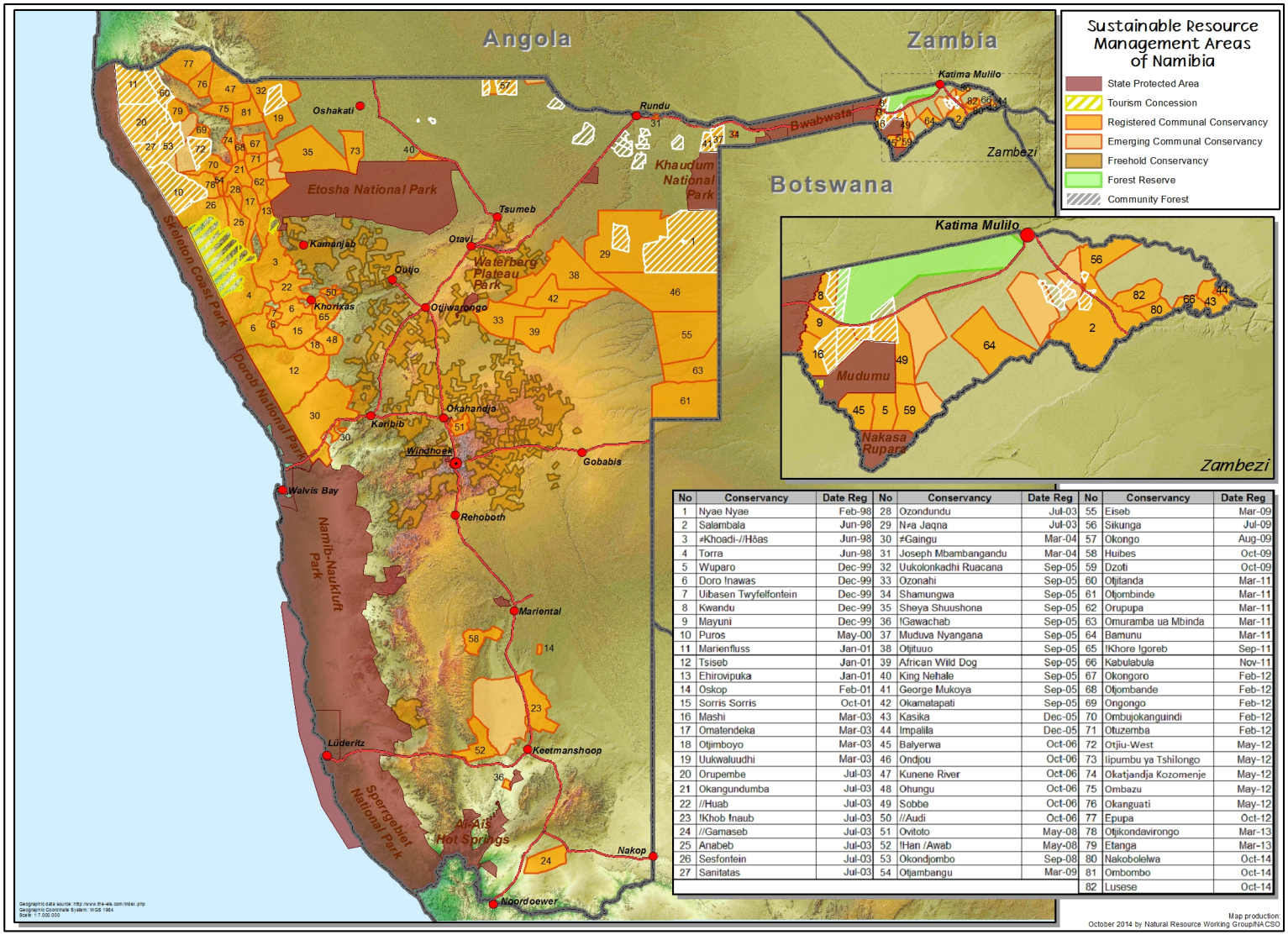
# Community lands map: Central African Republic



