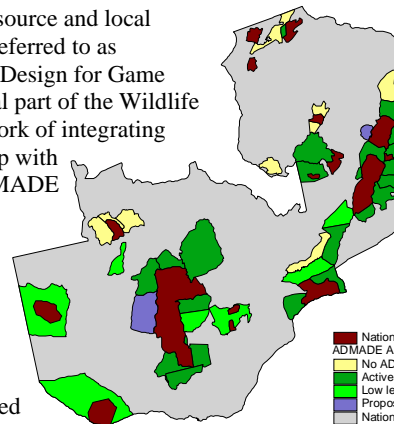


## Comparative Study of Factors Influencing ADMADE Success

The Government of Zambia has embarked on a wildlife conservation and development policy that decentralizes much of the resource management responsibility for areas surrounding national parks to locally elected community authorities, called Community Resource Boards. This policy has progressively evolved from a pilot study carried out in the mid-1980's and has subsequently undergone numerous transformations and adaptations in meeting the needs of both the resource and local community land owners. In 1999 this policy, referred to as ADMADE or the Administrative Management Design for Game Management Areas (GMAs), became an integral part of the Wildlife Act of Zambia, which provided a legal framework of integrating communities into a co-management relationship with Government and private sector investors. ADMADE continues to be an evolving program, actively applying principles of adaptive management to identify, test and refine methodologies that support community-based natural resource management (CBNRM). The vast geographic extent of ADMADE activity shown in Figure 1 provides host to a diverse set of interacting variables, including a varied megafauna, assorted cultural and demographic characteristics, and numerous geophysical features, that potentially influence ADMADE results for a given area. Most of Zambia's game management areas are at different stages of ADMADE activity with more than a third not yet implementing the policy. For this reason there is a practical and strategic need to identify and understand how different variables affect the likely success of CBNRM goals and activities in a given area. From such an analysis, additional questions can be asked as to how best to adapt ADMADE to these variables in achieving bio-diversity conservation and supporting community development needs. The past ten years of experience in the ADMADE program provide a rich set of comparative experiences to carry out such an analysis. This study attempts such an analysis to help synthesize key lessons that will help make the ADMADE approach more likely to succeed over the long-term as Government and its donor partners plan for the program's future expansion and continued strengthening.

