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Using the paired comparison methodology to assess environmental values in the coastal zone of Ghana

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Abstract Like many developing countries, Ghana is grappling with environmental issues, such as the degradation of coastal natural resources. In an attempt to ameliorate the current state of affairs, broad institutional arrangements and policy interventions have been put in place. However coastal natural resources are still being overexploited and the effects of this are felt more strongly by certain groups (such as women and the rural poor) than others. This has led to the argument pointing to an urgent need to include local resource users as active participants in environmental decision making and to incorporate their environmental values in the management of coastal natural resources. Using empirical data from women in two Ghanaian coastal communities, this paper highlights the importance of exploring how the environmental attitudes and values of women might be considered in the management of local coastal natural resources. It assesses effectiveness of the paired comparison methodology in this respects and how this method can be also used to prioritise their environmental concerns. The results show that in both areas respondents place the greatest importance on the coastal natural resources as sources of wealth creation and of food, values which are often described as being "anthropocentric". The paper thus argues that having discovered that the ecological value placed on natural resources is low, initiatives that could win the support of people would be those that link the livelihood and wellbeing to coastal NRM. It emphasizes the fact that conservation cannot exist outside of people and social systems; nor will it succeed unless they are linked to the welfare of resource users.

Keyword Coastal zone · Environmental values · Ghana · Natural resource management · Paired comparison

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Introduction

Coastal zones worldwide are under pressure especially from developmental activities and rapid population growth. In line with developmental patterns and urbanisation, the coastal communities are estimated to contain a large part of the world's population; with about 21% and 37% of global population reportedly living within 30 and 100 km from the sea, respectively (Cohen et al. 1997). In addition some of the world's most productive ecosystems such as sea grasses, mangroves and coral reefs occur here (UNEP/MAP/PAP 1999; UNEP 2007).

The most commonly cited definition of the coastal zone of Ghana is found in Laing (1991) where it is defined as the band of dry land and adjacent ocean space (water and submerged land), in which land ecology directly affects the ocean space ecology and vice versa. The land area of the coastal zone of Ghana is also defined here as the area below the 30 m contour and covers about 7% (16,240 km^2) of the total area of Ghana. It has a 18,095 km^2 continental shelf

area and the fifth largest Exclusive Economic Zone (EEZ) in West Africa with an area of 216,867 km^2 (Earthtrends 2003; Directorate of Fisheries 2003).

The coastal zone of Ghana comprises the sandy east coast, the central coast which is mainly made up of rocky beaches interspersed with short sections of sandy beaches between and west coast on the extremities of the zone (Armah and Amlalo 1998). The ecosystems here provide unique environmental services. For example, in some areas coastal species such as waterfowl, crabs, shrimps, marine turtles and juvenile stages of commercial fishes depend on these ecosystems for physical habitats and nursery grounds (Laing 1991). There are also benefits accrued by local residents. These include recreational, economic and cultural benefits (Table 1).

Again, like many other coastal ecosystems in the world, Ghana's coastal zone is plagued by a number of socio-economic as well as environmental problems. Issues such as increasing population, urbanisation and poverty, the loss of habitat and land through coastal erosion, wetland and mangrove degradation, fisheries degradation and declining fish stocks and poor sanitation worsen daily.

These problems persist in part because of major constraints such as the lack of detailed scientific data on coastal and marine ecosystems and the lack of sufficient technical human resources, equipment and funding (UNEP 2007). In addition, some broad institutional arrangements, legislative and policy interventions put in place for the management of coastal natural resources have proven largely inadequate.

This paper contends that in searching for a solution to these problems, there is the need to take into consideration the relationships between the physical impacts of coastal natural resource degradation and their socio-economic implications. A holistic approach which among others takes into consideration the environmental values of resource users and stakeholders is thus needed. In this regard an important group of stakeholders is women. They form a substantial proportion of resource users in the coastal zone of Ghana. Their daily activities whether it is taking care of the family or engaging in economic activities tend to bring them in close contact with the natural environment. A study detailing the environmental values of such primary coastal natural resource users and how this can be used to recommend practical ways of natural resource management is a requirement for the sustainability of the coastal zone in Ghana.

