



**Building a Sustainable Management System for Maasai Mara National Reserve: Understanding Staff and Community Members Perceptions of the Management of the MMNR and their Attitudes toward Wildlife, Conservation, and Environmental Issues**



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# Building a Sustainable Management System for Maasai Mara National Reserve: Understanding Staff and Community Members Perceptions of the Management of the MMNR and their Attitudes toward Wildlife, Conservation, and Environmental Issues

## Executive Summary

The Maasai Mara National Reserve (MMNR) is a world-renowned wildlife reserve and conservation area that has global significance because of its concentration of flora and fauna. Narok County Government administer this delicate national resource. It has brought fame to Kenya and is a key generator of revenue for the County and the entire Republic of Kenya. It serves as a centerpiece for tourism in Kenya (Hallo, Maghenda, Smith, ole Reson, Thiruaine, Mwalugongo, Bidu, Booth, & Achieno, 2011).

However, this fragile environmental resource requires constant care and attention to ensure that it is not in jeopardy of being permanently degraded to the point that the global community loses one of its most significant resources. The potential loss of biodiversity in the MMNR will seriously impact the entire ecosystem having environmental, social, and economic effects across the region, continent and world (UNESCO, 2010).

The key to its survival is the development of an adaptive and responsive management system that addresses the needs of both humans and wildlife, reflects the customs and traditions of Kenya, is sensitive to the changes in circumstances within and surrounding the MMNR, and that employs best practices in parks and protected area management ensuring the long-term viability of this global treasure. The project herein reported, relates to an initial effort to document MMNR staff and community members' perceptions of the management of the MMNR and their overall attitudes toward wildlife, conservation, and environmental issues. This effort supports the overarching purpose to create a sustainable management system for the MMNR for which this project team is seeking additional support and funding.

Thus, the present study was undertaken to accomplish the following three **objectives**:

1. To identify and document staff perspectives of management practices and challenges in the MMNR.
2. To measure the cultural context for conservation and management of the MMNR in communities around the MMNR.
3. To provide evidence of capacity to support future and more comprehensive research and management plan development activities.

## Project Methods

Input was gained from a cross-section of 135 rangers and officials from both sectors of the MMNR. Further, data were collected from 277 local community members from four different community areas.

The **Ranger Perceptions Survey** (WWF, 2016) was selected for this project to gain insights into frontline staff motivation and satisfaction with their job responsibilities and overall attitude toward their career options. This instrument focused on the immediate and long term opportunities for advancement within the system as well as the overall stability and safety of staff positions.

The **Rapid Assessment and Prioritization of Protected Area Management (RAPPAM)** methodology (Hockings, M., Stolton, S., and Dudley, N., 2000) was selected to identify and document the present management practices and challenges in the MMNR. The **Social Suitability Index for Predator Conservation** community survey was selected for gathering pertinent information from community members who may be impacted by the MMNR.

## Sampling and Data Collection Plan

Data collection among MMNR staff members was organized in accordance with the two management sectors in the MMNR: “The Triangle” sector is managed by the Mara Conservancy and the Narok sector is managed by the Narok County Government; although, both sectors are under the legal authority of the Narok County Government.

Rangers and officers were surveyed separately in small groups (7-25). Rangers from the Narok sector were surveyed at 10 different stations due to logistical challenges to transport them to a central location. The rangers in the Triangle sector were surveyed at their headquarters at the Serena compound. All rangers that were available at each station in the Narok sector were surveyed while a cross-section of rangers, selected based upon age and years of employment, from all areas of the Triangle were surveyed. The MMNR officers from a cross-section of areas within each sector were surveyed either at the Sekenani headquarters for the Narok sector or the Serena compound for the Triangle sector. Each data collection session was 120 to 150 minutes. A member of the project team from Maasai Mara University read and clarified the survey questions to all staff members.

The Social Suitability Index for Predator Conservation community survey was conducted in four community areas around the MMNR-Aitong, Talek, Sekenani, and Loita. These community centers were selected based on varying levels of impact from tourism: Sekenani (high tourism impact), Talek (high tourism impact), Aitong (moderate tourism impact), and Loita (low tourism impact). Within each of these centers, approximately 50 households were selected for participation in the survey using a systematic random sampling method of homesteads (bomas) within the community area. The head of household was selected in each situation where possible.

Research assistants from Maasai Mara University were the primary agents for data collection. Two days were allotted for each data collection effort in each of the four community areas. Each survey took approximately 45 minutes to complete. The research assistant read each question to the respondent and completed the survey instrument with the respondent to eliminate any potential issues with language and/or literacy. All data were analyzed using SPSS statistical package. Appropriate descriptive statistics were established for all items and ANOVA was conducted to test for significant differences among respondent groups on critical management and community conservation issues.

## Management Implications

Based on the findings of this effort, the following planning and management implications are presented:

1. **Create a Unified Management System.** There are significant differences in the management issues facing the Narok and Triangle sectors of the MMNR. If the new MMNR Management Authority is put in place, future efforts to **develop a unified management system** need to consider these differences and initially develop a comprehensive system that can bring both sectors into harmony regarding management policies, resources, and practices. A long-range planning committee with representatives from all four staff groups as well as county government officials should be formed to build a unified system for managing the MMNR.
2. **Focus on MMNR Staff Motivators.** Narok County officials and MMNR officers need to consider those aspects of the staff positions that motivate them (Table 4) to continue their work with the MMNR, as well as those aspects of their positions that detract (Table 5) from their continued employment with the MMNR.
  - a. All four groups very much enjoyed being with nature and overall enjoy being a ranger (officer). These two aspects of their positions need to be explored in more detail to ensure that future management efforts maximize staff opportunities to build on these very positive aspects of their positions. Other aspects of their positions that were viewed positively were: Living my dream (Triangle rangers), Respected by community for my work (Narok and Triangle rangers), Like implementing the law (Narok rangers & Triangle officers), and Like the

power and authority (Triangle rangers and officers). These positive motivators also need to be promoted with future management systems.

- b. Regarding the worst aspects of being a ranger (officer), these items varied considerably across the four groups. For Narok sector rangers, low pay, poor treatment by the public and government, poor facilities and infrastructure and dangerous work conditions were the four most critical items. For Triangle sector rangers, poor treatment by the public and government, low pay, dangerous work conditions and no reward for hard work were the four most critical items. For Narok sector officers, poor facilities and infrastructure, no reward for hard work, no recognition as a professional and poor treatment by the public and government were the most critical items. Finally, for Triangle sector rangers rarely seeing my family and dangerous work conditions were the two items that were most critical. All of these aspects of their work must be considered in building a new management system that improves the morale, trust and commitment of all the MMNR staff.

3. **Address Major Circumstances Impacting the MMNR.** The following major issues, impacting the protection and preservation of the MMNR, were consistently identified by the rangers and officers from both sectors (Table 11). These issues should be given consideration in developing the new management system and they include: 1. **Overall staff welfare** including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc., 2. **Illegal grazing** of cattle in the MMNR, 3. **Lack of equipment** including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, 4. **Poaching** and loss of key species in the MMNR, and 5. **Inappropriate tour guide behaviors** including off-road driving, harassment of wildlife, ballooning practices, etc.

Of these issues, **overall staff welfare** for rangers of both sectors is the most salient issue facing the management of the MMNR. Quality housing, food supply, cooking facilities especially for the far outposts, water supply, uniforms, first aid kits and other medical supplies, and appropriate allowances must be addressed quickly and comprehensively. Budgets must be increased for personal welfare, safety, and morale of all staff but especially the rangers. Again, a representative committee of staff should be formed to facilitate a phased in effort to upgrade all staff welfare issues over the next two years.

4. **Address Critical Infrastructure Needs.** Several areas of the MMNR need special attention especially in the Narok sector.
  - a. Each station needs to have adequate off-road vehicles to transport staff and to conduct daily operations including systematic patrols throughout the MMNR. The vehicular limitations are severely impacting the monitoring of tourists and tour guides, enforcement of rules and regulations protecting wildlife and biodiversity, and maintenance of the overall resource.
  - b. Staff need up-to-date safety equipment including firearms, vision equipment, telemetry equipment, etc.
  - c. Staff need state of the art communication equipment for personal safety and to conduct daily monitoring and patrolling efforts to protect the environment, wildlife and tourists effectively.
  - d. The road system is in disrepair and continues to deteriorate seasonally. Proper and sufficient road grading equipment must be purchased and well maintained to prevent the continued degradation of the environment and to enhance the overall tourist experience for the MMNR guests.

5. **Build Comprehensive Communication and Information System.** In addition to personal communication devices, the MMNR management needs to build a comprehensive communications and information system that allows the free flow of communication, vertically and horizontally, among the staff and other key stakeholders.
  - a. Additionally, a geo-spatial laboratory could be established to build a database management and monitoring system for all management activities including the recording of daily work actions and problems, monitoring of poaching and other illegal activities, tour guide and tourist activity, environmental hotspots, points of degradation, wildlife habitats and behaviors, and many other management practices that would benefit significantly from building consistent and comprehensive databases with useable reporting mechanisms for all staff and interested stakeholders.
  - b. Staff indicated that they need additional information and access to new training and materials. The geo-spatial laboratory could also provide scheduled training and new management information and materials to all staff electronically.
6. **Staffing, Financing and Planning are Three Critical Management Areas Needing Attention.** In addition to MMNR Communication and Information Issues (See Figure 6 for further details) and MMNR Infrastructure Issues (See Figure 7 for further details) identified in items 3 and 4 above, MMNR Staffing Issues (Figure 4), MMNR Financial Issues (Figure 8) and MMNR Management Planning Issues (Figure 9) should be given special attention in building the new management system because nearly 50% of the assessments from the four staff groups were below the 2.5 which indicates a negative perception of these areas.
7. **Build Narok Sector Officers Confidence in the System.** The Narok sector officers expressed the greatest concern regarding the management practices in the MMNR across all 11 areas. Future management efforts should invite input and involvement of these staff persons to address their specific concerns related to each of these areas to rebuild their confidence in the management authority of the MMNR.

In addition to the primary areas identified above in items 3-6, other concerns that need special attention are: the identification of MMNR policies and work plans that are consistent with the objectives in the MMNR, performance review process for staff, availability of ecological and socio-economic data for management planning, the creation of a system to collect, process and analyze management data, adequate funding for the immediate and long term preservation of the MMNR, creation of comprehensive management plan, inventory of natural and cultural resources, clear organizational structure, promotion of transparent decision making, research on key social issues impacting the MMNR, and access to research and recent data regarding the management of protected areas.
8. **Communities support the MMNR but not Their Level of Involvement in its Management.** Members were generally supportive of the importance and existence of the MMNR and felt it contributes to wildlife protection. However, they did not feel as though local opinions are sought out in the management of the Reserve. This finding conflicts with the responses from the MMNR staff who perceived that local residents did have sufficient input into the management practices and challenges facing the MMNR. Going forward, MMNR staff need to address this discrepancy. More formal mechanisms for seeking out local opinions and increasing community members' awareness and understanding of MMNR policies and procedures may be helpful.
9. **Human Wildlife Conflict is Critical.** Conflict with wildlife is a severe issue in communities surrounding MMNR. The compensation plans that are currently in use need to be reviewed and more efficient and effective processes should be considered in order to support local people as well as protect the wildlife that exists in the reserve and lessen further population declines.

10. **Expand on Local Community Members Support of Tourism.** Local people had positive views towards tourism and felt it had low impact on the environment and their culture. In addition, local people expressed high environmental resilience and positive attitudes towards wildlife. Together, these findings demonstrate the importance of developing tourism in a way that will allow for local economic growth while protecting the environment and natural resources local people rely heavily upon. MMNR staff should consider how it could facilitate the development of opportunities through tourism for the local communities.

The ten items identified above provide valuable input into building a sustainable management system that will protect and promote the long-term viability of the MMNR. If one were to condense these suggestions into broader based actions, clearly four themes dominated the discussion. These were:

1. **Building of infrastructure:** This includes physical infrastructure such as housing, personal equipment, and a quality road system but also management operation infrastructure related to establishing a clear organizational structure that effectively addresses the objectives and challenges in the MMNR, and creating an operations manual that identifies policies and procedures across all aspects of managing the MMNR.
2. **Training of all staff:** Throughout the data collection process, there was a clear need and desire expressed for additional and continuous training on the part of rangers as well as officers. Continuous training would help alleviate many of the management challenges that presently exist, enhance morale, establish a logical career progression system, and protect and preserve the overall MMNR.
3. **Establishing communication and information systems:** MMNR staff across both sectors strongly stated the need for better communication technology and processes to enhance the overall effectiveness of management actions and responsiveness of the staff. Further, they stated a strong need for additional information and research to enhance decision-making and planning in the MMNR. A geo-spatial laboratory would be a very valuable resource for addressing many of the challenges facing the management of the MMNR.
4. **Commitment to engage and support local residents:** The results of this study as well as the volumes of research that have been conducted on effective management of protected areas, clearly indicate that enhanced efforts to engage the local communities in the management and benefits of the MMNR are essential. These efforts include: building a more formal mechanism for seeking input from local community members, improving wildlife compensation programs, engaging local residents in training programs to support work actions in the MMNR as well as with the tourism industry, and building a committed relationship with the local communities where they receive direct benefits from the perpetuation of the MMNR and perceive a true sense of being a part of the management effort of the MMNR. Only through including local communities as active partners can the MMNR address the many challenges facing it.

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## Introduction: Need and Background

The Maasai Mara National Reserve (MMNR) is a world-renowned wildlife reserve and conservation area that has global significance because of its concentration of flora and fauna. Narok County Government administer this delicate national resource. It has brought fame to Kenya and is a key generator of revenue for the County and the entire Republic of Kenya.

Because of its magnificent landscapes, vegetation, and wildlife it has been designated one of the New Seven Wonders of the World, and it attracts worldwide interest from conservationists, scientists, and tourist alike. It remains a critical habitat for research on wildlife, ecosystems, and conservation management (Hatcher, 2013; Oindo & Skidmore, 2003). It also serves as a centerpiece for tourism in Kenya (Hallo, Maghenda, Smith, ole Reson, Thiruaine, Mwalugongo, Bidu, Booth, & Achieno, 2011).

However, this fragile environmental resource requires constant care and attention to ensure that it is not in jeopardy of being permanently degraded to the point that the global community loses one of its most significant resources. The potential loss of biodiversity in the MMNR will seriously impact the entire ecosystem having environmental, social, and economic effects across the region, continent and world (UNESCO, 2010).

Therefore, the preservation of this important resource is the responsibility of the global community and it requires support beyond the borders of Kenya. Furthermore, the key to its survival is the development of an adaptive and responsive management system that addresses the needs of both humans and wildlife, reflects the customs and traditions of Kenya, is sensitive to the changes in circumstances within and surrounding the MMNR and employs best practices in parks and protected area management ensuring the long-term viability of this global treasure.

The project herein reported, relates to an initial effort to document MMNR staff and community members' perceptions of the management of the MMNR and their overall attitudes toward wildlife, conservation, and environmental issues. This effort supports the overarching purpose to create a sustainable management system for the MMNR for which this project team is seeking additional support and funding.

### Challenges Facing the Management of the MMNR

The Maasai Mara National Reserve has been closely connected to the Maasai culture for centuries. The traditional nomadic pastoral lifestyle of the Maasai, which supported the long-term viability of rangelands, has dramatically changed in the recent past to a more sedentary agro-pastoral lifestyle.

This lifestyle is characterized by more permanent homesteads which exert a great deal of pressure on the lands around the MMNR and the process of sub-division of lands has created its own set of issues. For example, livestock grazing in the MMNR has become a significant problem impacting both the wildlife and the environment overall (Oguto, Piepho, Dublin, Bholá, & Reid, 2009). No longer can cattle, other domestic animals, and even wildlife freely roam the rangelands, so they must seek additional areas to graze that many times involve the lands in conservancies and the MMNR itself.

Further, there has been an increase in human-wildlife conflict, human-human conflict, and a reduction in wildlife dispersal areas as a result of these land tenure processes (Mundia & Murayama, 2009); Hallo et al, 2011).

The sub-division of land has also resulted in many Maasai leasing or selling their parcels of land to non- Maasai who are engaging in large scale developments including wheat farming, large resorts and the fencing of their lands that exacerbate the grazing problems (Serneels, Said, & Lambin, 2001; Oguto, Owen-Smith, Piepho & Said, 2011). These changes are further impacting scarce resources including drawing heavily on the permanent water resources originating from the Mau Forest and also bringing about localized overuse of the natural resources (water, wood, grazing lands).

Additionally, the sharing of revenue from wildlife-based tourism has been generating controversy between the Kenya Wildlife Service, the County Council, conservancies, and communities. Wildlife move from the MMNR, to conservancies and onto land owned by the local communities. It is estimated that at any one time, 70% of the wildlife is found outside protected areas (Norton-Griffiths, 2007).

Communities are increasingly demanding to know how much revenue is generated by tourism and to benefit from a share of that revenue. The new legislation defining that 19% of MMNR revenues be provided to the surrounding communities is a step in the right direction, however, adequate plans and systems need to be put in place to guarantee that these funds are accurately monitored and distributed to the communities.

**Development and Tourist Impacts on Management of the MMNR.** Other factors inside the MMNR also are negatively impacting its sustainability. As mentioned already, livestock grazing in and around the MMNR is having an impact on the vegetation and the wildlife. For example, many species, including elephants and rhinos, are very sensitive to the proximity of cattle and the entire landscape is being over grazed placing cattle in direct competition with wildlife and impacting the natural habitat of many species (Oguto, et. al, 2011).

Additionally, significant development of lodges, permanent campsites and even temporary campsites has affected the migratory patterns, natural habitat, and even the breeding behavior of many species in the MMNR. The licensing of new lodges and airstrips in the Mara ecosystem is inconsistent with recommendations of the environmental impact assessments conducted to protect the ecological balance of the MMNR. Unplanned and unregulated growth in and very near the MMNR is beginning to affect both visitor use of the area and the ecosystem by interfering with animal habitats, creating greater environmental pollution, and destroying the watershed that feeds the MMNR and Serengeti. Large mammals need vast tracks of open range to have unrestricted movement; otherwise they move to other areas, even outside the MMNR to find un-inhabited open space (Kenya Tourism Federation, 2012).

Further, the unrestricted movement of tourists inside the MMNR has further exacerbated the destruction of fragile vegetation and again, impacted biodiversity by disrupting the natural flow of the wildlife. Off-road vehicle traffic has become a major factor in the degradation of the MMNR.

Finally, there is an overarching concern of what is happening to the entire Mau Ecosystem and the subsequent impact on the MMNR. Some scientists are suggesting unrepairable devastation to the Mau Ecosystem in the near future. Most wildlife populations are facing a serious decline of up to 70% in some species (Oguto, et. al., 2011; Kenya Tourism Federation, 2012) and the destruction of the Mau Ecosystem will only exacerbate this decline. The migration of the wildebeest, for example, is being significantly impacted because of changes in land cover, population growth and inconsistent policy (Norton-Griffiths, 2007).

The current situation requires immediate attention. A more effective management system needs to be put in place with highly qualified and effective managers and scientists. The Narok County Government is deeply concerned with the protection of the Mara and is in the final stages of creating a new Maasai Mara National Reserve Management Authority where the “object and purpose of the Authority is to protect, conserve, manage and ensure sustainable use of the Maasai Mara National Reserve resources” (Narok County Assembly, 2015, p. 8).

This new independent Authority provides for the long-term stability of the oversight of the MMNR and one of its functions is to “develop and implement the Maasai Mara National Reserve Management Plan” (Narok County Assembly, 2015, p. 9). A management plan was created for the MMNR covering the period of 2012-2022 (Kenya Tourism Federation, 2012) that addresses many of the critical issues already raised. Although this Plan can serve as a guidepost for making the improvements that are needed in the MMNR and building a sustainable system, it has provided limited impact because there is neither an effective infrastructure nor operations management system in place to effectively implement this Plan. Below is a brief explanation of the 2012-2022 MMNR Management Plan.

**2012-2022 MMNR Management Plan.** It is important to have an understanding of the principal elements of the 2012-2022 MMNR Management Plan since it serves as the functional backdrop for building a sustainable management system. Although the 2012-2022 Plan has not been implemented, it puts in place significant actions that would address many of the concerns and issues outlined previously in this proposal. The main aims of the 2012-2022 Plan are:

1. **Ensure conservation of the Reserve’s globally significant biodiversity**
2. **Maintain the role of the MMNR as the flagship of Kenya’s tourism industry**
3. **Improve on a sustainable basis the revenues generated by the MMNR, to support increasing community livelihood and protected area management needs**



4. Provide a practical management framework to support MMNR managers in carrying out their day-to-day management responsibilities.

In response to these aims, the plan lays out five primary action areas. The core of the Management Plan is the Zonation and Visitor Use Scheme involving high and low use areas as well as the Mara River corridor. To support this scheme four management programs are also proposed: the Ecological Management Programme, the Tourism Management Programme, the Community Outreach and Partnership Programme; and the Protected Areas Operations Programme. The Zonal Scheme and the four Management Programmes are well thought-out and provide the framework to suggest a successful long range plan for the MMNR, except that the plan does not include information or management actions related to the eight operational conservancies surrounding the MMNR and its relationship with the Serengeti National Park. This gap needs to be addressed in an addendum to the Management Plan to truly create an effective plan to protect the entire ecosystem supporting the Mara. See Figure 1 for a map of Maasai Mara National Reserve and surrounding conservancies.

### Overarching Purpose and Current Project Objectives

The **purpose** of the overarching project is to establish an optimal management system to ensure the long-term sustainability of the MMNR. A sustainable management system, that includes an optimal organizational structure with strong staff capacity, must be in place first so the problems and issues facing the MMNR can be successfully addressed over time.

However, this overarching purpose can only be successfully achieved by securing involvement, input and trust of the MMNR staff and local communities in this effort. Therefore, a first step in this process is to gain a deeper and more comprehensive understanding from MMNR staff and local community members of their perceptions of current protected area management practices and strategies in the MMNR; local community support and perceptions of conservation practices, human-wildlife conflict issues, and MMNR management practices; and their input for addressing the most critical challenges facing the MMNR. Thus, the present study, for which this report is prepared, was undertaken to accomplish the following three **objectives**:

1. To identify and document staff perspectives of management practices and challenges in the MMNR. MMNR staff were interviewed and surveyed to gain insight into these practices and major challenges,
2. To measure the cultural context for conservation and management of the MMNR in communities around the MMNR. Community members were interviewed and surveyed to measure their beliefs and attitudes toward conservation, wildlife, tourism development and management practices within the MMNR. Perspectives from the community members will be used to inform future management directions in the MMNR.
3. To provide evidence of capacity to support future and more comprehensive research and management plan development activities. The data collected in January 2017 will support future development efforts in the region by providing needed perspectives and context for management.

Results will be used to make informed decisions regarding the establishment of an adaptive and sustainable management system to ensure the long-term sustainability of the MMNR by preserving its natural environment, promoting benefits to the local communities, protecting its wildlife, and preserving its culture for future generations.

## Project Methods

### Survey Selection

A major challenge of protected area management is gaining the trust and commitment of protected area staff and local community members to support the actions of the governing authority and decisions of upper management. Only through consistent and comprehensive engagement with staff and community members can this be achieved.

Therefore, the **Ranger Perceptions Survey** (WWF, 2016a) was selected for this project to gain insights into frontline staff motivation and satisfaction with their job responsibilities and overall attitude toward their career options. This instrument focused on the immediate and long term opportunities for advancement within the system as well as the overall stability and safety of staff positions. An effective management system must be responsive to the needs, desires and work attributes sought by the protected area staff. The Ranger Perceptions Survey has been used extensively in Asia and has recently been piloted in Africa (WWF, 2016b). However, it has not been used to gain a comprehensive understanding of MMNR staff perceptions to date.

The **Rapid Assessment and Prioritization of Protected Area Management (RAPPAM)** methodology which was adapted from the assessment process developed by International Union for Conservation of Nature (IUCN)-World Commission on Protected Areas (WCPA) (Hockings, M., Stolton, S., and Dudley, N., 2000) was selected to identify and document the present management situation in the MMNR.

It assesses six primary management areas: 1. Context: where are we now; 2. Planning-where do we want to be and how will we get there; 3. Inputs-what resources do we need to get there; 4. Management Process- how do we go about getting there; 5. Outputs-what did we do and what products, services and deliverable were provided; and 6. Outcomes-what did we achieve, were we successful. Again, this assessment tool has been used extensively around the world but only minimally in Africa, most notably in South Africa. Further adaptations were made to the Ranger Perceptions Survey and the RAPPAM to address situations and circumstances that are unique to the MMNR.