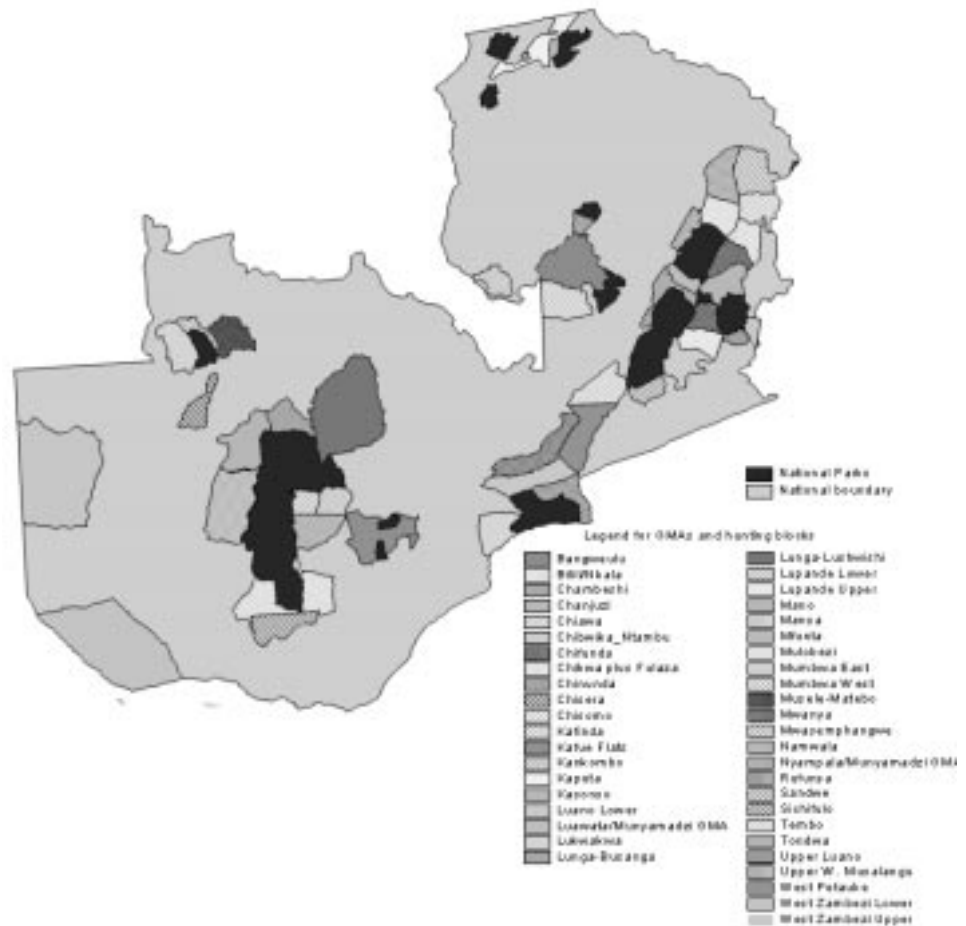


### Objectives of analysis

The primary objective of this study is to generate a quantitative basis to plan and successfully implement CBNRM in Zambia by building on the extensive knowledge acquired from ADMADE and other CBNRM activities in the country. In particular the study examines how a set of variables common to most all GMAs influence the efficacy of CBNRM approaches in achieving goals of resource conservation and rural development. This study has organized its results into six broad sets of analyses:

- 1) Identification and analysis of environmental factors likely to influence a CBNRM area's capacity to generate wildlife revenues. These factors are referred to as GMA 'environmental' variables.
- 2) Description of these variables for the different GMAs in Zambia.
- 3) An analysis of how these variables are impacting on CBNRM performance.
- 4) An analysis of CBNRM results in response to these variables.
- 5) A comparison of these results with expected results from other resource management approaches
- 6) A synthesis of lessons learned for future strengthening of the ADMADE program

To facilitate the discussion of these results, the following map (Figure 2) provides the names of all GMAs (and proposed GMAs) in Zambia.



## Analysis of the GMA 'Environment'

### 1. Bio-geophysical factors:

ADMADE depends largely on local community leadership and participation to manage and protect wildlife and other natural resources around national parks on communally owned lands. These efforts are both supported and rewarded from revenues derived from the sustainable and commercial use of these resources. ADMADE has adopted a number of steps for converting these revenues into resource management support and community development and relies heavily on local skills and involvement. These steps involve a process that can be measured in terms of how communities receive and manage funds, their capacity to identify households needs that may contribute to resource degradation, their managerial skills in implementing projects that meet these needs, and so forth. Underlying this process are bio-geophysical features that may limit how much income a given area can generate from its biodiversity. In the context of this paper bio-geophysical is defined as factors influenced by the geographical location of an area in relation to surrounding areas as well as the particular ecological, geological, or geographical features of the area itself. If such factors constrain sustainable income, then revenues may be too low to sufficiently motivate local households to adopt ecologically viable land use practices. In these cases the likelihood of ADMADE's success will be lowered

Some of the variables that may influence ADMADE success in this way and which were used in this analysis are as follows:

- 1) Proximity to major roads linking GMAs to urban markets.  
Major roads currently provide easy access to urban markets for illegal game meat, charcoal and other renewable resources. Without controls the high volume of commercial traffic on these roads help diminish resource production in a GMA.
- 2) Proximity to urban centers that impose resource use demands on nearby GMAs  
GMAs located relatively close to urban centers will be at greater risk to resource degradation from unsustainable exploitation and commerce of natural resources.
- 3) Availability of natural watering sites for wildlife throughout the year  
Availability and distribution of watering sites, including perennial water holes and perennial streams, influence the carrying capacity of most species of wildlife occurring in GMAs
- 4) Boundary effects with protected or semi-protected areas for restocking wildlife in GMAs  
Most GMAs practice consumptive wildlife management and open access to adjacent protected or semi-protected areas can provide a reservoir of animals for restocking if cross-boundary wildlife crossing are unimpeded.
- 5) Year-round secondary road access into GMAs for supplying management staff and local residents with commodities and supplies.  
Road access into a GMA increases the chances that management staff will be provisioned to carry out their duties during critical wet season months when illegal hunting is most common. Road access also enables critical commodities to reach

local residents in bulk, thus reducing living costs and risks of food shortages that might otherwise be mitigated by increased pressures on wildlife.