Environmental values have been assessed in many ways and in many disciplines. The daunting task for this paper however was to identifying a methodology that is easily adapted to the developing setting whilst effectively assessing environmental values. In this instance the paired compassion methodology seems promising. This method is used to estimate environmental values in two communities in the coastal zone of Ghana and produce a tentative prioritised environmental values typology for the study areas. With these results, specific policy options for managing coastal natural resources are proposed.

Study design

The research reported in this paper was undertaken in two communities in the coastal zone of Ghana. The two main sources of data were primary and secondary. A purposive non-probability sampling technique was used. This method was used because the aim of the study was to reach a specialised population, namely women. Because the case study approach was used, the generalisations of findings are theoretical rather than statistical. According to Yin (1993) case studies can be generalised to theoretical propositions and not to populations in general. Eisenhardt (1989) further explains that in case studies random selection is neither necessary nor even preferable.

The target population was women living in the coastal zone of Ghana above sixteen years (16) years. This lower limit was chosen because there was the need to interview women who could appreciate the issues at stake. The working population for this study was determined by two main factors. First of all, in line with the objectives of the study, they had to be coastal women. Secondly since personal interviews had to be conducted it was practical to choose coastal communities that were easily accessible to facilitate as many trips as possible to the study sites. To reduce the impacts of whatever limitation this could cause, the two communities were selected from two different regions namely the Greater Accra and Central Regions. These communities are inhabited by people of different ethnic backgrounds.

Data collection

Primary data was collected by means of focus group discussions, personal interviews and participant observations. In all 304 women; 151 in Bortianor and 153 in Moree were interviewed.

During the focus group discussions discussants were asked key yet simple questions such as "Why is the coastal zone important to you?" "Which aspect of the coastal zone is important to you?" and "What are some general problems here?" The discussions and audio recordings generated a lot of data which was analysed qualitatively using thematic analysis. This method involves "identifying, analyzing and reporting patterns (themes) within data" (Braun and Clarke 2006:79).The identified value statements (or themes) could be grouped and the first six based on frequency of occurrence were chosen for the paired comparison analysis.

Table 1 Some statistics of the coastal zone of Ghana

	Ghana	Sub-Saharan Africa	World
Length of coastline {a} (km)	533	63,124	1,634,701
Population within 100 Km of the coast	42%	–	39%
Area of continental shelf (km^2) {b}	18,095	987,021	24,285,959
Territorial sea (up to 12 nautical miles) (km^2)	11,890	871,895	18,816,919
Number of Mangrove species	6	17	70
Average Annual Capture (excludes aquaculture) in metric tons: Marine Fish, 2000	374,229	–	84,411,066
Total area of Ramsar sites, 2002 (000 ha)	178	–	102,283
Claimed Exclusive Economic Zone (km^2)	216,867	7,866,074	102,108,403

After EarthTrends 2003

This way the categories of values were derived by the discussants themselves. The value categories (aesthetic, ecological, economic, sense of place, spiritual/supernatural and moralistic values) were the foundation for the value assessments (Table 2).

In addition, a list of general environmental concerns was obtained from the focus group discussions (Tables 3 and 4). Since there was a maximum number of pairs that could be used for the comparison, the first six based on the frequency of occurrence were again chosen.