# Community lands map: Malawi



# Community lands map: Namibia




| No | Conservancy | Date Reg | No | Conservancy | Date Reg | No | Conservancy | Date Reg |
|---|---|---|---|---|---|---|---|---|
| 1 | Nyae Nyae | Feb-98 | 28 | Ozondundu | Jul-03 | 55 | Eiseb | Mar-09 |
| 2 | Salambala | Jun-98 | 29 | N≠a Jaqna | Jul-03 | 56 | Sikunga | Jul-09 |
| 3 | ≠Khoadi-//Hôas | Jun-98 | 30 | ≠Gaingu | Mar-04 | 57 | Okongo | Aug-09 |
| 4 | Torra | Jun-98 | 31 | Joseph Mbambangandu | Mar-04 | 58 | Huibes | Oct-09 |
| 5 | Wuparo | Dec-99 | 32 | Uukolonkadhi Ruacana | Sep-05 | 59 | Dzoti | Oct-09 |
| 6 | Doro !nawas | Dec-99 | 33 | Ozonahi | Sep-05 | 60 | Otjitanda | Mar-11 |
| 7 | Uibasen Twyfelfontein | Dec-99 | 34 | Shamungwa | Sep-05 | 61 | Otjombinde | Mar-11 |
| 8 | Kwandu | Dec-99 | 35 | Sheya Shuushona | Sep-05 | 62 | Orupupa | Mar-11 |
| 9 | Mayuni | Dec-99 | 36 | !Gawachab | Sep-05 | 63 | Omuramba ua Mbinda | Mar-11 |
| 10 | Puros | May-00 | 37 | Muduva Nyangana | Sep-05 | 64 | Bamunu | Mar-11 |
| 11 | Marienfluss | Jan-01 | 38 | Otjituuo | Sep-05 | 65 | !Khore !goreb | Sep-11 |
| 12 | Tsiseb | Jan-01 | 39 | African Wild Dog | Sep-05 | 66 | Kabulabula | Nov-11 |
| 13 | Ehirovipuka | Jan-01 | 40 | King Nehale | Sep-05 | 67 | Okongoro | Feb-12 |
| 14 | Oskop | Feb-01 | 41 | George Mukoya | Sep-05 | 68 | Otjombande | Feb-12 |
| 15 | Sorris Sorris | Oct-01 | 42 | Okamatapati | Sep-05 | 69 | Ongongo | Feb-12 |
| 16 | Mashi | Mar-03 | 43 | Kasika | Dec-05 | 70 | Ombujokanguindi | Feb-12 |
| 17 | Omatendeka | Mar-03 | 44 | Impalila | Dec-05 | 71 | Otuzemba | Feb-12 |
| 18 | Otjimboyo | Mar-03 | 45 | Balyerwa | Oct-06 | 72 | Otjiu-West | May-12 |
| 19 | Uukwaluudhi | Mar-03 | 46 | Ondjou | Oct-06 | 73 | Iipumbu ya Tshilongo | May-12 |
| 20 | Orupembe | Jul-03 | 47 | Kunene River | Oct-06 | 74 | Okatjandja Kozomenje | May-12 |
| 21 | Okangundumba | Jul-03 | 48 | Ohungu | Oct-06 | 75 | Ombazu | May-12 |
| 22 | //Huab | Jul-03 | 49 | Sobbe | Oct-06 | 76 | Okanguati | May-12 |
| 23 | !Khob !naub | Jul-03 | 50 | ///Audi | Oct-06 | 77 | Epupa | Oct-12 |
| 24 | //Gamaseb | Jul-03 | 51 | Ovitoto | May-08 | 78 | Otjikondavirongo | Mar-13 |
| 25 | Anabeb | Jul-03 | 52 | !Han /Awab | May-08 | 79 | Etanga | Mar-13 |
| 26 | Sesfontein | Jul-03 | 53 | Okondjombo | Sep-08 | 80 | Nakobolelwa | Oct-14 |
| 27 | Sanitatas | Jul-03 | 54 | Otjambangu | Mar-09 | 81 | Ombombo | Oct-14 |
| | | | | | | 82 | Lusese | Oct-14 |