An additional challenge of protected area management is gaining input, involvement and understanding of the attitudes of community members living in nearby rural communities of a protected area. Because of the importance of community involvement and commitment to underpin long-term management of the MMNR, community perspectives must be incorporated throughout the building of a sustainable management system for the MMNR.

Figure 1. Masai Mara National Reserve and Conservancies



The **Social Suitability Index for Predator Conservation** (Krafte, 2017) community survey was selected for gathering pertinent information from community members who may be impacted by the MMNR. The Index addressed factors including villager's perceptions of the advantages of having the MMNR in close proximity, the effectiveness of management practices in the MMNR, their tolerance towards predators and other wildlife, alternate livelihood options (primarily from tourism), the policy environment, and community resilience. Incorporating community input and promoting community involvement into protected area management efforts will build trust and commitment of local residents to support MMNR policies and procedures as well as facilitate greater economic development for the local residents and overall environmental protection. The Index has been tested and successfully used to inform management decisions in location around the world including Costa Rica, Jordan, Dominica, and Vietnam.

### Sampling and Data Collection Plan

**MMNR Staff Surveys.** Data collection among MMNR staff members was organized in accordance with the two management sectors in the MMNR: "The Triangle" sector is managed by the Mara Conservancy and the Narok sector is managed by the Narok County Government; although, both sectors are under the legal authority of the Narok County Government. Further, MMNR rangers and MMNR officers (wardens, sergeants, corporals, etc.) were surveyed separately to reduce potential bias in responses.

Both rangers and officers were surveyed in small groups (7-25). Rangers from the Narok sector were surveyed at 10 different stations due to logistical challenges to transport them to a central location. The rangers in the Triangle sector were surveyed at their headquarters at the Serena compound because transportation was available. All rangers that were available at each station in the Narok sector were surveyed while a cross-section of rangers, selected based upon age and years of employment, from all areas of the Triangle were surveyed. The MMNR officers from a cross-section of areas within each sector were surveyed either at the Sekenani headquarters for the Narok sector or the Serena compound for the Triangle sector. Each data collection session was 120 to 150 minutes.

A member of the project team from Maasai Mara University read and clarified the survey questions to all staff members. The Ranger Perception Survey was completed first followed by the Rapid Assessment and Prioritization of Protected Area Management Methodology. Each MMNR staff member was provided a copy of the surveys to complete individually.

**Community Surveys.** The Social Suitability Index for Predator Conservation community survey was conducted in four community areas around the MMNR - Aitong, Talek, Sekenani, and Loita. These community centers were selected based on varying levels of impact from tourism: Sekenani (high tourism impact), Talek (high tourism impact), Aitong (moderate tourism impact), and Loita (low tourism impact). Within each of these centers, approximately 50 households were selected for participation in the survey using a systematic random sampling method of homesteads (bomas) within the community area. Depending on the size of the boma, every second or third dwelling was selected for inclusion in the data collection. The head of household was selected in each situation where possible.

Research assistants from Maasai Mara University who were knowledgeable of the local setting and conversant in Swahili and Maa were the primary agents for data collection. The research assistants received training in appropriate data collection processes and techniques from the project team immediately prior to the data collection period. Two days were allotted for each data collection effort in each of the four community areas. Each survey took approximately 45 minutes to complete. The research assistant read each question to the respondent and completed the survey instrument with the respondent to eliminate any potential issues with language and/or literacy.

All data were analyzed using SPSS statistical package. Appropriate descriptive statistics were established for all items and further inferential statistics were calculated for some of the key management practice areas and community perceptions.

## Project Results

### Number of Respondents

There were 135 respondents from the MMNR staff. Ninety-five (95) of 400+ rangers from Narok sector were surveyed and 20 of 100 rangers were surveyed from the Triangle sector. Additionally, 10 of 47 officers responded from the Narok sector and 10 of 37 officers responded from the Triangle sector. In the original sampling plan there were to be 20 officers from each sector but again because of logistical issues it was not possible to achieve this level of response.

Within the four community areas, the sampling plan called for 50 households per area. However, because of some additional research assistants being available, additional households were secured in each area. Fifty-six (56) households were surveyed in the Aitong area while 60 households were surveyed in the Talek area. Also, 80 households were surveyed in the Sekenani area and 81 households were surveyed in the Loita area giving a total of 277 households responding across the four community areas.

For the remainder of the presentation of these results, the information related to the MMNR staff will be presented first and the information related to the community members will be presented second. Further, all tables and figures have been simplified for this narrative; however, more detailed tables of the results including more descriptive and inferential statistics are contained in Appendices A and C.

### Results from MMNR Staff Surveys

**Description of MMNR Staff Respondents.** Table 1 presents the distribution of MMNR staff by age across the four staff groupings. Sixty-six-point three percent (66.3%) of the Narok sector rangers were between the ages of 21-25, while the second largest group, with 17.9%, was between the ages of 26-30. For the Triangle sector rangers, again, the largest group (40%) was between the ages of 21-25 and the second largest group (25%) was between the ages of 26-30.

For the Narok sector officers, they were evenly split with the largest percentage being within the 31-35, 41-45 and 46-50 age groups with 22.2% in each group. The Triangle sector officers were slightly younger with the largest percentage (30%) being in each the 31-35 and 36-40 age groups.

Table 1. Age Distribution of Four Staff Groups (N=135)					
Age Categories	Rangers Narok Sector	Rangers-Triangle Sector	Officers Narok Sector*	Officers Triangle Sector	Total
	Count (%) **	Count (%)	Count (%)	Count (%)	Count (%)
less than 20	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	1 (.7)
21-25	63 (66.3)	8 (40.0)	0 (0.0)	0 (0.0)	71 (53.0)
26-30	17 (17.9)	5 (25.0)	1 (11.1)	2 (20.0)	25 (18.7)
31-35	5 (5.3)	2 (10.0)	2 (22.2)	3 (30.0)	12 (9.0)
36-40	1 (1.1)	1 (5.0)	1 (11.1)	3 (30.0)	6 (4.5)
41-45	2 (2.1)	1 (5.0)	2 (22.2)	1 (10.0)	6 (4.5)
46-50	1 (1.1)	1 (5.0)	2 (22.2)	1 (10.0)	5 (3.7)
51-55	0 (0.0)	0 (0.0)	1 (11.1)	0 (0.0)	1 (.7)
56-60	6 (6.3)	1 (5.0)	0 (0.0)	0 (0.0)	7 (5.2)
<b>Total</b>	95 (100.0)	20 (100.0)	9 (100.0)	10 (100.0)	134 (100.0)

\*One Officer in the Narok Sector did not indicate his/her age.

\*\*Percentages are within each staff group.

Regarding gender of the MMNR staff, the clear majority of respondents, well over 75%, were male in all four staff groups (see Table 2). The Narok sector rangers had the largest percentage of female ranger respondents with 13 (14.9%) while the Triangle sector rangers had 2 (10%) female respondents. The Narok sector officers had no female respondents while the Triangle sector officers had 2 (22.2%) female respondents. It should be pointed out that nine MMNR staff members did not indicate their gender.

<b>Table 2. Gender within Staff Groups (N=135)</b>					
	<b>Rangers Narok Sector</b>	<b>Rangers Triangle Sector</b>	<b>Officers Narok Sector</b>	<b>Officers- Triangle Sector</b>	<b>Total</b>
	<b>Count (%)*</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>
<b>Male</b>	74 (85.1)	18 (90.0)	10 (100.0)	7 (77.8)	109 (86.5)
<b>Female</b>	13 (14.9)	2 (10.0)	0 (0.0)	2 (22.2)	17 (13.5)
<b>Total</b>	87	20	10	9	126**

\*Percentages are within staff groups

\*\*Nine staff members did not indicate their gender

With respect to years of employment, the majority of Narok sector rangers had worked less than one year (74.5%) while 50% of Triangle sector rangers had worked less than one year (see Table 3). The Narok sector officers had considerably more experience with 3 (33.3%) having either 16-20 or 26-30 years of employment with the MMNR whereas the majority (40%) of Triangle sector officers had 2-5 years of experience with the MMNR.

<b>Table 3. Years Employed by Staff Groups (N=135)</b>					
	<b>Rangers Narok Sector</b>	<b>Rangers Triangle Sector</b>	<b>Officers Narok Sector</b>	<b>Officers Triangle Sector</b>	<b>Total</b>
<b>Years of Employment</b>	<b>Count (%)*</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>
<b>0-1</b>	70 (74.5)	10 (50.0)	0 (0.0)	0 (0.0)	80 (60.2)
<b>2-5</b>	9 (9.5)	5 (25.0)	0 (0.0)	4 (40.0)	18 (13.5)
<b>6-10</b>	6 (6.4)	2 (10.0)	1 (11.1)	2 (20.0)	11 (8.3)
<b>11-15</b>	0 (0.0)	2 (10.0)	2 (22.2)	2 (20.0)	6 (4.5)
<b>16-20</b>	2 (2.1)	1 (5.0)	3 (33.3)	0 (0.0)	6 (4.5)
<b>21-25</b>	3 (3.2)	0 (0.0)	0 (0.0)	2 (20.0)	5 (3.8)
<b>26-30</b>	0 (0.0)	0 (0.0)	3 (33.3)	0 (0.0)	3 (2.3)
<b>36-40</b>	3 (3.2)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.3)
<b>41-45</b>	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.8)
<b>Total</b>	94	20	9	10	133

\*Percentages are within each staff group

**Factors Influencing Continued Work with the MMNR-Motivating Factors.** MMNR staff were also asked what their primary motivations were for continuing their work with the MMNR as well as they were asked to indicate what they found to be the worst part of working with the MMNR. Table 4 identifies their primary motivations. Each potential motivating factor was rating on a 10-point scale with a score of 10 indicating that this factor was among the highest motivations for continuing work with the MMNR and a 1 meaning this factor had little or no influence on staff motivation to continue work with the MMNR. Means scores were calculated for each factor across the four staff groups.

For Narok sector rangers, the primary motivating factors were: *Like to implement the law* (8.43), *Enjoy being close to nature* (8.32), *Respected by the community for my work* (8.22) and *Enjoy being a*

ranger (8.11). Further, No other job options (5.26) and *Good promotion opportunities* were not significant factors in their employment with the MMNR. For the Triangle sector rangers, *Enjoy being a ranger* (9.11), *Enjoy being close to nature* (9.10), *Like the power and authority* (8.53) and *Living my dream* (8.44) were factors positively influencing their continued employment with the MMNR. Conversely, *No other job options* (4.35) was not a dominant factor in their continued employment with the MMNR.

The Narok sector officers were most positively motivated to continue their work with the MMNR because they: *Enjoy being an officer* (7.80) and *Enjoy being close to nature* (7.80). The least motivating factors for these officers were: *No other job options* (5.63) and *Good promotion opportunities* (5.90). For the Triangle sector officers, *Enjoy being close to nature* (9.20), *Like the power and authority* (8.70), *Enjoy being an officer* (8.60) and *Like to implement the law* (8.60) were the primary factors influencing their continued employment. Clearly, *No other job options* (2.89) was not a factor in their continued employment.

<b>Table 4. Motivations for Continuing Work with MMNR (N=135)</b>					
	<b>Rangers Narok Sector N=95</b>	<b>Rangers Triangle Sector N=20</b>	<b>Officers Narok Sector N=10</b>	<b>Officers Triangle Sector N=10</b>	<b>Total</b>
<b>Motivating Factors</b>	<b>Mean* (SD)**</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>
<b>Enjoy being a ranger(officer)</b>	8.11 (3.07)	9.11 (.88)	7.80 (2.66)	8.60 (2.76)	8.28 (2.80)
<b>Enjoy being close to nature</b>	8.32 (2.83)	9.10 (1.59)	7.80 (3.46)	9.20 (2.53)	8.48 (2.70)
<b>Exciting job</b>	7.24 (3.12)	7.68 (2.38)	6.20 (2.70)	8.40 (1.90)	7.40 (2.91)
<b>Good promotion opportunities</b>	5.71 (3.25)	7.47 (2.72)	5.90 (2.77)	7.60 (2.59)	6.17 (3.14)
<b>Living my dream</b>	7.40 (3.04)	8.44 (1.72)	6.90 (1.85)	7.10 (2.77)	7.49 (2.78)
<b>No other job options</b>	5.26 (3.41)	4.35 (3.33)	5.63 (3.20)	2.89 (3.02)	4.95 (3.39)
<b>Respected by community for my work</b>	8.22 (2.66)	8.28 (2.19)	5.90 (2.80)	7.10 (3.21)	7.96 (2.70)
<b>Like to implement the law</b>	8.43 (2.73)	7.84 (2.43)	6.78 (3.07)	8.60 (2.80)	8.23 (2.72)
<b>Like the power and authority</b>	7.43 (3.14)	8.53 (1.58)	6.00 (3.21)	8.70 (2.45)	7.62 (2.93)

\*Mean: rank each item from 1 to 10, 10 being highest

\*\*SD=Standard Deviation

**Factors Influencing Continued Work with the MMNR-Negative Factors.** Table 5 identifies the factors that were considered the worst aspect for continuing work with the MMNR. Again, these were rated on a 10-point scale, with 10 meaning that this factor was considered one of the worst aspects of working for the MMNR.

For Narok sector rangers: Low pay (7.99), Poor treatment by the public or government (7.94), Poor facilities and infrastructure (7.83), Dangerous work conditions (7.70), and No reward for hard work (7.22) were the factors that discouraged their continued employment with the MMNR. On the other hand, they did not Find the work boring (4.06) nor did they see Frequent transfers (5.09) as a negative factor. However, it must be pointed out that the clear majority of these individuals had just started working for the MMNR, thus transfers would not yet have been a factor.

For Triangle sector rangers, their mean scores on all factors were generally lower than for the Narok sector rangers, thus suggesting that these factors were not as significant to them. That said, *Poor treatment by the public or government* (6.88), *Low pay* (6.41), *Dangerous work conditions* (6.35) and *No reward for hard work* (6.24) were the factors having a negative influence on their continued employment with the MMNR. Also, these rangers did not see the *Work as boring* (3.36) nor was *Rarely seeing my family* (4.13) or *Frequent transfers* (4.38) viewed as negative factors for employment with the MMNR.

The Narok sector officers felt Poor facilities and infrastructure (9.70) was by far the worst aspect of continuing work for the MMNR, and No reward for hard work (8.60), No recognition as a professional (8.56), and Poor treatment by the public and government (8.11) were factors discouraging their continued work with the MMNR.

For the Triangle sector officers, the scores were considerably lower than for the Narok sector officers, which may suggest less dissatisfaction with their work conditions. However, they did view: *Rarely seeing my family* (5.80) and *Dangerous work conditions* (5.40) as two factors that were slightly negative for influencing their continued work with the MMNR.

Table 5. Worst Aspects of Continuing Work with the MMNR (N=135)					
	Rangers Narok Sector	Rangers Triangle Sector	Officers Narok Sector	Officers Triangle Sector	Total
Worst Factors	Mean* (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Boring work	4.06 (3.18)	3.36 (2.62)	3.78 (2.49)	2.90 (3.14)	3.86 (3.06)
Poor treatment by public or govt	7.94 (3.20)	6.88 (2.39)	8.11 (3.14)	4.90 (3.45)	7.57 (3.20)
Poor facilities and infrastructure	7.83 (3.28)	4.72 (2.80)	9.70 (.48)	4.00 (2.75)	7.23 (3.41)
No reward for hard work	7.22 (3.44)	6.24 (2.91)	8.60 (2.17)	2.50 (1.58)	6.83 (3.44)
Rarely see my family	5.58 (3.02)	4.13 (2.72)	4.30 (2.16)	5.80 (3.68)	5.32 (3.01)
Low pay	7.99 (3.18)	6.41 (3.59)	7.78 (2.54)	4.10 (2.96)	7.45 (3.34)
Irregular pay	6.38 (3.61)	5.35 (3.16)	7.50 (2.95)	4.70 (3.37)	6.19 (3.51)
Inadequate leave	5.99 (3.31)	4.47 (3.08)	7.10 (2.81)	4.90 (3.18)	5.78 (3.27)
No recognition as professional	6.91 (3.52)	5.65 (2.94)	8.56 (1.59)	4.10 (2.85)	6.63 (3.41)
Dangerous work conditions	7.70 (3.19)	6.35 (3.50)	6.10 (2.02)	5.40 (2.59)	7.20 (3.18)
Frequent transfers	5.09 (3.22)	4.38 (3.84)	5.00 (2.00)	4.90 (3.54)	4.96 (3.22)

\*Mean: rank each item from 1 to 10, 10 being highest



**Work Conditions, Condition in the MMNR, Proper Equipment and Training Issues.** Table 6 presents the mean scores for each staff group related to changing working conditions in the Mara and the changing condition of the Mara over the last three years. It should be pointed out that respondents were instructed not to answer these questions if they had worked less than one year for the first question and less than three years for the second question.

The staff in the Narok sector (rangers and officers) believe *working conditions and the overall condition of the Mara* had gotten worse over the past three years while the staff from the Triangle sector felt quite strongly that *working conditions and the overall conditions in the Mara* had improved considerable in the past three years.

Table 6. Changes in the Condition of the Mara (N=135)										
Conditions	Rangers Narok Sector		Rangers Triangle Sector		Officers Narok Sector		Officers Triangle Sector		Total	
	Mean***	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Have working conditions gotten better?*	1.58	0.84	2.88	0.35	1.50	0.85	2.90	0.32	2.06	0.94
Have conditions in Mara gotten better? **	1.39	0.78	2.89	0.33	1.00	0.47	3.00	0.00	1.94	1.01

\* Only respondents with at least one full year of experience answered this question

\*\*Only respondents with at least three full years of experience answered this question

\*\*\*Mean: Better=3; Same=2; Worse=1

Table 7 presents MMNR staff perceptions of the availability of proper equipment to ensure their health and safety and the adequacy of their job training. Sixty percent (60%) of the Triangle sector officers felt they have the *proper equipment to ensure their health and safety* while the remaining three MMNR staff groups felt quite strongly that they do not have *proper equipment to ensure their health and safety*.

Regarding the *adequacy of their training*, the Triangle sector officers were almost evenly split on this item while the remaining three MMNR staff groups felt quite strongly that they had received proper training.

Table 7. Equipment and Training Needs for Staff (N=135)						
		Rangers Narok Sector	Rangers Triangle Sector	Officers Narok Sector	Officers Triangle Sector	Total
		Count (%)	Count (%)	Count (%)	Count (%)	Count (%)
Do you have the proper equipment to ensure your health and safety?	no	83 (91.2)	15 (78.9)	10 (100.0)	4 (40.0)	112 (86.2)
	yes	8 (8.8)	4 (21.1)	0 (0.0)	6 (60.0)	18 (13.8)
	Total	91	19	10	10	130*
Have you received adequate training to do your job?	no	12 (13.6)	0 (0.0)	3 (30.0)	4 (44.4)	19 (15.2)
	yes	76 (86.4)	18 (100.0)	7 (70.0)	5 (55.6)	106 (84.8)
	Total	88	18	10	9	125*

\*Five and 10 individuals did not respond to these questions, respectively

Table 8 addresses the question of the *importance of community involvement in the management of the Mara*. This is an important issue especially given the long standing traditions of the Maasai people regarding wildlife, land tenure and pastoralism. Across all four groups, the staff felt community involvement in the management of the Mara was either important or very important given the magnitude of the means. This finding is very important in building a sustainable management system for the Mara.

<b>Table 8. Importance of Community Involvement in Managing the Mara (N=135)</b>					
	<b>Rangers Narok Sector</b>	<b>Rangers Triangle Sector</b>	<b>Officers Narok Sector</b>	<b>Officers Triangle Sector</b>	<b>Total</b>
<b>Mean*</b>	4.05	4.65	4.71	4.63	4.23
<b>N</b>	77	17	7	8	109**
<b>SD</b>	1.04	0.49	0.49	0.52	0.95

\*Mean: 5=very important to 1=very unimportant

\*\*26 staff did not respond to this question

Table 9 addresses an important issue related to the long-term commitment and overall morale of the staff. Asking the question of whether you *would like your child to become a ranger (officer)* is very revealing from a commitment and morale perspective. Three of the staff groups were very positive on this question indicating they would like their child to become a ranger (warden) where the youngest and least experienced staff group, Narok sector rangers, were ambivalent related to this question; they were evenly split.

<b>Table 9. Would you like Your child to become a Ranger (Officer)? (N=135)</b>					
	<b>Rangers Narok Sector</b>	<b>Rangers Triangle Sector</b>	<b>Officers Narok Sector</b>	<b>Officers Triangle Sector</b>	<b>Total</b>
	<b>Count (%)*</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>
<b>No</b>	44 (50.0)	5 (26.3)	1 (10.0)	2 (20.0)	52 (40.9)
<b>Yes</b>	44 (50.0)	14 (73.7)	9 (90.0)	8 (80.0)	75 (59.1)
<b>Total</b>	88	19	10	10	127**

\*Percentages are within each staff group

\*\*Eight staff did not respond to this question

**MMNR Staff Identification of Present and Future Critical Issues.** Tables 10 and 11 present the summary of responses given by the four staff groups related to the identification of the most critical issues they have faced over the past five years (Table 10) and the most critical issues they believe they will face the next five years (Table 11). It must be clarified that each group, through a brainstorming exercise, identified their own set of critical issues and then they ranked them from one to five as the most critical past issues and future issues. These tables are a summary of the composite of their rankings for each critical issue. A complete listing of all critical issues identified is presented in Appendix B.

Although each staff group created its own list of critical issues, there was significant consistency for those issues they felt were the greatest challenges. For the Narok sectors rangers the following five issues were the top challenges they have faced the past five years: 1. *Overall staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc.*, 2. *Illegal crazing of cattle in the MMNR*, 3. *Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment*, 4. *Inappropriate tour guide behaviors including off-road driving, harassment of wildlife, ballooning practices, etc.* and 5. *No communication system between staff and administration including communication of policies and procedures as well as communication for crisis and security situations.*

For the Triangle sector rangers, the top five issues were: 1. Overall staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc. 2. Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, 3. Training/Capacity building of staff, 4. Lack of rapid response to crisis situations, and 5. Lack of judicial follow through after arrests for poaching and other legal infractions.

For Narok sector officers, the top five critical issues were: 1. Illegal grazing of cattle in the MMNR, 2. Political interference by powerful individuals from government and communities, 3. Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, 4. Overall staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc., and a tie for 5. Inappropriate tour guide behaviors including off-road driving, harassment of wildlife, ballooning practices, etc., and Unregulated new lodges/camps in and around the MMNR.

For Triangle sector officers, the top five issues were: 1. Poaching and loss of key species in the MMNR, 2. Illegal grazing of cattle in the MMNR, 3. a tie between, Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, and Human-Wildlife conflict issues, and 5. Inappropriate tour guide behaviors including off-road driving, harassment of wildlife, ballooning practices, etc.

Clearly, Staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc.; Illegal grazing of cattle in the MMNR; Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment; and Inappropriate tour guide behaviors, including off-road driving, harassment of wildlife, ballooning practices, etc., were the top four critical issues among all staff groups.

The other critical issues receiving significant votes across the four staff groups included; No communication system between staff and administration including communication of policies and procedures as well as communication for crisis and security situations; Poaching and loss of key species in the MMNR; Training/Capacity building of staff; Ineffective management system; Political interference by powerful individuals from government and communities; and Poor infrastructure including a poor road system, limited water resources and electrical systems.