The paired comparison methodology measures environmental values of respondents by providing a clear order of the relative priority they place on coastal natural resources. An added advantage is that apparent preference intransitivities or inconsistent choice patterns are easily observable (Chuenpagdee 1998). Preference intransitivities can occur in the form of circular triads. An example of a circular triad or inconsistency could be shown as follows: A is preferred to B, which is preferred to C, which is preferred to A. To be consistent with preferences in this example, A should always be preferred to C. However, apparent intransitivities could occur because there is no valid ordering of these three items (David 1988). Even when they differ clearly the items may depend on more than one characteristic, which would

Table 2 Examples of value statements and their corresponding values

Statements by discussants	Value classification
-A place to relax with family and friends. -Even now that there is rubbish all over it is still a beautiful place.	Aesthetic
-I like the sea and the beach. There is fresh air here.	
-There are all sorts of animals living here, some we eat some we cannot eat. -It is home to the animals and plants.	Ecological/Biological support
-There are so animals everywhere; in the sea, in the sand and in the trees. If we destroy where they live, they will all die.	
-Most of food I eat is from around. Fish from the sea, cassava, maize and so on from my farm. -We depend on the natural resources for food. When there is no fish we all starve.	Economic/Utilitarian (Source of food)
-It provides us with jobs and money.	Economic/Utilitarian (Jobs)
-It was given to us by God to protect and be custodians of it . -We need to take good care of it for our children and grand children.	Duty/Custodian
-I want my children to live in a healthy, clean environment so I need to use the natural resources wisely	
-Need to protect it for the next generation	
-This is our home -My grandparents all lived here. I have no where else to go.	Culture/sense of identity
-It was names after a god so we need to protect it -It brings us peace and good fortune	Spiritual/Supernatural/ Religious
-Only the priest is supposed to enter that forest.	
-Sometimes we use the beaches for church retreats and prayers. The atmosphere is good. -My grandmother knows a lot of plants here that can be used to cure malaria, snake bite and so on.	Healing
-The sea washes away all the filth; that is important.	Use
Negative	

Table 3 Simple ranking of environmental problems by discussants in Bortianor

List of environmental problems	Rank
Noisy environment	1
Loss of scenery	2
Sea erosion	3
Lack of potable water	4
Loss of fisheries	5
Poor sanitation	6
Degradation of coastal and marine environment	7
Others (Loss of biodiversity, land degradation and indiscriminate sale of land to developers).	8

make it somewhat artificial to attempt to order the items on a linear scale (Chuenpagdee 2003).

This method has been used in many different ways to assess environmental values (Neuman and Watson 1993; Rutherford et al. 1998; Chuenpagdee 1998; Quah et al. 2003). In searching for a simple, easily duplicated and yet robust method for assessing environmental values local resource users, the paired comparison methodology was opted for and adapted to suit the local setting.

Analysis and results

Rather than scaling the scores, the paired comparison questions were analysed directly by examining a matrix of preferences and calculating an arithmetic average of the preference for each value across all other values with which it was paired. This was chosen because scaling would have not produced different results (Neuman and Watson 1993). A test of transitivity conducted showed that in 12.0% of respondents in Bortianor as compared to 14.0% of respondents in Moree were intransitive. Hence the results were consistent and could be used.

Table 4 Simple ranking of environmental problems by discussants in Moree

List of environmental problems	Rank
Loss of fisheries	1
Poor sanitation	2
Sea erosion	3
Noisy environment	4
Lack of potable water	5
Loss of scenery	6
Polluted water ways and surrounding seas	7
Loss of biodiversity	8
Others (Flooding, smoke, cutting of mangrove forests)	9

Table 5 List of values in study areas

Value type	Bortianor	Moree
Aesthetic	X	X
Ecological/Biological support	X	X
Economic/utilitarian/Livelihood	X	X
Duty/Custodian		X
Culture/Place of identity	X	X
Spiritual/supernatural/religious	X	

The values in this study are comparable with Brown's definition of value (Brown 1984) and are relative, indicating the importance of the object by implicit or explicit comparison. Each group of six environmental values and end environmental concerns comparisons resulted in 15 possible pairs (Table 5).

The data show that in both areas respondents place the greatest importance on the coastal natural resources as a source of wealth creation and source of food. Like most coastal communities in Ghana, the main source of livelihood in both Bortianor and Moree is the fishing industry (Fig. 1). Employment opportunities range from full-time employment to seasonal, occasional or opportunistic involvement in different stages of the post-harvest chain (Directorate of Fisheries 2003).