- 6) Species available in a GMA, their market value, and population sizes. Species present in a GMA represent the resource capital ADMADDE ultimately depends on to derive most of its income, which is dependent on their respective market value and number of animals on sustainable hunting quotas.
- 7) Area of a GMA. Spatial extent of a GMA contributes a variety of influences on ADMADDE success. The smaller an area the more easy and cost-effective it is to manage the area's resource use activities. However, if a GMA is too small, its own area may become insufficient to sustain the numbers of animals on quota and adjacent areas become increasingly important to the areas success under ADMADDE.
- 8) Suitability of soils. Soils are an important determinant to competing land uses. In cases where soils are suitable for farming, wildlife and other natural resource may be threatened from growing pressures of agrarian rural populations. On the other hand, limited arable soils tend to create food shortages among resident communities, and as a result, households are forced to over-exploitation wildlife as a commodity to exchange for maize.

Figures 3 - 8 are national maps describing urban population centres, major road networks, GMA boundary effects, and biodiversity and population characteristics based on quota statistics. One general conclusion these maps suggest is that there is considerable variation in potential risk that GMAs are exposed to in terms of how these variables may be influencing ADMADDE success. The elliptic circles in Figures 3 and 4 suggest those GMAs most vulnerable to urban pressures because of proximity to major roads and highly populated urban areas. Not surprisingly, the GMAs most vulnerable to the effects of urban centres are also the same most vulnerable to major roads.

Figure 3. Urban centres



Figure 4. Major roads



Figure 5. Boundary effects

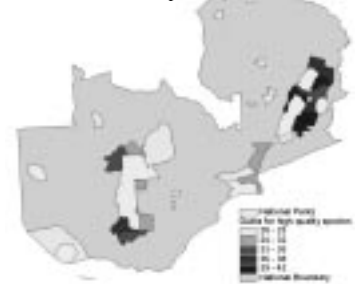


Figure 5 presents a variety of boundary effects on restocking rates from national park reservoirs, highlighted by elliptic and square outlines. In case 'a', the park boundary with Lunga-Lushwishi GMA are two deep rivers that impede the free movement of animals into the GMA. Case 'b', affecting Mumbwa and Namwala GMA is similar except the northern boundary of Mumbwa is adjacent to a relatively small section of the park, which is also cut off from the main park by a deep impassable river. In all three of these GMAs, buffalo numbers have declined over the past decade. Buffalo is a species much preferred by

both legal and illegal hunters. Without access to a protected area capable of supporting a safe reservoir of buffalo, these areas may not be able to sustain their own herds by natural recruitment from losses caused by hunting and poaching. Chiawa GMA, which is among those vulnerable to proximity effects of major roads and urban centres, is also isolated from the national park adjacent to its boundary by a deep river. It too has critically low numbers of buffalo. In case 'c', depicting Sandwe GMA, its relatively small area shares much of its boundary with South Luangwa National Park but animal movements across the park boundary are impeded by a major river, which animals can cross only seasonally, and by escarpment hills. Case 'd' is a generalized problem in much of Luangwa Valley where many GMAs share a border with either the South or North Park. Though the Luangwa River represents only a partial barrier to most wildlife species, local residents typically construct fishing camps and actively fish along the river during the dry season when the river is most easily crossed by wildlife. This human activity increases the barrier effect the Luangwa River has on wildlife, especially those sensitive to human presence.

Figures 6 – 8 examine some of the possible effects of wildlife biodiversity and population abundance on ADMADE success. Figure 6 illustrates a measure of variation in economic value for key wildlife species that occur in GMAs currently being hunted by safari clients. This measure is based on the total number of animals on safari hunting quota for the 7 most valuable species sold to overseas safari clients (excluding the wetland species found only in specialized habitats): lion, leopard, eland, buffalo, hippo, roan and sable. In particular, buffalo, lion and sable are among the most popular species sought by safari clients. GMAs with lowest values tend to be those nearest towns, major roads, or relatively isolated from a park in terms on boundary effects on wildlife crossings. This pattern was

Figure 6. Total quota for the 7 most valuable species



not simply a function of differences in total huntable species on quota, as is suggested in Figure 7, which illustrates total species on quota for each GMA. Unlike the previous figure, species numbers allowed on quota were relatively high for those GMAs having relative low economic value from the prime safari species. Figure 8 shows variation in total number of animals on quota among the hunting areas. Lowest scoring areas again are those nearest urban centres, near major paved roads or with limited access to wildlife border crossing with an adjacent national park.

