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Household Consumption and Natural Resource Management around National Parks in Zambia

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ABSTRACT *Game Management Areas in Zambia aim to combine nature conservation with economic empowerment of rural households. This study determines the impact of community-based wildlife management and participation in related community institutions on household welfare. The results indicate that the gains from living in Game Management Areas and from participating in natural resource management are large but unevenly distributed. Only Game Management Areas with limited alternative livelihoods exhibit significant consumption benefits. However, the gains accrue mainly to the relatively well off, while the poor do not gain even if they participate. The results also show that infrastructure development does not necessarily translate into household level consumption gains in the short run. The design of community-based natural resource management programmes needs to respond to the inherent diversity among both the national parks and the community members. There is a need to address impediments to effective participation by the majority of the community members.*

Introduction

Police-style protected area wildlife management programmes have been complemented by community based natural resource management in many countries since the 1980s and 1990s. These efforts emerged as a result of international and local resistance to protected regimes and greater awareness of the difficulties of state-run conservation without engaging the local communities. Community management of natural resources has the added advantage that it frees state resources at the centre and allows for local political, administrative and fiscal decentralization. Over the years international organizations and governments have invested in community based programmes and institutions to help manage natural resources (USAID, 2003; UNDP-GEF, 2004; Shyamsundar *et al.*, 2005; Emerton *et al.*, 2005).

A Game Management Area (GMA) in Zambia is a buffer zone around a national park in which licensed safari and subsistence hunting is permitted (ZAWA, 2007). It is a communal area in which people live by semi-subsistence agriculture, coexisting with wildlife.

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The Community Based Natural Resource Management programme allows Zambia Wildlife Authority (ZAWA) to share hunting license revenue and wildlife management responsibilities with the communities living in GMAs (GRZ, 1998). The communities allocate the revenue resources between employment of village scouts, and local infrastructure and developmental projects through Community Resource Boards (CRBs) and Village Action Groups (VAGs).

The Government of the Republic of Zambia identifies tourism as one of the growth frontiers for the country. Several interventions have been introduced in the areas around the national parks designated as GMAs. However, the effectiveness of these interventions by government, private sector and the respective communities, and their impacts on the households' living conditions remain unknown. Recent increases in nature tourism also beg the question whether nature tourism has had any impact on the welfare of the communities and households living in GMAs. This knowledge is the key to identifying strategies necessary for increasing the contribution of nature-based tourism to poverty alleviation. Lodges and campsites may employ local labour. Increased demand for handicraft and other nature based products may provide new enterprising opportunities. Traditional entertainment and culture may increase revenue potential from the tourists.

This paper focuses on the economic welfare of households living inside GMAs. It tries to answer the question, do the households in GMAs enjoy higher levels of welfare relative to the conditions they would have been in had these areas not been designated as GMAs? Within the GMA, the paper tries to determine the factors that influence household participation in CRB and VAG activities, and whether the participating households get any extra benefits. Also of interest is whether such benefits of living in the GMAs, and, once in the GMA, of participating in CRB and VAG activities (if they exist) accrue more to the poorer segments of the communities. This would be in line with the primary justification for the establishment of the GMA institution.

To answer these questions, we use household and community level survey data from GMAs and other areas near national parks (non-GMAs). The rest of the paper is organized as follows: Section 2 discusses the conceptual framework. Section 3 focuses on methods and procedure. Section 4 presents the estimation results. Section 5 summarizes and concludes.

Conceptual Framework

Most households in rural Zambia depend on agriculture for their livelihoods. These households usually face a number of challenges in their pursuit of agricultural development. Some of the challenges faced by smallholder agricultural households include poor infrastructure, lack of inputs and/credit, and poor or non-existent extension services. For those living near national parks, agriculture often is further constrained by crop damage by wildlife, tsetse infestation, and other human-wildlife conflicts. Traditionally, households in these areas would survive by harvesting the wildlife and other natural resources.

Like most other community-based natural resource management programmes, GMA designation and the associated interventions aim to achieve at least two complex goals: conservation of natural resources, and economic empowerment of rural households (Brandon & Wells, 1992; Wainwright & Wehrmeyer, 1998). The idea is to foster alternative livelihoods and to use them to turn the local people's attention away from unsustainable use of wildlife and other natural resources. It is argued that diversification in the non-farm sector

could have substantial welfare effects on rural households (Barrett *et al.*, 2001; De Janvry & Sadoulet, 2001). One of the outcomes of successful conservation is increased numbers of wildlife, which could in turn attract tourist activity. It is envisaged that the local people would benefit from increased revenues from ZAWA, some of which reach households as wages earned through employment as village scouts; and employment in lodges, and safari hunting. To the household, other benefits include the opportunity to play a greater role in prioritizing the types of investments through CRBs and VAGs, and in deciding the types and extent of private investment by tourism companies.

Community Based Natural Resource Management programmes make two important assumptions: (i) that community participation is more effective than centralized control; and (ii) that sustainable wildlife utilization is more profitable than any other alternative, such as farming. In reality, however, some of the benefits may be offset by losses due to human-wildlife conflicts, and by the resultant influx of immigrants attracted by the new employment opportunities. There is also no guarantee that the large numbers of high-value wildlife resulting from successful conservation will lead to increases in tourist activity. Hamilton *et al.* (2007) observe that the tourism sector in Zambia is most limited by infrastructure, rendering, in many places, tourism a seasonal activity.