Map production:
October 2014 by Natural Resource Working Group/NACSO

# Summary statistics on elephant counts by country (unrestricted)

| | mean | sd | min | max | # of obs |
|---|---|---|---|---|---|
| Benin | 349.70 | 413.09 | 0 | 1232 | 10 |
| Botswana | 22367.3 | 30479.8 | 651 | 80226 | 7 |
| Cameroon | 348.40 | 370.40 | 0 | 1354 | 15 |
| Congo | 6593.1 | 7451.7 | 104 | 18222 | 10 |
| Cóte d'Ivoire | 189 | 0 | 189 | 189 | 1 |
| DRC | 2366.0 | 3234.9 | 15 | 12500 | 31 |
| Gabon | 3931.8 | 5573.4 | 124 | 21070 | 13 |
| Ghana | 207.40 | 159.77 | 56 | 401 | 5 |
| Kenya | 1306.6 | 2169.3 | 0 | 9021 | 44 |
| Malawi | 179.83 | 195.36 | 0 | 530 | 6 |
| Namibia | 1728 | 2122.8 | 19 | 8725 | 19 |
| Nigeria | 74.800 | 152.94 | 0 | 348 | 5 |
| Rwanda | 33 | 4.5826 | 28 | 37 | 3 |
| Senegal | 1.5000 | 0.7071 | 1 | 2 | 2 |
| Sierra Leone | 42.500 | 53.033 | 5 | 80 | 2 |
| South Africa | 542.05 | 1959.6 | 0 | 12427 | 82 |
| Tanzania | 5099.2 | 11828.6 | 0 | 70406 | 69 |
| Togo | 18.125 | 22.229 | 0 | 61 | 8 |
| Uganda | 549.56 | 734.05 | 0 | 2959 | 18 |
| Zambia | 890.86 | 1403.1 | 0 | 6306 | 42 |
| Zimbabwe | 2686.3 | 7424.0 | 0 | 44492 | 67 |

# Summary statistics on elephant counts by country (restricted)

| | mean | sd | min | max | # of obs |
|---|---|---|---|---|---|
| Benin | 349.70 | 413.09 | 0 | 1232 | 10 |
| Botswana | 22367.3 | 30479.8 | 651 | 80226 | 7 |
| Cameroon | 299.75 | 298.85 | 0 | 901 | 8 |
| Congo | 9169.1 | 7578.9 | 104 | 18222 | 7 |
| Cóte d'Ivoire | 189 | 0 | 189 | 189 | 1 |
| DRC | 4001.3 | 3711.8 | 347 | 11175 | 8 |
| Gabon | 4690 | 6617.9 | 124 | 21070 | 9 |
| Ghana | 207.40 | 159.77 | 56 | 401 | 5 |
| Kenya | 1482.9 | 2473.8 | 0 | 9021 | 32 |
| Malawi | 69.667 | 76.173 | 0 | 151 | 3 |
| Namibia | 1929 | 2159.1 | 61 | 8725 | 17 |
| Nigeria | 116 | 200.92 | 0 | 348 | 3 |
| Rwanda | 28 | 0 | 28 | 28 | 1 |
| South Africa | 561.51 | 2033.9 | 0 | 12427 | 76 |
| Tanzania | 5913 | 12624.4 | 0 | 70406 | 59 |
| Togo | 0 | 0 | 0 | 0 | 2 |
| Uganda | 726 | 795.96 | 0 | 2959 | 13 |
| Zambia | 922.84 | 1446.6 | 0 | 6306 | 38 |
| Zimbabwe | 3490.9 | 8365.3 | 0 | 44492 | 51 |