<b>Table 10. Present Most Critical Pressures Summary (N=135)</b>					
<b>Present Pressure</b>	<b>Rangers Narok Sector N=95</b>	<b>Rangers Triangle Sector N=20</b>	<b>Officers Narok Sector N=10</b>	<b>Officers Triangle Sector N=10</b>	<b>Total N=135</b>
	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>	<b>Count (%)</b>
<b>Staff Welfare-all personal supplies and equipment</b>	69 (72.6)*	27(100)**	5 (50)	0	101 (74.8)
<b>Training/Capacity Building</b>	1 (1.1)	15 (75)	1 (10)	1 (10)	18 (13.3)
<b>Poaching/loss of key species</b>	13 (13.6)	0	0	10 (100)	23 (17.0)
<b>Number of Tourists</b>	3 (3.1)	0	1 (10)	0	4 (3.0)
<b>Inappropriate guide behaviors/off-road driving/ /wildlife harassment</b>	40 (42.1)	0	3 (30)	5 (50)	48 (35.6)
<b>Unregulated new lodges/camps/lack of cooperation from hoteliers, etc.</b>	5 (5.2)	0	3 (30)	3 (30)	11 (8.1)
<b>Lack of enforcement of policies and regulations/unclear protocols</b>	0	0	1 (10)	1 (10)	2 (1.5)
<b>Security of Rangers-Borders stations needing better equipment</b>	14 (14.7)	0	0	0	14 (10.4)
<b>Illegal grazing</b>	64 (67.3)	0	10 (100)	9 (90)	83 (61.5)
<b>Lack of equipment-vehicles, fuel, firearms, visual equipment</b>	44 (46.3)	25 (100)	6 (60)	6 (60)	81 (60.0)
<b>No communication equipment/radios, GPS, telemetry equipment, etc.</b>	30 (31.5)	4 (20)	2 (2)	0	36 (26.7)
<b>Poor monitoring of tourists</b>	8 (8.42)	0	0	0	8 (6.0)
<b>Poor infrastructure, poor road system/limited water and electrical systems</b>	15 (15.7)	1 (5)	1 (1)	0	17 (12.6)
<b>Feel intimidated by authority when enforcing laws and policies</b>	8 (8.4)	0	0	0	8 (6.0)
<b>Ineffective management system-top down decisions, no operational procedures or chain of command, limited skills</b>	14 (14.7)	2 (10)	1 (10)	1 (10)	18 (13.3)
<b>Human/wildlife conflict issues/loss of all wildlife</b>	3 (3.1)	0	0	6 (60)	9 (6.7)
<b>Waste disposal/ littering/environmental pollution</b>	9 (9.4)	0	0	0	9 (6.7)
<b>Political interference-interference by powerful individuals</b>	10 (10.5)	0	8 (80)	0	18 (13.3)
<b>Human population growth</b>	3 (3.1)	0	0	1 (10)	4 (3.0)
<b>Lack of judicial follow through after arrests</b>	0	6 (30)	0	0	6 (4.4)
<b>Lack of rapid response to crisis situations</b>	0	14 (70)	0	0	14 (10.4)
<b>No information centers</b>	0	1 (5)	0	1 (10)	2 (1.5)
<b>Climate Change</b>	4 (4.2)	0	0	0	4 (3.0)
<b>Loss of habitat/severe degradation of habitat</b>	0	0	1 (10)	1 (10)	2 (1.5)
<b>Totals</b>	<b>288</b>	<b>68</b>	<b>43</b>	<b>45</b>	<b>444</b>

\*Percentages relate to the number of responses within each staff group for present critical pressures

\*\*Because some items were collapsed into these primary categories a staff member could respond more than once to a primary category; thus, the number of responses could exceed 100%. Where that was the case we only used a maximum % of 100%

Table 11 presents the four staff groups' perceptions of the greatest challenges facing them over the next five years. The top five issues identified by the Narok sector rangers as the greatest challenges over the next five years were: 1. *Overall staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc.*, 2. *Illegal crazing of cattle in the MMNR*, 3. *Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment*, 4. *Inappropriate tour guide behaviors including off-road driving, harassment of wildlife, ballooning practices, etc.*, and 5. *Poaching and loss of key species in the MMNR*.

For Triangle sector rangers, the five most critical future issues were: 1. Overall staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc., 2. A tie between, Training/capacity building of staff and; Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, and a five-way tie for 4. Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment; Human-Wildlife conflict issues; Lack of judicial follow through after arrests for poaching and other legal infractions; Lack of rapid response to crisis situations; and Private ownership of lands and development of conservancies.

For Narok sector officers, the most critical issues were: 1. Human population growth, and a five-way tie for 2. Poaching and loss of key species in the MMNR; Inappropriate tour guide behaviors including off-road driving, harassment of wildlife, ballooning practices, etc.; Illegal crazing of cattle in the MMNR; and Loss of habitat or severe degradation of habitat.

For Triangle sector officers, the most critical issues for the future were, a four-way tie for 1. Poaching and loss of key species in the MMNR, Illegal crazing of cattle in the MMNR, Human-Wildlife conflict issues, and Loss of habitat or severe degradation of habitat, and a three-way tie for 5. Training/capacity building of staff, No information centers in the MMNR, and the Prolonged drought.

Overall, there was greater diversity of perceptions regarding the future issues or challenges facing the management of the MMNR, but there still was considerable agreement across the four groups as well as considerable consistency with the priority issues in Table 10. The overall top future threats across the four staff groups were: 1. *Overall staff welfare including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc.*, 2. *Illegal crazing of cattle in the MMNR*, 3. *Lack of equipment including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment*, 4. *Poaching and loss of key species in the MMNR*, and 5. *Inappropriate tour guide behaviors including off-road driving, harassment of wildlife, ballooning practices, etc.*

## Building a Sustainable Management System-2017

Table 11. Future Most Critical Threats Summary (N=135)					
	Rangers Narok Sector N= 95	Rangers Triangle Sector N= 20	Officers Narok Sector N= 10	Officers Triangle Sector N= 10	Total N=135
Future Threats	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)
Staff Welfare-all personal supplies and equipment	43(45.2)*	21(100)**	1 (10)	0	65 (48.1)
Training/Capacity Building	3 (3.1)	11 (55)	0	3 (30)	17 (12.6)
Poaching/loss of key species	20 (21)	4 (20)	3 (30)	5 (5)	32 23.7)
Number of Tourists	1 (1.1)	0	0	0	1 (0.7)
Inappropriate guide behaviors/off-road driving/ wildlife harassment	21 (22.1)	2 (10)	3 (30)	1 (10)	27 (20.0)
Unregulated new lodges/camps/lack of cooperation from hoteliers, etc.	9 (9.4)	0	3 (30)	5 (50)	17 (12.6)
Lack of enforcement of policies and regulations/unclear protocols	3 (3.1)	0	0	0	3 (2.2)
Security of Rangers-Borders stations needing better equipment	10 (10.5)	0	1 (10)	0	11 (8.1)
Illegal grazing	37 (38.9)	2 (10)	3 (30)	5 (50)	47 (34.8)
Lack of equipment-vehicles, fuel, firearms, visual equipment	32 (33.6)	11 (55)	0	1 (10)	44 (32.6)
No communication equipment/radios, GPS, telemetry equipment, etc.	14 (14.7)	2 (10)	0	0	16 (11.9)
Poor monitoring of tourists	11 (11.5)	0	0	0	11 (8.1)
Poor infrastructure, poor road system/limited water and electrical systems	14 (14.7)	1 (5)	0	1 (10)	16 (11.9)
Feel intimidated by authority when enforcing laws and policies	6 (6.3)	0	0	0	6 (4.4)
Ineffective management system-top down decisions, no operational procedures or chain of command, limited skills	18 (18.9)	0	0	1 (10)	19 (14.1)
Human/wildlife conflict issues/loss of all wildlife	7 (7.3)	4 (20)	0	5 (50)	16 (11.9)
Waste disposal/littering/ environmental pollution	4 (4.2)	0	0	0	4 (3.0)
Political interference-interference by powerful individuals	6 (6.3)	0	0	0	6 (4.4)
Human population growth	1 (1.1)	1 (5)	4 (40)	2 (20)	8 (6.0)
Lack of judicial follow through after arrests	0	4 (20)	0	0	4 (3.0)
Lack of rapid response to crisis situations	0	4 (20)	1 (10)	0	5 (3.7)
No information centers	0	1 (5)	1 (10)	3 (30)	5 (3.7)
Local communities' welfare	1 (1.1)	0	0	0	1 (0.7)
Loss of funding/donors	1 (1.1)	0	0	0	1 (0.7)
Private ownership/conservancies/fencing	1 (1.1)	4 (20)	1 (10)	0	6 (4.4)
Prolonged drought	1 (1.1)	0	0	3 (30)	4 (3.0)
Diseases	1 (1.1)	0	0	0	1 (0.7)
Climate Change	1 (1.1)	3 (3.1)	0	1 (10)	5 (3.7)
Revenue collection procedures	0	0	1 (10)	0	1 (0.7)
Loss of habitat/severe degradation of habitat	1 (1.1)	0	3 (30)	5 (50)	9 (6.7)
Loss of revenues	1 (1.1)	0	2 (20)	0	3 (2.2)
<b>Totals</b>	173	37	18	27	255

\*Percentages relate to the number of responses within each staff group for future critical threats

\*\*Because some items were collapsed into these primary categories a staff member could respond more than once to a primary category; thus, the number of responses could exceed 100%. Where that was the case we only used a maximum % of 100%

**Assessment of MMNR Management Practices.** The next section presents a summary of the MMNR staffs’ assessment of 11 areas of management practice in the MMNR. These 11 areas have been used extensively in assessing the management of protected areas around the world. Each item was assessed using a four-point scale: Yes (4 points), Maybe Yes (3 points), Maybe No (2 points) and No (1 point). Therefore, scores approximating 2.5 can be considered neutral on these issues while scores above and below 2.5 can be considered positive or negative, respectively, regarding these issues. The first 10 management practice areas had five questions related to each area, while the last management practice area had 10 questions related to its area. It should be noted that the survey instruments used in this project, used the term Mara as the generic term to refer to the MMNR.

These results are presented in graphic form (Figures 2-12) for easier interpretation of the overall findings. All statements related to each of the management practice areas are presented in bar graphs for each of the four staff groups (**Rangers-Narok Sector (RN)**; **Rangers Triangle Sector (RT)**; **Officers-Narok Sector (ON)**; **Officers-Triangle Sector (OT)**). Each staff group is presented using a different color and they are presented in the same sequence in each figure in order that comparisons across the groups can be easily made.

One-way analysis of variance (ANOVA) also was conducted for each management practice area across the four groups to determine any significant differences among the groups. Since each set of management practices contained multiple questions, the Bonferroni’s correction (adjustment) was used to set the alpha level for analysis within each management area. Therefore, the alpha level for those management practice areas with 5 statements was  $p \leq .01$  and for the last management practice area with 10 statements the alpha level was  $p \leq .005$ . Post hoc comparisons were conducted where the overall ANOVA revealed a significant difference. An alpha level of  $p \leq .05$  was used for all post hoc comparisons. The post hoc analysis column reports the direction of significant differences in mean scores between the four staff groups. For the reader who desires more details, table 12-22, which are in Appendix A, display the ANOVA’S for the 11 management practice areas in the MMNR.

Figure 2 presents the five statements related to the existence, clarity and utility of **MMNR Management Objectives**. Generally, the four staff groups were quite positive on these five issues (3.00 or above) except for the Narok sector officers who had the lowest scores on all five statements (2.50 or below) indicating they were neutral to negative on each of these practices. The four staff groups were the most positive on statement 1, *Mara objectives provide for the protection and maintenance of biodiversity* (Overall-3.48), and they were most concerned with statement 5, *Local communities support for overall MMNR objectives* (Overall-2.92). For further details about significant differences among the groups the reader is referred to Table 12 in Appendix A.

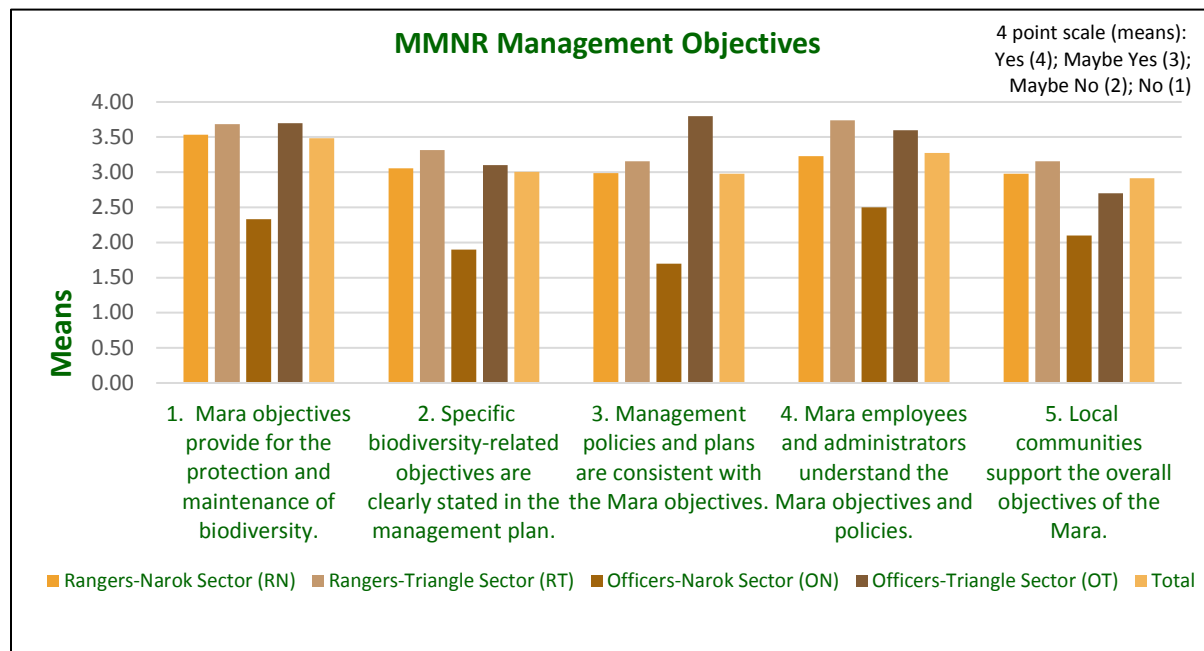


Figure 2. MMNR Management Objectives

Figure 3 presents the results from the second management practice area, **MMNR Legal Security Issues**. Once again, the Narok sector officers were at or below 2.50 on all five statements, and the other three staff groups only achieved positive scores on statement 1, *The Mara has long-term legally binding protection* (RN-3.22; RT-3.45; OT-3.00), and statement 5, *Conflicts with the local community are resolved fairly and effectively* (RN-3.22; RT-3.40; OT-3.60). The four staff groups were least satisfied with the management practices associated with statement 2, *There are no unsettled disputes regarding land tenure or use rights* (Overall-2.52), and 4, *Staff and financial resources are adequate to conduct critical law enforcement activities* (Overall-2.53). Generally, the Triangle sector rangers and officers had more favorable opinions on these issues than did the Narok sector staff. For further details about significant differences among the groups the reader is referred to Table 13 in Appendix A.

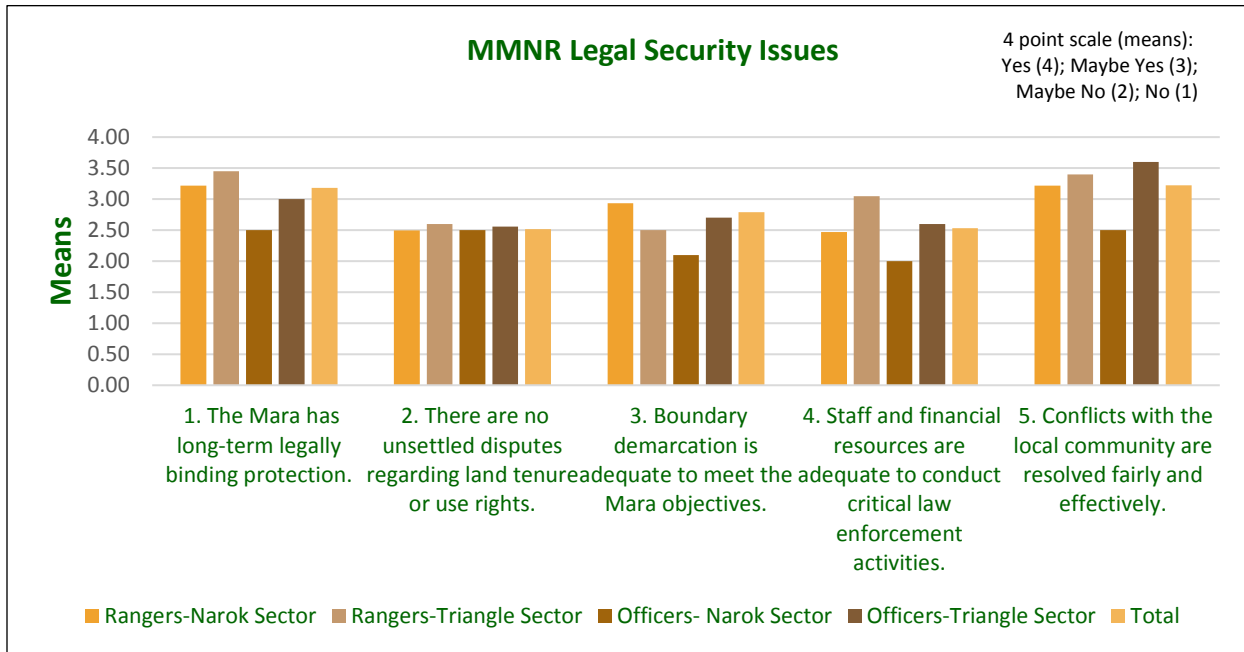


Figure 3. MMNR Legal Security Issues

Figure 4 presents **MMNR Staffing Issues**. Interestingly, the Narok sector officers had both the highest and lowest perceptions on these issues. They were very positive on statement 1, *The level of staffing is sufficient to effectively manage the MMNR* (ON-3.80) but they were least positive regarding statement 4, *Staff performance and progress on targets are periodically reviewed* (ON-1.67). Additionally, the Triangle sector officers were extremely positive on statement 3, *Training and development opportunities are appropriate to the needs of the staff* (OT-3.80). Finally, the three areas where all four groups were least favorable were statements 5, *Staff employment conditions are sufficient to retain high-quality staff* (Overall-2.37); 4, *Staff performance and progress on targets are periodically reviewed* (Overall-2.55); and 2, *Staff members have adequate skills to conduct critical management activities* (Overall-2.72). For further details about significant differences among the groups the reader is referred to Table 14 in Appendix A.



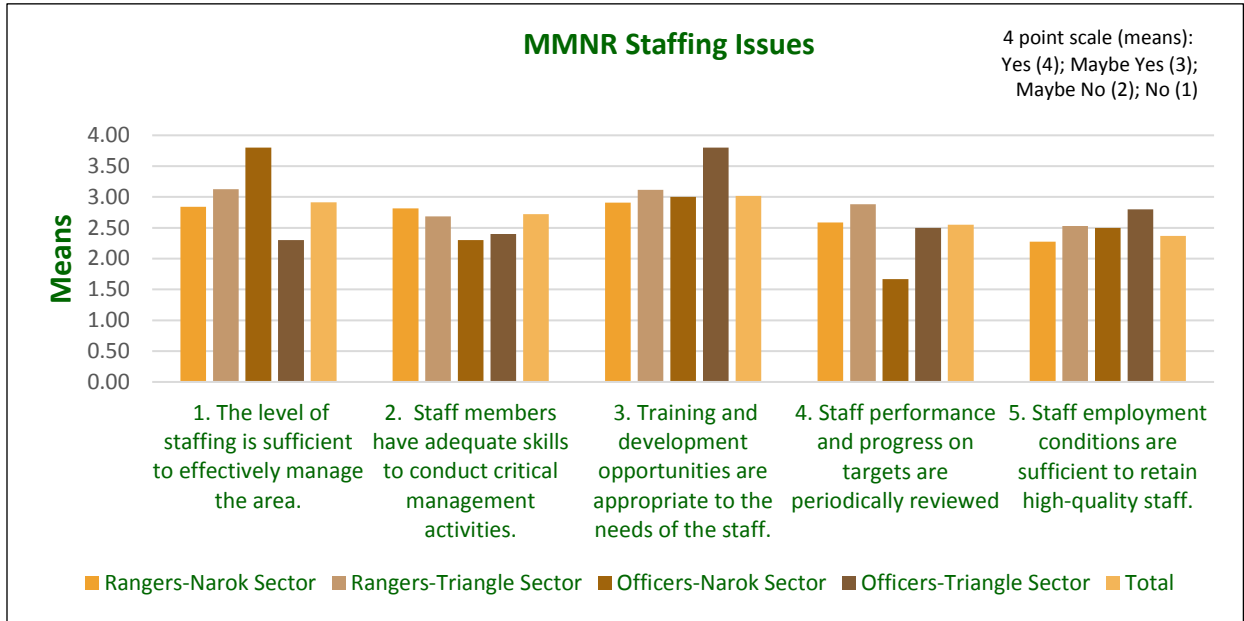


Figure 4. MMNR Staffing Issues

Figure 5 addresses **MMNR Site Design and Planning Issues**. The four staff groups were generally quite positive on these areas of management, again, except for the Narok sector officers. Narok sector officers were quite concerned about statement 2, *The layout and configuration of the Mara optimizes the conservation of biodiversity* (ON-2.00); statement 3, *The Mara zoning system is sufficient to achieve Mara objectives* (ON-2.38); and statement 1, *The siting of the Mara is consistent with the MMNR objectives* (ON-2.50). On the other hand, the other three staff groups were most positive on this later statement (RN-3.47; RT-3.63; OT-3.30). For further details about significant differences among the groups the reader is referred to Table 15 in Appendix A.

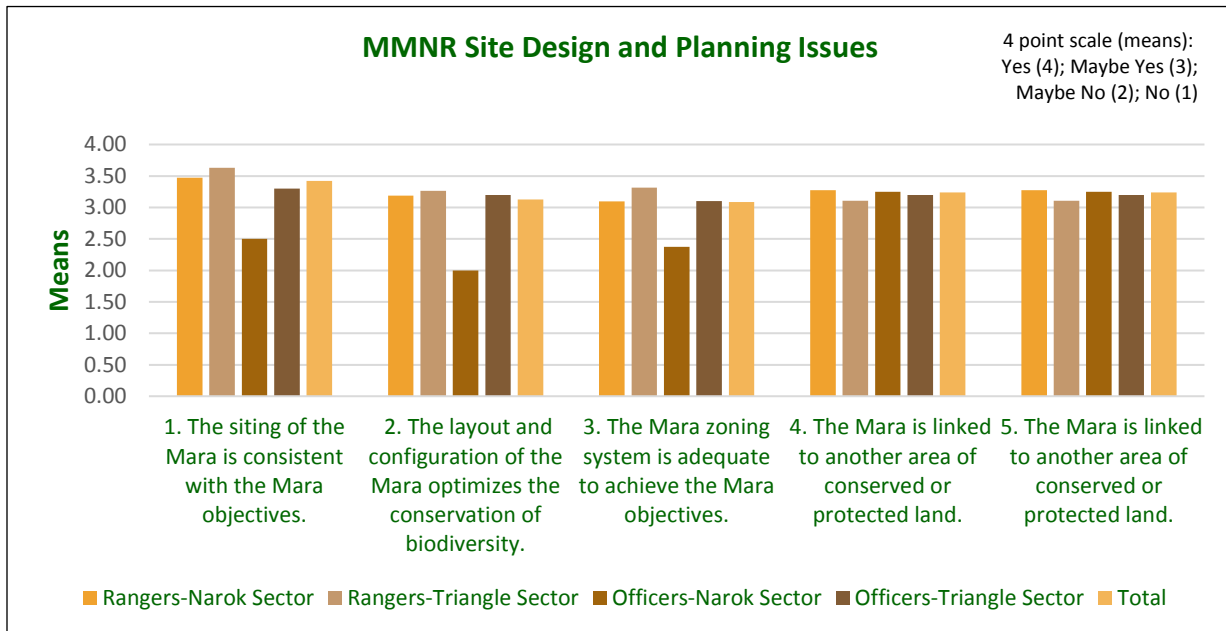


Figure 5. MMNR Site Design and Planning Issues

Figure 6 addresses **MMNR Communication and Information Issues** necessary for successful management of the MMNR. The responses were quite divergent across the four groups, although the perceptions were generally negative on these items compared to the other areas of management in the MMNR. No scores were above 3.25 on any of the five areas addressed and in most cases the scores were below 2.5. The Triangle sector rangers were most positive on all of these issues but their scores were still quite low in comparison to their scores in other management areas. Further, as has been the case, the Narok sector officers were most negative on all of these issues. Their greatest concerns related to statement 1, *There are adequate means of communication between field and office staff* (ON-1.00); statement 4, *There are adequate systems for processing and analyzing data* (ON-1.11); and statement 2, *Existing ecological and socio-economic data are adequate for management planning* (ON-1.33).