In the end the observable impact of GMA policies on household welfare will be the net effect of the potential benefits and costs associated with wildlife management policies. It is possible, for example, that revenues from hunting and employment in tourism could be outweighed by crop losses and the opportunity cost of alternative uses of the land. For example, Muchapondwa (2003) finds little evidence of poverty alleviation from the CAMPFIRE project in Zimbabwe. On the other hand, Bandyopadhyay *et al.* (2009) find some household economic gains from the community conservancies in Namibia.

We use consumption expenditure as the measure of household welfare. Income, while better understood is more volatile as compared with consumption. Income is also prone to under-reporting bias. Broader measures of welfare based on education and health that measure longer term non-economic benefits may not be evident for the community based natural resource management programme in the GMAs of Zambia that started relatively recently. Thus, the consumption based measure could be more informative as a welfare indicator than income or other broader measures of welfare in this study.

Methods and Procedures

Data and Data Sources

This study uses data collected through the 'Impact of Game Management Areas on Household Welfare (IGMAW)' survey, carried out in 2006 by the Zambia Central Statistical Office. The survey covered areas around national parks, with the exception only of those in the north and north-western parts of the country. For purposes of this survey the national parks were grouped into four 'park systems'. In some cases, the park system constituted a combination of national parks that are within the same geographical location.[1] The four park systems account for most of the consumptive and non-consumptive wildlife tourism in Zambia. Each park system is distinct in its geographical, wildlife, and other characteristics, and we treat them separately.

Two thousand eight hundred (2800) households in 139 communities were sampled of which about half were from GMAs and the rest from non-GMAs. Very few observations (about 32) were lost due to non-response. Survey data were collected at both household and community levels using household and community questionnaires, respectively. Among other things the household questionnaire elicited information about participation in CRBs and VAGs as well as other nongovernment and community based organizations. It also collected detailed information regarding food, non-food, and durable goods consumption expenditures to allow for computation of a consumption-based measure of welfare. The community questionnaire was filled from meetings with community leaders and other local knowledgeable persons. It collected detailed information on local physical and social infrastructure.

The quantitative data were complemented by key informant interviews with tour operators, VAG and CRB committee members, and ZAWA officials in the study areas. The preliminary results were also presented to various stakeholders in a series of meetings both in the areas where the survey took place and at a national workshop. The regional meetings were attended by various stakeholders, including VAG and CRB representatives, chiefs' representatives, tour operators, ZAWA officials, and other government officials. The national workshop included all members of the Natural Resources Consultative Forum (NRCF): relevant government departments (including Central Statistical Office, Ministry of Finance, and Ministry of Tourism); the World Bank and other development agencies; professional hunters; the University of Zambia; and the civil society.

Impact Evaluation

Many factors affect household welfare, and living in GMAs and participation in the CRB and VAGs are but some of them. Other factors include socio-demographic characteristics of the household. Yet other factors have community-wide effect on household welfare, such as levels of physical capital in infrastructure, social capital in community based organizations within the community, and access to markets. Under such circumstances, it is important to separate out the effects of the various confounding factors.

Many of the same factors that affect household welfare also influence the probability that the household lives in a GMA, and, if in GMA, the probability that the household participates in CRB and VAG activities. Selection bias arises because some households may choose to move into GMAs and social, economic, or other conditions may not allow some households to move out of GMAs. Once in the GMA, they self-select themselves to participate or not to participate in CRB and VAGs.

Historical factors for creations of Controlled Hunting Areas, which were later converted to GMAs, as well as criteria used by ZAWA to create recent GMAs are not always available in quantitative form. Such unobserved factors may also result in selection bias. One of the important implications of selection bias is that the simple differences in average welfare between households living in and outside GMAs, or that for participants and non-participants in CRBs and VAGs are not an accurate measure of respective impacts (Ravallion, 2001, 2003). With only cross-sectional data from households and communities in GMAs and non-GMAs, we use Maddala's treatment regression techniques (Maddala, 1983; Bandyopadhyay & Shyamsundar, 2004; Stata Corp, 2003) to estimate the impact on household welfare.

The estimable model for the treatment effects (TRE) regression can be written as:

$$\text{Prob}(G = 1|\mathbf{x}) = \varphi(a + \boldsymbol{\delta}'\mathbf{x} + e), \quad (1)$$

$$\ln y = \alpha + \boldsymbol{\beta}'\mathbf{x} + \gamma G + \varepsilon, \quad (2)$$

where y is per capita consumption expenditure, G takes the value 1 if a household lives inside a GMA and 0 otherwise, and x is a vector of household and community characteristics. The error terms e and ε are assumed to be correlated with correlation coefficient ρ. For the estimation of the impact of participation in CRB and VAGs by the households living in GMAs, G would be equal to one for those participating in CRBs or VAGs, and zero otherwise.

Although the treatment model can be estimated in two stages, we estimate the two relationships jointly using maximum likelihood techniques. Joint estimation helps to correct for selection biases from observed data in the model as well as bias resulting from unobserved and unknown factors. It also permits testing whether selection bias from unobserved and unknown factors are statistically significant.

The treatment regression results were corroborated with propensity score matching (PSM) based on a Gaussian kernel function and bootstrapped standard errors. Bootstrapped standard errors are consistent when combined with Gaussian kernel-based matching (Gilligan & Hoddinott, 2007). For the PSM approach, the conditional probability of participation (see equation 1) was used to match the treatment households with comparison households. Unlike the fully parametric treatment regression, no definite functional form is assumed in the PSM for the impact equation (2). Instead, the impact is estimated as the mean difference in the outcome variable between participants and non-participants in the matched sub-sample.