The coastal zone was least valued by respondents for ecological function reasons. Aethetic values ranked second with the coastal zone being valued as a place for recreation and relaxation (aesthetic values). Bortianor is increasingly becoming an important destination for tourists and holiday makers seeking less crowded beaches not far from the capital. Indeed the beaches of Kokrobite, Bortianor and Langma have the largest concentration of Beach Resorts

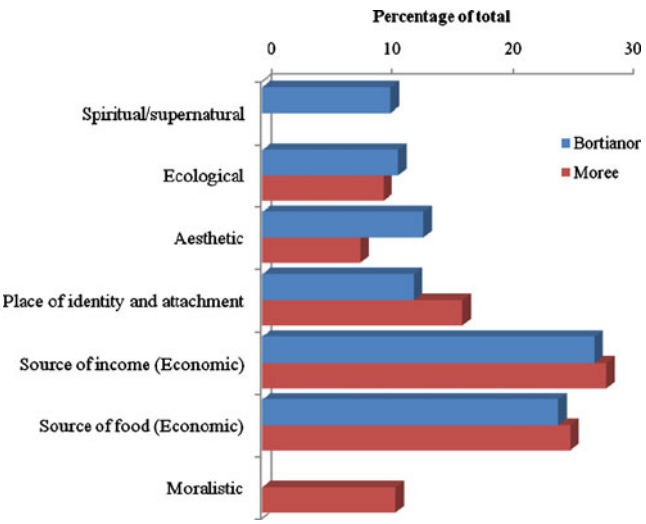

Fig. 1 Relative priorities of environmental values

Table 6 Percentage of respondents born in community

	Moree		Bortianor	
	Frequency	Percent	Frequency	Percent
Yes	127	83	80	52.9
No	26	17	71	47
	153	100	151	100

Field work, 2006

probably because of their nearness (about 25 to 30 km) to Accra. Bortianor also has a rich forest through which a stream named Solo by the inhabitants runs. The occurrence of spiritual/supernatural values in Bortianor were cited especially in relation to this stream and its surrounding forests. The occurrence of these values could provide strong incentives for some community members to protect coastal natural resources.

16.6% of respondents in Moree valued the coastal zone as a place of identity and attachment. Tables 6 and 7 show that more respondents in Moree were born and grew up in Moree as compared to Bortianor. Indeed there is a considerable population of settlers from the Volta Region of Ghana in Bortianor who do not own land and still see themselves as "settlers."

According to Preston (2003) values associated with how people individually and collectively *feel* about natural resources, whereby the environment is seen as a "place" could facilitate the roles of people in the conservation of its natural resources. An emotional attachment to place could be an asset in developing the respect and responsibility towards an environment which characterizes stewardship (Carr 2002). People born in a place could have greater people's emotional connections that arise through experience (Manzo 2005). However from the results, the role of

Table 7 Percentage of respondents born in community

	Bortianor		Moree	
	Frequency	Percent	Frequency	Percent
Indigenes	80	52.9	129	85
Greater Accra	15	9.9	2	1.3
Central	4	2.6	8	4.3
Western	5	3.3	2	1.3
Ashanti	1	0.6	6	3.9
Eastern	2	1.3	0	0
Volta	44	29.1	0	0
Liberia	–	–	4	2.6
Sasandra Cote d'ivoire	–	–	2	1.3
Total	151	100.0	153	100.0

