

'Oceans and Lakes'

Interuniversity Master in Marine and Lacustrine Science and Management



## **MANGROVES AND LIVELIHOOD: AN ASSESSMENT OF LIVELIHOOD PROJECTS IN MANGROVE ECOSYSTEMS ALONG THE KENYAN COAST**

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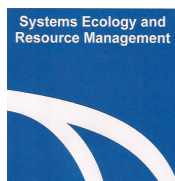
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LABORATORIUM VOOR ALGEMENE PLANTKUNDE EN NATUURBEHEER



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## **List of abbreviations**

|       |  |
|-------|--|
| BMUs  | Beach Management Units                         |
| CDA   | Coast Development Authority                    |
| CFAs  | Community Forest Associations                  |
| FD    | Fisheries Department                           |
| GDs   | Government Departments                         |
| GWMB  | Gazi Women Mangrove Boardwalk                  |
| KE    | Kenya  |
| KFS   | Kenya Forestry Service                         |
| KMFRI | Kenya Marine and Fisheries Research Institute  |
| KWS   | Kenya Wildlife Service                         |
| MOLD  | Ministry of Livestock Development              |
| NGOs  | Non Governmental Organisations                 |
| SWOT  | Strengths Weaknesses Opportunities and Threats |
| ULB   | Université libre de Bruxelles                  |
| VUB   | Vrije Universiteit Brussel                     |
| WWF   | World Wide Fund for Nature                     |

## **Abstract**

The combined pressure on fishery resources and critical habitats presents a challenge to community livelihood along the Kenyan Coast. To counter declining fishery and destruction of habitats several alternative livelihood activities have been initiated. These include ecotourism, mariculture, apiculture, and agro-forestry among others. The present study aimed at assessing the feasibility and sustainability of ecotourism, mariculture and beekeeping projects practiced in mangrove areas in the Kenyan Coast. Focus group discussions with project proponents, local interviews and online Delphi survey with project stakeholders were conducted on projects found in Mida and Majaoni in the North; and Makongeni, Gazi and Wasini in the South Coast of Kenya. A total of 209 local people were interviewed and 65% of invited stakeholders responded for the Delphi survey. A SWOT analysis identified the presence of a healthy mangrove forest and support from local stakeholders as projects strengths; and lack of technical skills as a weakness of the projects. Diversification of the livelihood projects was seen to be an opportunity; and illegal cutting of mangrove was found to be a major threat to the projects. The study found significant differences in causes of project failure in the five sites. The study also established lack of transparency and accountability, inadequate marketing, and lack of commitment among members as some of factors contributing to failure of these livelihood projects. This study provides recommendations on how to improve on efficiency and effectiveness of the initiatives so as to help in wise management of the mangrove ecosystem.

## **Key words**

Mangroves, livelihood projects, ecotourism, mariculture, beekeeping, Kenyan Coast

## 1 Introduction

Mangroves are valued resource, both ecologically and economically, as they support biodiversity including fish and birds (Alongi, 2002; Walters *et al.*, 2008). Traditionally, mangrove are used worldwide for fishery, fuel, timber and medicine (Walters *et al.*, 2008; Nfotabong Atheull *et al.*, 2009; Nfotabong Atheull *et al.*, 2011; Satyanarayana *et al.*, 2012). However, natural and human induced stresses threaten world mangrove ecosystems (Valiela *et al.*, 2001; Giri *et al.*, 2011) . Mangroves have been cleared for aquaculture and infrastructure development (Walters *et al.*, 2008); mining, timber and fuel wood exploitation, and less with pollution and global warming. The destruction is positively correlated with population growth and poverty status (Alongi, 2002).

Kenya is a resource base economy. In the coastal region, tourism contributes 45% to the livelihood and income of the coastal population; whereas, port and shipping, agriculture and fisheries contributes 15% and 10% respectively (GoK, 2009). There has been an increasing growth of the coastal population that poses a challenge to food security and environmental sustainability. Development of alternative livelihood activities is necessary to supplement dependence on fisheries and other natural resources.

The environmental benefit and the commercial uses of the mangroves have made this wetland a very important ecosystem (Sarker *et al.*, 2010). The coastal populations largely depend on this forest for their livelihood (Datta *et al.*, 2012). As defined in Maslow hierarchy management theory, “ livelihood is adequate stocks and flows of food and cash to meet basic needs”. Potential livelihood activities in mangrove areas reduce vulnerability of mangroves and at the same time providing social security to the people. These activities include ecotourism, apiculture and mariculture.

Ecotourism in the mangrove areas is an old activity, which is being practiced in several places in the world. In a study investigating tourism activities in the Caribbean mangroves (Avau *et al.*, 2011), mangrove tourism was presented as ‘soft’ ecotourism, a day trip-combining discovery of natural landscapes and ecosystems,

into more classical leisure activities. Ecotourism in the mangrove areas can provide a reasonable part of economic value of mangrove in Kenya as tourism is the major income source for the coastal population (UNEP, 2011). Approximately 5 boardwalks along the mangrove forest in the Kenyan coast have been constructed as a prerequisite to host and accommodate tourists. The projects provide a source of income to the local communities, conserve the ecosystem and create awareness on the ecosystem to both local and international tourists.

Mangrove support coastal and near shore fisheries as 30% of global fish species are dependent on mangrove (Naylor *et al.*, 2000). Mariculture has been a significant source of exchange earnings in a number of developing countries (Rasowo, 1992). Due to the fall in productivity of near shore fisheries and lack of gears to exploit the deep water fisheries in Kenya, mariculture has been an alternative source of income for coastal artisanal fishing community (GoK, 2009). In 1978, the first pilot project was started in Kenya Coast to test the economic viability of brackish water aquaculture of shrimp (Rasowo, 1992).

Worldwide, industrial aquaculture have been reported to have a great effect on mangrove forests as mangrove areas are being converted to aquaculture (Barbier, 2000). In Kenya the same has been witnessed in Ngomeni where mangrove areas have been cleared for large scale aquaculture. Besides mangrove destruction by aquaculture, industrial aquaculture creates problems to the environment through pollution of water and introduction of exotic species to the environment. To counter these effects the Kenyan government has seen the need of introducing silvofisheries, aiming at achieving co-management of mangrove forests while improving the livelihoods of the mangrove dependent communities (Mirera, 2008).

The current mariculture systems used are small earthen ponds and drive-in mud crab cages, as well as pen culture (Mirera & Ngugi, 2009; Mwaluma, 2002) . The main focus has been on the culture of fin fish (milk fish and mullet) and in some cases polyculture of fish and shrimps. Mirera & Ngugi (2009) recorded a total of 25 ponds constructed by 5 communities for milk fish production.

Worldwide, mangroves attract honey bees and facilitates apiculture (beekeeping) activities (Kathiresan, 2006). Honey has a high market value, always in demand and a good source of income (Carroll, 2006). Bee farming in the mangrove forest is a new venture in Kenya and several communities along the Kenyan Coast are now practicing it. In a way of creating benefits from mangroves, the hives, which are mainly langstroth type (See Annex 4), are installed in the mangrove forest usually in *Avicennia marina* stands. The assumption is that the bees get nectar from the mangrove flowers and to no other valuable sources such as the terrestrial forest nearby (UNEP, 2011).

These mangrove-related projects provide an alternative source of income to the coastal community whose livelihood mainly depend on the marine resources, and at the same time reduce pressure on in-shore fisheries and destructive land based activities on mangroves. Despite their contribution towards the enhancement of the productivity, stability as well as the functional integrity of mangrove ecosystems and associated fisheries production in Kenya, these projects are faced with challenges that affect project management, which if not addressed it will be impossible to sustain the livelihood projects.

The **general objective** of the study was to assess the feasibility and sustainability of mangrove-related livelihood projects.

The **specific objectives** were:

1. To identify the livelihood projects practiced in the mangrove areas
2. To assess the condition/status of the livelihood projects
3. To conduct a SWOT analysis of identified livelihood projects
4. To identify the causes of failure or success of the livelihood projects
5. To provide recommendation on project management

## **2 Research approach and method**

### **2.1 Description of the study sites**

Kenya's Coastal zone which is often classified with reference to the city of Mombasa as the North coast from Mombasa to Kiunga near the Somali border and the South Coast from Mombasa to Vanga near the Tanzanian border both have interlinked ecosystems including mangrove swamps, coral reefs, seagrass beds, rocky shores, estuaries, beaches, mud flats, sand dunes, and terrestrial habitats. The coastline is about 600 km along, from Somalia's border at Ishakani in the North (Longitude 1°41'47"S), to Tanzania's border at Vanga in the south (Longitude 4°40'42"S) (Hoorweg *et al.*, 2000; GoK, 2009). Occurring along the Coast in the intertidal area between the land and the sea and concentrated in the Northern Coast in Lamu (Doute *et al.*, 1981), mangroves form an important ecosystem in Kenya's Coastal areas producing goods and services that are of environmental, ecological and economic importance to human society (Abuodha & Kairo, 2001). According to the 2009 population and housing census (GoK, 2011), the population of the coast province is 3,325,307 equivalent to 8.6% of the national population showing an increase of 22.6% from 1999 to 2009. Most of this people have strong economic ties with the coastal ecosystem in which they interfere in one way or another (Dahdouh-Guebas *et al.*, 2000). In order to reduce pressure on the use of mangrove resources, several alternative livelihood activities have been initiated at the Kenyan Coast. These include integrated fish farming, ecotourism, apiculture, and agro-forestry among others. In order to get a much more objective representation of the assessment, projects were selected from both the South and the North Coast (referring to Mombasa). The sites include: Mida and Majaoni in the North; and Makongeni, Gazi and Wasini in the South. The sites selected are either practicing one or two of the livelihood projects in the mangrove area.

#### *2.1.1 Mida Creek*

Mida Creek is situated in Malindi district located 88 km north of Mombasa (03°21'S, 40°01'E) (See figure 1). A number of habitats are found in Mida Creek including mangroves forests, sea grass beds, corals and sand flats among others (Dahdouh-Guebas *et al.*, 2000; Kairo *et al.*, 2002). The survey was conducted in Mida village for



ecotourism and beekeeping projects. The village has a population of approximately 2300 as per the 2009 national population and housing census. The main tribal group is the Giriama (Mijikenda). The people are mainly practicing agriculture as a source of income (Zorini *et al.*, 2004).

#### *2.1.2 Mtwapa Creek*

Mtwapa Creek (3°57'S, 39°42'E) situated in Kilifi district (See figure 1) has a 2 km<sup>2</sup> of mangrove forest. The survey was conducted in Majaoni Village for aquaculture and ecotourism projects. The village population is about 4000 as per the 2009 national population and housing census. The main tribal group is the Giriama and the Kauma of the Mijikenda group. The people are practicing agriculture, mainly for subsistence use (Reid, 2002).

#### *2.1.3 Gazi Bay*

Gazi Bay (4°26'S, 39°30'E) situated 50 km south of Mombasa (see figure 1) was studied for ecotourism and beekeeping projects in Gazi; and aquaculture in Makongeni. Based on the 2009 national population and housing census, the two villages have a population of 2542 and 2283 respectively. The bay is bordered by 6.2 km<sup>2</sup> of mangrove forests. The forest is heavily used by local people as a fishing ground and source of wood for building and fuel (Dahdouh-Guebas *et al.*, 2004; Kairo *et al.*, 2009). The people are surviving on artisanal fishery and small-scale agriculture.

#### *2.1.4 Wasini Island*

Wasini is a coral island (4°39'S, 39°25'E) situated next to Shimoni (See figure 1). The island has coral and mangrove ecosystems. The study was conducted for an ecotourism project in Wasini village that has a population of 1650 according to the 2009 national population and housing census. The people are mainly of Vumba tribe, an indigenous group of the Bantu. The people in the village depend on fishing, tourism and small-scale business for their livelihood.