If the effects of selection bias from unobserved and unknown factors are not statistically significant, as indicated by ρ, treatment regression and propensity-score matching estimators should be close to each other. Where selection bias from unobserved and unknown factors are statistically significant, the propensity-score matching estimates would be biased and the differences between the estimates using the two methods should depend on the direction of the bias. We found significant selection bias from unobserved and unknown factors in some of the estimation results. In these situations the PSM estimates were substantially different as expected from the treatment regressions estimates. Where the bias was not statistically significant the estimation results from the two methods were very similar.

Results

Table A1 in the Appendix presents the descriptive statistics for the variables used in the analysis based on the full sample (Column 1), as well as for the non-GMA (Column 2) and GMA (Column 3) sub-samples. About half (49%) of all the interviewed households (or 1289 households) were in non-GMA, or control, areas. The asterisks at the end of the last column represent the level of significance based on an unequal variance t test between means. On average, a typical household had a per capita consumption expenditure of

ZMK 846 000 per annum.[2] When disaggregated by sub-sample, consumption was 1.7% higher in non-GMAs than it is in GMAs. However, the difference was not statistically significant at any acceptable level of significance. All but per capita consumption expenditure and a couple of distance variables were significantly different between non-GMAs and GMAs.

Although there was some CRB activity in non-GMAs, it was more intense in GMAs. Proportionately, the level of participation in non-GMAs (6%) was about half the level of participation in GMAs (13%). The proportion of households participating in CRBs that had been funded through community funds from ZAWA in GMAs was almost three times as high as that in non-GMAs.

Although agriculture is the most important livelihood, the sector is relatively less important in GMAs (indicated by 78.8% of the households) than non-GMAs (86.2%). GMAs also exhibited more diversified off-farm income sources (Figure 1). Outside of agriculture, in the GMAs proportionately more households were employed in the tourism sector, and in the non-tourism private sector compared to non-GMAs. In non-GMAs, non-farm employment opportunities are scarce. The bulk (64%) of the few that were in off-farm employment worked under non-ZAWA government departments.

Determinants of Being in Game Management Areas and Participation in VAGs and CRBs

A household's decision to locate in a GMA and, once in the GMA, to participate in natural resource management decisions through CRBs and VAGs were influenced by the circumstances that the household faced both within the household and around the community. Several factors were considered and the significance of their contribution towards explaining these decisions tested.[4] In this section we focus on equation (1).

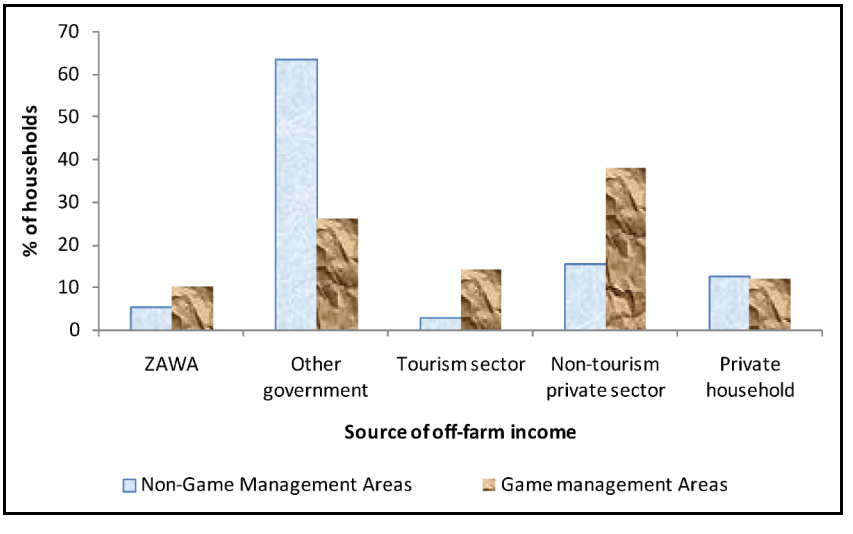

Figure 1. Proportion (%) of households using various sources of off-farm income in Game Management Areas and other areas around national parks.

Source: Data from the IGMAW Survey, 2006.

An average household's probability to reside in a GMA was directly and significantly related to the average distance to the nearest main road, the number of social projects in the area, and the viability of the CRB and VAG as measured by its ability to generate resources, and number of participating households (Column 1; Table A2 in the Appendix). Female-headed households were 19% more likely to reside in GMAs than their male-headed counterparts. The probability of locating in a GMA was also inversely related to the age of the household head, education of the most educated member, value of consumer durable assets, and participation in other area cooperatives. All these clearly suggest that households that resided in GMAs were relatively more disadvantaged than those in non-GMAs.

Within the GMAs, household participation in resource management decisions through CRBs and VAGs was directly related to education level of the most educated member, distance to the nearest main road, distance to the nearest health centre, participation in other area cooperatives, donor project activity in the area, and viability of the CRB and VAG (Column 2; Table A2 in the Appendix). Thus, educated segments of the population in the remotest parts of the GMAs are more likely to participate in resource management, regardless of the age and sex of the household head and regardless of the household's wealth status.

Impact of Wildlife Management Policies

Table 1 presents the average impact on household welfare of living in GMAs, comparing PSM and TRE estimates. In the areas where the TRE estimates were significant, negative selection bias from unobservable factors could not be rejected. As expected, the PSM estimates were significantly smaller than the TRE estimates. As a result, we focus on the treatment regression estimates for the rest of the paper.