Figure 7. Total species on quota

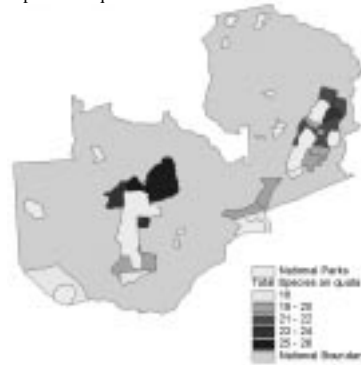


Figure 8. Total animals on quota

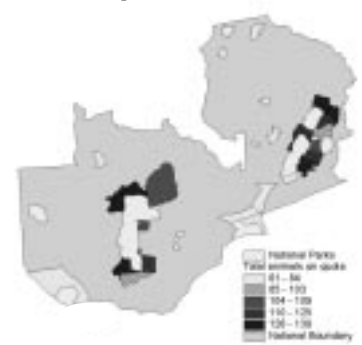


Figure 9. Protected forest areas and proximity to GMAs

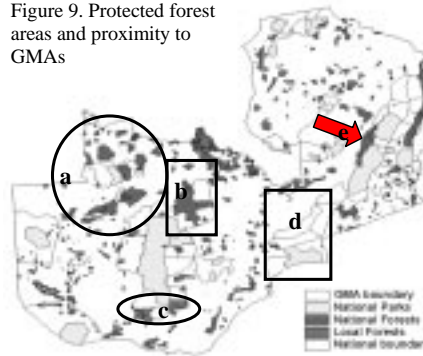


Figure 9 illustrates the locations of protected forest areas in relation to game management areas and various threats and opportunities that exist within the various matrix of situations that occur in Zambia. In *Area a*, there is a high concentration of protected forested areas that either overlap or border with 4 different GMAs (Chisera, Lukwakwa, Musele-Matebo, and Chibwika-Ntambu). Given their relative isolation in terms of only one relatively small national park that borders three of the GMAs, there exists the opportunity of significantly adding to

the range of managed wildlife areas by consolidating these forest areas as part of the GMAs. This would increase the total area of the GMAs from – to – and would also give increased protected status to wildlife since settlements are not allowed in protected forests. In *Areas b and c*, four of the major GMAs surrounding Kafue National Park have significant land areas gazetted as either national forests (Lunga-Lushwishi) or local forest (Mulobezi, Sichifulo, and Bilili). Those located in Mulobezi and Sichifulo extend

well beyond the GMA boundaries and offer an opportunity of consolidating the two land classifications for increased protection for wildlife under ADMADE management. Increased wildlife revenues derived from a protected forest area would theoretically enhance the value of a forest by managing it as a wildlife protected ADMADE area. Lunga-Lushwishi has one of the largest protected forest areas contained in any GMA and with improved management and protection of this forest, wildlife production would be expected to increase as well, thus creating an economic synergy between the two respective resources. *Area d* represents a complete converse of *Areas a, b, and c* by having a near total absence of protected forest areas. Moreover, these GMAs (Chiawa, Luano Upper and Lower, and Rufunsa) are located near Lusaka and have major roadway passing near or along their borders. All four GMAs are sources of large scale, unregulated charcoal production for the Lusaka and outerlying markets. This situation represents a serious threat to these areas as continued charcoal exploitation slowly erode prime wildlife habitat in the effected areas and attracts increased settlements to a potentially lucrative but destructive land use practice. *Areas e*, pointed to by the large red arrows, are protected forests representing important watersheds along the escarpment hills of Luangwa Valley. They also overlap with about half of the GMAs in the Valley and represent an important ecological function for recharging the many springs and streams that feed into the Valley below. Management of these areas and other surrounding forests should be a long-term concern for maintaining permanent water hole for wildlife populations if the Luangwa Valley is to remain the core of Zambia's wildlife tourism industry.

Figure 10, shown on the following page, is a land use soil suitability map for the Eastern Province and includes portions of the Northern and Lusaka Provinces. A total of 22 potential ADMADE areas (existing ones and those being proposed or requested among resident communities) are overlaid on this map. Within the extent of these GMAs, less than 6% of the total land area is arable and suitable for farming. Much of the land area is either hilly and rocky or characterized by valley clay soils subject to water-logging and not easily plowed for farming during the wet season. The arable land is primarily along river or stream drainages having alluvial deposits with relatively fertile, tillable soils. These soils are quite restricted and provide the mainstay for food production among resident communities. As populations expand over time, families are forced into less arable land along the fringes. These soils tend to be heavier in clays and food production is significantly less, forcing many households to supplement food production with game meat as a commodity to exchange for maize or sorghum with their more successful neighbors farming on better soils. Access to ground water also tends to be reduced on these clay soils and households often have to compete for the same waterholes used by wildlife. These conflicts and limitations of soil fertility in Luangwa Valley are a major challenge for ADMADE in this region and threat for the sustainability of wildlife in Luangwa Valley.