Effective communication, and the collecting and analyzing of appropriate information are primary concerns among all staff in the MMNR. For further details about significant differences among the groups the reader is referred to Table 16 in Appendix A.

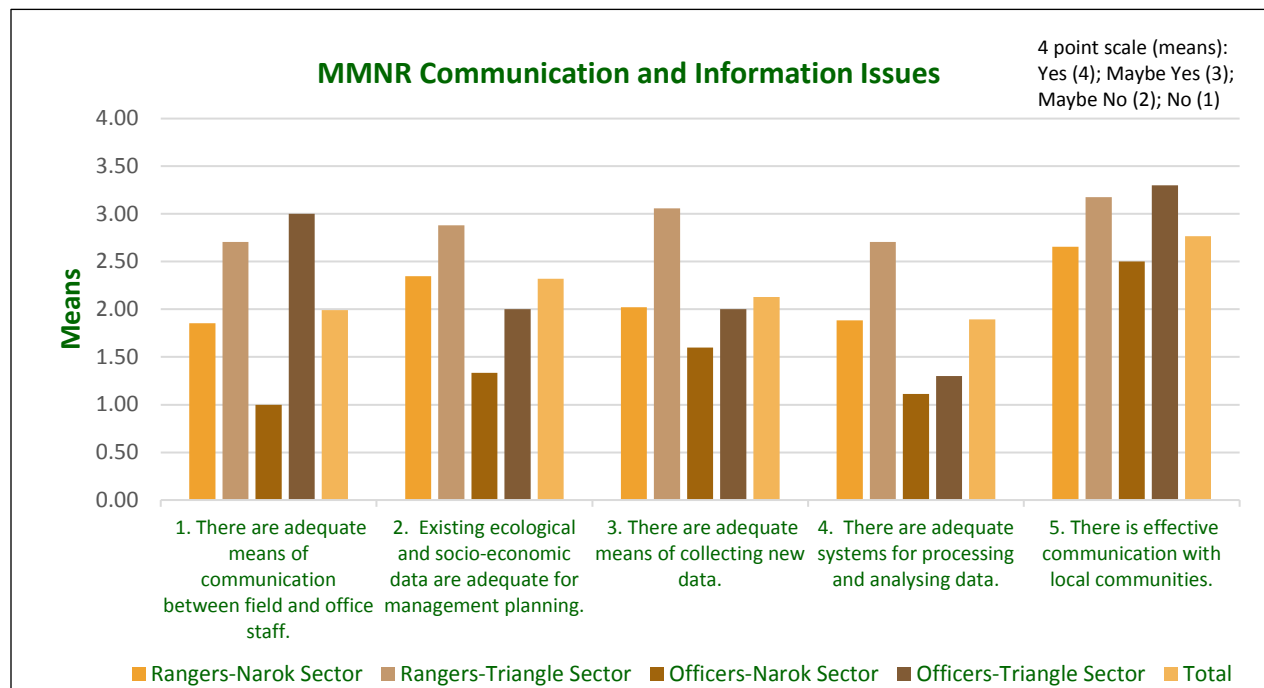


Figure 6. MMNR Communication and Information Issues

Figure 7 identifies key **MMNR Infrastructure Issues** related to the successful management of the MMNR. The scores related to these issues are also quite low across all five areas with the Narok sector staff (rangers and officers) displaying the most negative perceptions. The Narok sector staff had no scores above 2.5 on any of these issues. The lowest scores across all groups related to statement 2, *Field equipment is adequate to perform critical management functions* (Overall-1.79) and statement 3, *Staff facilities are adequate to perform critical management functions* (Overall-1.88). Additionally, statement 1, *Transportation infrastructure is adequate to perform critical management activities* (RN-1.75; ON-1.60) was not viewed as adequate by the Narok sector staff. Only Triangle rangers scored any items above a 3.0 and these related to statement 5, *Visitor facilities being adequate for the level of visitor use* (RT-3.41), and statement 4, *Maintenance and care of equipment is adequate to ensure long-term use* (RT-3.18).

Clearly, overall infrastructure in the MMNR is a critical issue that needs further attention and resources. For further details about significant differences among the groups the reader is referred to Table 17 in Appendix A.

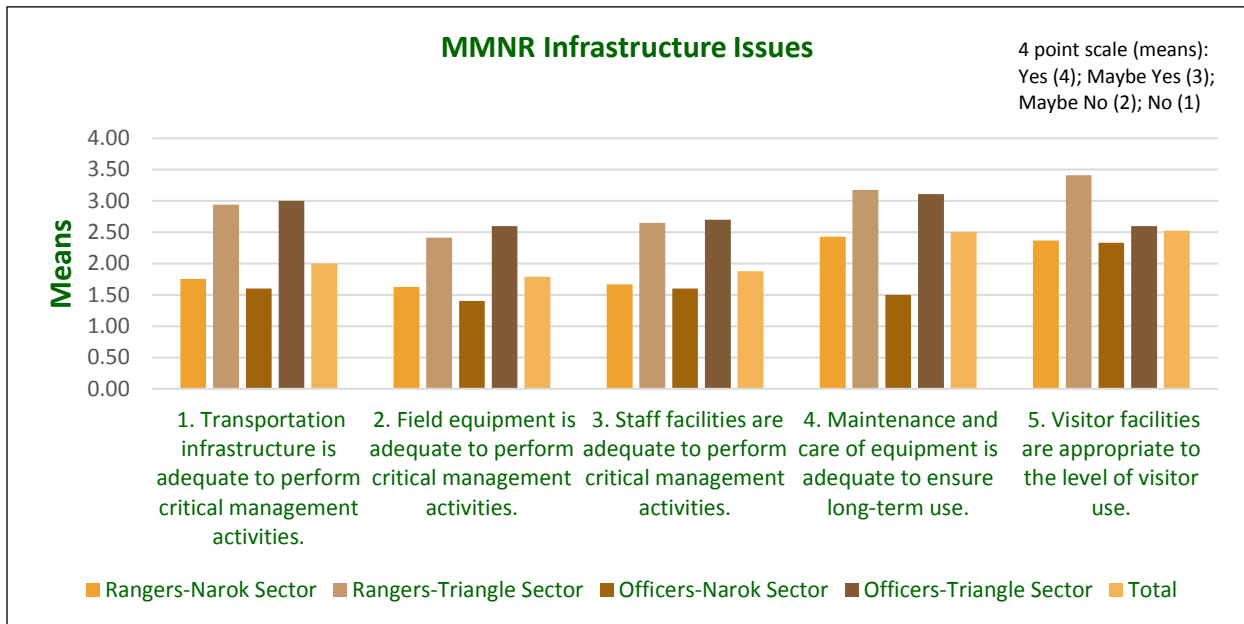


Figure 7. MMNR Infrastructure Issues

Figure 8 addresses **MMNR Financial Issues**. The Triangle sector rangers had the highest scores on these five areas of finance while the Narok sector officers had the lowest scores on these areas. However, most scores for these five issues were at or below 2.5, which reflect several concerns related to the financial management of the MMNR. The two areas that revealed the greatest concern for all four staff groups were statement 1, *Funding in the Mara the past 5 years has been adequate to conduct critical management activities* (Overall-2.10) and, statement 5, *The long-term financial outlook for the Mara is stable* (Overall-2.13). Interestingly, all staff groups except for the Narok sector officers were neutral to slightly positive on statement 3, *Financial management practices enable efficient and effective Mara management* (RN-2.63; RT-3.29; OT-3.10). For further details about significant differences among the groups the reader is referred to Table 18 in Appendix A.

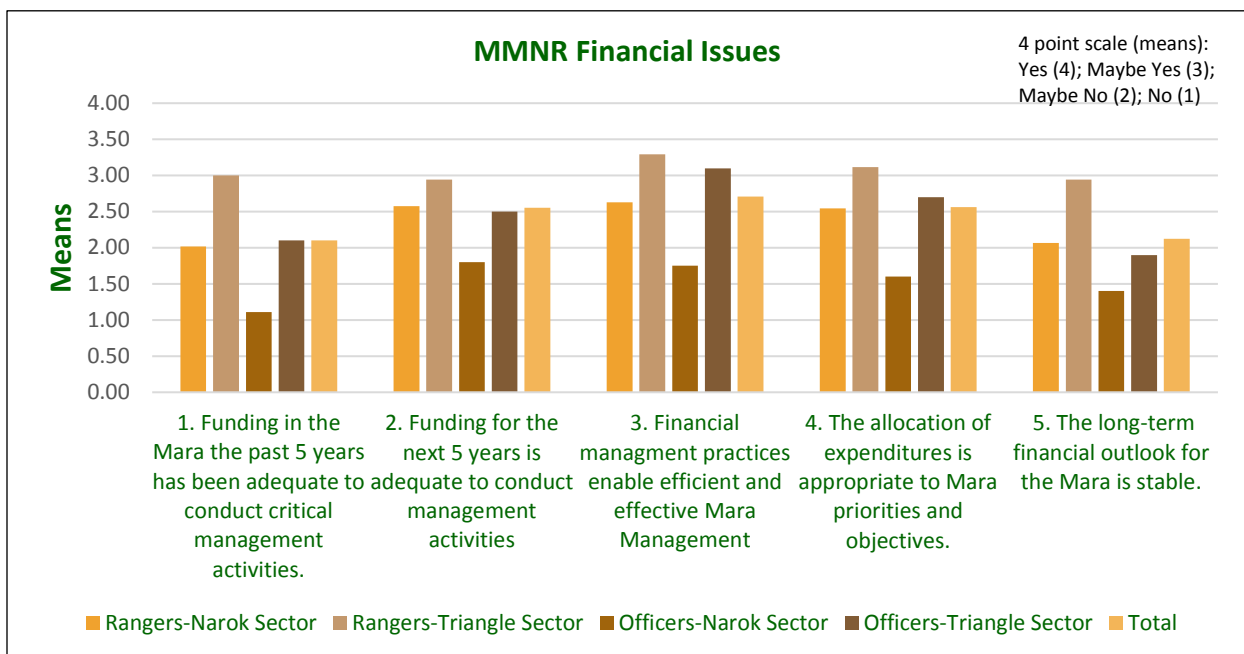


Figure 8. MMNR Financial Issues

Figure 9 addresses MMNR Management Planning Issues related to comprehensive planning as well as yearly and short term work plans. Items also relate to inventorying and monitoring activities being used to develop these plans. Again, the Triangle sector rangers were generally the most positive on these items while the Narok sector officers were, again, clearly the most concerned about these items. Only the Triangle sector officers felt *There was a comprehensive, relatively recent written management plan for the Mara* (statement 1: OT-3.40). All four groups were most concerned about *The lack of analysis and strategy to address threats and pressures in the Mara* (statement 3: Overall-2.49), *The lack of existence of an inventory of natural and culture resources in the Mara* (statement 2: Overall-2.52) and statement 5, *The results of research and monitoring are routinely incorporated into the planning* (Overall-2.54). Finally, the officers in both sectors were particularly concerned about management practices related to statements 2 (ON-1.10; OT-2.20) and 3 (ON-1.30; OT-2.00). For further details about significant differences among the groups the reader is referred to Table 19 in Appendix A.

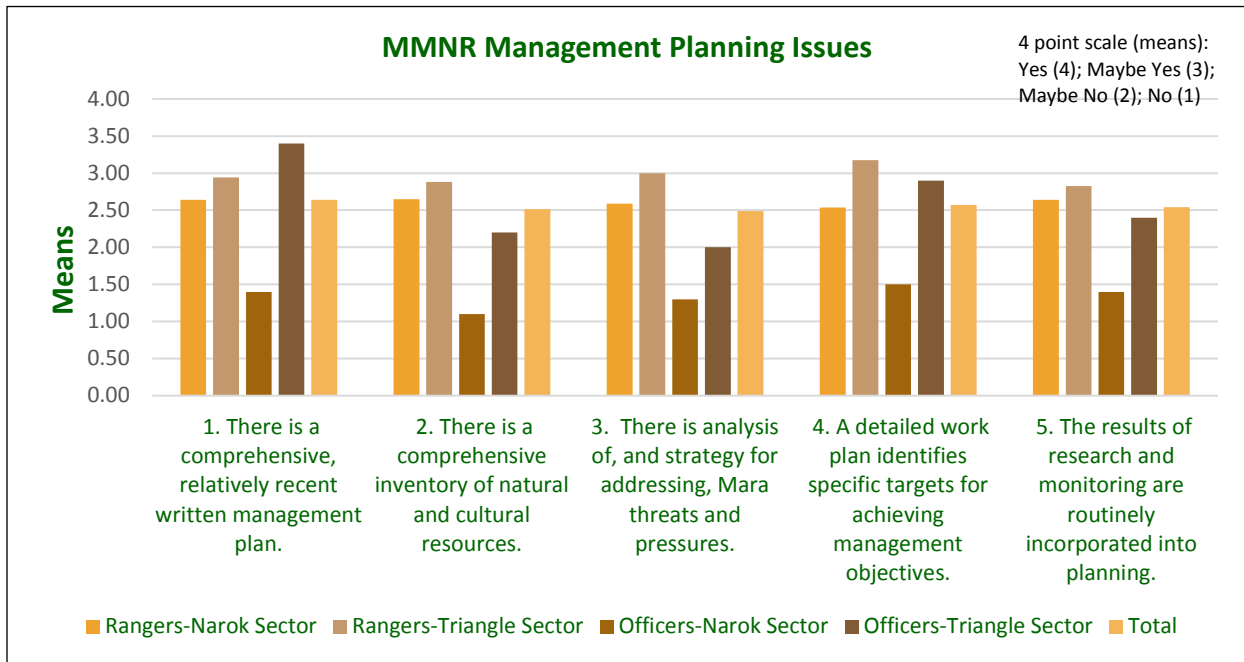
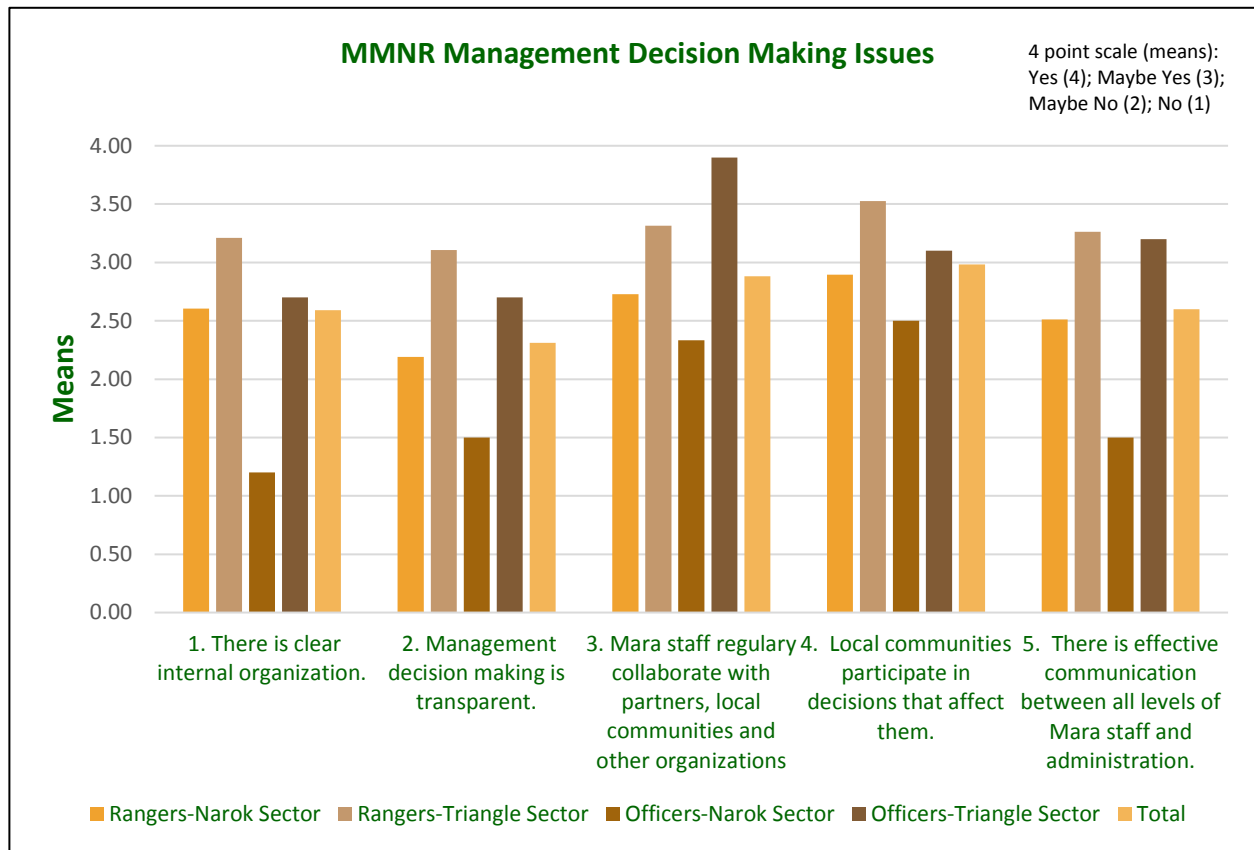


Figure 9. MMNR Management Planning Issues

Figure 10 presents the perceptions of staff regarding **MMNR Management Decision Making Issues**. Triangle sector rangers had positive perceptions on all five of the decision-making processes while the Narok sector officers had a neutral to negative perceptions on these same issues. Overall, the Triangle staff (rangers and officers) were quite positive on *The collaboration with partners, local communities and other organizations in the decision-making process* (statement 3: RT-3.32; OT-3.90) as well as *Local community’s participation in the decisions that affect them* (statement 4: RT-3.53; OT-3.10) and statement 5, *There is effective communication between all levels of Mara staff and administration* (RT-3.26; OT-3.20). The two items with the most negative perceptions among all four groups were the *The transparency of management decision making* (statement 2: Overall-2.31) and, *Lack of a clear internal organization* (statement 1: Overall-2.59). A third item of concern for the Narok sector staff (rangers and officers) was *The lack of effective communication among Mara staff and administration* (statement 5: RN-2.51; ON-1.50). On the other hand, the Triangle sector staff (rangers and officers) felt quickly strongly that *There was effective communication between all levels of Mara staff and administration* (statement 5: RT-3.26; OT-3.20). For further details about significant differences among the groups the reader is referred to Table 20 in Appendix A.



**Figure 10. MMNR Management Decision Making Issues**

Figure 11 presents the practices related to the **MMNR Research, Evaluation, and Monitoring Issues**. The Triangle staff (rangers and officers) and Narok sector rangers were neutral to positive that *research on key ecological issues is consistent with the needs of the Mara* (statement 2: RN-2.95; RT-3.16; OT-3.00), that *the impact of legal and illegal uses of the Mara are accurately monitored and recorded* (statement 1: RN-2.68; RT-3.42; OT-2.90), and *research on key social issues is consistent with the needs of the Mara* (statement 3: RN-2.94; RT-3.17; OT-2.60)). All four groups were neutral to negative on their *access to recent scientific research and advice* (statement 4: Overall-2.24), and *critical research and monitoring needs are identified and prioritized* (statement 5: Overall-2.50). Whereas, the Narok sector officers were again very concerned about all five of these items. For further details about significant differences among the groups the reader is referred to Table 21 in Appendix A.

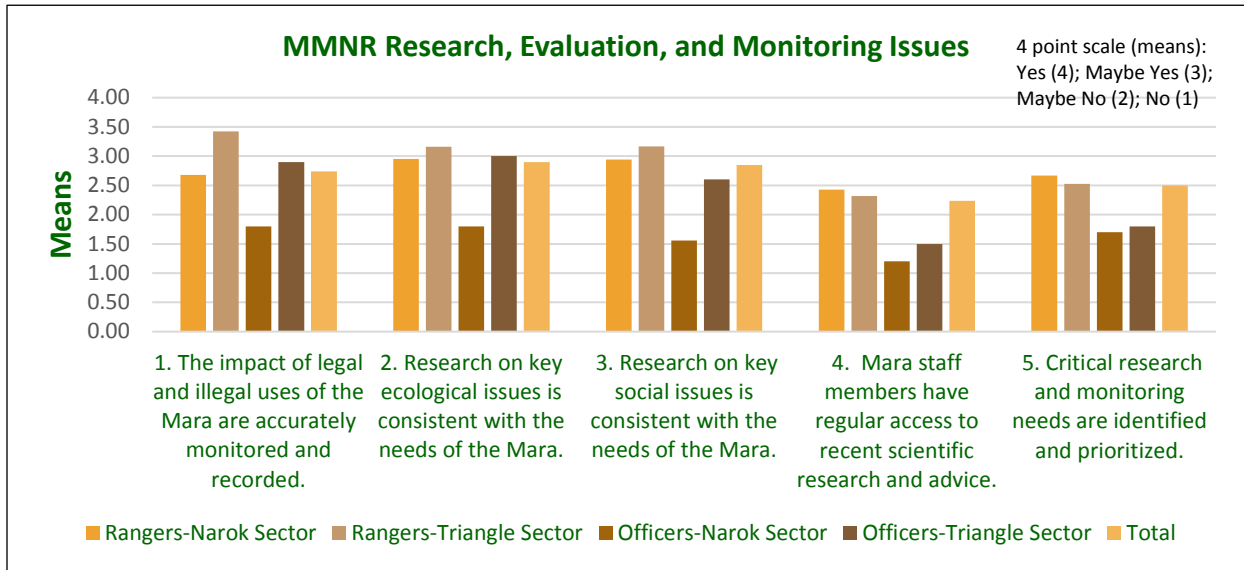


Figure 11. MMNR Research, Evaluation, and Monitoring Issues

All protected areas have a similar set of core management outputs. Figure 12 presents 10 **MMNR Management Outputs**. The Triangle sector rangers were quite positive on nine of the 10 management outputs. The only output for which they were somewhat concerned was *the research and monitoring management function* (statement 10: OT-2.50). The Triangle sector officers were positive on seven of the 10 outputs. However, they did express some concern with the output related to the *research and monitoring management function* (statement 10: OT-1.40), *the site restoration and mitigation function* (statement 2: OT-2.40) and, *the management planning and inventorying function* (statement 7: OT-2.60). On the other hand, the Narok sector rangers were only positive on two of the 10 outputs. They felt the *Visitor and tourist management function* was being successfully performed (statement 5: RN-3.27), and they felt the *Wildlife and habitat management function* (statement 3: RN-3.06) was also being performed satisfactorily. Finally, the Narok sector officers did not feel the output for any of the management functions was satisfactory. For further details about significant differences among the groups, the reader is referred to Table 22 in Appendix A.

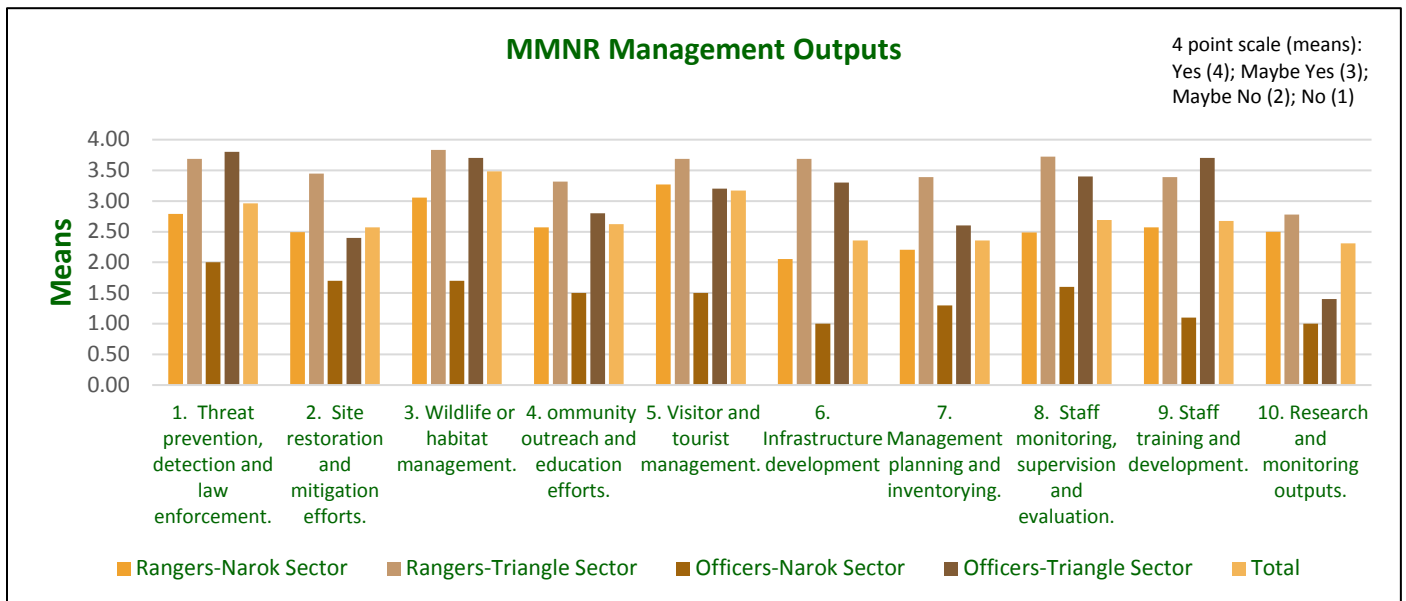


Figure 12. MMNR Management Outputs

**Results from Four Community Areas Surveys**

**Data Analyses.** In this section of the report, frequency distributions and descriptive statistics are reported in aggregate for all variables. The mean (average) for each question or statement is reported because it represents an attitude, or particular skill or action that is relevant to further development in the MMNR. Again, for clarity of the results, this information is presented in graphic format using bar graphs.