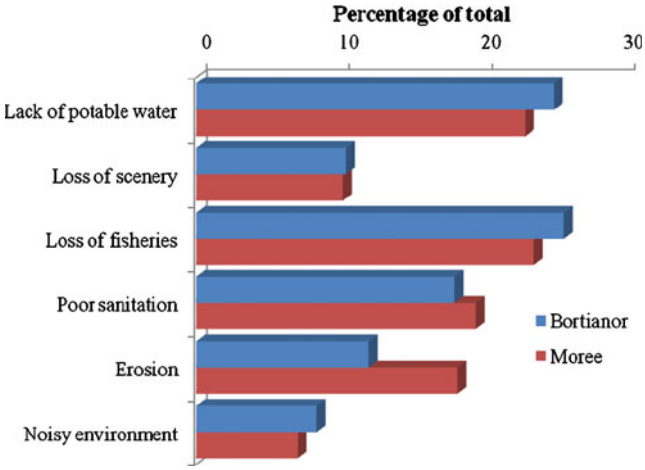

Fig. 2 Environmental concerns in Bortianor and Moree

residence history seemed negligible. Some researchers believe that migrants to an area, especially those with a long history of ties to a locality, may have less concern for valuing local natural resources. The study did not find this to be the case. Both migrants or settlers and residents expressed similar concerns about the decrease in the availability of some natural resources such as fish.

Environmental concerns

The study also assessed values through the judgment of severity placed by respondents on certain environmental concerns (Quah et al. 2003). Again the choices made by respondents were analyzed in a straight-forward fashion by examining a matrix of preferences and calculating an arithmetic average of the preference for each value across all other values with which it was paired. 20.3% of the results in

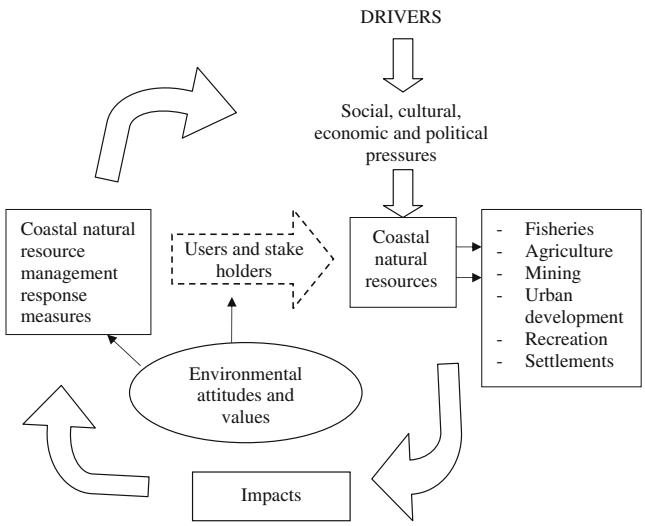

Fig. 3 Value based coastal Natural Resource Management

Bortianor as compared to 16.0% of the results in Moree were inconsistent. The results could thus be used (Figs. 2 and 3).

Whilst respondents in Bortianor found it difficult to choosing between the lack of potable water and loss of fisheries, respondents in Moree judged the loss of fisheries as the most severe natural resource loss.

Discussion

The high transitive levels show that respondents had no difficulty understanding the questions. It also establishes the paired comparison methodology as a simple, easily understood and replicable method for assessing environmental values in Ghana. It is most useful in instances where economic methods of valuation are not feasible or in instances where the issues have similar importance for a simple rank order. It also ensures that all participants have a say in what eventually gets prioritised.

Most of the respondents were more concerned about providing the basic necessities of life such as food, water, clothing and shelter to themselves and their dependants. Although other environmental values such as aesthetic and moralistic values also featured, their environmental values were generally utilitarian. Issues of safe drinking water, available fish and good sanitation are most important to respondents. Erosion is an important environmental concern to the respondents from Moree especially because of its associated impacts which directly or indirectly influence their standard of living.

Respondents' environmental values were measured by the relative importance they placed on coastal natural resources. The values were influenced by culture and certain social belief systems, which also influences how natural resources are perceived and used. Whilst basic value orientations are, indeed, important to the formulation of environmental concern (Stern and Dietz 1994), such concern has other socio-economic correlates. Again poverty levels, lack of alternative livelihoods, poor access to some basic amenities like potable water and electricity all influence the environmental values of respondents and natural resource degradation. So do customs and belief systems. This shows that natural resource conservation cannot succeed outside of people and social systems. Despite some cultural differences in both study areas, it did not seem enough to create significant differences in their environmental values.