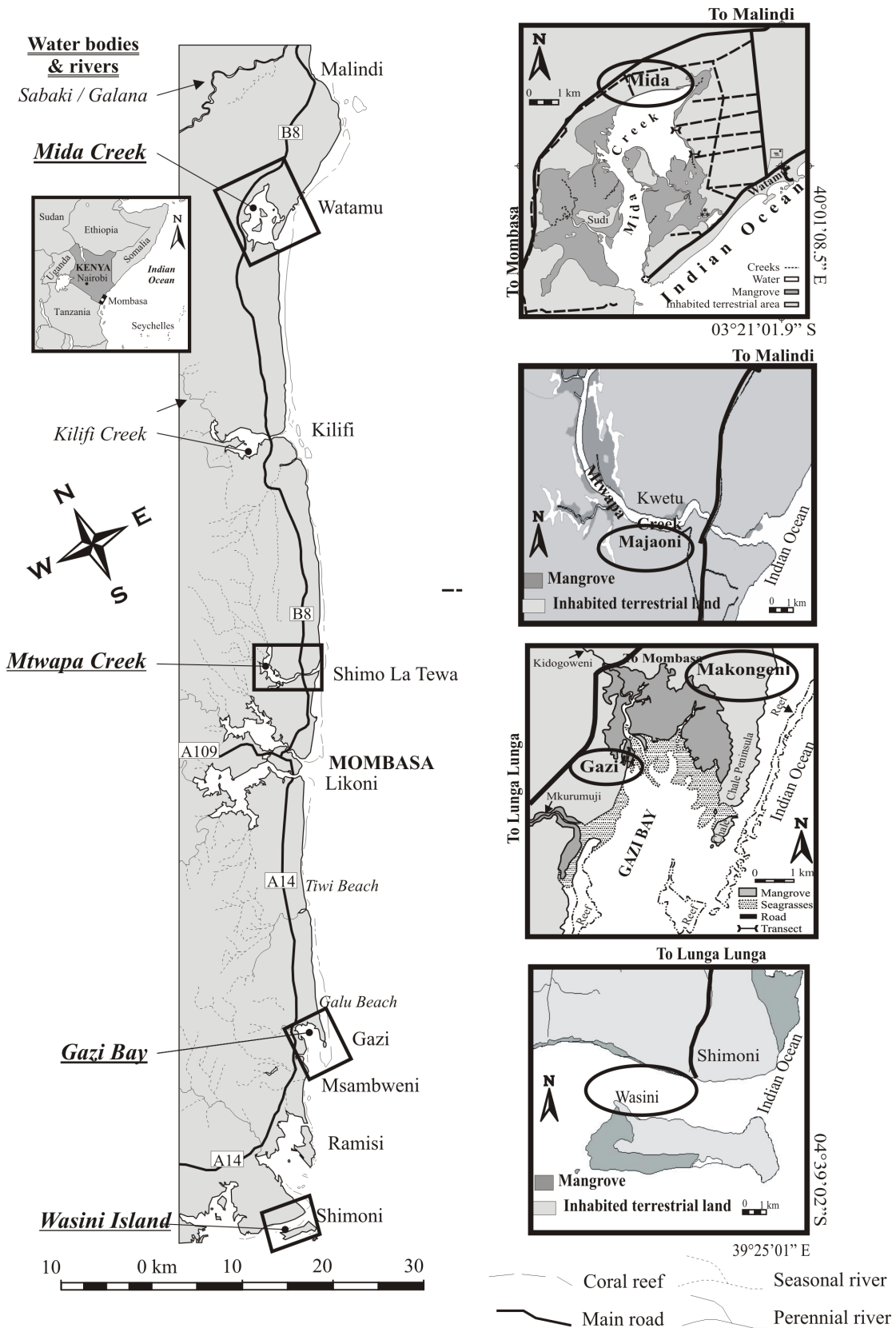


Figure 1: Map of the Kenyan Coast showing the study sites (Mida Creek, Mtwapa Creek, Gazi Bay and Wasini Island). Adapted from Dahdouh-Guebas *et al.* (2000) and (2002)

## 2.2 Data collection

To assess the feasibility and sustainability of the livelihood projects in the selected areas, socio-economic data were collected using participatory techniques namely: focus group discussions and local interviews during the period July to September 2012; and an online Delphi approach, a procedure conducted by mail or face to face which allows experts to deal jointly and consecutively (but anonymously) with a problem or learn from each other (Elliot *et al.*, 2005). The Delphi survey was conducted from December 2012 to February 2013 to build consensus (or detect dissensus) on matters raised during focus group discussions. Before the survey, the respective village elders of the sites were informed on the survey. The elders then informed the respective project groups and planned for the focus group discussions and further informed the villagers on the household interviews to be conducted.

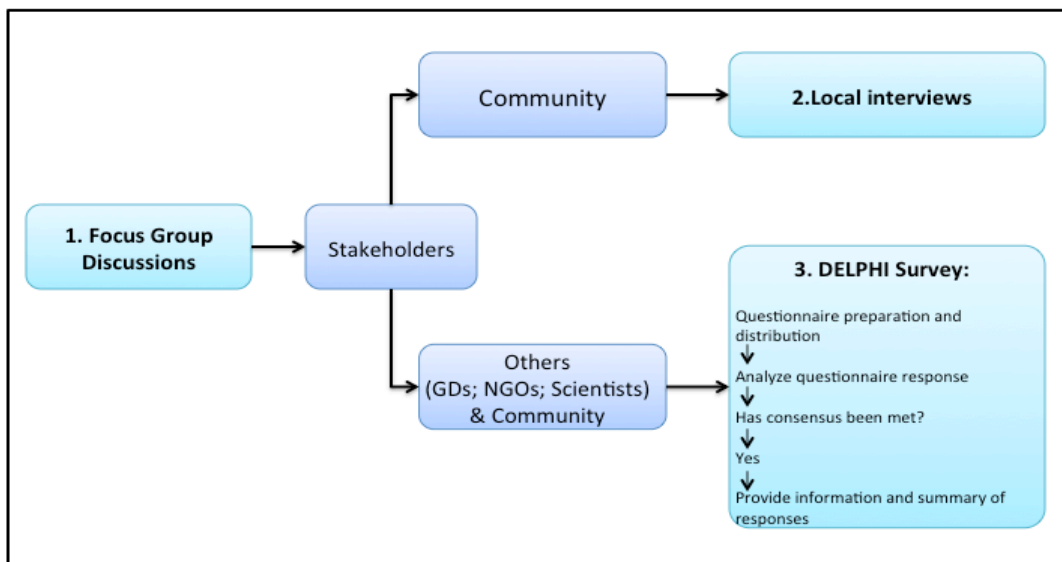


Figure 2: Summary of research approach used

### 2.2.1 Focus group discussions

Focus group discussions were conducted at the project sites and with project members that are directly involved in the running of the project. The focus group discussions were held in view of generating qualitative information on the strengths, weaknesses, opportunities and threats (SWOT) of the respective projects. The researcher used guiding SWOT questions (Annex 1) in getting information from the group members. The interviews were conducted in Kiswahili, which is not a native language of the respondents in all the sites but usually used for communication in

the sites with people not sharing a mother tongue. The researcher would start by introducing the objective of the discussion. The discussion would last for one to two hours at each site. This tool was important in giving a general view of the project before the local interviews and Delphi study.

Table 1: Members present for focus group discussions at project sites

| Site      | Number of people present | Gender |        |
|-----------|--------------------------|--------|--------|
|           |                          | Male   | Female |
| Mida      | 25                       | 8      | 17     |
| Majaoni   | 6                        | 5      | 1      |
| Makongeni | 8                        | 0      | 8      |
| Gazi      | 12                       | 0      | 12     |
| Wasini    | 10                       | 0      | 10     |

### 2.2.2 Local interviews

Every other house was selected for a household interview. Interviews were conducted in Kiswahili in the home of respondent. To avoid repetition and interference from members of the same household, only one person per household was interviewed. If present, the head of the house will be interviewed, if not any elder person would be interviewed. A questionnaire, which comprised both open ended and close-ended questions, was systematically filled during the interviews (Annex 2). A total of 209 people in the five villages were interviewed.

Table 2: Number of respondents for the local interviews at each site

| Site      | Number of respondents |
|-----------|-----------------------|
| Mida      | 42                    |
| Majaoni   | 44                    |
| Makongeni | 42                    |
| Gazi      | 42                    |
| Wasini    | 39                    |

### 2.2.3 Delphi survey

The procedure involved project stakeholders identified during focus group discussions. Stakeholders were invited from four categorical groups that include officials from the Government, Non Governmental Organizations (NGOs), scientists or academicians and community representatives. Invited stakeholders included

individuals from identified Institutions involved in the projects as mentioned by project proponents. For scientists, these were researchers or academicians conducting their research or studies on the project or project area and tend to be involved in these projects. These scientists may be affiliated to a government department or an NGO in the area but with no permanent employment. The community in this case is those individuals from the project site that participate in the project and are born and live in the project area. Email addresses of identified individuals from the different groups were sourced and an invitation email to the survey was sent explaining the aim of the survey. A questionnaire was created in Google docs and a link sent to the stakeholders by email <https://docs.google.com/spreadsheet/viewform?fromEmail=true&formkey=dFhWZ2l3ajRZdXJyQ2VTRTRKcGhiVGc6MQ>. The stakeholders were given 2 weeks to participate in the survey but others asked for an extension because of other commitment and therefore the survey lasted for three weeks from February 19<sup>th</sup> to March 13<sup>th</sup> 2013. The results obtained from focus group discussions were used to develop the questionnaire used for the first round of the survey and therefore constituting mainly close-ended questions. The questions were followed by an open dialogue box in which the participants could comment or compliment responses. Finally a report was prepared and sent to the stakeholders. The aim of Delphi is usually to develop consensus over several rounds (MacMillan & Marshall, 2006), the present study was stopped after the first round because a 90% consensus was reached. However, focus group discussions was considered to be a pre round for Delphi survey due to the fact that the response from the focus group discussions was used to develop the questions for the survey.

### **2.3 Data analysis**

Data analysis was performed using Statistical Package for Social Scientists (SPSS V.18.0). Chi-square tests ( $\chi^2$ ) were used to determine whether there was any significant difference ( $p < 0.05$ ) in response in sites. Likert scale questions in the Delphi survey were described with descriptive statistics of rating; rating Mean (qi), standard deviation (SD), and quartile deviation (Q). The statistical validation was measured in accordance to Chu & Hwang (2008), where a consensus is reached

when  $Q \leq 0.5$  and when the rating mean  $(q_i) \geq 3.5$  or  $(q_i) \leq 3.5$ . Graphical analysis and presentations were done in Microsoft Excel 2011.

### 3 Results

#### 3.1 Focus group discussions

##### 3.1.1 SWOT analysis of livelihood projects

The focus group discussions that were held with project proponents came up with the following SWOT results.

##### 3.1.1.1 Ecotourism

|   |  |
|---|--|
| <p><b>Strengths</b></p> <p>The mangrove forests are in good condition – A<br/>         There is a large creek with biodiversity hence attracting tourists – Md<br/>         Members having technical capacity – guiding skills, bookkeeping – Md, Mj<br/>         Regular meetings by members for project update – Md, W<br/>         Project supporting socio-economic activities like education and medical services in the village – Md, W<br/>         Income generation by the project – Md, W</p> | <p><b>Weaknesses</b></p> <p>High maintenance cost – G, W<br/>         Poor leadership – G<br/>         Poor service delivery – G, W<br/>         Lack of social corporate by the hotels in the project area – G<br/>         Lack of cooperation between members and project committee – Mj, G, W<br/>         Lack of collaboration and government support – Mj<br/>         Seasonality of the project – A</p> |
| <p><b>Opportunities</b></p> <p>Project diversification – G, W<br/>         Reinforcing the boardwalk by raising the boardwalk or using cemented poles – G, W</p>  | <p><b>Threats</b></p> <p>Insecurity – G, W<br/>         Illegal cutting of mangroves – Md, W</p>   |

A – All (Mida, Majaoni, Gazi, Wasini), Md – Mida, Mj – Majaoni, G – Gazi, W – Wasini

##### 3.1.1.2 Aquaculture

|  |   |
|--|---|
| <p><b>Strengths</b></p> <p>Next to a channel – Mk<br/>         High fish production – A<br/>         Members are well organized – A<br/>         Perseverance in members – A</p> | <p><b>Weaknesses</b></p> <p>Lack of ownership – Mj<br/>         High expenditure – A<br/>         Project seasonality – A<br/>         Weak constitution – A<br/>         Inadequate resources – Mk</p>   |
| <p><b>Opportunities</b></p> <p>Youth involvement – Mk<br/>         High participation by men – Mk</p>  | <p><b>Threats</b></p> <p>Suffocation of fish – Mk<br/>         Lack of recruitment of energetic members – Mk<br/>         Climate change, long rains that kill fish – Mj<br/>         Poor link between government and community – Mj<br/>         Poor governance – Mj</p> |

A – All (Majaoni, Makongeni), Mj – Majaoni, Mk – Makongeni.