Additionally, to better understand differences between communities, one-way analysis of variance (ANOVA) was conducted on all relevant variables. Also, Bonferroni correction (adjustment) was used to control for family wise error level within each set of questions or statements related to one content area. Thus, the critical p-value will vary based upon the number of questions or statements associated with each content area. Post hoc comparisons also were conducted among the four community areas. These ANOVA tables (Tables 23-33) are presented in Appendix C.

**Description of Community Participants.** Table 34 presents a summary of the demographic characteristics of the two hundred and seventy-seven respondents (277) across the four community areas. 59.1% of respondents were male and 40.9% were female. The respondents' ages ranges from 18 to 75+ and the mean age was 37.56 years. The households surveyed included an average of 4.34 adults and 4.52 children. The mean number of years respondents had lived in their community was 28.31 and the mean number of years respondents had attended school was 5.99.

Of the 277 community members surveyed, 56 (20.2%) of respondents were from the Aitong community area, 60 (21.7%) of respondents were from the Talek community area, 80 (28.9%) were from the Sekenani community area, and 81 (29.2%) were from the Loita community area (see Table 35). The oldest group of respondents was from Aitong (44.0 years) and the largest percentage of male respondents was in Loita (63.9%). Loita respondents also had the most education (6.92 years) while the Sekenani respondents had the largest households (5.72 adults; 5.88 children).

Table 34. Summary of the Demographics (N= 277)				
Demographic	Frequencies (%)		Mean	Standard Deviation
Age			37.56	12.69
Gender (n=257)	Male	Female		
	152 (59.1)	105 (40.9)		
Years in Community			28.31	15.49
Education (years attended school)			5.99	6.72
How many adults (over 18) also live in household			4.34	3.52
How many children (under 18) also live in household			4.52	3.62

Table 35. Summary of the Demographics by Community (N=277)				
Demographic	Aitong Mean (SD*) N=56	Talek Mean (SD) N=60	Sekenani Mean (SD) N=80	Loita Mean (SD) N=81
Age	44.00 (14.79)	37.32 (10.30)	35.58 (12.56)	37.44 (12.86)
Years in Community	12.21 (8.26)	29.29 (17.15)	27.14 (11.66)	35.18 (14.20)
% Male	62.50	51.70	58.80	63.90
Education (years attended school)	4.25 (6.11)	4.89 (6.15)	6.31 (6.33)	6.92 (7.52)
How many adults (over 18) also live in household	3.85 (1.74)	3.55 (2.00)	5.72 (4.93)	3.87 (2.42)
How many children (under 18) also live in household	5.00 (2.96)	4.20 (3.54)	5.88 (4.71)	3.36 (2.20)

\*SD=Standard Deviation

**Opinions Regarding MMNR Management.** Community opinions regarding MMNR were assessed using a scale of 1 (strongly disagree) to 5 (strongly agree) (Figure 13). On three of the five questions, all 4 community areas responded higher than the midpoint (3) indicating agreement with the following statements 1, *MMNR effectively protects wildlife populations* (Overall-4.01), 2, *MMNR contributes to jobs and well-being in my community* (Overall-3.74), and 3, *The MMNR should be protected from people in general* (Overall-3.78). However, there generally was disagreement with the following two statements that the *MMNR is well managed* (statement 4: Overall-2.72) and *MMNR managers ask for opinions of local people when making decisions* (statement 5: Overall-2.30). For further details about significant differences among the communities the reader is referred to Table 23 in Appendix C.

Respondents were also asked, *Which idea do you support regarding the MMNR?* One hundred and forty-nine (149) respondents answered *Retain it as it*, 57 responded *Make it bigger*, 19 responded *Make it smaller* and 16 responded *Get rid of it* (Figure 14). For further details about significant differences among the communities the reader is referred to Table 24 in Appendix C.

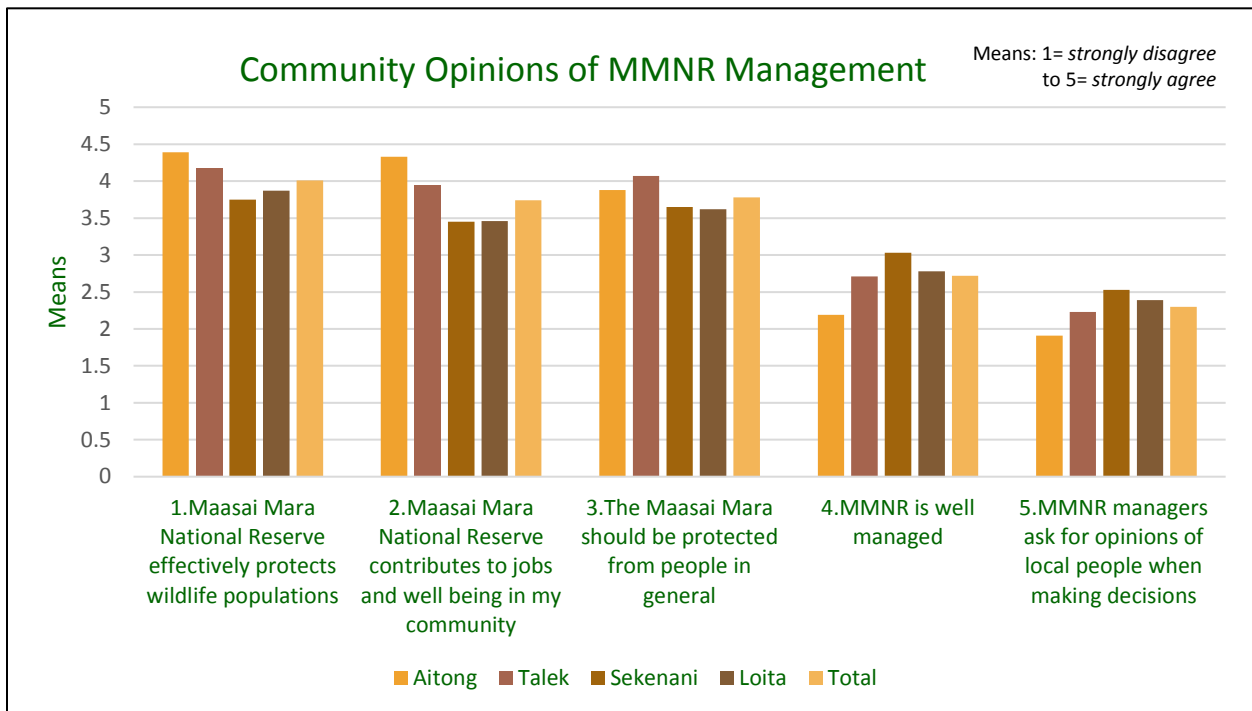


Figure 13. Community Opinions regarding Management of MMNR.



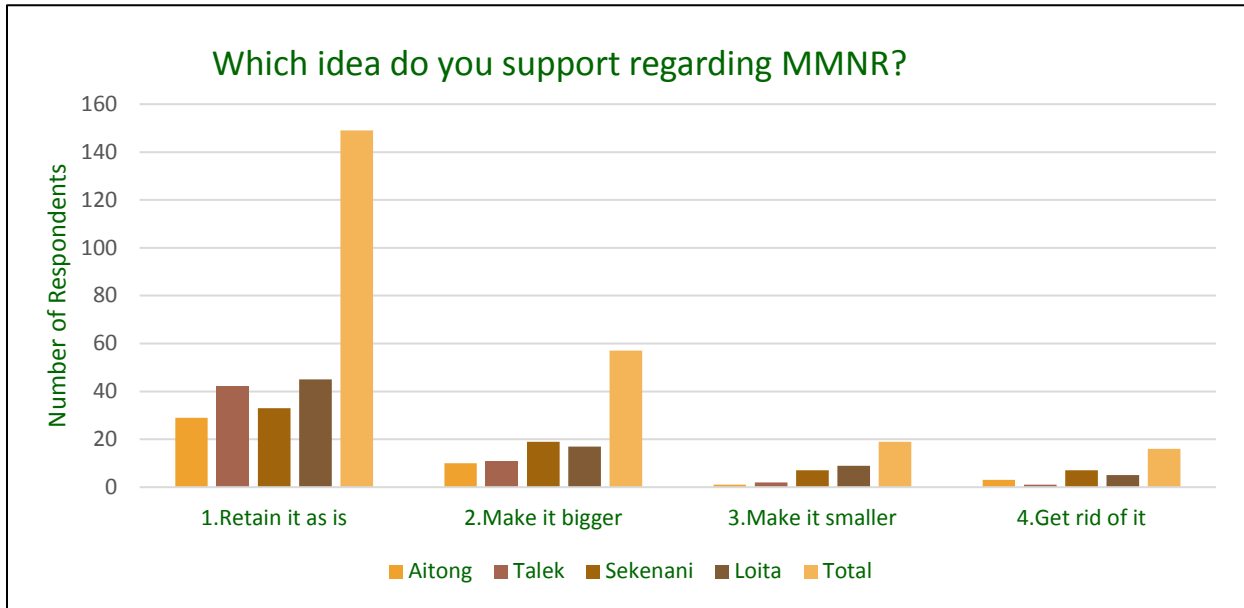


Figure 14. Community Support for MMNR.

**General Concerns about Wildlife.** General community concerns about wildlife were assessed using a scale of 1 (not concerned at all) to 5 (extremely concerned) (Figure 15). Overall, highest concern was shown in response to the statements 5, *Injuring or killing people* (Overall-3.97) and 2, *Injuring or killing livestock* (Overall-3.82). Highest concern was noted in the Aitong community area for statement 5, *Injuring or killing people* (4.26) and in the Talek community area for statement 2, *Injuring or killing livestock* (4.05). *Damaging or destroying crops* (statement 1) was much more of a concern in the Loita community area (3.53) than in any of the other three areas. Areas of least concern overall were *Damaging or destroying crops* and *Competing with people for resources* (statement 1: Overall-2.51). For further details about significant differences among the communities the reader is referred to Table 25 in Appendix C.

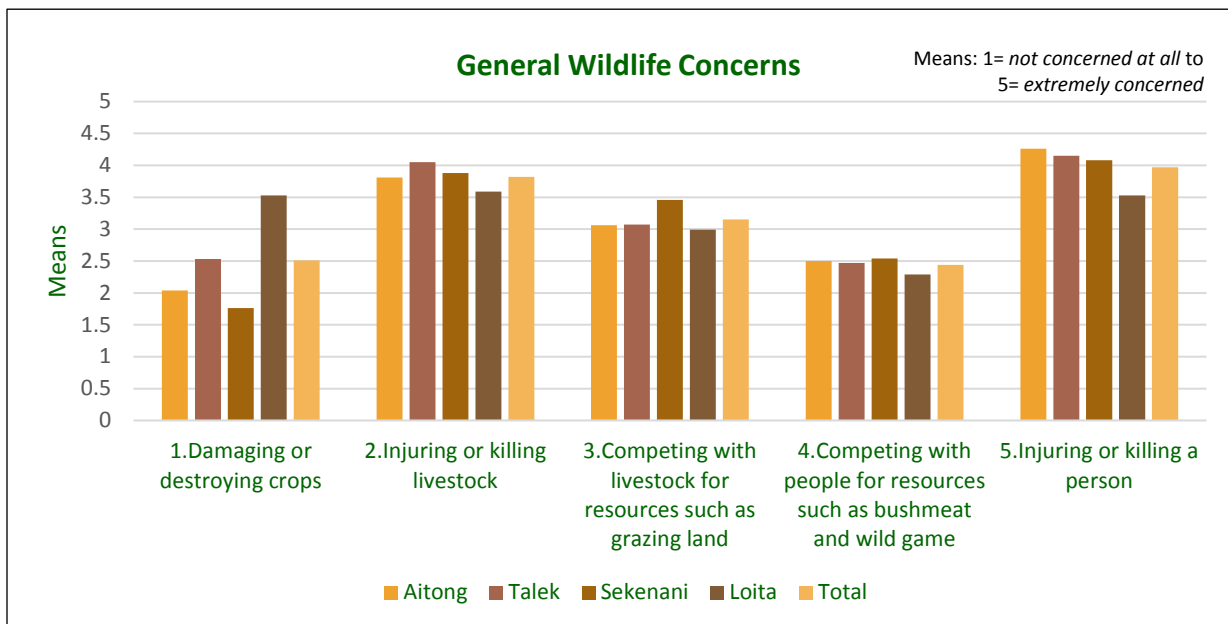
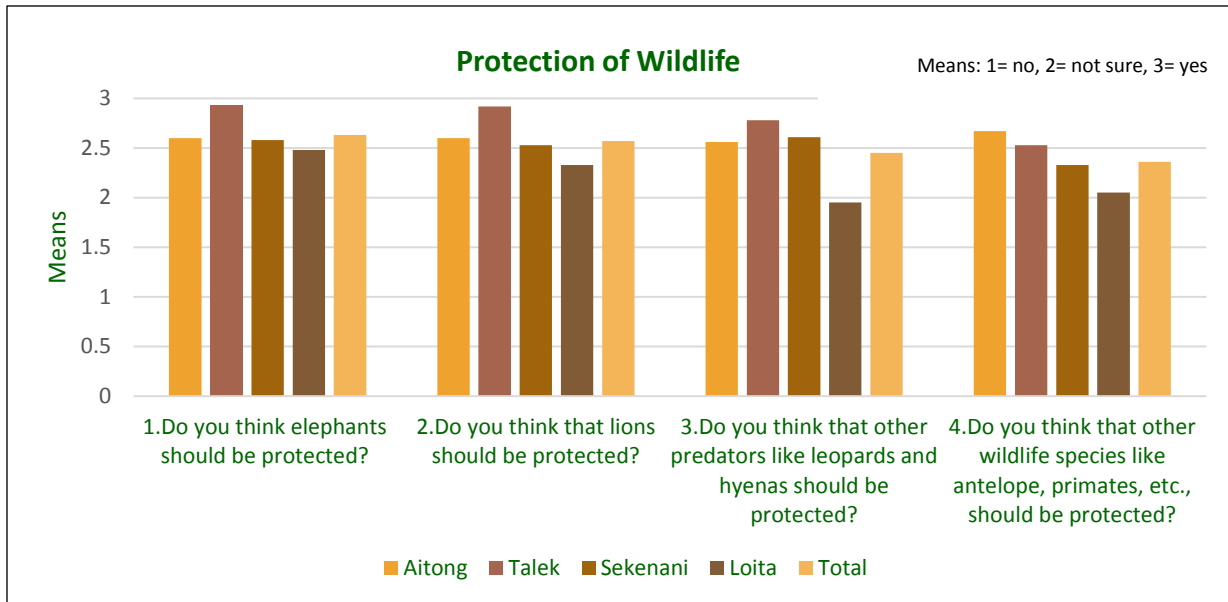


Figure 15. General Wildlife Concerns of Community Members around MMNR.

**Opinions on Protection of Wildlife.** Opinions on protection of wildlife were assessed using a scale of 1 (no), 2 (not sure), and 3 (yes) (Figure 16). All total community responses showed agreement that *elephants, lions, other predators like leopards and hyenas, and Other wildlife species like antelope and primates* should be protected (all > 2). In the Loita community area, slight disagreement was demonstrated (1.95) to the question 3, *Do you think other predators like leopards and hyenas should be protected*. Scores to all 4 questions were lowest in the Loita community area. For further details about significant differences among the communities the reader is referred to Table 26 in Appendix C.



**Figure 16. Community Opinions regarding Protection of Wildlife Species.**

**Opinions Regarding Amount of Wildlife.** Opinions regarding the amount of wildlife in community areas were assessed using a scale of 1 (too few), 2 (just right), or 3 (too many) (Figure 17). In the Aitong and Loita community areas, respondents thought there were *too few elephants* (Aitong = 1.73, Loita = 1.71) and *lions* (Aitong = 1.60, Loita = 1.46). Respondents in Sekenani also agreed that there were *too few lions* (1.75) however they responded that there were slightly *too many elephants* (2.07). Respondents in the Talek community area also thought there were *too many elephants* (2.31) and *lions* (2.07). All four community areas responded that there were *too many other wildlife* and Loita area also felt that there were *too many other predators*. For further details about significant differences among the communities the reader is referred to Table 27 in Appendix C.

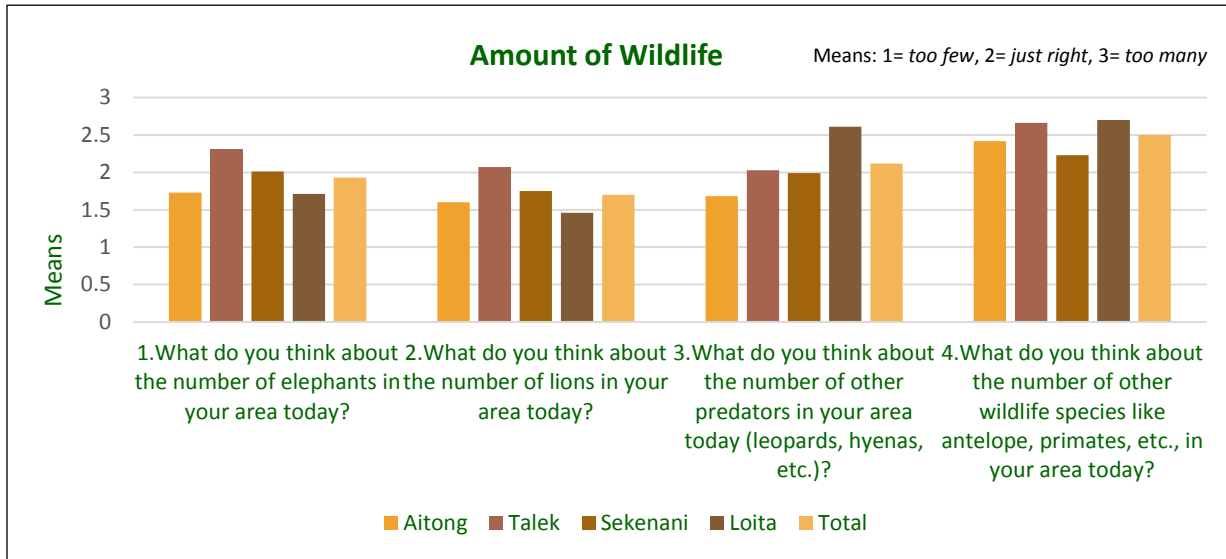
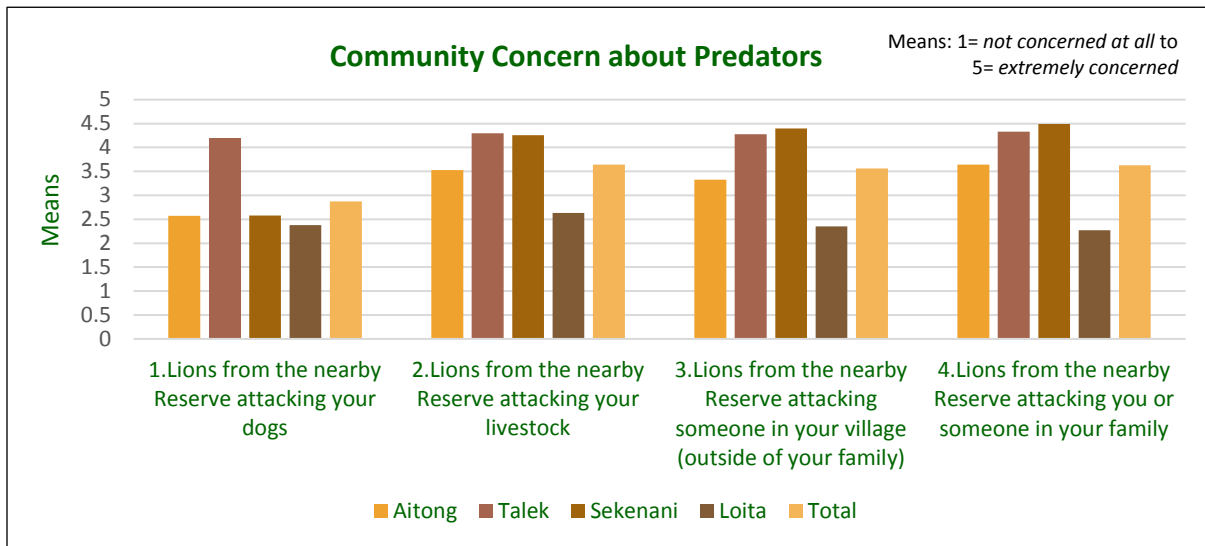


Figure 17. Community Opinions regarding Amount of Wildlife Species.

**Concerns about Predators.** Community concerns about predators were assessed using a scale of 1 (not concerned at all) to 5 (extremely concerned) (Figure 18). Concerns in the Loita community area were all notably lower than in most of the other community areas (less than 3 for all items). Highest concern was demonstrated in the Sekenani community area in response to the statements 4, *Lions from the nearby reserve attacking you or someone in your family* (4.49) and 3, *Lions from the nearby reserve attacking someone in your village (outside of your family)* (4.40). Concern in the Talek community area was high for all items (>4). For further details about significant differences among the communities the reader is



referred to Table 28 in Appendix C.

Figure 18. Community Concern about Lions from MMNR.

**Opinions regarding Poaching.** Community opinions regarding poaching were assessed on a scale of 1 (strongly disagree) to 5 (strongly agree) (Figure 19). Community responses were close to neutral (2.96 total) in response to the statement 1, *Poaching wildlife is a problem in my community* except for the Aitong area (3.60). Communities all disagreed with the statement 2, *There are people in my community that poach wildlife*, though at different levels (Aitong = 1.27, Talek = 1.42, Sekenani = 2.26, Loita = 2.72). Similarly, communities showed varying levels of disagreement towards the statements 3, *There are people in my community that assist in poaching efforts* (Aitong = 1.51, Talek = 1.43, Sekenani = 2.31,

Loita = 2.85) and 4, *Poachers often pass through my community* (Aitong = 1.24, Talek = 1.48, Sekenani = 2.38, Loita = 2.46). Communities all demonstrated some level of agreement or neutrality towards the statement 5, *People caught poaching animals should be punished* (Aitong = 4.62, Talek = 4.65, Sekenani = 3.75, Loita = 3.01). For further details about significant differences among the communities the reader is referred to Table 29 in Appendix C.