# Results excluding West Africa

| | (1) log_eleph_adj | (2) log_eleph_adj | (3) log_eleph_adj | (4) log_eleph_adj |
|---|---|---|---|---|
| CBNRM | 0.753 | 0.753 | 1.468 | 1.468* |
| | (1.567) | (0.860) | (1.336) | (0.822) |
| CITES Ban | -1.066 | -1.066* | -1.018 | -1.018** |
| | (0.738) | (0.512) | (0.710) | (0.455) |
| CBNRM#CITESBan | 1.302*** | 1.302* | 0.469 | 0.469* |
| | (0.469) | (0.689) | (0.503) | (0.222) |
| CBNRM#Fractionalization | -1.810 | -1.810 | -1.112 | -1.112 |
| | (1.910) | (1.433) | (1.645) | (1.027) |
| CBNRM#TrophyHuntingEleph | -0.00564 | -0.00564 | -0.863 | -0.863*** |
| | (0.559) | (0.437) | (0.535) | (0.246) |
| Fraser Summary Index of Governance | 0.184 | 0.184 | 0.0982 | 0.0982 |
| | (0.240) | (0.239) | (0.254) | (0.146) |
| Log(GNIpc) | 0.628 | 0.628 | 0.328 | 0.328 |
| | (0.934) | (0.575) | (1.010) | (0.529) |
| Protected Area | -0.0579 | -0.0579 | -0.121* | -0.121** |
| | (0.0741) | (0.0458) | (0.0662) | (0.0503) |
| Forest Rent | 0.0756 | 0.0756*** | 0.0205 | 0.0205 |
| | (0.0513) | (0.0223) | (0.0517) | (0.0294) |
| Area Fixed Effects | YES | YES | YES | YES |
| Year Fixed Effects | YES | YES | YES | YES |
| SEs clustered at country level | NO | YES | NO | YES |
| Surveys included | All | All | Reliable only | Reliable only |
| Observations | 426 | 426 | 329 | 329 |
| Adjusted $R^2$ | | 0.149 | | 0.209 |

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

# Results for Southern Africa

| | (1) log_eleph_adj | (2) log_eleph_adj | (3) log_eleph_adj | (4) log_eleph_adj |
|---|---|---|---|---|
| CBNRM | 2.263 | 2.263* | 2.808 | 2.808 |
| | (2.326) | (1.110) | (2.163) | (1.684) |
| CITES Ban | -1.111 | 0 | -0.493 | -1.611 |
| | (1.503) | (.) | (1.472) | (1.183) |
| CBNRM#CITESBan | 2.270* | 2.270** | 0.485 | 0.485 |
| | (1.331) | (0.589) | (1.225) | (0.628) |
| CBNRM#Fractionalization | 2.005 | 2.005 | 1.694 | 1.694** |
| | (3.748) | (1.039) | (2.900) | (0.581) |
| CBNRM#TrophyHuntingEleph | -3.562 | -3.562*** | -3.928 | -3.928** |
| | (2.329) | (0.637) | (2.533) | (1.488) |
| Fraser Summary Index of Governance | -0.592 | -0.592** | -0.141 | -0.141 |
| | (0.424) | (0.162) | (0.397) | (0.235) |
| Log(GNIpc) | 1.759 | 1.759 | 2.943 | 2.943 |
| | (3.399) | (1.739) | (4.486) | (3.505) |
| Protected Area | -0.167 | -0.167** | -0.185** | -0.185** |
| | (0.122) | (0.0574) | (0.0917) | (0.0503) |
| Forest Rent | -0.461 | -0.461 | -0.0416 | -0.0416 |
| | (0.483) | (0.361) | (0.527) | (0.544) |
| Area Fixed Effects | YES | YES | YES | YES |
| Year Fixed Effects | YES | YES | YES | YES |
| SEs clustered at country level | NO | YES | NO | YES |
| Surveys included | All | All | Reliable only | Reliable only |
| Observations | 223 | 223 | 192 | 192 |
| Adjusted $R^2$ | | 0.260 | | 0.347 |