Certain constructive belief systems and taboos which protected natural coastal resources are being eroded. In the past these contributed to the development of intrinsic values among community members (Ntiamoa-Baidu et al. 2000). As rural communities become increasingly modern and yet sink deeper into poverty, the coming together of the traditional and modern has become more and more complicated and contradictory. Undeniably, a substantial number of people still depend on coastal natural resources to meet their basic human needs, strengthening the utilitarian, instrumental value of coastal natural resources.

Policy implications of findings

Various organizations that implement coastal natural resources management (NRM) programmes such as governmental institutions, local and foreign NGOs all have differing environmental values. Sometimes these values are set to reflect global values of coastal natural resources. More often than not, the intrinsic values of coastal natural resources are highlighted. However these priorities and values are often in conflict with those of the people who rely on the resources for their livelihoods. In the study areas, coastal natural resources were valued as a source of income and food. Again in both areas respondents judged loss of fisheries, lack of potable water and poor sanitation are the three most important natural resource concerns.

The results are helpful, in that they provide a clear ordering of values, from a methodology that is comparatively simple to replicate in other areas. This methodology does not force respondents to assign monetary value to coastal natural resources. In addition since in both areas coastal natural resources as sources of food and income rank highest, basing natural resource management on the argument that reducing the resource base now would be to the detriment of future generations might not be enough to motivate users into action. For example having discovered that the ecological value placed on natural resources is low, the support of people could be won by linking their livelihood and wellbeing to coastal NRM. Immediate examples would be the development of woodlots, stricter enforcement of the ban on illegal methods of fishing and the use of inappropriate mesh size and protecting water resources.

Pressures on coastal natural resources include indirect (such as those related to culture and demographic change) or direct human-induced pressure (such as land degradation and exploitative human use of natural resources). These affect the state of the coastal natural resources and require the appropriate response measures (Fig. 3). An effective policy/social response is one that changes the drivers, having ripple effects throughout the framework. The measures put in place to improve the quality of the ecosystems maybe policy directives, management initiatives or changes in the institutional frame work (MEST 2004). Hence emphasising resource users' values during environmental education could help transform the attitudes and behavioural patterns of natural resource users. Knowing that certain structures were put in place because of values and preferences shown by them will make them more responsible towards the environment. The assessment of environmental values can help policy makers develop

appropriate indicator sets that measure indirect or direct human-induced pressure on coastal natural resources.

Existing legal and policy framework in addition to the effective use of human and material resources is fundamental to coastal NRM. There are a number of ways to ensure that the environmental values of resource users are included in improving environmental standards in the coastal zone of Ghana. (Caldwell and Shrader-Frechette 1993; Caldwell 1993). For an external actor entering a community, there are a number of documented ways to ensure local participation in coastal NRM. The paper categorises six practical steps as being most important (Fig. 4).

a. **Assess existing coastal NRM**: It is important to assess the current state of natural resources, NRM interventions and levels of community participation to ensure that there is really a need for new NRM plans or interventions. Local institutions and any NGOs already in existence also need to be consulted. Whether an Integrated Coastal Zone Management Plan or Community Based Natural Resource Management plan is being developed, an Information, Education and Communication (IEC) programme then needs to be included. Education, training, and effective communication are the vital for effective stakeholder participation and empowerment coastal NRM.
b. **Seek required permission**: When the need has been identified, efforts to enter the community can be made. In many local communities, especially those in the rural areas, the consent and support of traditional and local community leaders are vital. Depending on the nature of the intervention, permission might be sought also from the appropriate national agencies.