On average, households in GMAs had 66% more per capita consumption expenditure than their counterparts in non-GMAs (Column 2). Unconditional comparisons of the welfare of households in GMA and non-GMAs in Table A1 hide these relatively large benefits as

Table 1. Estimates of average Game Management Area effect on per capita consumption expenditure, 2005/06

	PSM	Treatment regression	
Park system	Estimates	Estimates	ρ
	(1)	(2)	(3)
Bangweulu	–0.151**	0.729***	–0.76***
Kafue	–0.029	–0.444	0.51
Lower Zambezi	–0.118	–0.362	0.26
Luangwa	0.260**	0.744***	–0.39***
Overall	–0.005	0.665***	–0.58***

Notes: Significance: *= 10%; **= 5%; ***= 1%. Dependent variable: natural log of per capita consumption expenditure. Impact estimated as the average treatment effect on the treated (ATT).
Source: Data from the IGMAW Survey, 2006.

other household and community characteristics of GMA households make them worse off relative to households in non-GMAs (see Column 2 in Table 1). However, the GMA effect was not evenly distributed across all park systems. Households in GMAs near Bangweulu and Luangwa park systems show significant welfare gains while those near Kafue and Lower Zambezi park systems appear not to benefit at all.

Ideally, one would expect all households in the GMA to gain from the broad-based social infrastructure from the hunting licensing revenue. However, if active participants in these communities restrict benefit sharing to themselves, we would expect participants to gain more in welfare relative to non-participants.

Table 2 presents estimates of the impact of participation in VAG and CRB activities on household welfare. Households in the GMAs of Kafue and Lower Zambezi park systems obtain no welfare gains from participating in CRB and VAGs. The residents of the GMAs near the other two park systems, Bangweulu and Luangwa, seem to obtain significant benefits from participation in CRBs and VAGs. Overall, GMA households participating in CRBs and VAGs consume 44% more per capita than their non-participating counterparts. The complete estimation results in Tables A2 and A3 show various factors and their effects on household welfare.

When estimating GMA and CRB and VAG effects, we controlled for a set of 16 other variables postulated to influence per capita consumption expenditure. The impact results in Tables 2 and 3 are net of some of these confounding factors. Most of these factors were strongly significant, many of them at 1% level (Table A3 in the Appendix). Most of the coefficients also had signs that were consistent with *a priori* expectations. Holding GMA and CRB and VAG participation status constant, households with higher consumption levels were more likely to have educated members, to have more consumer durables, and to participate in community cooperatives. High-consumption households were also likely to have smaller family sizes regardless of the composition. The fact that additional working-age adult (15–60 years) is associated with a reduction in welfare levels may imply that there are limited income-generating opportunities in these areas. As expected, children

Table 2. Estimates of the impact of participation in community-based natural resource management through Village Action Groups and Community Resource Boards on per capita consumption expenditure

	PSM	Treatment regression	
Park system	Estimates	Estimates	ρ
	(1)	(2)	(3)
Bangweulu	–0.074**	0.858***	–0.56***
Kafue	–0.240	–0.286	0.13
Lower Zambezi	–0.118	0.494	0.37
Luangwa	0.034	0.530***	–0.42***
Overall	0.083	0.438***	–0.30*

Notes: Significance: *= 10%; **= 5%; ***= 1%. Dependent variable: natural log of per capita consumption expenditure. Impact estimated as the average treatment effect on the treated (ATT).
Source: Authors' calculations, data from the IGMAW Survey, 2006.

under 15 years and elderly members over 60 years of age had greater welfare-depressing effects than the working-age groups. As expected, female-headed households had (15–19%) less consumption expenditure than their male-headed counterparts. Similarly, the distance to infrastructure, such as roads, was inversely related to consumption expenditure. Every additional kilometre to the main road or health centre was associated with 0.2–0.6% less per capita consumption expenditure.

The Park System Effect

Table 3 presents the average levels of the major confounding factors in the different park systems. More female-headed households, less education, longer distances to all-weather roads and less livestock indicate less human resources, man-made resources, and economic opportunities in and near Bangweulu and Luangwa National Parks. Thus, the households living in these GMAs are more likely to be dependent on natural resources and to seek benefits from the GMA institution.

The second group of factors in Table 3 also supports this hypothesis. The less economic opportunities around Bangweulu and Luangwa park systems may explain the migration pressure in those areas and higher dependence on income from nature-based activities. Households in these areas are more effective with utilizing cooperatives and community based organizations as they pay less in fees as compared with households in GMAs near Kafue and Lower Zambezi, but earn more from cooperatives and community based organizations. Households in GMAs near Luangwa show the highest level of involvement in VAGs and CRBs, followed by those near Bangweulu. Higher involvement with VAGs and CRBs combined with more effective use of cooperatives by the households may indicate a higher level of social capital in these areas as compared with those near Kafue and Lower Zambezi. The significance of these factors is that they are different in Bangweulu and Luangwa as compared with Kafue and Lower Zambezi, and may explain part of the observed differential impacts.

Table 3. Similarities and differences in confounding factors in the four park systems

	Kafue	Lower Zambezi	Bangweulu	Luangwa
Variables with negative effects				
Percent of female headed household	22%	24%	36%	27%
Education in years	7.5	7.4	5.5	6.4
Value of livestock in ZMK	1 156 841	449 612	76 987	187 715
Distance to all-weather road in km	4.8	3.1	6.0	10.5
Variables with positive effects				
Migration in 5 years	11.4	10.3	5.5	1.7
Income from nature-based activities	115 253	412 158	695 262	860 078
Fees paid to Community Based Organizations	1376	1905	697	766
Income from Community Based Organizations	1722	1951	2683	4009
Involvement in the CRB/VAG relative to Luangwa	41%	43%	57%	100%

Source: Data from the IGMAW Survey, 2006.