Beyond the escarpment perimeter of the Valley on the plateau above (see Figure 10 below), the availability of arable land is dramatically improved, particularly in the Eastern Province. It is no surprise that this area of Zambia is becoming a major produce of maize and cash crops (e.g. cotton and tobacco) for Zambia with parallel increases in human populations. The impact such land use pressures may be having on these existing GMAs raises a number of obvious ecosystem concerns, such as river siltation, watershed impact, resource extraction rates, pesticide management, and so forth. A more immediate concern is the way commercial farming from the plateau has begun to spread into the Lupande GMA, where road access is favorable for supporting farming variety and production. The consequences of these land uses in terms of human settlement patterns and the influx of people into the area do pose serious challenges for CBNRM, and wildlife in particular. Similar pressures are being experienced among the two proposed GMAs, Mwasemphangwe and Chinunda, whose areas provide a potential link between Kasungu National Park in Malawi and Lukusuzi National Park in Zambia.

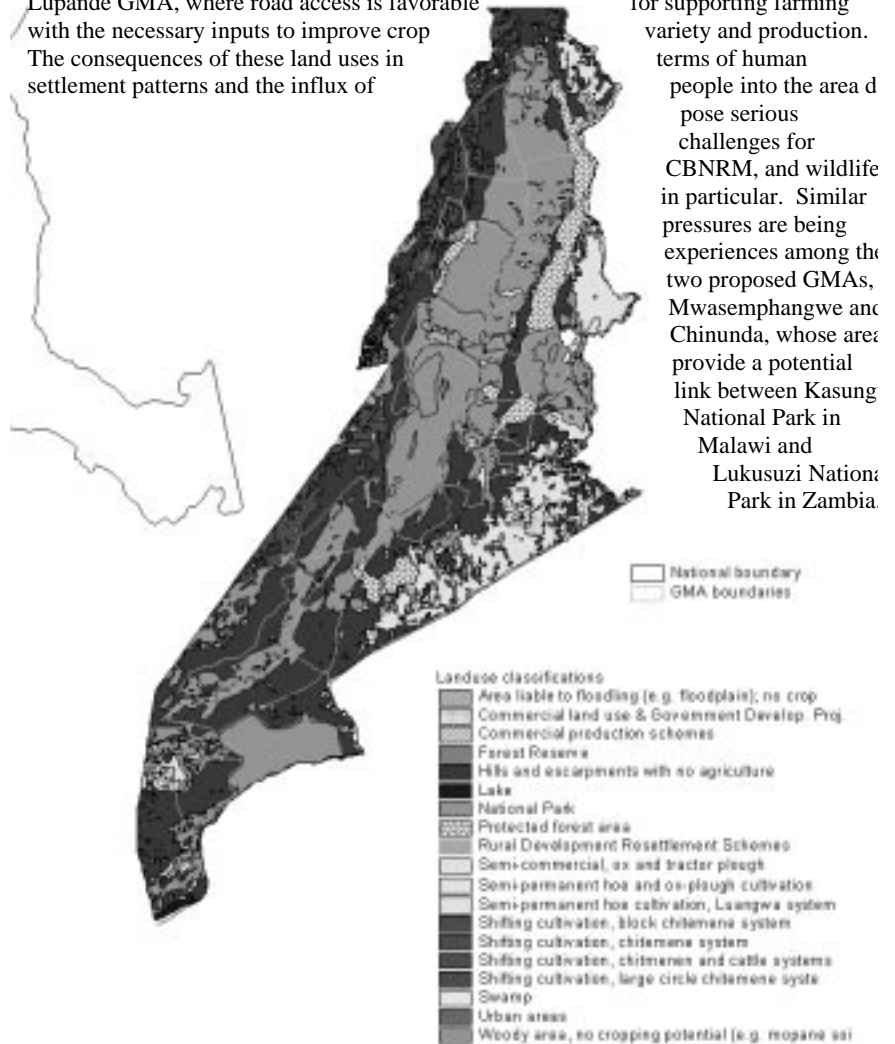


Table 1. below presents additional environmental variables and their possible influence on ADMADE revenues for supporting program objectives. These include the actual area of the hunting block, boundary effects with adjacent GMAs and national parks, proximity effects to town centres, number of months the area can be accessed by a 4-wheel-drive vehicle, and total distance of rivers that contain water throughout the year.