### 3.1.1.3 Beekeeping

|   |   |
|---|---|
| <p><b>Strengths</b></p> <p>Members own a good number of langstroth bee hives – A</p> <p>Support from other stakeholders (Government, NGO’s) – A</p> <p>Personnel with adequate technical capacity on bee keeping – Md, Mj</p> | <p><b>Weaknesses</b></p> <p>Hives not colonized – Md, G</p>   |
| <p><b>Opportunities</b></p> <p>Use of Kenya Top Bar hives (KBH) have shown to produce a good harvest – Md</p>   | <p><b>Threats</b></p> <p>Prolonged drought – Md</p> <p>Insecurity – A</p> <p>Livestock intrusion – Md</p> |

A – All (Mida, Majaoni, Gazi), Md – Mida, Mj – Majaoni, G – Gazi

### 3.1.2 Challenges and solutions proposed by project proponents

The research revealed that all projects are being faced with several challenges. However, in addressing these challenges, the project executive recommended various interventions. The identified challenges and recommendations are detailed in table 3.

Table 3: Identified challenges and proposed solution

| Project     | Challenges  | Proposed solution  |
|-------------|---|--|
| Aquaculture | <ul style="list-style-type: none"> <li>• Site selection</li> <li>• Ownership</li> <li>• Lack of technical skills</li> <li>• Nepotism</li> <li>• Overexpectation</li> <li>• Conflict of interest</li> </ul>  |  |
| Ecotourism  | <ul style="list-style-type: none"> <li>• Poor marketing</li> <li>• High cost of repair</li> <li>• Poor management</li> <li>• Corruption</li> <li>• Professional tour guiding skills lacking</li> <li>• Conflict of interest</li> <li>• Transparency and accountability</li> <li>• Politics</li> </ul>                 | <ul style="list-style-type: none"> <li>• Capacity building</li> <li>• Awareness and involvement</li> <li>• Proper planning</li> <li>• Honesty and integrity</li> <li>• Government involvement</li> <li>• Networking</li> </ul> |
| Beekeeping  | <ul style="list-style-type: none"> <li>• Low production</li> <li>• Economic sustainability</li> <li>• Prolonged drought</li> <li>• Lack of technical skills</li> <li>• Site selection</li> <li>• Lack of practical skills</li> <li>• Overexpectation</li> <li>• Corruption</li> <li>• Conflict of interest</li> </ul> |  |

## 3.2 Local Interviews

### 3.2.1 Social demographic traits of respondent

Table 4 summarizes the social demographic traits of the respondents. 90% of the respondents had lived in the study sites for more than the age of the oldest project, this was very important because they were able to confidently give views on the livelihood projects.

Table 4: Social demographic traits of respondents

| Social demographic traits                | Frequency |          |           |           |          | Total            |
|--|-----------|----------|-----------|-----------|----------|------------------|
|  | Mida      | Majaoni  | Makongeni | Gazi      | Wasini   |                  |
| Number of respondents                    | 43        | 44       | 42        | 42        | 38       | 209              |
| <b>Gender</b>                            |           |          |           |           |          |                  |
| Female                                   | 21 (49%)  | 17 (39%) | 20 (48%)  | 19 (45%)  | 18 (47%) | <b>95 (45%)</b>  |
| Male                                     | 22 (51%)  | 27 (61%) | 22 (52%)  | 23 (55%)  | 20 (53%) | <b>114 (55%)</b> |
| <b>Years lived in the village</b>        |           |          |           |           |          |                  |
| Less than oldest project age             | 1 (2%)    | 9 (20%)  | 7 (17%)   | 0 (0%)    | 3 (8%)   | <b>20 (10%)</b>  |
| More than oldest project age             | 41 (95%)  | 35 (80%) | 35 (83%)  | 42 (100%) | 35 (92%) | <b>188 (90%)</b> |
| <b>Level of education</b>                |           |          |           |           |          |                  |
| None                                     | 19 (44%)  | 7 (16%)  | 14 (33%)  | 9 (21%)   | 3 (8%)   | <b>52 (25%)</b>  |
| Incomplete primary school                | 13 (30%)  | 10 (23%) | 8 (19%)   | 9 (21%)   | 3 (8%)   | <b>43 (21%)</b>  |
| Complete primary school                  | 5 (12%)   | 9 (20%)  | 13 (31%)  | 10 (24%)  | 6 (16%)  | <b>43 (21%)</b>  |
| Incomplete secondary                     | 3 (7%)    | 9 (20%)  | 0 (0%)    | 2 (5%)    | 5 (13%)  | <b>19 (9%)</b>   |
| Complete secondary                       | 2 (5%)    | 8 (18%)  | 5 (12%)   | 9 (21%)   | 16 (42%) | <b>40 (19%)</b>  |
| Tertiary                                 | 1 (2%)    | 1 (2%)   | 2 (5%)    | 3 (7%)    | 5 (13%)  | <b>12 (6%)</b>   |
| <b>Respondent primary occupation</b>     |           |          |           |           |          |                  |
| None                                     | 2 (5%)    | 3 (7%)   | 12 (29%)  | 2 (5%)    | 4 (11%)  | <b>23 (11%)</b>  |
| Fishing                                  | 7 (16%)   | 10 (23%) | 6 (14%)   | 8 (19%)   | 3 (8%)   | <b>34 (16%)</b>  |
| Farming                                  | 8 (19%)   | 11 (25%) | 1 (2%)    | 4 (10%)   | 0 (0%)   | <b>24 (11%)</b>  |
| Tourism                                  | 8 (19%)   | 3 (7%)   | 1 (2%)    | 0 (0%)    | 4 (11%)  | <b>16 (8%)</b>   |
| Mangrove related                         | 3 (7%)    | 0 (0%)   | 0 (0%)    | 1 (2%)    | 0 (0%)   | <b>4 (2%)</b>    |
| Makuti weaving                           | 0 (0%)    | 0 (0%)   | 0 (0%)    | 4 (10%)   | 0 (0%)   | <b>4 (2%)</b>    |
| Employed                                 | 6 (14%)   | 6 (14%)  | 6 (14%)   | 6 (14%)   | 8 (21%)  | <b>32 (15%)</b>  |
| Self employed                            | 4 (9%)    | 8 (18%)  | 16 (38%)  | 9 (21%)   | 7 (18%)  | <b>44 (21%)</b>  |
| Student                                  | 0 (0%)    | 3 (7%)   | 0 (0%)    | 0 (0%)    | 2 (5%)   | <b>5 (2%)</b>    |
| Housewife                                | 4 (9%)    | 0 (0%)   | 0 (0%)    | 6 (14%)   | 9 (24%)  | <b>19 (9%)</b>   |
| Others                                   | 1 (2%)    | 0 (0%)   | 0 (0%)    | 2 (5%)    | 1 (3%)   | <b>4 (2%)</b>    |
| <b>Respondent alternative occupation</b> |           |          |           |           |          |                  |
| Not Applicable                           | 15 (35%)  | 26 (59%) | 31 (74%)  | 29 (69%)  | 30 (79%) | <b>131 (63%)</b> |
| Fishing                                  | 12 (28%)  | 6 (14%)  | 1 (2%)    | 0 (0%)    | 0 (0%)   | <b>19 (9%)</b>   |
| Farming                                  | 5 (12%)   | 0 (0%)   | 0 (0%)    | 0 (0%)    | 2 (5%)   | <b>7 (3%)</b>    |
| Tourism related                          | 2 (5%)    | 0 (0%)   | 0 (0%)    | 2 (5%)    | 0 (0%)   | <b>4 (2%)</b>    |
| Mangrove related                         | 0 (0%)    | 0 (0%)   | 0 (0%)    | 1 (2%)    | 0 (0%)   | <b>1 (0.5%)</b>  |
| Makuti weaving                           | 0 (0%)    | 3 (7%)   | 1 (2%)    | 0 (0%)    | 1 (3%)   | <b>5 (2%)</b>    |
| Employed                                 | 7 (16%)   | 8 (18%)  | 7 (17%)   | 6 (13%)   | 2 (5%)   | <b>30 (14%)</b>  |
| Self employed                            | 0 (0%)    | 0 (0%)   | 0 (0%)    | 1 (2%)    | 2 (5%)   | <b>3 (1%)</b>    |
| Housewife                                | 2 (5%)    | 1 (2%)   | 2 (5%)    | 3 (7%)    | 1 (3%)   | <b>9 (4%)</b>    |

The values in parentheses indicate percentages per village or for all villages together (Total) for a particular demographic trait



### 3.2.2 Information on mangrove-related projects

The respondents were asked about the importance of mangrove and 96% indicated that mangroves are very important because the community benefits through the projects situated in the mangrove areas, supporting fisheries among others. In addition 93% of the respondents confirmed that there are projects initiated in the village in order to reduce pressure on the utilization of mangrove resources while only 5% of the respondents were not aware. On the effectiveness of the mangrove projects, 76% of the respondents confirmed importance of such initiatives in mangrove conservation. Nevertheless, there was a significant difference in the response by site with 50% of the respondents in Wasini indicating that the projects are not effective ( $\chi^2 = 60.4$ , d.f= 8, P=0.000). This is because illegal mangrove cutting is witnessed in some areas.

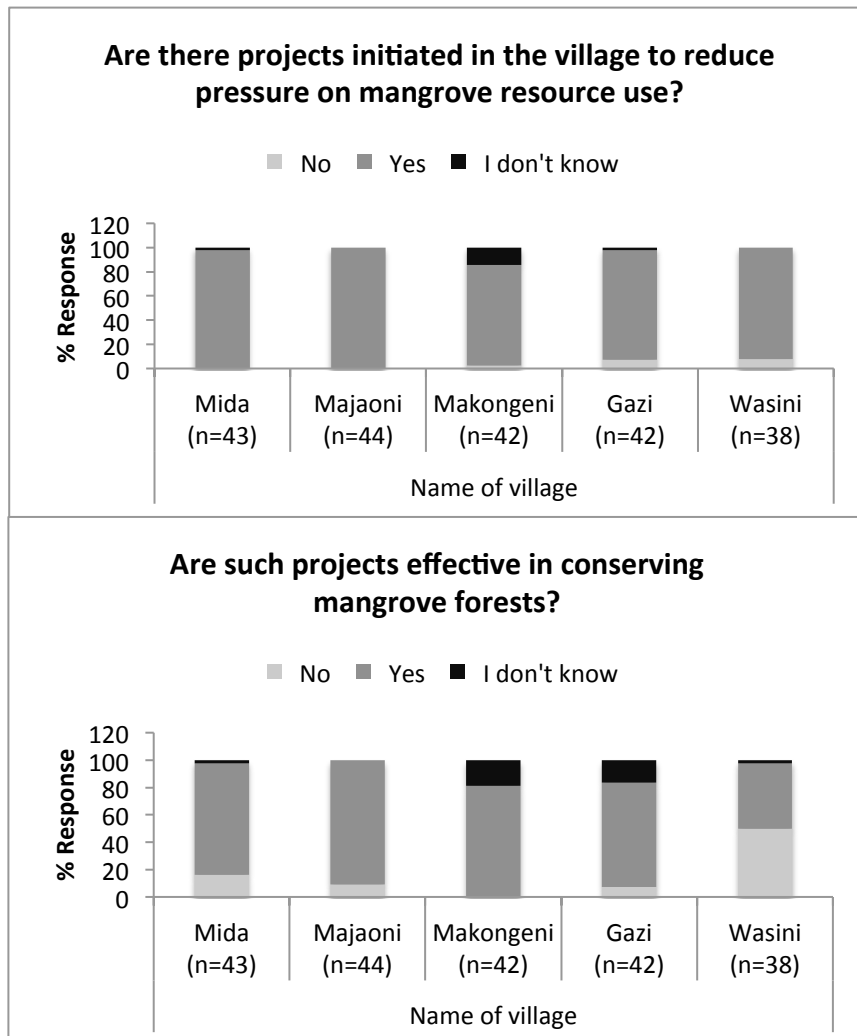


Figure 3: Respondents' views on mangrove-related projects

The projects that were introduced to reduce pressure on mangrove forest utilization identified by the respondents were ecotourism, aquaculture, beekeeping, agroforestry, seaweed farming, butterfly farming, mushroom farming, guinea fowl and chicken rearing. The respondents identified environmental conservation groups and beach management units (BMUs) as part of initiatives introduced in the view of reducing pressure on mangrove resource use, but it is important to note these are not income generating projects but organizational initiatives. BMU is a government initiative through the Fisheries Department, which engages the local community in the management of fisheries resources.

Projects like agroforestry where planting of species such as *Casuarina* are implemented provide an alternative source of fuel and timber whereas projects such as ecotourism and beekeeping protect mangrove from illegal cutting thus conserving mangrove. The local communities manage all the mangrove-related projects in the study sites with support from other stakeholders. These stakeholders are drawn from the government departments, Non Governmental Organisations (NGO's) and private sectors. The government departments include Kenya Wildlife service (KWS), Kenya Forest Service (KFS), Kenya Marine and Fisheries Research Institute (KMFRI), Fisheries department, Ministry of Livestock development and Coast Development Authority (CDA); Non Governmental Organisations (NGO's) comprises of Nature Kenya, Kwetu training Centre, World Wide Fund for Nature (WWF), Pact Kenya; and while the private sectors is mainly composed of touristic hotels.