Heterogeneous Impact Across Wealth Groups

Households were categorized as asset-poor if the value of consumer durable assets fell below the bottom two quintiles, where the value of durable assets is used as a proxy for relative poverty. The impact of the GMA institution as well as participation in CRB and VAG activities on per capita consumption is large and positive but only for the non-poor households (Figure 2). About 54% to 60% of the welfare benefits to the non-poor households are associated with GMA and participation effect. However, the GMA and participation effects, though positive, are not significant in the asset-poor category. Moreover, the poor do not gain any welfare benefits even when they actively participate in CRB and VAG activities. The results do not change even when asset-poor category is redefined to include the bottom three quintiles of the value of assets. This suggests that the GMA institution does not benefit the poorest in the community. Instead, the elites in the GMA capture all the benefits.

These results are, to some extent, not surprising. Although natural resource management responsibility has been decentralized, authority is still highly concentrated at the top. Even within the communities, the CRBs are constituted through elections in which all candidates have to be ratified by the chief. Revenues generated by the communities through hunting are first collected by ZAWA before a fraction is returned, not to the communities or VAGs, but to the area CRB. Although VAGs are encouraged to submit project proposals, such proposals have to be 'subjectively' approved by the CRBs and often the CRBs hang on to the funds, using them for travel and other such allowances.

Thus, participation in community resource management is in levels. The powerful, who often are more educated, richer, and closer to traditional power participate more actively in the CRBs and are able to access more benefits than ordinary community members.

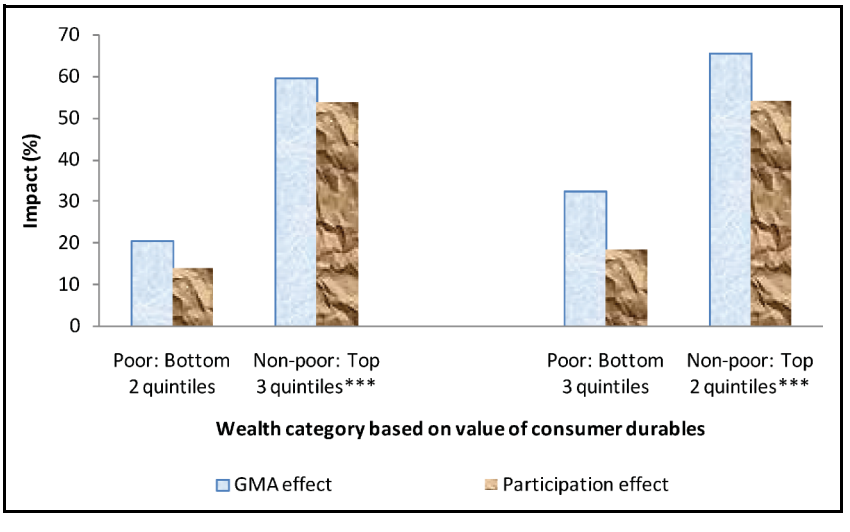

Figure 2. Heterogeneous impact of Game Management Areas and participation in CRB/VAG on consumption expenditure by asset wealth category.

Notes: Significance: *= 10%; **= 5%; ***= 1%. Impact estimated as the average treatment effect on the treated (ATT).

Source: Authors' calculation, data from the IGMAW Survey, 2006.

Discussions with the community stakeholders indicate that such active members can even access CRB funds as loans. Those in the CRB executive committees also participate in meetings called by ZAWA during which they are paid allowances drawn from their CRBs. The powerful also perpetuate themselves in CRB management positions, serving in some cases for as long as 15 years. Blunt misappropriation of CRB funds has also been reported in a number of active CRBs (Mulenga, 2003; Astle, 1999). Unfortunately, in most cases, calls for action have gone unanswered due to the committee members' close links with traditional leadership.

At the other end of the participation continuum, the poorer and less powerful members of the communities only attend local meetings in which they contribute in a limited capacity. Mulenga (2003) cites weak community participation and information sharing regarding community entitlements as major constraints. Conversations with community members suggest a clear disjoint between the CRBs and their member VAGs. CRBs in turn complain about lack of transparency on the part of ZAWA, citing their inaccessibility to ZAWA financial reports on the revenues generated from hunting. Thus, though the rhetoric is bottom-up decentralization, in reality implementation is strongly top-down.

In addition to elite capture, it is important to note that a portion of the gains from the GMA institution are invested in community infrastructure such as schools and health clinics. The economic impact of education may not be evident in the short term and newer buildings do not always imply better health care. However, if GMAs are associated with improved community infrastructure, they may benefit all the sections of the community. To understand investments in community infrastructure in the GMAs we looked at the average age of the newest infrastructure and noticed that infrastructure were relatively recent in the park systems that did not exhibit significant GMA effects (Figure 3). The average age of the newest infrastructure in Kafue and Lower Zambezi park systems was between 2 and 5 years, compared to 8–10 years in Bangweulu and Luangwa. Thus, it may appear that GMAs that show no measurable economic impact at the household level indicate some community infrastructure improvements.