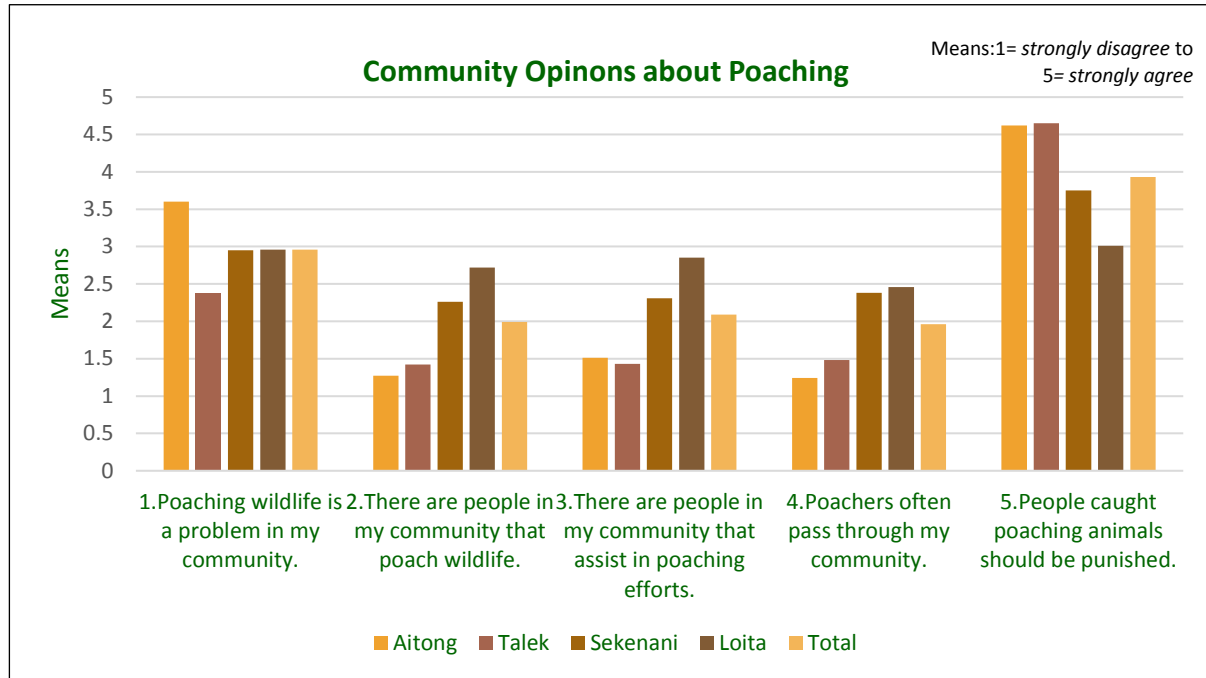


Figure 19. Community Opinions about Issues related to Poaching wildlife.

**Policy Environment.** Community perceptions of policy environment were assessed using a scale of 1 (strongly disagree) to 5 (strongly agree) (Figure 20). Disagreement was demonstrated in all four community areas in response to the statements 2, *I am aware of policies designed to compensate for livestock losses* (Aitong = 2.73, Talek = 2.81, Sekenani = 2.96, Loita = 2.87), 3, *I have benefited from policies designed to compensate for livestock losses* (Aitong = 2.18, Talek = 1.68, Sekenani = 2.44, Loita = 2.13), 5, *I think the rules and regulations related to wildlife management in my area are fair to local residents* (Aitong = 2.64, Talek = 2.64, Sekenani = 2.78, Loita = 2.97). All community areas agreed with the statement 6, *I think the rules and regulations related to wildlife management in my area help protect wildlife* (Aitong = 3.98, Talek = 4.36, Sekenani = 3.43, Loita = 3.48). For further details about significant differences among the communities the reader is referred to Table 30 in Appendix C.

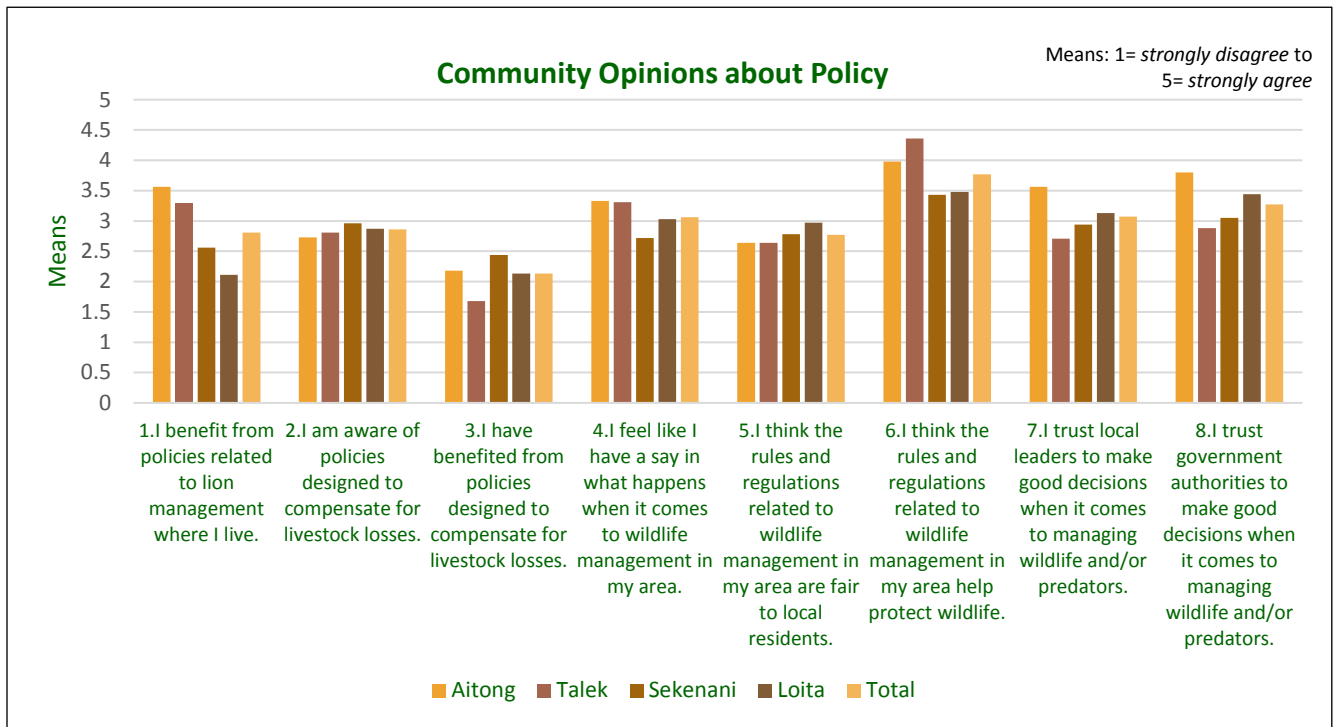


Figure 20. Community Opinions about the Policy Environment.

**Environmental Resilience.** Environmental resilience was assessed on a scale of 1 (strongly disagree) to 5 (strongly agree) (Figure 21). For community totals, agreement was demonstrated in response to the statements 1, *The quality of air in my community is good* (Overall: 4.03), and 3, *The natural environment in my community is healthy* (Overall: 3.28). Disagreement was demonstrated for the statements 2, *The rivers in my community are clean* (Overall: 2.97), and 4, *I have reliable access to safe drinking water* (Overall: 2.80). In response to statement 5 addressing *forage available for cattle*, Aitong (2.44), Talek (1.55) and Sekenani (2.63) community areas all disagreed with the statement; however, respondents in the Loita community area showed agreement (3.61). The Loita community was also the only community to respond slightly above the midpoint (3) to statement 4 addressing *access to safe drinking water*. These responses demonstrate that environmental resilience may be slightly higher in the Loita community than in the other study areas. For further details about significant differences among the communities the reader is referred to Table 31 in Appendix C.

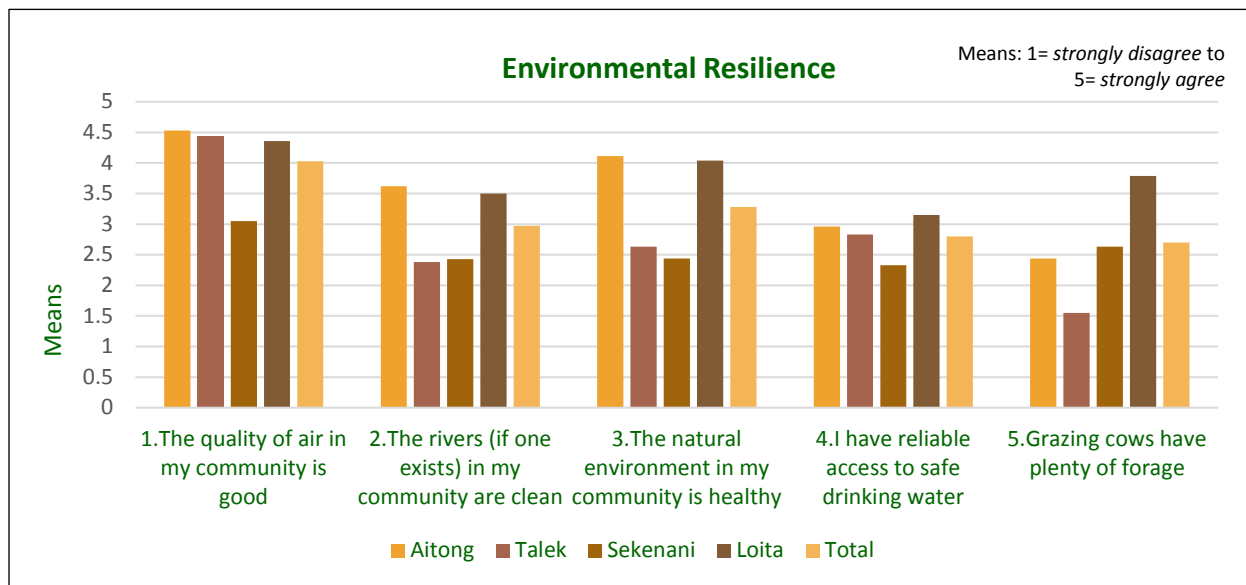


Figure 21. Environmental Resilience around MMNR.

**Governance within Communities.** Governance within communities was assessed on a scale of 1 (strongly disagree) to 5 (strongly agree) (Figure 22). The lowest level of agreement in the governance category was demonstrated in the Talek community area in response to the statements 3, *Locals have control over how the community uses its resources* (1.9) and 1, *Local community leaders learn from their mistakes* (1.9). This second statement was also the lowest agreement for the total community scores (Overall: 2.44). High agreement was demonstrated in the Sekenani community (3.74) in response to the statement 6, *Local people do not have to wait on national leaders to make community decisions*. This statement also generated the highest agreement in the other three communities. High agreement was also demonstrated by the Aitong community area in response to statement 7, *The community leaders have as much power as the national leaders* (3.77). The other three community areas did not agree with this statement (scores < 3). For further details about significant differences among the communities the reader is referred to Table 32 in Appendix C.

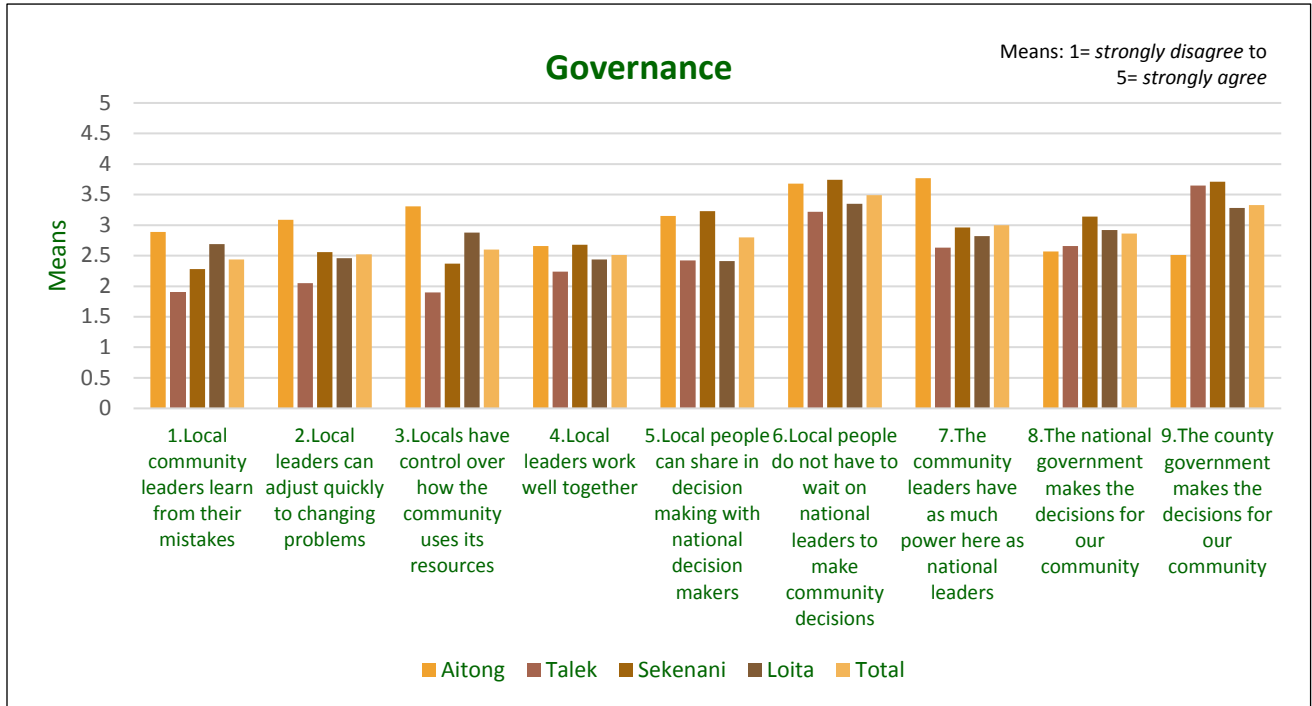


Figure 22. Community Opinions related to Governance in Areas around MMNR.

**Attitudes towards Tourism.** Attitudes towards tourism were assessed on a scale of 1 (strongly disagree) to 5 (strongly agree) (Figure 23). Scores ranged from a low of 2.21 to a high of 4.27 among communities. Strongest overall agreement was shown towards the statements 2, *Tourism is good for my community* (Overall: 4.01) and 7, *Tourism provides jobs for local people* (Overall: 4.01). The lowest responses for all communities was related to the statement 5, *I rely on tourism for my livelihood* (Overall: 2.21). For further details about significant differences among the communities the reader is referred to Table 33 in Appendix C.

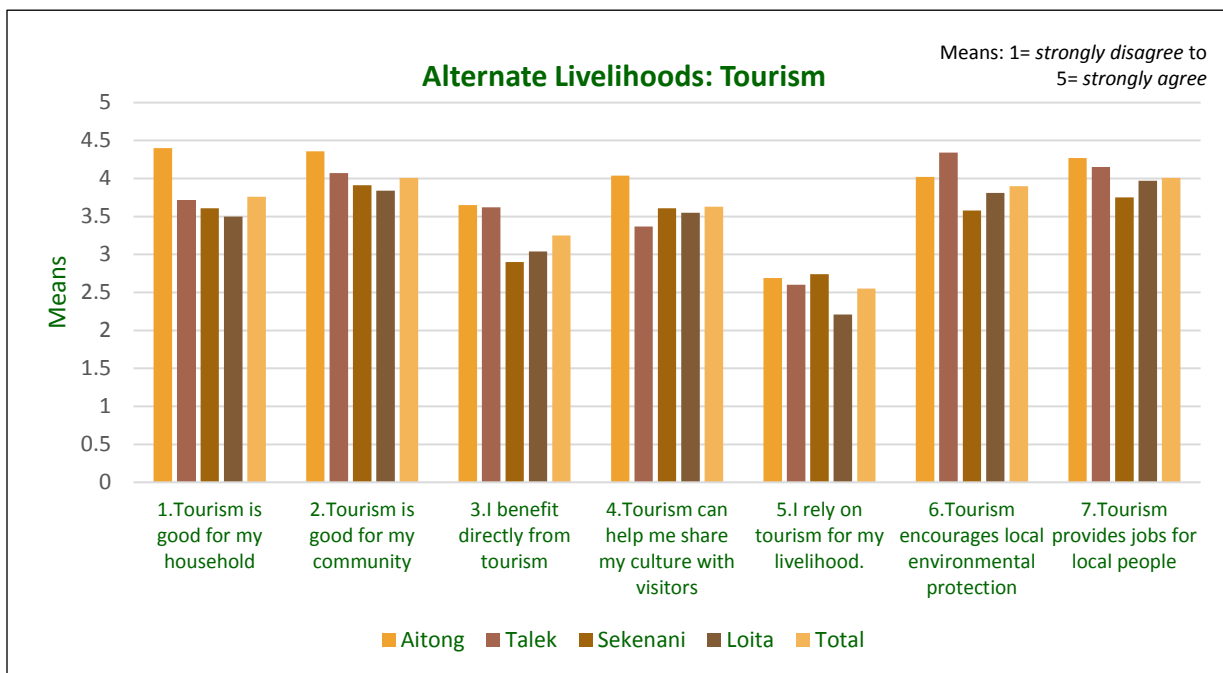


Figure 23. Community Attitudes towards Tourism as an Alternate Livelihood Option.

**Opinions on Importance of Tourism Skills and their Preparedness to Implement Skills.** Importance of tourism skills was assessed on a scale of 1 (not important at all) to 4 (very important) (Table 36). Preparedness was assessed on a scale of 1 (not at all prepared) to 4 (very prepared) (Table 37). In Table 38, the mean weighted discrepancy scores are reported for each competency item. This mean weighted discrepancy score (MWDS) was computed for each individual utilizing the formula (Preparedness – Importance)\* Importance Grand Mean) (Robinson & Garton, 2008; Edwards & Briers, 1999; Bullard et. al, 2013). Subsequently, a MWDS was computed and reported. This mean weighted discrepancy score is used to identify training needs and measures the “gap” between importance and preparedness while also taking into account the overall importance of a competency as reported by the total number of respondents. The MWDS is therefore weighted by the overall importance assigned to a competency and is considered more robust than simply using the mean difference between importance and preparedness.

Based on these scores, respondents are somewhat well prepared for tourism skills. Respondents will need the most training in *Driving tourists in and around the reserve, English language skills, and Tracking wildlife*. Respondents will require the least amount of training in *Explaining my culture and Advertising and marketing skills*.

<b>Table 36. Importance of Tourism Skills in Communities around MMNR (N=277)</b>				
	<b>Aitong</b>	<b>Talek</b>	<b>Sekenani</b>	<b>Loita</b>
<b>Tourism Skills (Importance)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>
English communication skills	3.58 (0.70)	3.63 (0.64)	3.28 (0.66)	3.44 (0.55)
Understanding how to service foreign visitors to meet their expectations	3.54 (0.74)	3.44 (0.95)	3.39 (0.63)	3.32 (0.67)
Guiding safari trips	3.49 (0.87)	3.48 (0.97)	3.26 (0.63)	3.32 (0.63)
Driving tourists in/around the reserve	3.36 (0.96)	3.79 (0.61)	3.25 (0.72)	3.25 (0.72)
Explaining how local products are made	3.40 (0.81)	2.97 (1.21)	3.08(0.69)	3.17 (0.75)
Explaining my culture	3.26 (0.99)	3.28 (1.01)	3.16 (0.76)	3.37 (0.76)
Tracking wildlife to provide viewing opportunities for tourists	3.38 (0.96)	3.52 (0.80)	2.89 (0.93)	3.28 (0.59)
Computer and internet skills	3.57 (0.59)	3.19 (1.11)	3.28 (0.62)	3.47 (0.60)
Social media skills	3.50 (0.84)	3.20 (1.09)	3.14 (0.71)	3.38 (0.62)
Advertising and marketing skills	2.92 (1.23)	3.23 (0.98)	3.20 (0.74)	3.20 (0.67)

<b>Table 37 Preparedness to use Tourism Skills in Communities around MMNR (N=277)</b>				
	<b>Aitong</b>	<b>Talek</b>	<b>Sekenani</b>	<b>Loita</b>
<b>Tourism Skills (Preparedness)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>
English communication skills	3.14 (1.05)	2.54 (1.01)	2.81 (0.84)	2.61 (0.99)
Understanding how to service foreign visitors to meet their expectations	3.16 (1.10)	2.55 (1.00)	2.78 (0.91)	2.65 (0.94)
Guiding safari trips	3.28 (0.93)	2.79 (1.12)	2.75 (0.85)	2.62 (0.98)
Driving tourists in/around the reserve	2.89 (1.24)	2.73 (1.06)	2.75 (0.91)	2.29 (1.01)
Explaining how local products are made	3.11 (1.13)	2.35 (1.08)	2.55 (0.79)	2.24 (1.04)
Explaining my culture	3.24 (0.97)	2.73 (1.24)	2.87 (0.90)	3.07 (1.03)
Tracking wildlife to provide viewing opportunities for tourists	3.20 (1.11)	2.64 (1.07)	2.56 (0.97)	2.49 (1.08)
Computer and internet skills	3.13 (1.04)	2.42 (1.10)	2.78 (0.86)	2.43 (1.01)
Social media skills	3.27 (1.03)	2.51 (1.09)	2.71 (0.91)	2.61 (1.18)
Advertising and marketing skills	2.68 (1.35)	2.41 (1.03)	2.77 (0.89)	2.61 (1.12)



Table 38. Mean Weighted Discrepancy Scores for all Competencies (N=277)			
Competencies	Total Mean Importance (SD)	Total Mean Preparation (SD)	Mean Weighted Discrepancy Score (SD)
English communication skills	3.46 (0.65)	2.75 (0.97)	-2.46 (3.22)
Understanding how to service foreign visitors to meet their expectations	3.14 (0.74)	2.75 (0.99)	-2.26 (3.37)
Guiding safari trips	3.37 (0.77)	2.81 (0.99)	-1.91 (3.30)
Driving tourists in/around the reserve	3.39 (0.78)	2.64 (1.05)	-2.55 (3.45)
Explaining how local products are made	3.14 (0.88)	2.50 (1.02)	-2.10 (3.17)
Explaining my culture	3.26 (0.87)	2.95 (1.04)	-1.11 (2.90)
Tracking wildlife to provide viewing opportunities for tourists	3.23 (0.85)	2.66 (1.07)	-2.36 (3.40)
Computer and internet skills	3.36 (0.76)	2.65 (1.04)	-1.79 (3.16)
Social media skills	3.29 (0.82)	2.73 (1.08)	-1.81 (3.31)
Advertising and marketing skills	3.15 (0.89)	2.63 (1.08)	-1.76 (2.89)

## Summary of Results

### Descriptive Information for the Four MMNR Staff Groups

- The majority of rangers in both sectors were young and had limited field experience.
- Staff in all four groups were predominantly males.
- All four staff groups had positive motivations for continuing work with the MMNR. **Enjoy being close to nature**, and **Enjoy being a ranger (officer)** were consistently strong motivators for all groups. **Like the power and authority** was a strong motivator for the Triangle sector staff (rangers and officers)
- For rangers from both sectors, **Low pay**, **Poor treatment by the public and government**, **Dangerous working conditions** and **No reward for hard work** were negative factors impacting their continued work with the MMNR. **Poor facilities and infrastructure** was also a major dissatisfier for the Narok sector rangers.
- For Narok sector officers, **Poor facilities and infrastructure** was the worst factor influencing their continued work in the MMNR, followed by **No reward for hard work**, **No recognition as a professional**, and **Poor treatment by the public and government**.
- The Triangle sector officers had less dissatisfaction with any of the work aspects in the MMNR, but they were concerned with the **Rarely seeing my family** and **Dangerous work conditions**.
- The Narok sector rangers and officers and the Triangle sector rangers had overwhelming concerns that they did not have the **proper equipment to ensure their health and safety**. The Triangle sector officers were slightly positive on this item.
- The Narok sector rangers and officers felt that **working conditions and the condition of the Mara** had gotten worse in the last three years, while Triangle sector rangers and officers felt these conditions had gotten better in the last three years.
- The Narok sector rangers and officers and the Triangle sector rangers were quite positive that they had **adequate training to do their job** while the Triangle sector officers were quite ambivalent on this item.
- All four staff groups feel **community involvement in managing the MMNR** was important.
  - All staff groups would **like their child to become a ranger (officer)** except for the Narok sector rangers. They were split on this item.

### Past and Future Critical Issues in Managing the MMNR

- Although there was some variation, the four staff groups felt the following issues were the most critical in managing the MMNR the past five years: 1. **Overall staff welfare** including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc., 2. **Illegal crazing** of cattle in the MMNR, 3. **Lack of equipment** including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, and 4. **Inappropriate tour guide behaviors** including off-road driving, harassment of wildlife, ballooning practices, etc.
- Again, although there was some variation, the four staff groups felt the following issues will be the most critical in managing the MMNR the next five years: 1. **Overall staff welfare** including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc., 2. **Illegal crazing** of cattle in the MMNR, 3. **Lack of equipment** including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, 4. **Poaching** and loss of key species in the MMNR, and 5. **Inappropriate tour guide behaviors** including off-road driving, harassment of wildlife, ballooning practices, etc.