HBlockName	Area (km2)	Boundary Value	Town Factor	Road access	Water holes	Rivers (km)	High value quota	Total quota
Bilili/Nkala	400	376	126.8	7	10	96	32	126
Chanjuzi	2555	404.2	75.2	11	20	32	33	107
Chifunda	2104	1143.5	95.2	10	25	87	40	117
Chikwa plus Fulaza	5051	225.1	84.9	11	34	255	36	136
Kasonso	4592	299.1	91.6	12		287	35	138
Luano Lower	4901	88	4158	9			20	67
Lunga-Busanga	2094	322	17.2	12	1	133	29	138
Lunga-Lushwishi	13323	32	1197.2	12	6	682	23	108
Mulobezi	3573	460.1	320.8	9	6	0	38	128
Mumbwa West	1580	175.5	305.9	12	14	56	31	108
Luawata	1284	1206.2	171.7	6	3	126	37	116
Nyampala	1893	2615.3	171.7	6	5	201	39	127
Mwanya	1587	704.2	256.5	10	18	48	36	109
Rufunsa	3180	718	4092.3	12	8	76	31	79
Sandwe	1492	673	84.9	9	9	62	23	80
Sichifulo	3478	190.5	393.6	12	7	0	35	108
West Petauke	4354	82	50.9	8	11		30	84

Boundary effects were defined as the potential benefit adjacent parks and GMAs may have on restocking a given GMA. Its value, referred to as 'Boundary Value', was based on the following equation:

- A=km shared boundary between given GMA and national park
- B=km of this shared boundary not passable by wildlife
- C=km<sup>2</sup> of national park accessible to GMA
- D=wildlife abundance factor of the national park
- F=km shared boundary with adjacent GMA
- G=km of shared GMA boundary not passable by wildlife

$$\text{Boundary Value} = ((A-B) \cdot \log(C) \cdot D) + (F-G).$$

Proximity effects to town centres were defined as the possible influence urban centres may have on illegal game meat marketing as a function of distance to a town centre and its urban population. Population data were based on 1990 Zambian census data. Referred to as 'Town Factor', these effects were calculated by dividing the population of a town with the road distance from its urban centre to the centre of a GMA. Selection of town was based on the largest urban population as long as its road distance was less than 300 km.

Possible influence of these variables is shown in the graphs below:

Figure 11

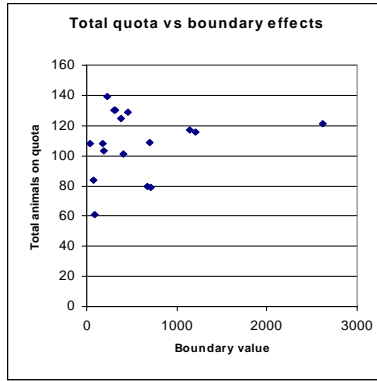
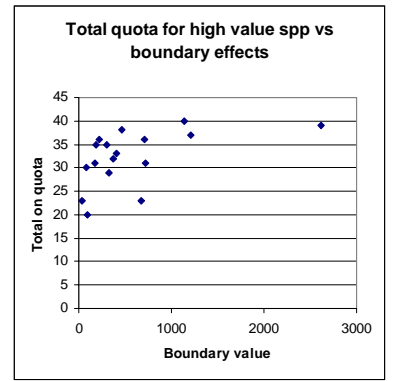


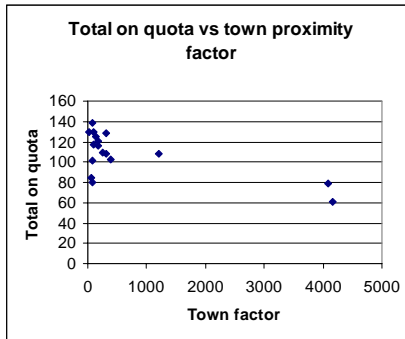
Figure 12



Total animals on quota was not influenced by the possible effects on wildlife protected lands adjacent to a GMA, possibly because most species on quota do not have large ranges and cross frequently between the two areas. In contrast, Figure 11 suggested a possible relationship in which the higher value species on quota (buffalo, hippo, lion, leopard, roan, sable, eland) and the larger body size species are more likely to maintain larger populations when their range is adjacent to a national park or game management area. Given that these species are generally low density (with the exception of buffalo and hippo) and in relatively high demand, this conclusion is not surprising, if over the history of safari hunting in Zambia the effects of hunting in GMAs have tended to lower populations. Since these species tend to range further than smaller species, the possible effects of parks as a reservoir for restocking would more likely be beneficial to these species, as the graph suggests, while also suggesting the possibility of historical over-hunting.