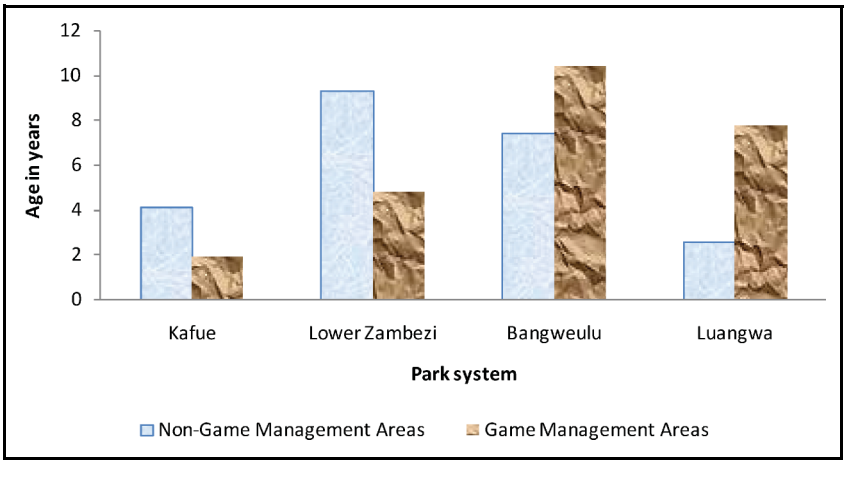

Figure 3. Age of the newest infrastructure in Game Management Areas and control areas across park systems.

Source: Data from the IGMAW Survey, 2006.

However, the age of latest infrastructure in itself does not indicate the impact of GMAs. The newer infrastructure may have been built with the help of other nongovernment and community based organizations working within the GMAs in the Kafue and Lower Zambezi areas. After controlling for wealth, community size, frequency of meetings by the leadership, number of droughts during the 10 years prior to the survey, distance to all-weather roads, non-government organization-funded projects in the community, and labour contribution by the community, the impact of the GMA on the age of new infrastructure disappears.[4]

Summary and Conclusions

Game management areas in Zambia were conceived as controlled hunting ground where people coexist with nature. In recent years ZAWA has started sharing some of the revenue and responsibilities with the local communities. The result of this devolution of responsibilities and resources has been uneven with respect to wildlife management (Simwanza, 2007). This study focuses on the human aspect of the impact of the devolution of rights and responsibilities in the GMA. To be precise, we look at the impact of the GMA institution on the welfare of those living in it, using consumption expenditure as an indicator of welfare. For those households in GMAs, we also measure the impact of participating in two community institutions, Community Resource Boards (CRBs) and Village Action Groups (VAGs). The two institutions allow households to actively take part in natural resource management and decide on how the revenue raised is spent within the community.

We find substantial gains associated with living in GMAs and participating in CRBs and VAGs. We find significant welfare gains in some GMAs after controlling for household and community characteristics. However, these gains are unevenly distributed across various park systems around which GMAs are clustered. In particular, households living in GMAs near Bangweulu and Luangwa park systems appear to gain substantially from the GMA institution while those in GMAs near the other two park systems do not.

The other two park systems, Kafue and Lower Zambezi, show improvements in different dimensions. The GMAs in these park systems have more new community infrastructure, such as school rooms. More recent investments in infrastructure in these park systems may provide benefits but these benefits are not reflected in the consumption-based welfare indicators for the households in the short run. Paucity of household level indicators of benefits from the new infrastructure in the GMAs in these park systems does not allow us to investigate whether all households evenly benefit from the new infrastructure.

We also find that households in GMAs do not gain equally. Those households who actively participate through CRBs and VAGs gain substantially more than those who do not. The gains from participation follow the same special pattern of uneven distribution of consumption welfare among the park systems. Elite capture of all the benefits from GMAs has also been a long standing source of concern. The local institutions such as CRBs and VAGs were created to allow broader participation of households in GMA-related community decisions and prevent elite capture of the resources. We find wealth, as measured by consumer durable assets, is not a significant factor in participation in CRBs and VAGs. Other things being equal, the poor and non-poor households are equally likely to participate in CRBs and VAGs. However, the nature and degree of participation varies between the two groups. While the non-poor households participate close to the CRB resources, the

poor are largely passive participants in their VAGs. As a result, we find no evidence of welfare gains to the poor households associated with living in the GMAs or participating in CRBs and VAGs. On the contrary, the top 40% derive consumption benefits from living in GMAs and participating in CRBs and VAGs.

In conclusion, some GMAs are associated with significant welfare gains to those living in there and more gains to those who participate in CRB and VAGs. However, these gains are captured by the relatively non-poor households in the community. Community benefits as measured by newer infrastructure may not be associated with GMAs, but other contributing factors. The devolution of community rights and responsibilities for natural resource management in Zambia is not complete. The coexistence of traditional and modern local and national institutions makes the devolution of power and resource sharing a complex issue. Historically powerful national institutions like ZAWA and local elites have vested interests in maintaining the status quo in revenue sharing.

These results seem to suggest that no single size can fit all and that the design of community-based natural resource management programmes needs to respond to the inherent diversity among both the national parks and the community members. There is need to foster effective participation by the majority of the community members. Impediments to effective bottom-up resource management need to be understood and addressed. Clearly, the existing model, in which ZAWA shares the revenues through CRBs, and in which the VAGs are weak players is not achieving the intended objectives.