### Perceptions of Management Practices in the MMNR

- The staff from the Triangle sector (rangers and officers) generally had much more positive perceptions of the management practices in the MMNR than did the Narok sector staff.
- The Narok sector officers had the least favorable perceptions of management practices in the MMNR among the four staff groups.
- Of the 11 management areas, two had a majority of positive (3.0 or above) assessments by the four staff groups; these were: **MMNR Management Objectives** and **MMNR Site Design and Planning Issues**.
- Of the 11 management areas, two had a majority of negative (2.5 or below) assessments by the four staff groups; these were: **MMNR Communication and Information Issues** and **MMNR Infrastructure Issues**.
- Additionally, three management areas had nearly 50% of the assessments from the four staff groups at 2.5 or below; they were: **MMNR Staffing Issues**, **MMNR Financial Issues** and **MMNR Management Planning Issues**.
- Of the 10 Management Outputs that are traditional in all protected areas, two were assessed at 3.0 or above by all four staff groups; they were: **Wildlife or habitat management** and **Visitor and tourist management**.
- Of the 10 Management Outputs that are traditional in all protected areas, the Triangle sector rangers rated nine of the 10 above a 3.0. Only **Research and monitoring outputs** was rated below a 3.0 by this group.
- Of the 10 Management Outputs that are traditional in all protected areas, the Triangle sector officers rated six of the 10 above a 3.0.
- Of the 10 Management Outputs that are traditional in all protected areas, the Narok sector rangers rated three at or below a 2.5. They were: **Site restoration and mitigation efforts**, **Infrastructure development**, and **Management planning and inventorying**.
- Of the 10 Management Outputs that are traditional in all protected areas, the Narok sector officers rated all 10 below a 2.0. Clearly, this staff group has some strong feelings regarding the efficacy and effectiveness of the management practices in the MMNR.

### Perceptions of Conservation, Wildlife and MMNR Management by Respondents from the Four Communities

- **Injuring and killing livestock and/or people** was the greatest wildlife concern to local people. **Damaging of destroying crops** was more of a concern for Loita than the other three community areas.
- Respondents showed high agreement towards statements related to the **protection of wildlife** and **feel that populations of elephants and lions are low**.
- Respondents did not feel that **MMNR managers ask for opinions of local people when making decisions**. Community members did **demonstrate that they value the MMNR and derive benefits from it**.
- While community members value the Reserve, **they did not show high agreement to the idea that it is well managed**.
- With regards to the size of MMNR, the **majority of respondents felt that it should be retained as it is rather than reduce, enlarge, or eliminate it**.
- **Environmental resilience** varied greatly between communities. The Sekenani community area showed lower environmental resilience than the other three areas surveyed.
- **Governance scores** varied greatly between and within communities. Governance scores reflected community perceptions of leadership on the local, county, and national levels. Respondents felt that they did not have to wait on national leaders to make decisions and that the county government made decisions for their community.
- **Predators were of high concern** in the Aitong, Talek, and Sekenani communities. Respondents from Loita were not as concerned about issues related to predators. Highest concern for predators was demonstrated in the Talek community.
- Only Aitong community respondents felt **poaching was a problem** in their community. However, all community members believed that **people caught poaching should be punished**. None of the community respondents felt that **people in their community were involved with poaching** nor were **local residents assisting poaching efforts**. Finally, all community respondents did not feel **poachers pass through their communities**.
- With regards to policies related to **compensation for livestock loss**, community members were moderately aware of the existence of these compensation policies nor were they benefitting from the policies. Also, they did not view **the policies as fair to local residents**.
- Respondents showed positive attitudes towards tourism in all four communities however, the majority of respondents were not reliant on tourism for their livelihoods.
- With regards to tourism skills, respondents need the most training in **driving tourists in and around the reserve, English language skills, and tracking wildlife**. Respondents require the least amount of training in **explaining my culture and advertising and marketing skills**.

### Management Implications

This project provides valuable information for the creation of a sustainable management system for the MMNR. Input has been obtained from a cross-section of rangers and officers from both the Narok and Triangle sectors of the MMNR as well as a large contingent of local community members from four primary community areas surrounding the MMNR.

Although the data collection plan for this effort was to obtain a minimum of 20 responses from each of the four MMNR staff groups identified in this study, this was not possible because of logistical complications to and from data collection sites. Ninety-five (95) responses were obtained from the rangers in Narok sector, 20 responses from rangers in the Triangle sector, and 10 responses from officers in both the Narok and Triangle sectors. For this reason, we caution the reader to view these results as preliminary in clarifying important management issues in the MMNR and recognize that future

efforts will need to validate these preliminary findings. This fact notwithstanding, these results provide an important view of critical perceptions of the management of the MMNR from both a staff and local community perspective.

Based on the findings of this effort, the following planning and management implications are presented:

1. **Create a Unified Management System.** There are significant differences in the management issues facing the Narok and Triangle sectors of the MMNR. If the new MMNR Management Authority is put in place, future efforts to **develop a unified management system** need to consider these differences and initially develop a comprehensive system that can bring both sectors into harmony regarding management policies, resources, and practices. A long-range planning committee with representatives from all four staff groups as well as county government officials should be formed to build a unified system for managing the MMNR.
2. **Focus on MMNR Staff Motivators.** Narok County officials and MMNR officers need to consider those aspects of the staff positions that motivate them (Table 4) to continue their work with the MMNR, as well as those aspects of their positions that detract (Table 5) from their continued employment with the MMNR.
  - a. All four groups very much enjoyed *Being with nature* and overall *Enjoy being a ranger (officer)*. These two aspects of their positions need to be explored in more detail to ensure that future management efforts maximize staff opportunities to build on these very positive aspects of their positions. Other aspects of their positions that were viewed positively were: *Living my dream* (Triangle rangers), *Respected by community for my work* (Narok and Triangle rangers), *Like implementing the law* (Narok rangers & Triangle officers), and *Like the power and authority* (Triangle rangers and officers). These positive motivators also need to be promoted with future management systems.
  - b. Regarding the worst aspects of being a ranger (officer), these items varied considerably across the four groups. For Narok sector rangers, *Low pay, Poor treatment by the public and government, Poor facilities and infrastructure* and *Dangerous work conditions* were the four most critical items. For Triangle sector rangers, *Poor treatment by the public and government, Low pay, Dangerous work conditions* and *No reward for hard work* were the four most critical items. For Narok sector officers, *Poor facilities and infrastructure, No reward for hard work, No recognition as a professional* and *Poor treatment by the public and government* were the most critical items. Finally, for Triangle sector rangers, *Rarely see my family* and *Dangerous work conditions* were the two items that were most critical. All of these aspects of their work must be considered in building a new management system that improves the morale, trust and commitment of all the MMNR staff.
3. **Address Major Circumstances Impacting the MMNR.** The following major issues, impacting the protection and preservation of the MMNR, were consistently identified by the rangers and officers from both sectors (Table 11). These issues should be given consideration in developing the new management system and they include: 1. **Overall staff welfare** including inadequate or limited housing, uniforms, food, water, allowances, medical supplies, etc., 2. **Illegal grazing** of cattle in the MMNR, 3. **Lack of equipment** including proper vehicles for patrolling, firearms, fuel, maintenance equipment, communication equipment, 4. **Poaching** and loss of key species in the MMNR, and 5. **Inappropriate tour guide behaviors** including off-road driving, harassment of wildlife, ballooning practices, etc.

Of these issues, **overall staff welfare** for rangers of both sectors is the most salient issue facing the management of the MMNR. Quality housing, food supply, cooking facilities especially for the far outposts, water supply, uniforms, first aid kits and other medical supplies, and appropriate

allowances must be addressed quickly and comprehensively. Budgets must be increased for personal welfare, safety, and morale of all staff but especially the rangers. Again, a representative committee of staff should be formed to facilitate a phased in effort to upgrade all staff welfare issues over the next two years.

4. **Address Critical Infrastructure Needs.** Several areas of the MMNR need special attention especially in the Narok sector.
  - a. Each station needs to have adequate off-road vehicles to transport staff and to conduct daily operations including systematic patrols throughout the MMNR. The vehicular limitations are severely impacting the monitoring of tourists and tour guides, enforcement of rules and regulations protecting wildlife and biodiversity, and maintenance of the overall resource.
  - b. Staff need up to date safety equipment including firearms, vision equipment, telemetry equipment, etc.
  - c. Staff need state of the art communication equipment for personal safety and to conduct daily monitoring and patrolling efforts to protect the environment, wildlife and tourists effectively.
  - d. The road system is in disrepair and continues to deteriorate seasonally. Proper and sufficient road grading equipment must be purchased and well maintained to prevent the continued degradation of the environment and to enhance the overall tourist experience for the MMNR guests.
5. **Build Comprehensive Communication and Information System.** In addition to personal communication devices, the MMNR management needs to build a comprehensive communications and information system that allows the free flow of communication, vertically and horizontally, among the staff and other key stakeholders.
  - a. Additionally, a geo-spatial laboratory could be established to build a database management and monitoring system for all management activities including the recording of daily work actions and problems, monitoring of poaching and other illegal activities, tour guide and tourist activity, environmental hotspots, points of degradation, wildlife habitats and behaviors, and many other management practices that would benefit significantly from building consistent and comprehensive databases with useable reporting mechanisms for all staff and interested stakeholders.
  - b. Staff indicated that they need additional information and access to new training and materials. The geo-spatial laboratory could also provide scheduled training and new management information and materials to all staff electronically.
6. **Staffing, Financing and Planning are Three Critical Management Areas Needing Attention.** In addition to MMNR Communication and Information Issues (See Figure 6 for further details) and MMNR Infrastructure Issues (See Figure 7 for further details) identified in items 3 and 4 above, MMNR Staffing Issues (Figure 4), MMNR Financial Issues (Figure 8) and MMNR Management Planning Issues (Figure 9) should be given special attention in building the new management system because nearly 50% of the assessments from the four staff groups were below 2.5 which indicates a negative perception of these areas.
7. **Build Narok Sector Officers Confidence in the System.** The Narok sector officers expressed the greatest concern regarding the management practices in the MMNR across all 11 areas. Future management efforts should invite input and involvement of these staff persons to address their

specific concerns related to each of these areas to rebuild their confidence in the management authority of the MMNR.

In addition to the primary areas identified above in items 3-6, other concerns that need special attention are: the identification of MMNR policies and work plans that are consistent with the objectives in the MMNR, performance review process for staff, availability of ecological and socio-economic data for management planning, the creation of a system to collect, process and analyze management data, adequate funding for the immediate and long term preservation of the MMNR, creation of comprehensive management plan, inventory of natural and cultural resources, clear organizational structure, promotion of transparent decision making, research on key social issues impacting the MMNR, and access to research and recent data regarding the management of protected areas.

8. **Communities support the MMNR but not their Level of Involvement in its Management.** Community members were generally supportive of the importance and existence of the MMNR and felt it contributes to wildlife protection. However, they did not feel as though local opinions are sought out in the management of the Reserve. This finding conflicts with the responses from the MMNR staff who perceived that local residents did have sufficient input into the management practices and challenges facing the MMNR. Going forward, MMNR staff need to address this discrepancy. More formal mechanisms for seeking out local opinions and increasing community members' awareness and understanding of MMNR policies and procedures may be helpful.
9. **Human-Wildlife Conflict is Critical.** Conflict with wildlife is a severe issue in communities surrounding MMNR. The compensation plans that are currently in use need to be reviewed, and more efficient and effective processes should be considered to support local people as well as protect the wildlife that exists in the reserve and lessen further population declines.
10. **Expand on Local Community Members Support of Tourism.** Local people had positive views towards tourism and felt it has a low impact on the environment and their culture. In addition, local people expressed high environmental resilience and positive attitudes towards wildlife. Together, these findings demonstrate the importance of developing tourism in a way that will allow for local economic growth while protecting the environment and natural resources local people rely heavily upon. MMNR staff should consider how it could facilitate the development of opportunities through tourism for the local communities.

The ten items identified above provide valuable input into building a sustainable management system that will protect and promote the long-term viability of the MMNR. If one were to condense these suggestions into broader based actions, clearly four themes dominated the discussion. These were:

1. **Building of infrastructure:** This includes physical infrastructure such as housing, personal equipment, and a quality road system but also management operation infrastructure related to establishing a clear organizational structure that effectively addresses the objectives and challenges in the MMNR, and creating an operations manual that identifies policies and procedures across all aspects of managing the MMNR.
2. **Training of all staff:** Throughout the data collection process, there was a clear need and desire expressed for additional and continuous training on the part of rangers as well as officers. Continuous training would help alleviate many of the management challenges that presently exist, enhance morale, establish a logical career progression system, and protect and preserve the overall MMNR.
3. **Establishing communication and information systems:** MMNR staff across both sectors strongly stated the need for better communication technology and processes to enhance the overall

effectiveness of management actions and responsiveness of the staff. Further, they stated a strong need for additional information and research to enhance decision-making and planning in the MMNR. A geo-spatial laboratory would be a very valuable resource for addressing many of the challenges facing the management of the MMNR.

4. **Commitment to engage and support local residents:** The results of this study as well as the volumes of research that have been conducted on effective management of protected areas, clearly indicate that enhanced efforts to engage the local communities in the management and benefits of the MMNR are essential. These efforts include: building a more formal mechanism for seeking input from local community members, improving wildlife compensation programs, engaging local residents in training programs to support work actions in the MMNR as well as with the tourism industry, and building a committed relationship with the local communities where they receive direct benefits from the perpetuation of the MMNR and perceive a true sense of being a part of the management effort of the MMNR. Only through including local communities as active partners will the MMNR be able to address the many challenges facing it.

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Appendix A

ANOVA Tables for MMNR Staff Management Practices

Table 12. MMNR Management Objectives								
Management Practices	1. Rangers Narok Sector	2. Rangers Triangle Sector	3. Officers Narok Sector	4. Officers Triangle Sector	Total	One-Way ANOVA		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F- value	p- value*	Post Hoc Comparisons (p-values)
Mara objectives provide for the protection and maintenance of biodiversity.	3.53 (.91)	3.68 (0.48)	2.33 (1.41)	3.70 (0.93)	3.48 (0.93)	5.662	0.001	None met p≤.05
Specific biodiversity-related objectives are clearly stated in the management plan.	3.06 (1.10)	3.32 (0.82)	1.90 (1.10)	3.10 (0.99)	3.01 (1.09)	4.318	0.006	2>3**(.017)
Management policies and plans are consistent with the Mara objectives.	2.99 (1.11)	3.16 (0.76)	1.70 (1.16)	3.80 (0.42)	2.98 (1.11)	7.317	0.000	1>3(.039) 1<4(.001) 2>3(.019) 2<4(.042) 3<4(.001)
Mara employees and administrators understand the Mara objectives and policies.	3.23 (1.08)	3.74 (0.45)	2.50 (1.58)	3.60 (0.52)	3.27 (1.06)	3.554	N.S.***	
Local communities support the overall objectives of the Mara.	2.98 (1.08)	3.16 (0.83)	2.10 (1.29)	2.70 (1.06)	2.92 (1.08)	2.535	N.S.	

\* Using Bonferroni's correction, the critical P-value for this set of questions was p≤.01

\*\*These numbers correspond with the staff groups that are significantly different

\*\*\*N.S.= non-significant

<b>Table 13. MMNR Legal Security Issues</b>								
Management Practices	1. Rangers Narok Sector	2. Rangers Triangle Sector	3. Officers Narok Sector	4. Officers Triangle Sector	Total	One-Way ANOVA		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F-value	p-value*	Post Hoc Comparisons (p-values)
The Mara has long-term legally binding protection.	3.22 (1.08)	3.45 (0.76)	2.50 (1.27)	3.00 (1.25)	3.18 (1.08)	1.911	N.S.**	
There are no unsettled disputes regarding land tenure or use rights.	2.49 (1.19)	2.60 (1.05)	2.50 (1.35)	2.56 (1.33)	2.52 (1.18)	0.047	N.S.	
Boundary demarcation is adequate to meet the Mara objectives.	2.93 (1.15)	2.50 (1.28)	2.10 (1.29)	2.70 (1.42)	2.79 (1.21)	1.964	N.S.	
Staff and financial resources are adequate to conduct critical law enforcement activities.	2.47 (1.25)	3.05 (0.89)	2.00 (1.41)	2.60 (1.26)	2.53 (1.23)	1.935	N.S.	
Conflicts with the local community are resolved fairly and effectively.	3.22 (1.10)	3.40 (0.94)	2.50 (1.18)	3.60 (0.70)	3.22 (1.08)	2.149	N.S.	

\* Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq 0.01$

\*\*=Non-significant

<b>Table 14. MMNR Staffing Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons (p-values)</b>
<b>The level of staffing is sufficient to effectively manage the area.</b>	2.84 (1.26)	3.13 (0.81)	3.80 (0.42)	2.30 (1.16)	2.91 (1.19)	3.159	N.S.**	
<b>Staff members have adequate skills to conduct critical management activities.</b>	2.82 (1.31)	2.69 (0.95)	2.30 (1.16)	2.40 (1.35)	2.72 (1.26)	0.757	N.S.	
<b>Training and development opportunities are appropriate to the needs of the staff.</b>	2.91 (1.25)	3.12 (0.93)	3.00 (1.50)	3.80 (0.42)	3.02 (1.20)	1.731	N.S.	
<b>Staff performance and progress on targets are periodically reviewed</b>	2.58 (1.25)	2.88 (1.11)	1.67 (1.12)	2.50 (1.27)	2.55 (1.24)	2.002	N.S.	
<b>Staff employment conditions are sufficient to retain high-quality staff.</b>	2.27 (1.23)	2.53 (1.07)	2.50 (1.43)	2.80 (1.23)	2.37 (1.22)	0.728	N.S.	

\* Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq 0.01$

\*\*=Non-significant

<b>Table15. MMNR Siting Design and Planning Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons (p-values)</b>
<b>The siting of the Mara is consistent with the Mara objectives.</b>	3.47 (0.91)	3.63 (0.50)	2.50 (1.20)	3.30 (1.06)	3.42 (0.92)	3.340	N.S.**	
<b>The layout and configuration of the Mara optimizes the conservation of biodiversity.</b>	3.19 (1.00)	3.26 (0.73)	2.00 (1.31)	3.20 (0.63)	3.13 (1.00)	3.911	0.010	None met p≤.05
<b>The Mara zoning system is adequate to achieve the Mara objectives.</b>	3.10 (1.09)	3.32 (0.82)	2.38 (1.51)	3.10 (1.10)	3.09 (1.09)	1.435	N.S.	
<b>The land use in the surrounding area enables effective Mara management.</b>	3.02 (1.18)	2.74 (1.05)	1.75 (1.39)	2.60 (1.51)	2.87 (1.23)	3.039	N.S.	
<b>The Mara is linked to another area of conserved or protected land.</b>	3.27 (1.13)	3.11 (1.15)	3.25 (1.39)	3.20 (1.23)	3.24 (1.14)	0.113	N.S.	

\*Using Bonferroni's correction, the critical P-value for this set of questions was p≤.01

\*\*=Non-significant

<b>Table 16. MMNR Communication and Information Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons – (p-values)</b>
<b>There are adequate means of communication between field and office staff.</b>	1.85 (1.28)	2.71 (1.16)	1.00 (0.00)	3.00 (1.25)	1.99 (1.29)	6.912	0.000	1>3(.000) 2>3(.000) 4>3(.004)
<b>Existing ecological and socio-economic data are adequate for management planning.</b>	2.35 (1.28)	2.88 (0.93)	1.33 (0.50)	2.00 (1.25)	2.32 (1.23)	3.539	N.S.**	
<b>There are adequate means of collecting new data.</b>	2.02 (1.29)	3.06 (1.14)	1.60 (0.84)	2.00 (1.25)	2.13 (1.28)	4.061	0.009	2>1(.016) 2>3(.005)
<b>There are adequate systems for processing and analysing data.</b>	1.89 (1.18)	2.71 (1.21)	1.11 (0.33)	1.30 (0.95)	1.89 (1.19)	5.308	0.002	1>3(.000) 2>3(.000) 2>4(.017)
<b>There is effective communication with local communities.</b>	2.66 (1.32)	3.18 (0.88)	2.50 (1.08)	3.30 (1.06)	2.77 (1.24)	1.640	N.S.	

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

\*\*=Non-significant

<b>Table 17. MMNR Infrastructure Issues</b>								
Management Practices	1. Rangers Narok Sector	2. Rangers Triangle Sector	3. Officers Narok Sector	4. Officers Triangle Sector	Total	One-Way ANOVA		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F-value	p-value*	Post Hoc Comparisons – (p-values)
Transportation infrastructure is adequate to perform critical management activities.	1.75 (1.14)	2.94 (1.20)	1.60 (1.07)	3.00 (1.25)	2.00 (1.25)	8.062	0.000	2>1(.006) 2>3(.041)
Field equipment is adequate to perform critical management activities.	1.63 (1.11)	2.41 (1.37)	1.40 (0.97)	2.60 (1.35)	1.79 (1.20)	4.257	0.007	None met p≤.05
Staff facilities are adequate to perform critical management activities.	1.67 (1.05)	2.65 (1.27)	1.60 (1.26)	2.70 (1.25)	1.80 8(1.18)	5.754	0.001	1<2(.043)
Maintenance and care of equipment is adequate to ensure long-term use.	2.43 (1.32)	3.18 (0.95)	1.50 (1.08)	3.11 (1.05)	2.50 (1.30)	4.646	0.004	3<2(.005) 3<4(.026)
Visitor facilities are appropriate to the level of visitor use.	2.37 (1.30)	3.41 (0.71)	2.33 (1.41)	2.60 (1.26)	2.53 (1.28)	3.452	N.S.**	

\*Using Bonferroni's correction, the critical P-value for this set of questions was p≤.01

\*\*=Non-significant

<b>Table 18. MMNR Financial Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons – (p-values)</b>
<b>Funding in the Mara the past 5 years has been adequate to conduct critical management activities.</b>	2.02 (1.18)	3.00 (0.97)	1.11 (0.33)	2.10 (1.45)	2.10 (1.21)	5.793	0.001	1<2(.010) 1>3(.000) 2>3(.000)
<b>Funding for the next 5 years is adequate to conduct management activities</b>	2.57 (1.15)	2.94 (1.14)	1.80 (1.32)	2.50 (1.27)	2.55 (1.19)	1.998	N.S.**	
<b>Financial management practices enable efficient and effective Mara Management</b>	2.63 (1.28)	3.29 (0.59)	1.75 (1.16)	3.10 (1.20)	2.71 (1.23)	3.596	N.S.	
<b>The allocation of expenditures is appropriate to Mara priorities and objectives.</b>	2.55 (1.23)	3.18 (0.86)	1.60 (0.97)	2.70 (1.34)	2.56 (1.21)	3.565	N.S.	
<b>The long-term financial outlook for the Mara is stable.</b>	2.07 (1.17)	2.94 (0.83)	1.40 (0.84)	1.90 (1.29)	2.13 (1.16)	4.697	0.004	1<2(.006) 2>3(.001)

\*Using Bonferroni’s correction, the critical P-value for this set of questions was  $p \leq .01$

\*\*=Non-significant

<b>Table 19. MMNR Management Planning Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons – (p-values)</b>
<b>There is a comprehensive, relatively recent written management plan.</b>	2.64 (1.22)	2.94 (0.75)	1.40 (0.97)	3.40 (.84)	2.64 (1.19)	6.056	0.001	1>3(.016) 2>3(.003) 3<4(.001)
<b>There is a comprehensive inventory of natural and cultural resources.</b>	2.65 (1.14)	2.88 (0.70)	1.10 (0.32)	2.20 (1.23)	2.52 (1.14)	7.436	0.000	1>3(.000) 2>3(.000)
<b>There is analysis of, and strategy for addressing, Mara threats and pressures.</b>	2.59 (1.19)	3.00 (0.87)	1.30 (0.95)	2.00 (1.05)	2.49 (1.19)	5.788	0.001	1>3(.011) 2>3(.001)
<b>A detailed work plan identifies specific targets for achieving management objectives.</b>	2.54 (1.15)	3.18 (0.64)	1.50 (1.08)	2.90 (1.20)	2.57 (1.15)	5.315	0.002	1<2(.016) 2>3(.004)
<b>The results of research and monitoring are routinely incorporated into planning.</b>	2.64 (1.14)	2.82 (0.88)	1.40 (0.97)	2.40 (1.17)	2.54 (1.14)	4.244	0.007	1>3(.016) 2>3(.008)



<b>Table 20. MMNR Decision Making Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons – (p-values)</b>
<b>There is clear internal organization.</b>	2.60 (1.28)	3.21 (0.79)	1.20 (0.42)	2.70 (1.34)	2.59 (1.29)	6.451	0.000	1>3(.000) 2>3(.000) 3<4(.037)
<b>Management decision making is transparent.</b>	2.19 (1.23)	3.11 (0.74)	1.50 (0.97)	2.70 (1.34)	2.31 (1.22)	5.250	0.002	1<2(.001) 2>3(.002)
<b>Mara staff regularly collaborate with partners, local communities and other organizations</b>	2.73 (1.28)	3.32 (1.00)	2.33 (1.41)	3.90 (0.32)	2.88 (1.25)	4.322	0.006	1<4(.000)
<b>Local communities participate in decisions that affect them.</b>	2.90 (1.22)	3.53 (0.61)	2.50 (1.20)	3.10 (0.99)	2.98 (1.15)	2.150	N.S.	
<b>There is effective communication between all levels of Mara staff and administration.</b>	2.51 (1.32)	3.26 (0.73)	1.50 (0.97)	3.20 (1.23)	2.60 (1.29)	5.521	0.001	1<2(.008) 2>3(.001) 3<4(.019)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

\*\*=Non-significant

<b>Table 21. MMNR Research, Evaluation and Monitoring Issues</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons – (p-values)</b>
<b>The impact of legal and illegal uses of the Mara are accurately monitored and recorded.</b>	2.68 (1.22)	3.42 (0.52)	1.80 (1.23)	2.90 (1.10)	2.74 (1.18)	4.750	0.004	1<2(.000) 2>3(.013)
<b>Research on key ecological issues is consistent with the needs of the Mara.</b>	2.95 (1.15)	3.16 (0.50)	1.80 (1.23)	3.00 (1.15)	2.90 (1.12)	3.895	N.S.**	
<b>Research on key social issues is consistent with the needs of the Mara.</b>	2.94 (1.12)	3.17 (0.79)	1.56 (1.01)	2.60 (1.26)	2.85 (1.14)	5.148	0.002	1>3(.018) 2>3(.006)
<b>Mara staff members have regular access to recent scientific research and advice.</b>	2.43 (1.34)	2.32 (1.20)	1.20 (1.50)	1.50 (0.97)	2.24 (1.30)	4.118	0.008	1>3(.000) 2>3(.008)
<b>Critical research and monitoring needs are identified and prioritized.</b>	2.67 (1.29)	2.53 (1.17)	1.70 (0.82)	1.80 (0.92)	2.50 (1.25)	3.072	N.S.	