### *3.2.3 Respondents involvement in mangrove-related projects*

There was a significant difference in respondents' involvement in projects per site ( $\chi^2 = 58.4$ , d.f= 8, P=0.000). The frequency of respondents' involvement in the project also varied significantly per site ( $\chi^2 = 67$ , d.f= 12, P=0.000).

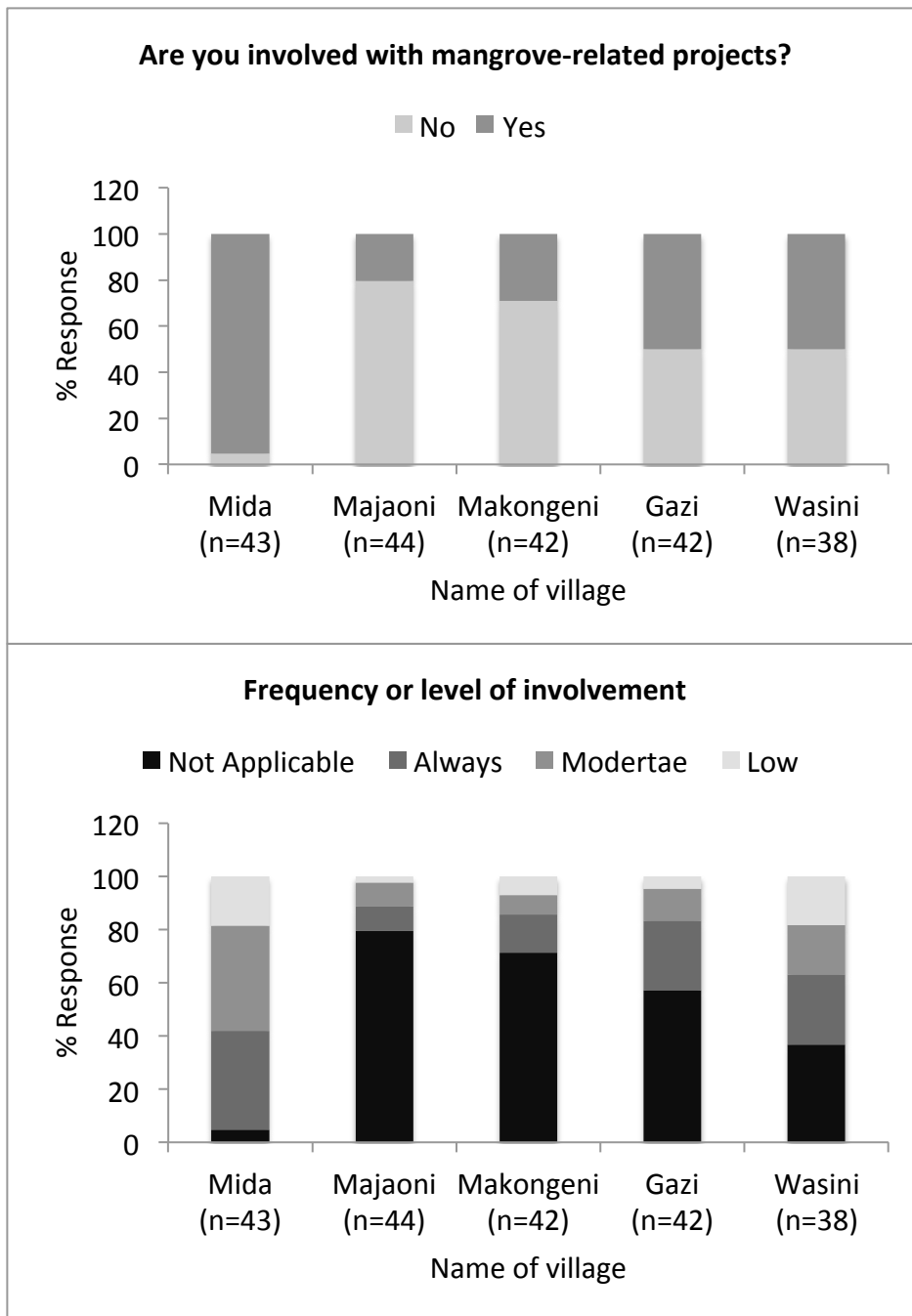


Figure 4: Respondent's involvement in mangrove-related projects

Figure 5 show the reasons raised by respondents for not being involved in project activities, which vary significantly in sites.

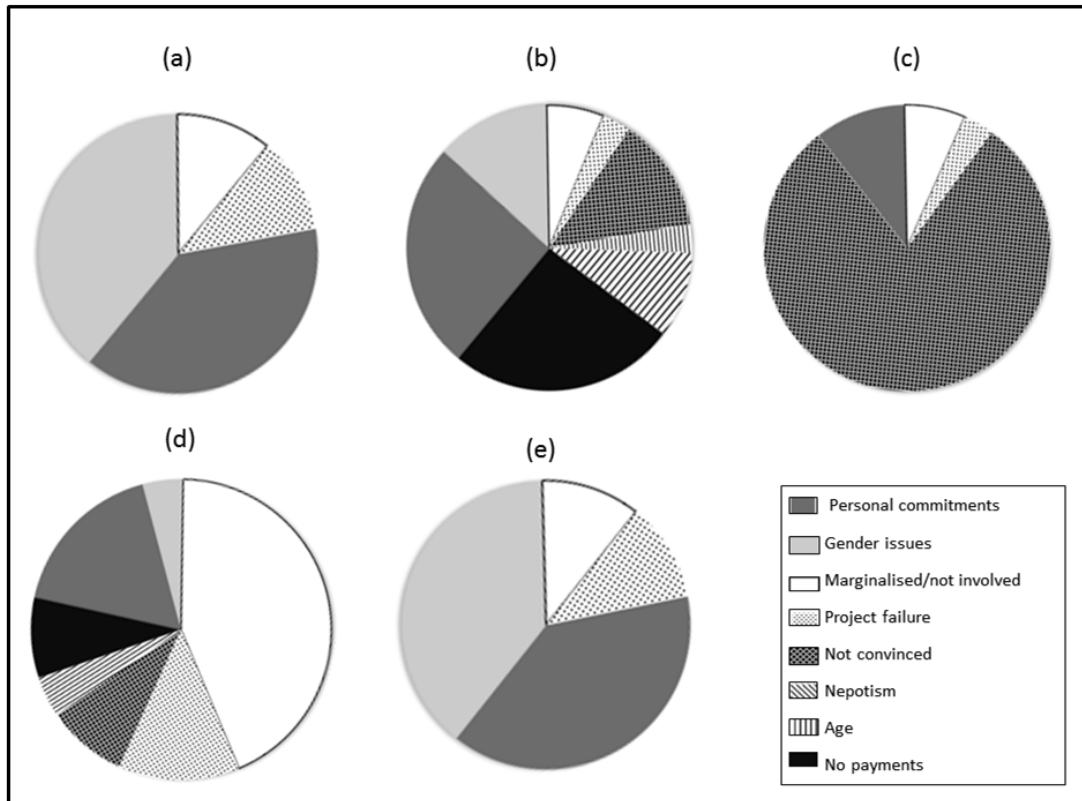


Figure 5: Reasons given by project proponents for not being involved in projects activities (a) Mida, (b) Majaoni, (c) Makongeni, (d) Gazi and (e) Wasini

### 3.2.4 Respondent views on mangrove-related projects

The results indicated a non significant difference in project strengths mentioned in the different sites except for environmental protection ( $\chi^2 = 7.9$ , d.f= 3,  $P=0.047$ ). There was a significant difference in most of the weaknesses raised in sites. These weaknesses include: lack of transparency and accountability, poor leadership, poor service delivery, illiteracy, having low project returns on investments, inadequate marketing, and inadequate resources. The results indicated a significance difference of  $\chi^2 = 23$ , d.f= 4,  $P=0.000$  for lack of transparency and accountability, and  $\chi^2 = 26$ , d.f= 4,  $P=0.000$  for inadequate marketing. Poor leadership indicated a significance of  $\chi^2 = 25$ , d.f= 4,  $P=0.000$  and inadequate resources indicated a significance of  $\chi^2 = 12$ , d.f= 4,  $P=0.019$ . Illiteracy indicated a significance of  $\chi^2 = 44$ , d.f= 4,  $P=0.000$  and poor service delivery had a significance of  $\chi^2 = 14$ , d.f= 4,  $P=0.008$ . Table 5 outlines the project strengths and weaknesses raised by respondents.

Table 5: Project strengths and weaknesses as per local interview

|   | % Response |           |           |           |           |           |
|---|------------|-----------|-----------|-----------|-----------|-----------|
|   | Total      | Mida      | Majaoni   | Makongeni | Gazi      | Wasini    |
| <b>Number of response</b>   | <b>209</b> | <b>43</b> | <b>44</b> | <b>42</b> | <b>42</b> | <b>38</b> |
| <b>Project strengths</b>  |            |           |           |           |           |           |
| Cooperation, unity and responsibility sharing                             | 20         | 9         | 27        | 38        | 5         | 18        |
| Environmental protection (Reduce mangrove usage, planting)                | 13         | 5         | 27        | 7         | 5         | 21        |
| Support from, working with or involving other stakeholders                | 12         | 23        | 18        | 17        | 2         | 0         |
| Project generate income, improve living standard                          | 12         | 5         | 9         | 24        | 14        | 8         |
| Members have knowledge and understanding on mangrove                      | 10         | 12        | 14        | 7         | 14        | 0         |
| Site related (large creek, mangrove in good condition, natural resources) | 9          | 19        | 5         | 0         | 7         | 16        |
| Project well marketed, well known   | 7          | 2         | 0         | 0         | 31        | 3         |
| Support community (education, medical)                                    | 7          | 5         | 0         | 0         | 5         | 26        |
| Creating awareness, Education   | 6          | 2         | 2         | 7         | 19        | 0         |
| Readily available market  | 6          | 2         | 9         | 12        | 5         | 3         |
| Have community support  | 6          | 0         | 5         | 19        | 2         | 3         |
| Good leadership and management  | 5          | 9         | 7         | 5         | 2         | 3         |
| Good technical skills   | 5          | 7         | 0         | 0         | 14        | 3         |
| Managed by community  | 4          | 16        | 0         | 2         | 0         | 0         |
| Give rise to other income generating project                              | 3          | 2         | 0         | 5         | 2         | 5         |
| Good tourism site   | 2          | 2         | 0         | 0         | 5         | 5         |
| Creating job opportunities  | 2          | 2         | 7         | 0         | 2         | 0         |
| Have other assets, attraction sites and activities                        | 2          | 7         | 0         | 0         | 2         | 0         |
| Project ownership and committed members                                   | 1          | 2         | 0         | 2         | 2         | 0         |
| <b>Project weaknesses</b>   |            |           |           |           |           |           |
| In adequate resources   | 24         | 28        | 30        | 24        | 5         | 34        |
| Lack of technical skill   | 14         | 7         | 25        | 5         | 10        | 24        |
| Poor leadership   | 13         | 5         | 9         | 33        | 17        | 0         |
| Lack of transparency and accountability                                   | 12         | 7         | 7         | 7         | 33        | 5         |
| No collaboration, irresponsibility in members                             | 11         | 2         | 16        | 17        | 10        | 13        |
| Low project returns on investments  | 11         | 12        | 9         | 2         | 24        | 5         |
| In adequate marketing   | 10         | 2         | 0         | 5         | 29        | 13        |
| Conflicts   | 8          | 5         | 9         | 21        | 0         | 5         |
| Illiteracy  | 8          | 33        | 2         | 5         | 0         | 0         |
| Lack of project ownership   | 8          | 5         | 16        | 7         | 2         | 8         |
| Insecurity/theft  | 6          | 5         | 16        | 0         | 2         | 5         |
| No community support  | 6          | 5         | 14        | 0         | 5         | 5         |
| Nepotism  | 4          | 0         | 9         | 0         | 12        | 0         |
| Gender imbalance  | 4          | 12        | 7         | 0         | 0         | 3         |
| Lack of support from stakeholders   | 4          | 5         | 5         | 7         | 2         | 3         |
| Corruption  | 4          | 0         | 2         | 0         | 0         | 18        |
| Prolonged drought   | 3          | 9         | 7         | 0         | 0         | 0         |
| Illegal cutting of mangrove   | 3          | 2         | 9         | 0         | 2         | 0         |
| Poor service delivery   | 2          | 0         | 0         | 0         | 2         | 11        |
| Lack of constitution/constitution not implemented                         | 2          | 0         | 2         | 2         | 5         | 3         |
| High maintenance cost   | 1          | 5         | 0         | 0         | 0         | 0         |
| Project seasonality   | 0          | 0         | 2         | 0         | 0         | 0         |
| Land problems   | 0          | 2         | 0         | 0         | 0         | 0         |

### 3.3 Stakeholders' Delphi Survey

Stakeholders were invited from four categorical groups that include officials from the Government, Non Governmental Organizations (NGO), scientists or academicians and community representatives. A total of 23 stakeholders were invited, however 15 stakeholders were able to respond in the first and final round. Since a 90% consensus as measured in terms of statistical consensus was reached with a quartile deviation ( $Q \leq 0.5$ ) and a rating mean ( $q_i \geq 3.5$ ), the responses were sufficient to make a conclusion.