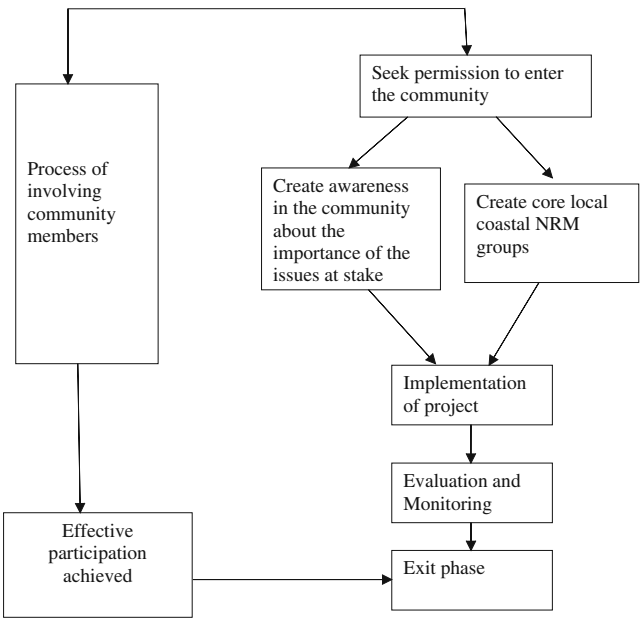

Fig. 4 Framework for involving the local community in coastal NRM. After: White et al. 1994

c. **Create awareness in the community about the need for coastal NRM plans**: There is the need to create awareness in the community about the importance of the issues to be tackled. This can be done using workshops, preparation and distribution of print materials, meetings, presentations at local forums, durbars depending of the area. The potential of using existing groups such as fish smoking groups and welfare groups in awareness creation can also be explored. Sometimes the development and implementation of coastal NRM plans require specialised knowledge and some level of scientific and ecological expertise as they relate to environmental issues in the community. Hence the capacity of these local NRM groups/committees will need to be strengthened using training and educational programmes adapted to suit the local situation. Perceptions and priorities of community members can be obtained using village mappings, focus groups, semi-structured interviews and so on.
d. **Implementation stage**: Coastal NRM plans should also take into consideration local environmental values and include economic and livelihood generation projects. Incorporating local values also helps ensure that conservation initiatives are compatible with local concerns and builds mutual respect and trust. Tools for community implementation are varied and depend on the local setting. For example radio and training programmes which advocate for the adoption of the coastal NRM plan, workshops, local newspapers available in local languages that educate the communities about the status of natural resources and the need for behaviour changes can all be used. Formal educational structures and school curriculum can also be used when possible. Community groups can identify the actions and tools that that are likely to produce the best results. In encouraging local participation, it is important to take into consideration the diversity of the community.
e. **Evaluation and Monitoring**: Once implementation begins, an effective monitoring and evaluation program should be maintained. Conditions prior to implementation, current conditions and possible future impacts need to be assessed for future recommendations. Without an effective monitoring programme, it is difficult to make any conclusive statements about outcomes of the implementation stage. It also helps to identify the need for changes and modifications to the approach used. Finally monitoring and evaluation is important for financial accounting. One way it can be achieved is through regular reporting procedure for those implementing the NRM plan.
f. **Exit stage**: At this stage the community should be ready to manage the coastal NRM programme on its own. They should recognise their contribution to the problem

and take collective responsibility for managing and protecting these resources. Local stakeholders should be able to share benefits from natural resources. The community should also be able to organise itself and to solve issues to so with environmental and natural resource degradation in a communal manner. When local participation is effective, the community can take responsibility for its own management plans.

Conclusions

The study reported in this paper investigated a promising approach to measuring environmental values especially in a developing country setting like Ghana. The results show that in both areas respondents place the greatest importance on the coastal natural resources as sources of wealth creation and of food, values which are described as being "anthropocentric". Primary environmental and natural resource concerns were loss of fisheries, lack of potable water and poor sanitation. With this in mind, it is important to note that coastal NRM initiatives that could win the support of people would be those that link the livelihood and wellbeing to coastal NRM (Lawson 2010).

The natural environment serves as a source of well-being and livelihood especially for many rural dwellers. Its management cannot succeed unless effective local participatory measures are put in place and these are linked to the welfare of resource users. To this effect coastal NRM plans must be designed and implemented in partnership with major groups within local communities. Their environmental attitudes and values play a vital role in this respect.

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