Figure 13 shows a possible relationship between reduced hunting quotas and proximity to town centres. This relationship is presumed to be caused by the higher rates of illegal game meat trafficking from those areas closest to major urban areas, as was also

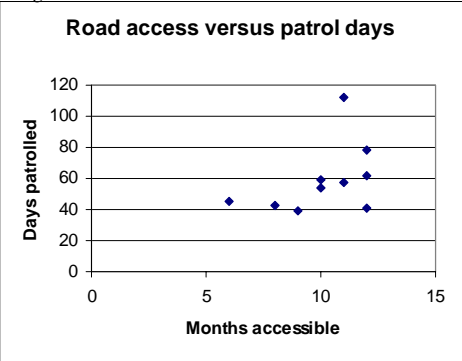
Figure 13



suggested in Figure –. This situation underlies the critical importance of having a legal market that out-competes illegal markets in terms of benefits derived for the local community. If the benefits of the wildlife industry are not substantial enough to benefit households in the community, risks of illegal trafficking will likely increase among those areas within commercial range of urban areas. Associated with this relationship to urban proximity is the network of paved highways that lead to Zambia's larger towns and cities and that help facilitate the movement of game meat on these commercial routes. Another conduit for game meat is by rail and is especially relevant to Sichifulo and Mulobezi GMAs where the train linking these areas with Livingstone has become a major supplier of illegal game meat to Livingstone.

Though the number of waterholes did not show any relationship to quota size, Figure 14 suggests quotas or total population sizes for hunted species are positively related to total distance of rivers that keep water throughout the year. Basic road infrastructure that facilitates management operations in a GMA may also be a factor influencing ADMADI success, especially in terms of year-round access for supporting patrol requirements, dispatching poachers when they are arrested, facilitating completion of community projects and so forth. This relationship was tested in Figure 15 by relating the number of months a 4-wheel drive vehicle can reach the unit HQ throughout the year to total number of days scouts went on patrol during the wet season months of January to May, averaged for 1998 and 1999. As might be expected, those units with poor access tended to have few days of patrolling during the wet season, suggesting greater difficulty in preparing for wet season patrol requirements.

Figure 15



Somewhat surprising was the result that size of the hunting area did not correlate with quota size or ADMADI income (based on 1998 safari hunting season, see Figure 16). Figure 17 shows a clear relationship between total quota size among all hunted areas in Zambia and their expected revenues based on individual species' license values. The fact that hunting concession area did not influence quota size suggested at least two possible reasons with important implications for

CBNRM success. First, from a management perspective, areas that exceed a certain size become increasingly difficult to patrol and police due to a disproportionately higher cost of maintaining and supervising increased number of scouts as the size of the area increases. This is especially true if income levels do not correlate with concession area. It would therefore be expected that as the size of an ADMADI or CBNRM unit increases, it becomes increasingly difficult to maintain adequate levels of law enforcement and resource protection. As a result the overall quality of the area in terms of available trophy animals on quota would be expected to decline.

Another likely explanation is that a single safari operator having a relatively large hunting concession will likely be unable to effectively hunt all viable areas unless there are hunting roads covering the full extent of the hunting concession. This is particularly true if lease periods are too short for operators to see a return on any financial investment for improving hunting roads in their concession. This factor will be treated separately under the private sector 'environmental variables'.