#### 3.3.1 Characteristics of Delphi participants

As seen from table 4, there were more male than female perhaps showing a bias on the participants' population. The representation of the different categorical groups was not equal possibly posing a bias on the views given. This risk for bias could not be avoided since those were the only respondents even when invitation to participation was to a wider group and primarily the lack of gender balance in these institutions. Hence it represents the actual constitution and opinion of these bodies.

Table 6: Characteristics of stakeholders in the Delphi survey

|  |                         | <b>Response</b> |
|--|-------------------------|-----------------|
| <b>Gender</b>                            | Male                    | 11              |
|  | Female                  | 4               |
| <b>Area of operation</b>                 | Mida creek              | 3               |
|  | Mtwapa creek            | 4               |
|  | Gazi Bay                | 14              |
|  | Wasini Island           | 3               |
| <b>Mangrove related project involved</b> | Ecotourism              | 11              |
|  | Aquaculture             | 8               |
|  | Beekeeping              | 9               |
|  | All activities          | 5               |
| <b>Respondent categorical group</b>      | Government              | 5               |
|  | NGO                     | 3               |
|  | Scientists/academicians | 4               |
|  | Community               | 3               |

### 3.3.2 Stakeholders opinion on mangrove-related projects

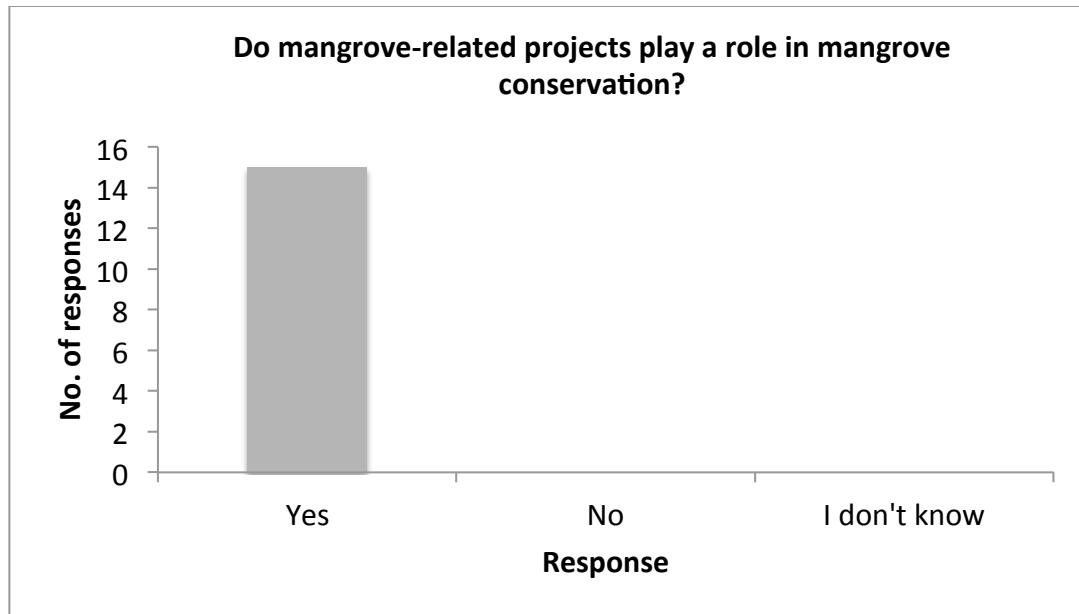


Figure 6: Response to whether projects play a role in mangrove conservation

The stakeholders who responded indicated 100% agreement that mangrove-related projects play a role in conserving mangrove forest as seen in figure 6.

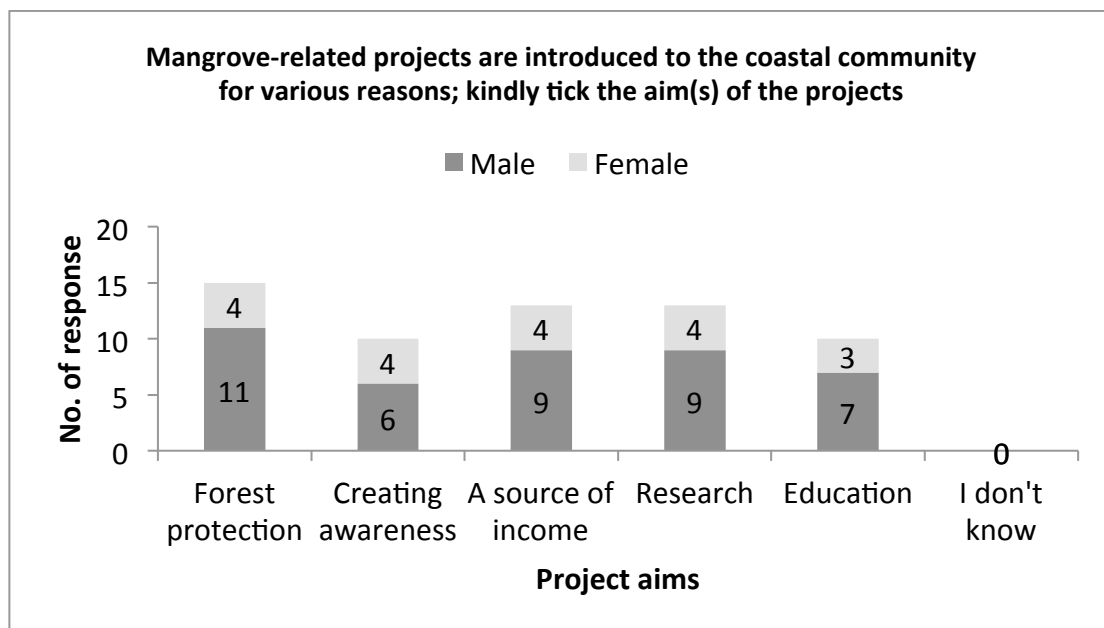


Figure 7: Response to suggested project aims

The objective of this question was to provide a comparison on perception between stakeholders and project proponents on the aims of the projects. It should be noted that four out of the fifteen stakeholders who participated were females. The stakeholders considered all the aims suggested by the project proponents to be very important. In addition they also suggested incorporation of poverty alleviation;

enhancement of sustainable utilization of mangrove forests; enhancement of collaboration between institutions and keeping pace with climate change to be part of the project aims.

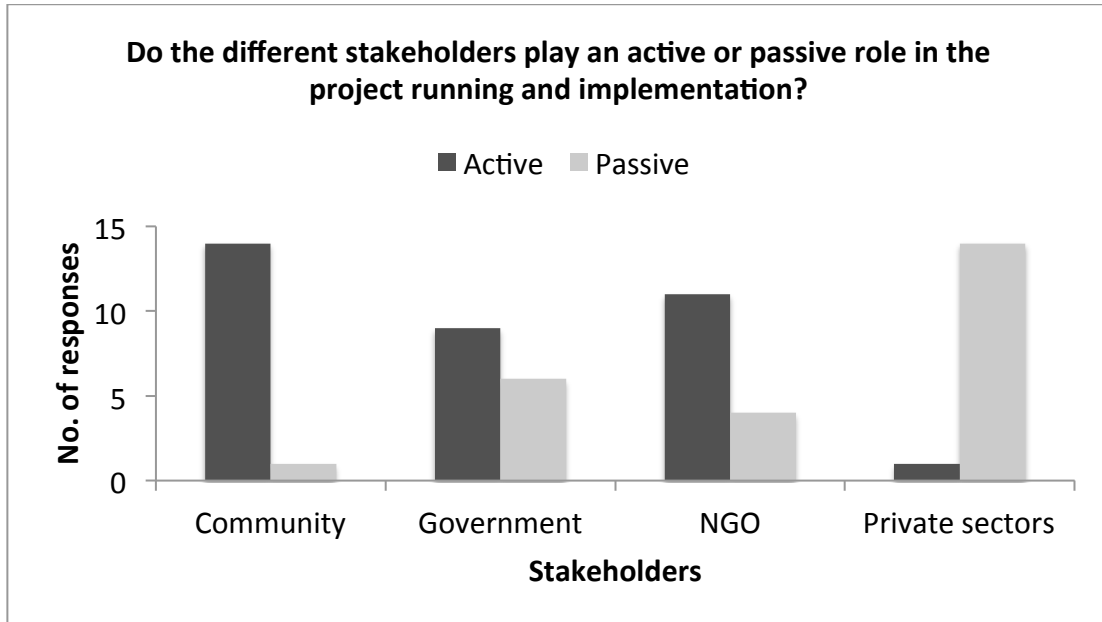


Figure 8: Responses to the role played by stakeholders in mangrove-related projects

As clearly defined in the survey, active role meant being fully involved in management of the projects while passive role meaning only involved when needed or from time to time. As shown in the figure 8, it is clear from the survey that the community plays an active role in the project management, while the private sector play a passive role.

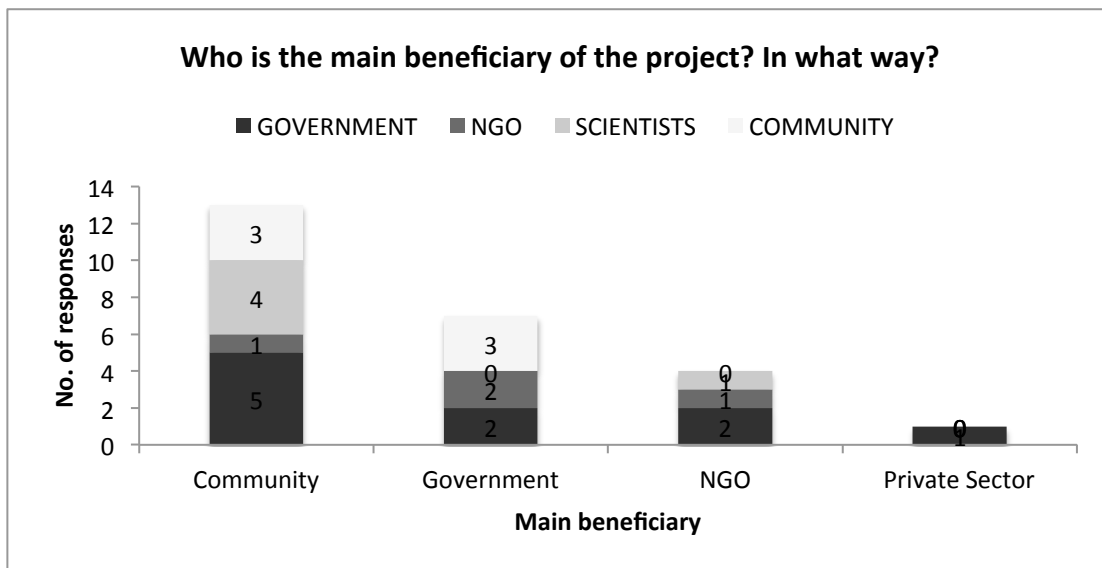


Figure 9: Responses to who is the main project beneficiary



The community was found to be the main beneficiary to these projects as seen in the output of the survey (Fig. 9). It is important to note that scientists do not consider governments as the beneficiary of the projects and communities do not see NGO's benefiting from the projects. All the stakeholders consider private sectors the least beneficiary of the mangrove-related projects. The stakeholders noted the following ways in which the different stakeholders benefit.

Table 7: Ways in which different stakeholders benefit from mangrove-related projects

| Category   | Benefits  | Response |
|------------|---|----------|
| Community  | Source of income                                  | 11       |
|            | Alleviate poverty                                 | 4        |
|            | Job creation                                      | 4        |
|            | Increased awareness in environmental conservation | 3        |
| Government | Protection of country's flora and fauna           | 5        |
| NGO's      | More funding due to project success               | 3        |

Among the three livelihood projects studied, ecotourism is considered to be the most sustainable as seen from figure 10.