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

# Results for unadjusted elephant counts

| | (1) log_eleph | (2) log_eleph | (3) log_eleph | (4) log_eleph |
|---|---|---|---|---|
| CBNRM | 1.286 | 1.286 | 1.437 | 1.437* |
| | (1.455) | (1.152) | (1.245) | (0.700) |
| CITES Ban | -0.762 | -0.762 | -0.863 | -0.863** |
| | (0.658) | (0.455) | (0.662) | (0.368) |
| CBNRM#CITESBan | 0.945** | 0.945 | 0.0212 | 0.0212 |
| | (0.402) | (0.675) | (0.414) | (0.268) |
| CBNRM#Fractionalization | -2.451 | -2.451 | -1.350 | -1.350 |
| | (1.769) | (1.592) | (1.533) | (0.951) |
| CBNRM#TrophyHuntingEleph | -0.155 | -0.155 | -0.782* | -0.782*** |
| | (0.493) | (0.375) | (0.470) | (0.217) |
| Fraser Summary Index of Governance | 0.0616 | 0.0616 | 0.184 | 0.184 |
| | (0.225) | (0.218) | (0.233) | (0.152) |
| Log(GNIpc) | 1.000 | 1.000* | 1.052 | 1.052* |
| | (0.847) | (0.540) | (0.878) | (0.603) |
| Protected Area | -0.0649 | -0.0649 | -0.105* | -0.105** |
| | (0.0677) | (0.0564) | (0.0605) | (0.0400) |
| Forest Rent | 0.0810* | 0.0810*** | 0.0259 | 0.0259 |
| | (0.0472) | (0.0181) | (0.0478) | (0.0250) |
| Area Fixed Effects | YES | YES | YES | YES |
| Year Fixed Effects | YES | YES | YES | YES |
| SEs clustered at country level | NO | YES | NO | YES |
| Surveys included | All | All | Reliable only | Reliable only |
| Observations | 428 | 428 | 324 | 324 |
| Adjusted $R^2$ | | 0.135 | | 0.226 |

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

# Results using Y = Eleph_count

| | (1) eleph_count | (2) eleph_count | (3) eleph_count | (4) eleph_count |
|---|---|---|---|---|
| cbnrm | 11846.2** | 11846.2*** | 13392.7** | 13392.7** |
| | (4619.8) | (3970.9) | (5504.9) | (4788.2) |
| cites_ban | -581.7 | -581.7 | 164.8 | 164.8 |
| | (2008.8) | (896.4) | (2894.9) | (1166.9) |
| CBNRM#CITESBan | 1324.6 | 1324.6 | 1206.3 | 1206.3 |
| | (1284.8) | (882.4) | (1843.0) | (1421.3) |
| CBNRM#Fractionalization | -14321.9** | -14321.9*** | -15591.2** | -15591.2** |
| | (5619.2) | (4390.5) | (6765.5) | (5494.0) |
| CBNRM#TrophyHuntingEleph | -2137.5 | -2137.5 | -2863.6 | -2863.6* |
| | (1569.0) | (1349.1) | (2089.5) | (1605.0) |
| Fraser Summary Index of Governance | -199.5 | -199.5 | -412.2 | -412.2 |
| | (693.0) | (724.3) | (1003.2) | (726.0) |
| log_gni | 5805.7** | 5805.7** | 6454.3* | 6454.3* |
| | (2685.5) | (2772.1) | (3877.7) | (3679.4) |
| protect_area | -306.9 | -306.9*** | -321.4 | -321.4** |
| | (215.4) | (97.75) | (268.7) | (120.6) |
| forest_rent | 280.5* | 280.5*** | 312.1 | 312.1*** |
| | (148.6) | (43.22) | (211.8) | (72.06) |
| Observations | 459 | 459 | 350 | 350 |
| Adjusted $R^2$ | | 0.129 | | 0.127 |

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

# Results using Y = Eleph_count (restricted)

| | (1)<br>eleph_count |
|---|---|
| cbnrm | 11846.2*** |
| | (3970.9) |
| cites_ban | -581.7 |
| | (896.4) |
| CBNRM#CITESBan | 1324.6 |
| | (882.4) |
| CBNRM#Fractionalization | -14321.9*** |
| | (4390.5) |
| CBNRM#TrophyHuntingEleph | -2137.5 |
| | (1349.1) |
| Fraser Summary Index of Governance | -199.5 |
| | (724.3) |
| log_gni | 5805.7** |
| | (2772.1) |
| protect_area | -306.9*** |
| | (97.75) |
| forest_rent | 280.5*** |
| | (43.22) |
| Observations | 459 |
| Adjusted $R^2$ | 0.129 |

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$