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Notes

1. The study was conducted in the GMAs and non-GMAs of four park systems—(a) Bangweulu (including Kasanka, Lavushi, and Isangano National Parks), (b) Kafue (Kafue, Blue Lagoon, and Lochinvar National Parks), (c) Lower Zambezi (Lower Zambezi National Park), and (d) Luangwa (North and South Luangwa National Park).
2. Some GMAs in the northern edge of North Luangwa National Park were dropped from the sample due to the absence of corresponding control areas close to the park.
3. Average exchange rate in 2006 was US$1 = 3600.00 ZMK.
4. See Table A2 in the Appendix for the estimation results of the full model. Participation models for the individual park systems were also estimated but their results are not reported in order to save space. We don't report these regression results to save space. The coefficients were also not statistically significant.

References

Astle, W. L. (1999) *A History of Wildlife Conservation and Management in the Mid Luangwa Valley, Zambia* (Bristol: British Empire & Commonwealth Museum).

Bandyopadhyay, S., & Shyamsundar, P. (2004) *Fuelwood Consumption and Participation in Community Forestry in India*, World Bank Policy Research Working Paper 3331, June. Washington, DC: World Bank.

Bandyopadhyay, S., Humavindu, M., Shyamsundar, P., & Wang, L. (2009) Benefits to local communities from community conservancies in Namibia: an assessment, *Development Southern Africa*, 26(5), pp. 733–754.

Barrett, C. B., Reardon, T., & Webb, P. (2001) Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications, *Food Policy*, 26(5), pp. 315–331.

Brandon, K. E., & Wells, M. (1992) Planning for people and parks: Design dilemmas, *World Development*, 20(4), pp. 557–570.

De Janvry, A.D, & Sadoulet, E. (2001) Income strategies among rural households in Mexico: The role of off-farm activities, *World Development*, 29(3), pp. 467–480.

Emerton, L., Bishop, J., & Thomas, L. (2005) *Sustainable Financing of Protected Areas: A Global Review of Challenges and Options*, Draft manuscript. Gland, Switzerland and Cambridge: IUCN.

Gilligan, D. O., & Hoddinott, J. (2007) Is there persistence in the impact of emergency food aid? Evidence on consumption, food security, and assets in Ethiopia, *American Journal of Agricultural Economics*, 89(2), pp. 225–242.

GRZ (Government of the Republic of Zambia) (1998) *The Zambia Wildlife Act No. 10 of 1998* (Lusaka, Zambia: Government of the Republic of Zambia).

Hamilton, K., Tembo, G., Sinyenga, G., Bandyopadhyay, S., Pope, A., Guillon, B., Muwele, B., Mann, S. & Pavy, J.-M. (2007) in: Camilla Hebo Buus (Ed.) *The Real Economic Impact of Nature Tourism in Zambia* (Lusaka, Zambia: Natural Resource Consultative Forum and The World Bank).

Maddala, G. S. (1983) *Limited-Dependent and Qualitative Variables in Econometrics* (Cambridge: Cambridge University Press).

Muchapondwa, E. (2003) The economics of community-based wildlife conservation in Zimbabwe, Doctoral thesis. Available at https://gupea.ub.gu.se/dspace/bitstream/2077/2928/1/Muchapondwa.full.pdf (accessed 26 May 2009).

Mulenga, B. S. (2003) Understanding community-based wildlife governance in southern Africa: A case study from Zambia, *African Journal of Environmental Assessment and Management*, 7, pp. 41–60.

Ravallion, M. (2001) The mystery of the vanishing benefits: An introduction to impact evaluation, *The World Bank Economic Review*, 15(1), pp. 115–140.

Ravallion, M. (2003) Assessing the poverty impact of an assigned program, in: F. Bourguignon, L. A. Pereira da Silva (Eds.) *The Impact of Economic Policies on Poverty and Income Distribution: Evaluation Techniques and Tools*, Chapter 5 (Oxford: Oxford University Press).

Shyamsundar, P., Araral, E., & Weeraratne, S. (2005) *Devolution of Resource Rights, Poverty and Natural Resource Management: A Review*, Environment Department Paper No. 104. Washington, DC: World Bank.

Simwanza, H. I. (2007) *Financial Viability of Current National Parks and Game Management Areas in Zambia: A Case for 2006*, GRZ/GEF/UNDP funded project for the Reclassification and Effective Management of the National Protected Areas System.

Stata Corp (2003) *Stata Statistical Software: Release 8.0*. (College Station, TX: Stata Corporation).

UNDP-GEF (United Nations Development Program and the Global Environmental Facility) (2004) *Developing Capacity, Conserving Biodiversity, Sustaining Livelihoods* (New York: UNDP-GEF).

USAID (2003) *Biodiversity Conservation: A Guide to Staff and Partners*. Prepared by ARD Inc. for USAID. Washington, DC: USAID.

Wainwright, C., & Wehrmeyer, W. (1998) Success in integrating conservation and development? A study from Zambia, *World Development*, 26(6), pp. 933–944.

ZAWA (2007) *Community based natural resources management*. Available at http://www.zawa.org.zm/cbnrm.htm (accessed 7 July 2008).