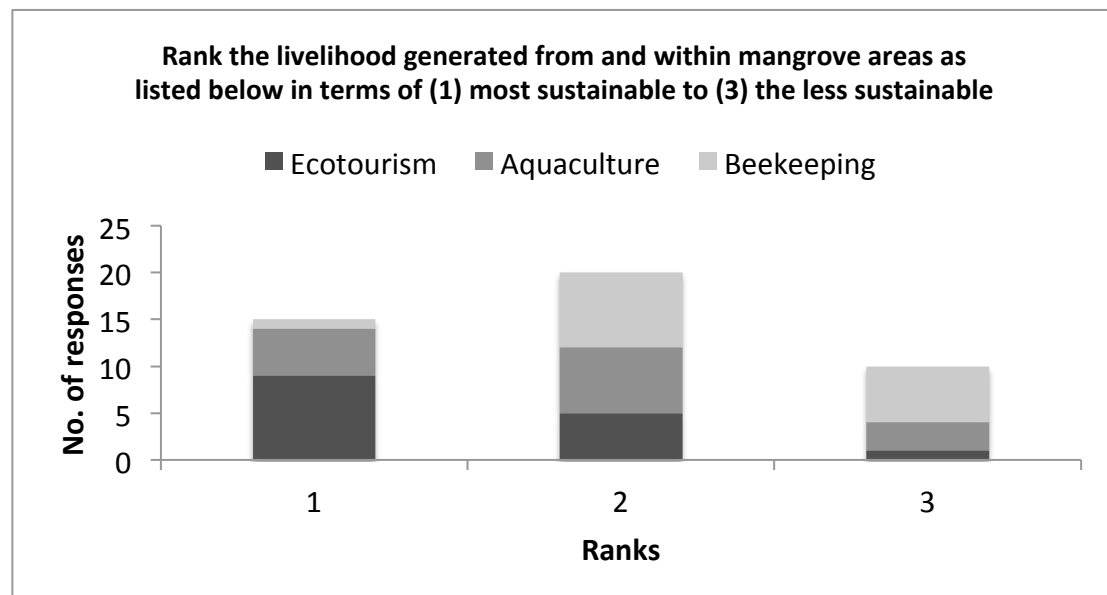


Figure 10: Responses to rank given to sustainability of ecotourism, aquaculture and beekeeping projects

### 3.3.3 Stakeholders opinion on projects challenges

Out of ten Likert scale questions nine reached a consensus ( $q_i \geq 3.5$ ,  $Q < 0.5$ ) and one did not ( $q_i < 3.5$ ,  $Q > 0.5$ ). The respondents were asked to rank the questions in Likert scale of agreement (1= Strongly disagree, 2= Disagree, 3= Not sure, 4= Agree, 5= Strongly agree) or Likert scale of importance (1= Not important, 2= Little importance, 3= Importance unclear, 4= Important, 5= Very Important). The questions were based on the challenges facing the livelihood projects raised during focus group discussions. The table below shows the descriptive measures for each question. In addition, the respondents were asked to give suggestions of improvements for each challenge.

Table 8: Descriptive measures for project challenges

|  | Frequency | Rating mean<br>( $q_i$ ) | Standard<br>deviation<br>(SD) | Quartile<br>deviation<br>(Q) |
|--|-----------|--------------------------|-------------------------------|------------------------------|
| <b>Rating scale of agreement</b>                         |           |                          |                               |                              |
| Is conflict of interest a challenge facing all projects? | 5         | 4.6                      | 0.55                          | 0.5                          |
| Is corruption a challenge facing all projects?           | 5         | 3.4                      | 1.67                          | 1                            |
| <b>Rating scale of importance</b>                        |           |                          |                               |                              |
| <b>Challenges on ecotourism</b>                          |           |                          |                               |                              |
| Poor marketing   | 11        | 4.5                      | 0.69                          | 0.5                          |
| Lack of transparency                                     | 11        | 4.2                      | 0.60                          | 0.25                         |
| Accountability   | 11        | 4.4                      | 0.50                          | 0.5                          |
| <b>Challenges on aquaculture</b>                         |           |                          |                               |                              |
| Lack of ownership  | 8         | 4.1                      | 0.99                          | 0.5                          |
| Site selection   | 8         | 4.5                      | 0.53                          | 0.5                          |
| Lack of technical skills                                 | 8         | 4.8                      | 0.46                          | 0.13                         |
| <b>Challenges on beekeeping</b>                          |           |                          |                               |                              |
| Lack of technical skills                                 | 9         | 4.2                      | 0.97                          | 0.5                          |
| Prolonged drought  | 9         | 3.9                      | 0.93                          | 0                            |

### 3.3.4 Proposed improvements on mangrove-related projects

Table 9: Suggested improvements for the projects

| <b>What should be done to improve the mangrove-related projects?</b>   | <b>Responsible category</b> |
|--|-----------------------------|
| Continuous community awareness and education, selecting projects with direct impact to the community, supporting existing projects, need assessment, monitor project activities  | Government                  |
| Knowledge in bookkeeping and project management, leading the projects, project ownership, developing operational guidelines for the group, resource use creativity, marketing of products, enhancing project transparency  | Community                   |
| Need assessment  | NGO                         |
| Need assessment  | Scientists                  |
| <b>What solutions do you propose to improve the ecotourism projects?</b>   |                             |
| Technical support, mapping ecotouristic projects in an area, linking community tourism projects to national tourism projects, assured security at project sites  | Government                  |
| Promoting marketing, regular trainings, transparency and accountability, project diversification, changing project executives from time to time, provision of good accommodation facilities at project site, assisting in creating tour circuits, attractive hospitality with fair charges   | Community                   |
| <b>What solutions do you propose to improve the aquaculture projects?</b>  |                             |
| Trainings on site selection, construction and management, Committed technical support, promoting awareness on importance of aquaculture, provide initial funding, needs analysis before project commence, source of seed should be considered before the project starts, create demand driven by exposing the groups to similar projects, setting community information centers in villages, use of bottom up approach, ensure security, assist in marketing | Government                  |
| Community involvement and participation, proper site choice, transparency and accountability, getting clearance with respective government department, source of seed should be considered before the project starts, ensure ready markets for the products, project ownership and commitment,   | Community                   |
| Committed technical support, promoting awareness on importance of aquaculture, provide initial funding, needs analysis before project commence, create demand driven by exposing the groups to similar projects, setting community information centers in villages, use of bottom up approach, assist in marketing   | NGO                         |
| Committed technical support, promoting awareness on importance of aquaculture  | Scientists                  |
| <b>What solutions do you propose to improve the beekeeping projects?</b>   |                             |
| Continuous training and demonstrations, group supplied with equipment's, exposure visits to successful projects, encourage environmental conservation  | Government                  |
| Promote marketing through value addition and advertisement, engaging Government and NGO's officers, committed members, Transparency and accountability, timely interventions measures incase of drought, proper site selection, rewarding individuals efforts in groups, incorporate men in groups   | Community                   |
| Continuous training and demonstrations, group supplied with equipments, exposure visits to successful projects   | NGO                         |
| Research on pest control and drawbacks in beekeeping industry  | Scientists                  |

## **4 Discussion**

### **4.1 Livelihood projects**

As presented in the results, a number of livelihood projects are being practiced in Mida Creek, Mtwapa Creek, Gazi Bay and Wasini Island, with an aim of reducing pressure on mangrove utilization. Although the study focused mainly on mangrove-related projects and in particular ecotourism, mariculture and beekeeping, the results also revealed that non mangrove-related activities are introduced and practiced with the same aim of reducing pressure on mangrove utilization. This is mainly because the coastal communities have a high reliance on marine resources for their livelihood and energy needs for the communities as noted in Datta *et al.* (2012). Clearance of mangrove for housing, aquaculture, salt mining and agriculture has been witnessed in Kenya (Dahdouh-Guebas *et al.*, 2000; Abuodha & Kairo, 2001). This necessitates the introduction of alternative sustainable livelihood projects and diversification of income generating projects, which is necessary in enhancing mangrove conservation.

The direct use value of mangrove such as boardwalk and honey collection generates income for the community hence supporting livelihood (Kokwaro, 1985; Dahdouh-Guebas *et al.*, 2000; Kairo *et al.*, 2009). This was also confirmed by this study in the sense that apart from protecting the forest, the projects are initiated to generate income to the local communities, and to create awareness on the ecosystem to both local and international tourists. In the Delphi survey the stakeholders confirmed that the community is the main beneficiary of the projects in terms of income generation hence alleviating poverty.

### **4.2 Condition of the livelihood projects**

The results showed ineffectiveness and inefficiency for ecotourism projects and failures in aquaculture and beekeeping projects. In Wasini, the beekeeping project had completely failed whereas in Gazi, Mida and Majaoni the project is not realizing its objectives. Aquaculture was noted to have completely failed in Gazi, while in Makongeni and Majaoni the project is in the beam of survival. As presented in table 8 of the results, these projects are faced with a number of challenges that affects

project management. Stakeholders confirmed 90% of the challenges raised by project proponents during Delphi survey except for corruption. This was expected as 90% of the challenges were targeting the community whereas corruption seems to be a cross cutting issue. Conflict of interest was noted to be a challenge facing all the three livelihood projects as members have different interest in projects with some expecting short-term benefits and others in favor of long-term benefit. This tussle contributed to project failures.

#### *4.2.1 Ecotourism*

Poor marketing; and lack of transparency and accountability are the main challenges facing ecotouristic projects. Poor marketing, leads to low number of visitors and hence low income to the projects. This made the projects unable to meet its operational cost. Good advertisement of the services of mangrove tourism promotes development of tourists. In a study of promoting Caribbean mangroves to tourist (Avau *et al.*, 2011), mangrove was displayed in two ways; first a mysterious natural and wild site and a good place to practice leisure activities which significantly attracted tourist. As observed from the results both in adequate marketing; and lack of transparency and accountability had a significant difference in site with Gazi rating highest in both. During focus group discussions with project proponents, it was noted that marketing in Gazi was mainly conducted in local schools and they do not engage the local hotels as noted in Mida and Wasini where they receive a good number of international tourists. Gazi receives more locals than international tourist as seen in Annex 3 where 78% of the visitors received during January to June 2012 were locals. Most of these visitors were students who are charged at a subsidized fee. The data collected from January to June 2012, showed that 54% of visitors received in Gazi were students. This can be explained by the fact that marketing was mainly conducted in local schools and higher learning institutions.

Promoting local tourism is an opportunity that can be utilized to secure ecotourism. The current security problem worldwide may have tourism falling, if there is strong dependence on foreign tourism, so is the impact. There may be buffers with diversification of activities but people will have complex management duties, which may end up affecting project management. Hence, in spite of lower income

generated by domestic and local tourism, diversifying domestic and foreign tourism buffers income better in the long run. The added value of domestic ecotourism is the local educational potential.

As compared to the other sites, the results show that Gazi project executives and members were not holding regular and frequent management meetings and the accounts were never availed to the general membership. This explains the high percentage on the response of lack of transparency and accountability. Further to this, the executives are not implementing the weak constitution thus providing loopholes for misappropriation of funds and power.

#### *4.2.2 Mariculture*

As noted from the results, among the major challenges facing aquaculture projects are lack of ownership and site selection. In Gazi, the aquaculture project has failed because of lack of fingerlings to stock the ponds. Initially fingerlings were being sourced in Makongeni at a cost of EUR 0.10 (KES 10) per fingerling, this could not be supported for long and combining with other factors the project ceased to function. Despite mangrove proving to be a nursery for fish as juvenile fish were found to be abundant in Mida creek (Gajdzik *et al.*, 2012), a difference of fish larvae densities in sites was noted in a study conducted in Malindi and Watamu Marine park (Mwaluma *et al.*, 2010). Hence proper site selection is important before embarking to aquaculture as also suggested by stakeholders in the survey. This study also revealed lack of ownership in project as another challenge in aquaculture. Members fail to be committed to project activities thus affecting management.

Climate change is a potential threat to mariculture. For example, increase in atmospheric temperature aggravates evaporation hence increasing salinity for the cultured species. Increase in pond water temperature would have an effect on fish physiology. This effect can be reduced by practicing Intergrated aquaculture where mangroves are planted around the ponds. Wanjiru (2009) noted that planting mangroves around dykes prevents the pond water temperatures from getting very high.

### *4.2.3 Beekeeping*

Lack of technical skills was one of the challenges in beekeeping projects. Members lack skills in beekeeping practice, which is an important aspect in management of bees and hives. Carroll (2006) noted that for a bee-keeping project to be successful, the project requires good management of bees and hives. She explained that drought affects hive colonization as bees tend to lose food and water posing a threat to beekeeping projects. Carroll (2006) further emphasized that absconding of bees in hives can be very frustrating but can be avoided by providing sugar syrup and a water source in an apiary.