Figure 16

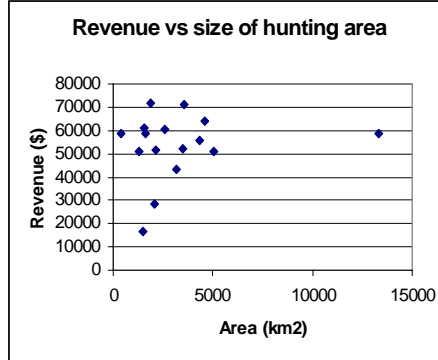
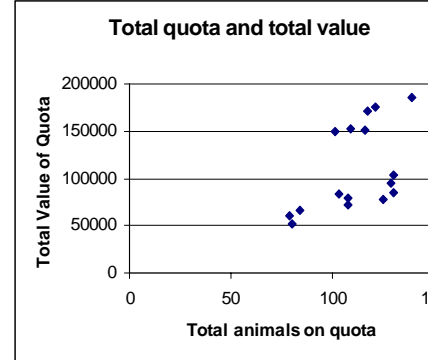


Figure 17



Conclusion: impact on CBNRM performance

1. Wildlife CBNRM areas isolated from any adjacent protected area, particularly large, well stocked national parks, are at much greater risk at having unsustainable hunting quotas to support economic incentives for maintaining land for wildlife as a land use. Unless non-consumptive options exist to produce comparable wildlife revenues (e.g. Chiawa), CBNRM will have much greater difficulty in succeeding. While the exact effects on wildlife crossings caused by different geophysical features are not well understood, it is safe to conclude that deep rivers, high escarpment hills, and well settled zones do impede the free movement of animals to and from more protected wildlife areas. Such effects do need to be appreciated in the CBNRM planning process in order to take the necessary precautions for those species most effected, primarily the larger and more valuable species. Otherwise the cost of restocking species once locally extinct will likely be prohibitive for most communities and their private sector partners. This problem is particularly relevant for Chiawa, Mansa and Chizera areas, which are almost totally isolated and have key species missing to support the higher paying classical safaris.

Boundary effects are also becoming more apparent for even those areas adjacent to national parks where the parks themselves are small or have suffered a recent history of heavy poaching with severely depleted wildlife stocks. In these cases, the CBNRM process must be extremely conservative on setting hunting quotas to ensure the critical

economic species are not over-hunted. This is especially relevant for Mumbwa, Lunga-Lushwishi, Lunga-Busanga, Kasonso, and Mwasemphangwe. Even areas with favorable crossing opportunities for certain species on one side of the GMA may not offer any added cushion for restocking for species found only in regions of the opposite where border areas are less favorable. Many of the Valley areas face this problem for hartebeest, roan and eland, and in certain areas (e.g. Upper Lupande) roan and possibly hartebeest have become essentially extinct.

2. In such cases where GMA's are isolated and hope to achieve ADMADE success, extending GMA boundaries to enclose protected forest areas, should they exist (as they do for Chizera, Mutele-Matebu, Lukwakwa, and Chibwika-Ntambu), could be an important option. Increased protected land areas will reduce risks of population extinction if portions of the contiguous area can be more extensively protected to ensure certain core wildlife populations provide a reserve of breeding stock. Since human settlements are not allowed on national forests, including such forests as part of a GMA would make this option viable.

3. Agricultural pressures from surrounding regions having increased economic opportunity or access to credit, fertile soils, etc. may create increased markets for illegal game meat, especially if CBNRM areas are unable to produce sufficient food for themselves but can produce wildlife for legal commercial markets. This imbalance of food security will lessen the likelihood of CBNRM success since wildlife will be used as an exchangeable commodity for securing food shortages and thereby depreciate their wildlife capital through snaring or poaching. An appropriate CBNRM approach to this problem is to use ADMADE capital for purchasing maize from the high maize producing areas to meet the food shortfalls that regularly cause local famines in many ADMADE areas. In exchange, maize producing areas will find a ready market for their produce and may come to realize the advantage of not encouraging residents to exploit wildlife illegally in ADMADE areas where their maize markets are supported by revenues derived legally from wildlife.

4. Size of an area is an important factor for achieving CBNRM success and should be based on optimum size that allows a single operator to fully utilize a sustainable quota while also providing the necessary management requirements to maintain wildlife production at these harvest locations. If this is not done, management will be overly concentrated in limited areas at the expense of lowered protection in other areas, thus reducing future opportunities of economic development from these less managed portions of a concession. Figure 18 below shows the distribution of concession size for Zambia's GMAs. This analysis suggests that those concessions that approach or exceed 5000km<sup>2</sup> are too large and need to be divided into two smaller concessions, each with their own respective CBNRM management and administration. The concessions that this recommendation applies to are Upper and Lower Zambezi areas, Lunga-Lushwishi, Lower Luano and Chikwa-Fulaza. The less favorable portions of the two sub-divisions will likely require different tendering arrangements to favor more private sector investments to help support the economic development of the resource.