Appendix

Table A1. Comparison of Game Management Areas and non-Game Management Areas on selected characteristics, August 2006

Variable description	Full sample	Sub-samples	
		Non-GMA	GMA
	(1)	(2)	(3)
Number of sample households	2649	1289	1360
Per capita consumption expenditure in ZMK	846331	853750	839359
Household participation in CRB/VAG dummy	0.09	0.06	0.13***
Age of household head in years	42.42	43.6	41.29***
Female-headed household	0.25	0.22	0.28***
Education of the most educated household member in years	6.87	7.45	6.33***
Number of children below 15 years	2.55	2.66	2.44***
Number of female members 15–60 years	1.27	1.3	1.24*
Number of male members 15–60 years	1.19	1.22	1.15**
Number of adults above 60 years	0.26	0.3	0.23***
Distance to the nearest all-weather road in km	5.25	3.58	6.86***
Distance to the nearest basic school in km	4.88	4.96	4.8
Distance to the nearest health centre in km	11.52	11.27	11.77
Value of consumption durable assets in million ZMK	0.44	0.58	0.3
Participation in cooperatives dummy	0.15	0.19	0.11
Number of projects in the community	2.01	1.84	2.16
CRB obtained funds from ZAWA past three years	0.09	0.05	0.14
Number of households participating in the CRB/VAG	1.86	1.16	2.51

Note: Significance: *= 10%; **= 5%; ***= 1%.
Source: Data from the IGMAW Survey, 2006.

Table A2. Factors affecting the household's probability to live in the Game Management Area and the probability of participating in CRBs and VAGs

Variable description	Probit models for the household's probability to	
	Live in the GMA	Participate in the VAG/CRB[a]
	(1)	(2)
Intercept	0.707**	–2.612***
	(0.279)	(0.262)
Kafue dummy variable	–1.099***	–0.247
	(0.332)	(0.190)
Lower Zambezi dummy	–0.523	–0.123
	(0.330)	(0.106)
Luangwa dummy	–0.512	–0.336***
	(0.340)	(0.121)
Age of the household head in years	–0.006*	0.001
	(0.003)	(0.006)
Female-headed household dummy	0.193**	–0.018
	(0.088)	(0.138)
Education of the most educated household member in years	–0.033**	0.034**
	(0.013)	(0.015)
Number of children below 15 years	–0.026	0.015
	(0.019)	(0.030)
Number of female members 15–60 years old	0.009	0.071
	(0.039)	(0.076)
Number of male members 15–60 years old	0.058	0.055
	(0.036)	(0.071)
Number of members older than 60 years	–0.062	–0.125
	(0.075)	(0.158)
Distance to the nearest main road in km	0.008*	0.008***
	(0.004)	(0.002)
Distance to the nearest basic school in km	0.004	–0.011
	(0.010)	(0.010)
Distance to the nearets health centre in km	–0.002	0.006*
	(0.004)	(0.004)
Value of consumer durable assets in ZMK	–0.020**	–0.003
	(0.008)	(0.018)
Participation in cooperatives dummy	–0.388***	0.552***
	(0.098)	(0.157)
Number of projects in the community	0.042**	0.055
	(0.019)	(0.017)
CRB funded dummy variable	0.617***	0.829***
	(0.159)	(0.155)
Number of participants in the CRB/VAG	0.097*	0.203***
	(0.058)	(0.019)

Notes: Significance: *= 10%; **= 5%; ***= 1%. Figures in parentheses are standard errors. [a]Based only on the sub-sample of households that are located in the GMAs.
Source: Data from the IGMAW Survey, 2006.

Table A3. Impact of living in the Game Management Area and, once in the Game Management Area, of participating in the VAG/CRB

	Treatment regression models for the impact on per capita consumption expenditure of	
Variable description	Living in GMA[a]	Participating in VAG/CRB[b]
	(1)	(2)
Intercept	13.020***	13.580***
	(0.209)	(0.086)
Kafue dummy variable	0.400***	0.192**
	(0.143)	(0.088)
Lower Zambezi dummy variable	0.416***	0.217***
	(0.127)	(0.063)
Luangwa dummy variable	0.434***	0.537***
	(0.100)	(0.096)
Age of the household head	–0.001	–0.001
	(0.001)	(0.002)
Female-headed dummy	–0.186***	–0.150***
	(0.047)	(0.054)
Education of the most educated member (years)	0.043***	0.022**
	(0.010)	(0.010)
Number of children less than 15 years old	–0.132***	–0.145***
	(0.011)	(0.011)
Number of female members 15–60 years	–0.063**	–0.091***
	(0.025)	(0.029)
Number of male members 15–60 years	–0.100**	–0.090***
	(0.022)	(0.022)
Number of members older than 60 years	–0.140***	–0.186***
	(0.037)	(0.051)
Distance to the nearest main road in km	–0.005***	–0.006***
	(0.002)	(0.002)
Distance to the nearest basic school in km	0.001	0.010***
	(0.003)	(0.003)
Distance to the nearest health centre in km	–0.002	–0.004***
	(0.002)	(0.002)
Value of consumer durable assets in ZMK	0.045***	0.107***
	(0.014)	(0.024)
Participation in cooperatives dummy	0.357***	0.237***
	(0.051)	(0.066)
Participation dummy variable[a,b]	0.665***	0.438**
	(0.237)	(0.205)
Number of observations	2209	1112
Log-likelihood value	–3405	–1333
Goodness of fit Chi-Square	297.73***	407.06***
Rho	–0.583***	–0.301*

Notes: Significance: *=Significant at 10%; **=Significant at 5%; ***=Significant at 1%. Values in parentheses are standard errors. [a]Participation dummy variable refers to the Game Management Area dummy, equal to 1 if the household is located in a Game Management Area. [b]The participation dummy variable refers to the CRB/VAG dummy, equal to 1 if the household participates in the VAG/CRB. This model uses a sub-sample of households that are located in the Game Management Area.
Source: Data from the IGMAW Survey, 2006.