In addition to drought, pest infestation in beehives causes absconding of bees in the hives. This has been a noticeable threat and yet no studies have been done to devise pest control strategies. Research in pest controls and drawbacks in beekeeping is an opportunity that will improve beekeeping in mangrove area.

### **4.3 SWOT analysis of identified livelihood projects**

As seen in the results, focus group discussions and the local interviews produced similar SWOT analysis outcomes. This is in contrary to the findings of Morgan (1996), who noted that focus group discussions and individual interviews tend to yield different sets of data. This is because group expression tends to interfere with individual expression. The interference was avoided in the current study in which the projects proponents were requested to write down in papers the different aspects of SWOT and made a presentation to the larger group.

From the results the biggest strength observed is the presence of healthy, rich mangrove forests in all the sites under study. This was also noted in a report prepared on the state of the Coastal resources of Kenya (GoK, 2009). Projects are seasonal hence output from the projects are high during specific seasons. For instance ecotourism projects are a peak during July to September, it takes 6 months to raise milkfish to harvestable size and in beekeeping it is difficult for the hives to be colonized during the dry seasons. Whereas seasonality was seen to be a weakness by the project proponents the complementarity of the three activities can be an opportunity in the mangrove-related projects.

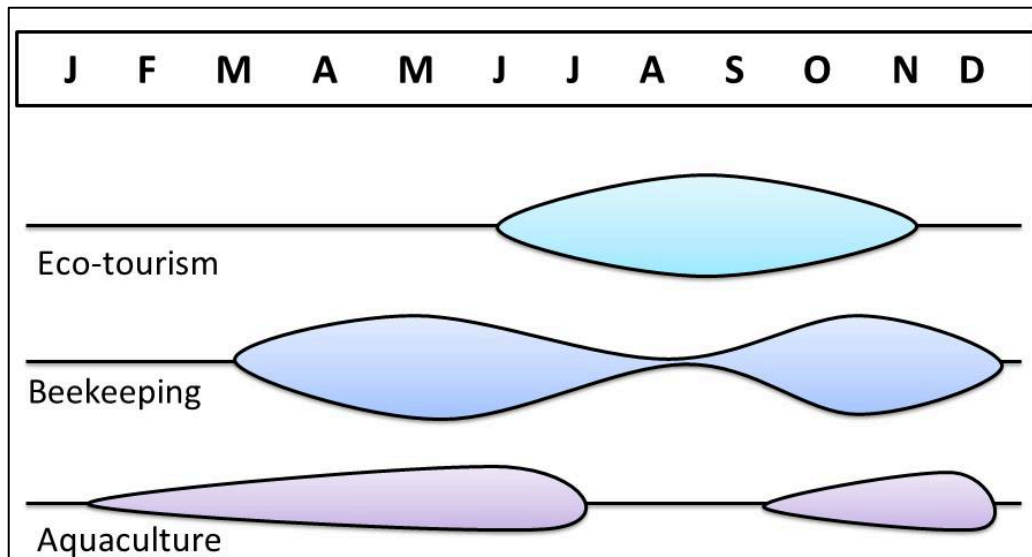


Figure 11: Seasonality calendar for ecotourism, aquaculture and beekeeping

Diversification of livelihood activities is a great opportunity in all the sites. For instance, Mida is doing well in ecotourism because apart from the boardwalk, they offer boat riding along the mangrove to its tourist hence increasing the package fee for the visit, unlike Gazi and Wasini who only offer a tour to the boardwalk ending up charging low fees leading to low returns. For Gazi, the incorporation of other activities e.g. boat rides was indeed part of the original plan of the ecotourism project (Kairo & Dahdouh-Guebas, 2002), where fishermen were to do the boat rides and charge as a whole package. Probably if they had stuck to the original plan they would be doing well. Other activities that were suggested to be incorporated include cultural dances, acrobat and integrating aquaculture with ecotourism by placing crab cages along the boardwalk. This is also supported by Rasowo (1992) where it was noted that aquaculture activities can exist in harmony with the mangrove ecosystem if aquaculture-friendly methods like pen and cage culture are adopted. In another study conducted in Mtwapa Creek in Kenya (Reid, 2002) , crab culture in the mangrove area proved to be of direct benefit to the local community while at the same time promoting mangrove conservation. Nevertheless, care needs to be taken that the two activities (aquaculture and ecotourism) may be in conflict since aquaculture has the potential to distract tourism through vices such as waste generation and obstructing scenic view. Furthermore, conservationists may also have concerns on nature preservation as a result of habitat modification. These



potential conflicts can be managed but require pro-active actions of responsables and community leaders.

The analysis identified high maintenance costs as a threat of ecotourism project. The boardwalks need constant repairs as the wood needs to be replaced after a short period due to seawater that allows the wood to rot. Suggestion of incorporating cemented poles instead of wood was recommended to reduce the high cost of repair. This has been a plan of the ecotouristic projects but has not been feasible because of lack of funds. Investing into cemented poles is an opportunity that will ensure reduction in maintenance cost, although these structures would lower the attractiveness of the mangrove forests to many visitors. Other suggestions were to raise the boardwalk to above sea water levels, but still the wood will undergo wet and dry seasons. Hence, the project executives should ensure that funds are set aside for regular repairs and unexpected damage. This is a budget management issue where education and guidance is needed.

Table 10: General SWOT analysis for ecotourism, aquaculture and beekeeping projects (Own research)

|   |   |
|---|---|
| <p><b>Strengths</b><br/>Mangrove forest in a good condition and continuous management<br/>Relevant stakeholders support</p> | <p><b>Weaknesses</b><br/>Lack of relevant technical skills in project run up<br/>Not sufficient representation of the community</p> |
| <p><b>Opportunities</b><br/>Diversification of activities<br/>Balancing gender<br/>Formation of CFAs</p>                    | <p><b>Threats</b><br/>Illegal mangrove cutting<br/>Lack of community support</p>  |

#### 4.4 Causes of failure or success of the livelihood projects

Table 11 shows the causes of project failure and project success raised during local interviews. There was a significant difference in some of the causes of failure in the different sites. These causes include no support from relevant stakeholders, nepotism, corruption, lack of transparency and accountability, irresponsible members, poor project management, lack of ownership and conflict among members. The result indicated a significant of  $\chi^2 = 17$ , d.f= 4, P=0.002 for lack of transparency and accountability and significance of  $\chi^2 = 19$ , d.f= 4, P=0.001 for

conflict among members with Gazi recording highest in both. These two causes are highly correlated because lack of transparency and accountability, leads to conflicts amongst members.

Table 11: Causes of projects success and failure

|                                       | Total      | % Response |         |           |      |        |
|---------------------------------------|------------|------------|---------|-----------|------|--------|
|                                       |            | Mida       | Majaoni | Makongeni | Gazi | Wasini |
| <b>Number of response</b>             | <b>209</b> | 43         | 44      | 42        | 42   | 38     |
| <b>Causes of project success</b>      |            |            |         |           |      |        |
| Unity and cooperation                 | 20         | 5          | 23      | 36        | 12   | 26     |
| Donations from well wishers           | 13         | 7          | 25      | 29        | 0    | 3      |
| Community involvement and support     | 11         | 12         | 16      | 0         | 17   | 13     |
| Diversification of activities         | 11         | 42         | 5       | 0         | 5    | 3      |
| Good management                       | 9          | 7          | 7       | 14        | 12   | 3      |
| Capacity building                     | 9          | 0          | 20      | 7         | 2    | 13     |
| Environmental conservation            | 8          | 12         | 14      | 0         | 5    | 8      |
| Good output                           | 8          | 0          | 5       | 2         | 5    | 29     |
| Project support community             | 7          | 5          | 23      | 0         | 7    | 0      |
| Transparency                          | 7          | 5          | 5       | 12        | 12   | 0      |
| Stakeholders support                  | 6          | 5          | 5       | 21        | 0    | 0      |
| Good leadership                       | 4          | 0          | 5       | 2         | 14   | 0      |
| Hardworking & active members          | 4          | 5          | 0       | 10        | 5    | 0      |
| Community awareness                   | 4          | 0          | 7       | 7         | 0    | 5      |
| Responsibility sharing                | 2          | 2          | 5       | 2         | 0    | 3      |
| Meeting project objectives            | 2          | 2          | 0       | 2         | 0    | 8      |
| Project ownership                     | 1          | 5          | 2       | 0         | 0    | 0      |
| Market availability                   | 1          | 0          | 7       | 0         | 0    | 0      |
| Perseverance                          | 1          | 2          | 2       | 0         | 0    | 0      |
| <b>Causes of project failure</b>      |            |            |         |           |      |        |
| Conflicts among members               | 25         | 31         | 7       | 32        | 43   | 13     |
| In adequate funds                     | 20         | 29         | 19      | 20        | 7    | 24     |
| Lack of transparency, accountability, | 19         | 21         | 14      | 5         | 38   | 18     |
| Lack o technical skills               | 16         | 14         | 9       | 25        | 10   | 21     |
| Poor project management               | 10         | 19         | 2       | 0         | 10   | 18     |
| Poor leadership                       | 9          | 2          | 12      | 11        | 12   | 5      |
| Nepotism                              | 8          | 2          | 0       | 14        | 19   | 3      |
| Corruption                            | 7          | 17         | 2       | 2         | 5    | 11     |
| Lack of ownership                     | 7          | 5          | 5       | 20        | 0    | 3      |
| Marketing                             | 6          | 2          | 7       | 7         | 7    | 8      |
| No support from stakeholders          | 6          | 2          | 9       | 16        | 2    | 0      |
| Irresponsibility in members           | 6          | 10         | 5       | 14        | 0    | 0      |
| Low production                        | 4          | 5          | 2       | 5         | 7    | 3      |
| No community support                  | 3          | 5          | 0       | 5         | 7    | 0      |
| Illegal cutting of mangroves          | 2          | 0          | 0       | 7         | 0    | 5      |
| Donor syndrome                        | 2          | 5          | 2       | 2         | 0    | 0      |
| Exclusion of certain group            | 2          | 0          | 0       | 5         | 5    | 0      |
| Lack of awareness                     | 1          | 0          | 0       | 2         | 5    | 0      |
| Insecurity                            | 1          | 0          | 2       | 2         | 0    | 0      |
| Drought                               | 1          | 0          | 5       | 0         | 0    | 0      |
| Land ownership problems               | 0          | 0          | 0       | 2         | 0    | 0      |

Collaboration with key stakeholders in projects was identified to be a cause of project success in all the livelihood projects. Projects with no stakeholders support were failing due to not achieving their objectives. This was also noted in a feasibility study conducted for an ecotourism project in Gambia (Satyanarayana *et al.*, 2012), where importance of involvement of relevant stakeholders in project management was found necessary to ensure successfulness and sustainability of projects.

Lack of marketing can be the biggest threat in projects causing their failure, at least in the first line. For instance, in aquaculture various projects in the coast have failed due to lack of market. This was observed in some areas, e.g. Shirazi and Gazi in the South coast of Kenya, where oyster culture has been tried but failed due to lack of marketing (GoK,2009). Even when markets are provided, it needs to be noted that other secondary challenges may arise. For instance, ecotourism activities have a tendency to generate huge volumes of waste, and therefore sustainable garbage management strategies would have to be devised. Further on, not to be overlooked is the likelihood of rising conflicts among the various stakeholders when income is not equally generated or investment/maintenance and income generated do not relate to the same stakeholder category, which may influence development of the said projects negatively. It is for this reason that an effective interdisciplinary management approach system is required. These issues are beyond the objective of the study but merit serious consideration.

In general the approach applied in this study was quite effective. Starting with a more general method, focus group discussions to have a general understanding of the projects. As noted in Elliot *et al.* (2005) focus group discussions are given weight when combined with other research tools, the same was done by incorporating local interviews and later on Delphi survey. The Delphi had to be stopped after the first round because of consensus being rapidly reached but if time allowed the same questionnaire would have been sent back and find out whether the same response would have been gotten. Given more time a focus group discussion should have been first done to get a general overview from which the local interviews would have been based on. Furthermore the study was mainly based on the rural communities even when urban communities are equally concerned, though either

less aware of indirectly. In future studies, there is a need to incorporate the urban area so that a much more general consensus is reached. Apart from considering the perception of the local community and/or the stakeholders as was done for this study, more assessment on the quality and quantity of the projects output need to be done, such as e.g. mariculture yield, honey quality, and ecotourism quality.