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

\*\*=Non-significant

<b>Table 22. MMNR Management Outputs</b>								
<b>Management Practices</b>	<b>1. Rangers Narok Sector</b>	<b>2. Rangers Triangle Sector</b>	<b>3. Officers Narok Sector</b>	<b>4. Officers Triangle Sector</b>	<b>Total</b>	<b>One-Way ANOVA</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>F-value</b>	<b>p-value*</b>	<b>Post Hoc Comparisons – (p-values)</b>
<b>Threat prevention, detection and law enforcement.</b>	2.79 (1.29)	3.68 (0.48)	2.00 (1.33)	3.80 (0.42)	2.96 (1.23)	7.275	0.000	1<2(.000) 1<4(.000) 2>3(.018) 3<4(.012)
<b>Site restoration and mitigation efforts.</b>	2.49 (1.25)	3.44 (0.51)	1.70 (1.16)	2.40 (1.17)	2.57 (1.22)	5.563	0.001	1<2(.000) 2>3(.005)
<b>Wildlife or habitat management.</b>	3.06 (1.17)	3.83 (0.38)	1.70 (1.25)	3.70 (0.67)	3.12 (1.18)	9.837	0.000	1<2(.000) 1>3(.045) 2>3(.002) 3<4(.003)
<b>Community outreach and education efforts.</b>	2.57 (1.25)	3.32 (0.75)	1.50 (0.97)	2.80 (1.23)	2.62 (1.22)	5.583	0.001	1<2(.012) 1>3(.044) 2>3(.001)
<b>Visitor and tourist management.</b>	3.27 (1.06)	3.68 (0.48)	1.50 (0.97)	3.20 (0.92)	3.17 (1.10)	12.098	0.000	1>3(.001) 2>3(.000) 3<4(.005)
<b>Infrastructure development</b>	2.06 (1.17)	3.68 (0.48)	1.00 (0.00)	3.30 (0.82)	2.35 (1.26)	22.402	0.000	1<2(.000) 1>3(.000) 1<4(.005) 2>3(.000) 3<4(.000)
<b>Management planning and inventorying.</b>	2.20 (1.13)	3.39 (0.61)	1.30 (0.95)	2.60 (1.26)	2.36 (1.18)	9.644	0.000	1<2(.000) 2>3(.000)
<b>Staff monitoring, supervision, and evaluation.</b>	2.49 (1.28)	3.72 (0.46)	1.60 (1.26)	3.40 (1.07)	2.69 (1.30)	9.566	0.000	1<2(.000) 2>3(.002) 3<4(.018)
<b>Staff training and development.</b>	2.57 (1.23)	3.39 (0.85)	1.10 (0.32)	3.70 (0.67)	2.68 (1.25)	12.810	0.000	1<2(.013) 1>3(.000) 1<4(.002) 2>3(.000) 3<4(.000)
<b>Research and monitoring outputs.</b>	2.50 (1.21)	2.78 (1.22)	1.00 (0.00)	1.40 (0.70)	2.31 (1.23)	8.463	0.000	1>3(.000) 1>4(.003) 2>3(.000) 2>4(.005)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .005$

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## Appendix B

### Complete Listing of Present and Future Critical Issues

1. Staff welfare-lack of support from county government
  - Housing
  - Water
  - Food
  - Medical supplies
  - Uniforms
  - Allowances
  - First Aid kits
  - Fire control equipment
  - Medical support especially for work related injuries
  - Workman's compensation and disability insurance are not well implemented
2. Training/capacity
  - Low Capacity training
  - Management skills
  - Technical skills
  - After basic training-more advanced skills in conservation and environmental issues
3. Poaching/ loss of rhinos
4. Number of Tourist
5. Inappropriate tour operator behaviors
  - Off road driving
  - Harassment of wildlife
  - Balloons-harassment
6. Unregulated new lodges/campsites
  - Number of lodges
  - Lack of cooperation by investors (hoteliers), e.g. access roads randomly built to accommodate new lodges not on main road
7. Lack of Enforcement of policies and regulations
  - Fine protocols are not clear
8. Security of ranger-border stations without the right equipment
9. Illegal grazing
  - Lack of Buffers
10. Equipment
  - Lack of Vehicles and fuel
  - Firearms - Old and limited
    - Old ammunition and limited
  - Visual equipment-binoculars, night goggles, etc.
  - Energy source
  - Transport
11. No communication system or equipment-very dangerous because they are completely isolated
  - Communication Equipment-radios, GPS, telemetry, etc.
12. Poor monitoring of tourists
13. Poor Infrastructure
  - Inadequate road system and quality is poor- poor infrastructure
  - Poor infrastructure equipment-graders, rollers, etc.
14. Feel intimidated by authority when enforce the laws and policies

15. No effective organizational structure
  - Top down management-everything is centralized now
  - Management is not effective
    - Decision making must go through too many levels
    - Non-implementation of the subsidiarity principle
  - No career progression- Lack of training, no recognition of experience
    - Too political
  - Skill level of administrators does not match the job requirements.
  - Fuzzy management structure
    - Lack of clear chain of command
    - No clear operational procedures and objectives
  - No Clear institutional policies for collaboration and linkage
16. Human wildlife conflict because of grazing-predation/Loss of species/Extinction of flagship species
17. Littering/ waste disposal
18. Political interference
  - Political interference-can't enforce laws and regulations because primarily county officials intercede
19. Human population growth
20. Lack of Follow through after arrest of perpetrators by judicial system
21. Lack of Rapid response facilitation
22. No Information centers around Reserve
24. Local community's welfare
25. Loss of funding/donors
26. Private ownership of lands
  - Conservancies
  - Electric fences
27. Prolonged drought
28. Diseases
29. Climate change
30. Revenue collection procedures
31. Loss of habitat/severe degradation of habitat-lands
32. Loss of revenues
33. Loss of tourists/visitation

## Appendix C

## ANOVA Tables for Perceptions of Respondents from Four Community Areas

Table 23. Community Opinions about MMNR								
MMNR Opinions	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
Maasai Mara National Reserve effectively protects wildlife populations	4.39 (0.96)	4.18 (0.95)	3.75 (0.76)	3.87 (1.07)	4.01 (0.96)	6.26	<.001	1>3 (<.001) 1>4 (.002) 2>3 (.007)
Maasai Mara National Reserve contributes to jobs and well being in my community	4.33 (0.89)	3.95 (1.02)	3.45 (1.07)	3.46 (1.22)	3.74 (1.12)	10.11	<.001	1>3 (<.001) 1>4 (<.001) 2>3 (.007) 2>4 (.007)
The Maasai Mara should be protected from people in general	3.88 (1.23)	4.07 (1.04)	3.65 (1.16)	3.62 (1.24)	3.78 (1.18)	2.17	N.S.**	
MMNR is well managed	2.19 (1.38)	2.71 (1.22)	3.03 (0.95)	2.78 (0.99)	2.72 (1.15)	6.17	<.001	2>1 (.013) 3>1 (<.001) 4>1 (.003)
MMNR managers ask for opinions of local people when making decisions	1.91 (1.42)	2.23 (1.49)	2.53 (1.19)	2.39 (1.20)	2.30 (1.32)	2.59	N.S.	

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

\*\*N.S.= Non-significant

Table 24. Community Support of MMNR					
Which idea do you support regarding MMNR?	Aitong Frequency	Talek Frequency	Sekenani Frequency	Loita Frequency	Total Frequency
Retain it as is	29	42	33	45	149
Make it bigger	10	11	19	17	57
Make it smaller	1	2	7	9	19
Get rid of it	3	1	7	5	16

Table 25. Community Opinions about General Wildlife Issues								
General Wildlife	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
Damaging or destroying crops	2.04 (1.07)	2.53 (1.27)	1.76 (1.15)	3.53 (1.45)	2.51 (1.44)	29.68	<.001	2>1** (.038) 4>1 (.001) 2>3 (.001) 4>2 (.001) 4>3 (.001)
Injuring or killing livestock	3.81 (1.35)	4.05 (1.53)	3.88 (1.17)	3.59 (1.41)	3.82 (1.36)	1.39	N.S.***	
Competing with livestock for resources such as grazing land	3.06 (1.51)	3.07 (1.40)	3.46 (1.02)	2.99 (1.36)	3.15 (1.32)	2.04	N.S.	
Competing with people for resources such as bushmeat and wild game	2.5 (1.45)	2.47 (1.37)	2.54 (1.49)	2.29 (1.28)	2.44 (1.39)	0.49	N.S.	
Injuring or killing a person	4.26 (1.26)	4.15 (1.38)	4.08 (1.00)	3.53 (1.34)	3.97 (1.27)	4.97	0.002	1>4 (.001) 2>4 (.004) 3>4 (.006)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

\*\* These numbers correspond with the community groups that are significantly different

\*\*\*N.S. = Non-significant

Table 26. Community Opinions about Protection of Wildlife								
Protecting Wildlife	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
Do you think elephants should be protected?	2.60 (0.66)	2.93 (0.31)	2.58 (0.69)	2.48 (0.75)	2.63 (0.66)	6.20	<.001	2>1 (.006) 2>3 (.001) 2>4 (.001)
Do you think that lions should be protected?	2.60 (0.66)	2.92 (0.34)	2.53 (0.78)	2.33 (0.83)	2.57 (0.73)	8.09	<.001	2>1 (.017) 2>3 (.001) 2>4 (.001) 1>4 (.028)
Do you think that other predators like leopards and hyenas should be protected?	2.56 (0.71)	2.78 (0.56)	2.61 (0.63)	1.95 (0.87)	2.45 (0.77)	18.61	<.001	1>4 (.001) 2>4 (.001) 3>4 (.001)
Do you think that other wildlife species like antelope, primates, etc., should be protected?	2.67 (0.55)	2.53 (0.77)	2.33 (0.85)	2.05 (0.87)	2.36 (0.82)	7.91	<.001	1>3 (.012) 1>4 (.001) 2>4 (.001) 3>4 (.028)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .0125$



<b>Table 27. Community Opinions about Amount of Wildlife Species</b>								
Amount of Wildlife	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
What do you think about the number of elephants in your area today?	1.73 (0.68)	2.31 (0.57)	2.01 (0.61)	1.71 (0.82)	1.93 (0.72)	10.72	<.001	2>1 (.001) 3>1 (.018) 2>3 (.013) 2>4 (.001) 3>4 (.005)
What do you think about the number of lions in your area today?	1.6 (0.63)	2.07 (0.45)	1.75 (0.63)	1.46 (0.73)	1.70 (0.66)	11.11	<.001	2>1 (.001) 2>3 (.003) 2>4 (.001) 3>4 (.005)
What do you think about the number of other predators in your area today (leopards, hyenas, etc.)?	1.68 (0.61)	2.03 (0.59)	1.99 (0.65)	2.61 (0.68)	2.12 (0.72)	25.64	<.001	2>1 (.004) 3>1 (.007) 4>1 (.001) 4>3 (.001) 4>2 (.001)
What do you think about the number of other wildlife species like antelope, primates, etc., in your area today?	2.42 (0.53)	2.66 (0.48)	2.23 (0.66)	2.70 (0.56)	2.50 (0.60)	11.01	<.001	2>1 (.024) 4>1 (.005) 2>3 (.001) 4>3 (.001)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .0125$

<b>Table 28. Community Concerns about Predators</b>								
Concerns about predators	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
Lions from the nearby Reserve attacking your dogs	2.57 (1.74)	4.20 (1.40)	2.58 (1.03)	2.38 (1.40)	2.87 (1.55)	23.93	<.001	2>1 (.001) 2>3 (.001) 2>4 (.001)
Lions from the nearby Reserve attacking your livestock	3.53 (1.69)	4.30 (1.41)	4.26 (0.76)	2.63 (1.48)	3.64 (1.52)	25.56	<.001	2>1 (.002) 2>3 (.002) 2>4 (.001) 1>4 (.001) 3>4 (.001)
Lions from the nearby Reserve attacking someone in your village (outside of your family)	3.33 (1.85)	4.28 (1.35)	4.40 (1.15)	2.35 (1.49)	3.56 (1.69)	33.11	<.001	2>1 (.001) 3>1 (.001) 1>4 (.001) 3>4 (.001)
Lions from the nearby Reserve attacking you or someone in your family	3.64 (1.71)	4.33 (1.31)	4.49 (1.00)	2.27 (1.61)	3.63 (1.69)	39.55	<.001	2>1 (.009) 3>1 (.001) 1>4 (.001) 3>4 (.001)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .0125$

<b>Table 29. Community Opinions about Poaching</b>								
Poaching	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
Poaching wildlife is a problem in my community.	3.60 (1.45)	2.37 (1.10)	2.95 (1.19)	2.96 (1.41)	2.96 (1.35)	8.73	<.001	1>2 (.001) 1>3 (.004) 1>4 (.006) 3>2 (.009) 4>2 (.009)
There are people in my community that poach wildlife.	1.27 (0.62)	1.42 (0.62)	2.26 (1.16)	2.72 (1.20)	1.99 (1.14)	32.27	<.001	3>1 (.001) 4>1 (.001) 3>2 (.001) 4>2 (.001) 4>3 (.004)
There are people in my community that assist in poaching efforts.	1.51 (0.90)	1.43 (0.75)	2.31 (0.94)	2.85 (1.13)	2.09 (1.11)	33.17	<.001	3>1 (.001) 4>1 (.001) 3>2 (.001) 4>2 (.001) 4>3 (.001)
Poachers often pass through my community.	1.24 (0.51)	1.48 (0.70)	2.38 (1.14)	2.46 (1.05)	1.96 (1.06)	29.06	<.001	3>1 (.001) 4>1 (.001) 3>2 (.001) 4>2 (.001)
People caught poaching animals should be punished.	4.62 (0.66)	4.65 (0.72)	3.75 (1.31)	3.01 (1.40)	3.93 (1.30)	30.89	<.001	1>3 (.001) 1>4 (.001) 2>3 (.001) 2>4 (.001) 3>4 (.001)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

<b>Table 30. Community Opinions regarding Policies</b>								
Policy Environment	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
I benefit from policies related to lion management where I live.	3.56 (1.27)	3.29 (1.29)	2.56 (0.65)	2.11 (1.07)	2.81 (1.20)	24.42	<.001	1>3 (.001) 1>4 (.001) 2>3 (.001) 2>4 (.001) 3>4 (.011)
I am aware of policies designed to compensate for livestock losses.	2.73 (1.43)	2.81 (1.44)	2.96 (1.01)	2.87 (1.17)	2.86 (1.25)	0.41	N.S.**	
I have benefited from policies designed to compensate for livestock losses.	2.18 (1.11)	1.68 (0.80)	2.44 (0.71)	2.13 (0.98)	2.13 (0.94)	8.23	<.001	1>2 (.003) 3>2 (.001) 4>2 (.005) 3>4 (.036)
I feel like I have a say in what happens when it comes to wildlife management in my area.	3.33 (1.33)	3.31 (1.51)	2.72 (0.86)	3.03 (0.86)	3.06 (1.16)	4.31	.005	1>3 (.003) 3>2 (.003)
I think the rules and regulations related to wildlife management in my area are fair to local residents.	2.64 (1.51)	2.64 (1.23)	2.78 (0.78)	2.97 (1.01)	2.77 (1.12)	1.21	N.S.	
I think the rules and regulations related to wildlife management in my area help protect wildlife.	3.98 (0.99)	4.36 (0.76)	3.43 (0.94)	3.48 (0.89)	3.77 (0.97)	15.51	<.001	2>1 (.027) 1>3 (.001) 1>4 (.002) 2>3 (.001) 2>4 (.001)
I trust local leaders to make good decisions when it comes to managing wildlife and/or predators.	3.56 (1.30)	2.71 (1.26)	2.94 (0.82)	3.13 (0.99)	3.07 (1.11)	6.49	<.001	1>2 (.001) 1>3 (.001) 1>4 (.026) 4>2 (.029)
I trust government authorities to make good decisions when it comes to managing wildlife and/or predators.	3.80 (1.11)	2.88 (1.22)	3.05 (1.04)	3.44 (0.90)	3.27 (1.11)	8.94	<.001	1>2 (.001) 1>3 (.001) 4>2 (.003) 4>3 (.025)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .00625$

\*\*N.S. = Non-significant

<b>Table 31. Environmental Resilience of Communities around MMNR</b>								
Environmental Resilience	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean SD	One-way ANOVA		
						F- value	P- value*	Post Hoc (p-value)
The quality of air in my community is good	4.53 (0.66)	4.43 (0.91)	3.05 (0.97)	4.36 (0.84)	4.03 (1.07)	48.67	<.001	1>3 (.001) 2>3 (.001) 4>3 (.001)
The rivers (if one exists) in my community are clean	3.62 (1.23)	2.38 (0.98)	2.43 (1.12)	3.50 (1.25)	2.97 (1.28)	22.54	<.001	1>2 (.001) 1>3 (.001) 4>2 (.001) 4>3 (.001)
The natural environment in my community is healthy	4.11 (0.89)	2.63 (1.11)	2.44 (1.12)	4.04 (0.89)	3.28 (1.27)	53.71	<.001	1>2 (.001) 1>3 (.001) 4>2 (.001) 4>3 (.001)
I have reliable access to safe drinking water	2.96 (1.23)	2.83 (1.34)	2.33 (1.16)	3.15 (1.43)	2.80 (1.33)	5.82	.001	3>1 (.006) 3>2 (.023) 3>4 (.001)
Grazing cows have plenty of forage	2.44 (1.37)	1.55 (0.75)	2.63 (0.91)	3.79 (1.15)	2.70 (1.33)	53.55	<.001	1>2 (.001) 4>1 (.001) 4>2 (.001) 4>3 (.000)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .01$

Table 32. Community Opinions about Governance								
Governance	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-values)
Local community leaders learn from their mistakes	2.89 (1.55)	1.90 (1.05)	2.28 (0.82)	2.69 (1.20)	2.44 (1.21)	8.95	<.001	1>2 (.001) 1>3 (.003) 4>2 (.001) 4>3 (.025)
Local leaders can adjust quickly to changing problems	3.09 (1.46)	2.05 (0.95)	2.56 (0.96)	2.46 (1.10)	2.52 (1.16)	8.48	<.001	1>2 (.001) 1>3 (.007) 1>4 (.001) 3>2 (.008) 4>2 (.032)
Locals have control over how the community uses its resources	3.31 (1.38)	1.90 (0.87)	2.37 (0.85)	2.88 (1.21)	2.60 (1.19)	18.12	<.001	1>2 (.001) 1>3 (.001) 1>4 (.029) 3>2 (.016) 4>2 (.001) 4>3 (.006)
Local leaders work well together	2.66 (1.48)	2.24 (1.00)	2.68 (0.81)	2.44 (1.19)	2.51 (1.13)	1.67	N.S.**	
Local people can share in decision making with national decision makers	3.15 (1.49)	2.42 (1.25)	3.23 (0.97)	2.41 (0.97)	2.80 (1.21)	10.38	<.001	1>2 (.001) 1>4 (.001) 3>2 (.001) 3>4 (.001)
Local people do not have to wait on national leaders to make community decisions	3.68 (1.24)	3.22 (1.20)	3.74 (0.79)	3.35 (1.21)	3.49 (1.13)	3.11	N.S.	
The community leaders have as much power here as national leaders	3.77 (1.11)	2.63 (1.13)	2.96 (0.90)	2.82 (1.10)	3.00 (1.12)	12.38	<.001	1>2 (.001) 1>3 (.001) 1>4 (.001)
The national government makes the decisions for our community	2.57 (1.35)	2.66 (1.28)	3.14 (1.01)	2.92 (1.24)	2.86 (1.22)	3.00	N.S.	
The county government makes the decisions for our community	2.51 (1.36)	3.65 (1.15)	3.71 (0.87)	3.28 (1.09)	3.33 (1.19)	14.82	<.001	2>1 (.001) 3>1 (.001) 4>1 (.001) 3>4 (.017)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .0056$

\*\*N.S. = Non-significant

<b>Table 33. Community Attitudes towards Tourism as an Alternate Livelihood Option</b>								
Alternate Livelihoods	1. Aitong Mean (SD)	2. Talek Mean (SD)	3. Sek. Mean (SD)	4. Loita Mean (SD)	Total Mean (SD)	One-way ANOVA		
						F- value	p- value*	Post Hoc (p-value)
<b>Tourism is good for my household</b>	4.40 (0.76)	3.71 (1.24)	3.61 (0.74)	3.50 (1.05)	3.76 (1.01)	10.67	<.001	1>2 (.001) 1>3 (.001) 1>4 (.001)
<b>Tourism is good for my community</b>	4.36 (0.83)	4.07 (0.87)	3.91 (0.64)	3.84 (1.01)	4.01 (0.86)	4.77	.003	1>3 (.003) 1>4 (.001)
<b>I benefit directly from tourism</b>	3.65 (1.31)	3.62 (1.44)	2.90 (1.06)	3.04 (1.11)	3.25 (1.25)	6.67	<.001	1>3 (.001) 1>4 (.005) 2>3 (.001) 2>4 (.007)
<b>Tourism can help me share my culture with visitors</b>	4.04 (0.91)	3.37 (1.39)	3.61 (0.85)	3.55 (0.96)	3.63 (1.06)	4.12	.007	1>2 (.001) 1>3 (.021) 1>4 (.009)
<b>I rely on tourism for my livelihood.</b>	2.69 (1.32)	2.60 (1.43)	2.74 (0.90)	2.21 (1.22)	2.55 (1.22)	2.95	N.S.**	
<b>Tourism encourages local environmental protection</b>	4.02 (0.98)	4.34 (0.76)	3.58 (0.73)	3.81 (1.00)	3.90 (0.92)	9.06	<.001	1>3 (.006) 2>3 (.001) 2>4 (.001)
<b>Tourism provides jobs for local people</b>	4.27 (0.73)	4.15 (1.03)	3.75 (0.74)	3.97 (0.91)	4.01 (0.88)	4.75	.003	1>3 (.001) 2>3 (.007)

\*Using Bonferroni's correction, the critical P-value for this set of questions was  $p \leq .007$

\*\*N.S. = Non-significant