## Summary

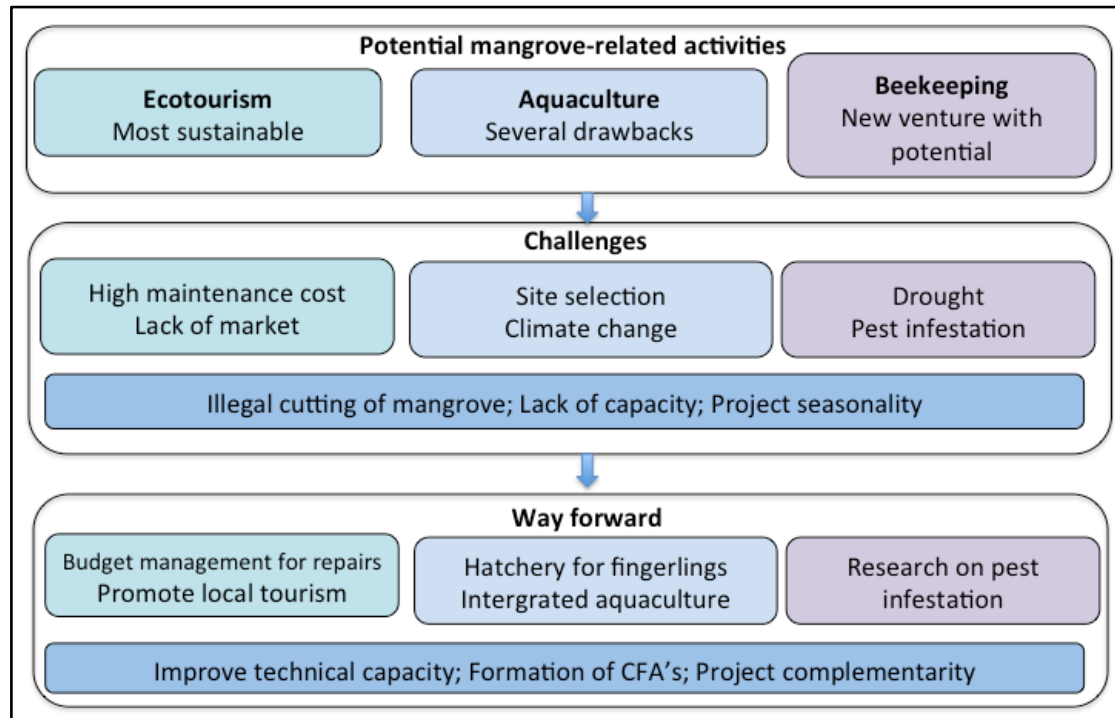


Figure 12: Research synthesis

## **5 Conclusion and way forward**

The Kenyan coastal community does recognize the ecological, environmental and economic role of mangrove as observed worldwide. This study assessed ecotourism, mariculture and beekeeping projects as livelihood activities practiced in mangrove ecosystems along the Kenyan Coast. A number of other livelihood projects are being initiated in the coastal area in order to reduce the pressure on the use of mangrove resources. The study has noted ecotourism as being the most sustainable project among the three. The study established that these projects play a significant role in conserving the mangrove forests as areas under the projects are indirectly protected from illegal cutting of mangrove. Apart from conserving the forest, the projects generate income through sale of products and offer employment opportunities; hence they improve the living standards of the communities who were identified as the main beneficiary of the project. The study established challenges which if not properly addressed would affect project management. These challenges were recurrently identified by the respondents and hence felt as priorities to address.

It is evident that the present survey covers the actual situation and the perception of strengths, weaknesses, opportunities and threats as they appear now. The situation 'in the field' can be highly dynamic and respondents will follow new developments, also in their perception, views and solutions. This also entails that a follow-up of the survey as presented is needed, a monitoring scheme as a part of the policies to be applied and their implementation, without overquestioning the same respondents in a short timeframe. The approach for such a monitoring is beyond the scope of this work but elements therein can hopefully be used.

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## 7 Annexes

### Annex 1: Guiding questions during SWOT analysis

#### *Strengths*

- What is well organized in the project (services/ Production, marketing, etc.)?
- What do other people see as the project strengths (Services/production, marketing, etc.)?
- What are the major sources of project operational costs?
- What is the major focus of the project?
- Is the project marketing/advertising effective?
- Why was the project started? What were the motivating factors and influences? Do these factors still represent some of the strengths?
- Why do people visit the project?
- What differentiates the project from other ecotouristic/beekeeping/aquaculture projects?
- What have been the most notable achievements?
- What relevant resources exist?
- What is the project greatest asset?

#### *Weaknesses*

- What is not well organized in the project (Services/production, marketing, etc.)?
- What do others see as the project weaknesses (Services/production, marketing, etc.)?
- What should be avoided?
- Is the project marketing/advertising effective?
- What is the biggest expense of the project?
- Why do people not visit the project?
- What relevant resources are needed?
- Does the project personnel perform at their best?

#### *Opportunities*

- What new technologies are available that the project can use?
- What new relationships could the project develop?
- Are there new strategies that could be used in project operation?
- Can quality of operations, products, and inventory management be improved?
- Should the project create higher fees for better services?
- Can income be increased through the sale of other commodities?
- What can be done that is not currently done to improve the project?
- What interesting social patterns, population profiles, lifestyle changes, etc. are occurring that could benefit the project?
- What are interesting local events that might be used to benefit the

project?

### *Threats*

- Have there been any significant changes in the project?
- What obstacles do the project face?
- Are there any, or new competitors in the market?
- Are there any new regulations that hinder project operations?
- What other changes in the market could damage the projects operation?
- Is project personnel adequately trained and motivated?
- Could any of the weaknesses seriously threaten project sustainability?
- What interesting social patterns, population profiles, lifestyle changes, etc. are occurring that could threaten the project?
- What are interesting local events that might be used to threaten the project?

**Annex 2: Local interview questionnaire**

Questionnaire NO: ..... Name of interviewer: ..... Date: .....

This research is conducted in order to establish feasibility and sustainability of the livelihood projects and provide recommendation on how best such initiatives could be carried out to help in wise management of the mangrove ecosystem.

1. Name of Village: .....

2. Occupation of respondent: Primary..... Alternative .....

3. Sex ( ) Female ( ) Male

4. Age .....

5. Level of education (tick one) ( ) None ( ) Incomplete primary school ( ) Complete primary school ( ) Incomplete secondary ( ) Complete secondary ( ) Tertiary

6. For how long have you lived in this area? .....

7. a. Do you think that mangroves are important?

( ) Yes ( ) No ( ) Do not know

b. If yes, for whom or for what are mangrove tree/ vegetation important?

.....

8. Do you think mangrove forests of Gazi /general Kenya are under threat?

( ) Yes ( ) NO ( ) I don't know

9 a. Are there any projects that have been initiated in the village as a way of reducing pressure on the use of mangrove resources?

( ) Yes ( ) NO ( ) I don't know

b. If yes, name them

.....

10. Do you think such projects are effective in conserving mangrove forests?

Yes                       NO     I don't know

11 a. Are you involved in any of these projects?

Yes                       NO

b. If yes, which one?.....

c. Frequency/level of involvement ( ) always ( ) moderate ( ) low

d. If no, why not? .....

12. What are the strengths of the projects?

.....

13. What are the weaknesses of the projects?

.....

14. Name some of the causes of

a. failure of such projects in the village?

.....

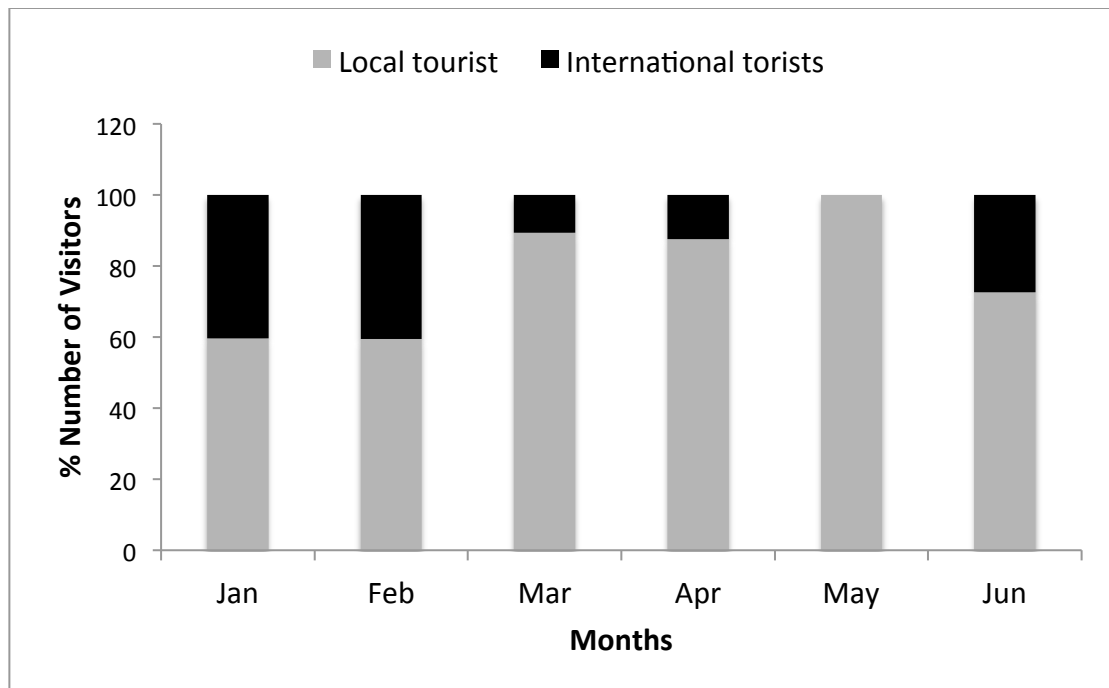
b. success of such projects in the village?

.....

15. What are your recommendations for the project's improvement?

.....

**Annex 3:** % Number of visitors in GWMB for the period January to June 2012



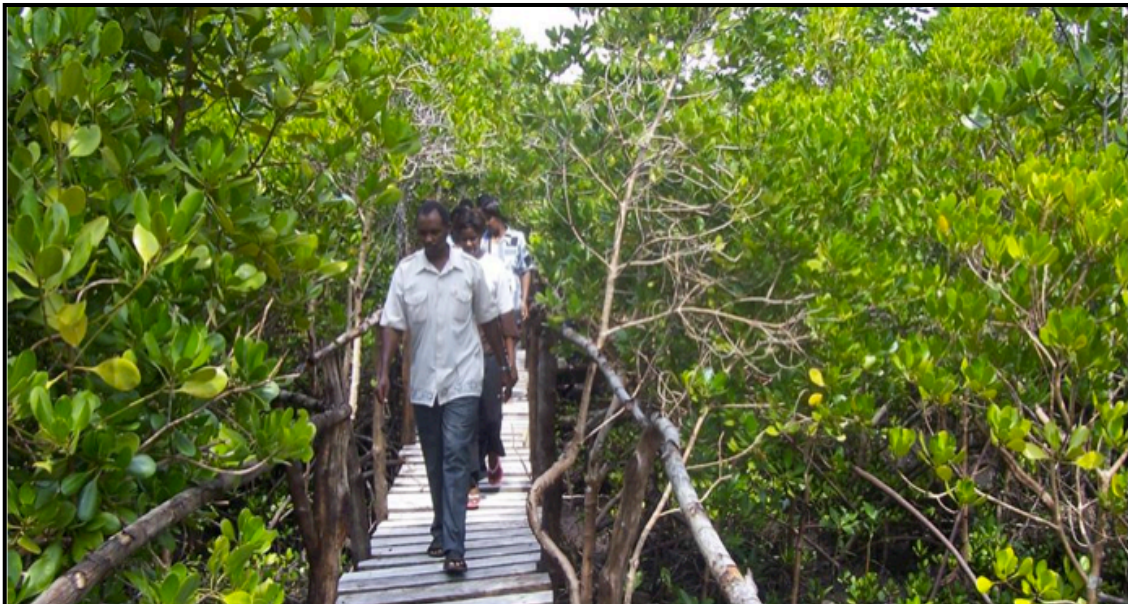
**Annex 4:** Langstroth beehive installed in *Avicennia marina* stands in Majaoni (photo credit Amina Juma, 2012)



**Annex 5:** Working with bees in a Kenya Top Bar hive in Molo Kenya (photo credit Carroll, 2006)



**Annex 6:** Local tourists visiting the Gazi Women Mangrove Boardwalk (Photo credit Joseph Langat, 2004)





**Annex 7:** Earthen pond constructed for finfish farming in Majaoni in the Mtwapa Creek system (Photo credit Amina Juma, 2012).

