The valuation of biodiversity conservation by the South African Khomani San "bushmen" community

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Abstract

The restitution of land to the Khomani San "bushmen" and Mier "agricultural" communities in May 2002 marked a significant shift in conservation in the Kgalagadi area in South Africa. The Khomani San and Mier communities were awarded land inside and outside the Kgalagadi Transfrontier Park. Given that the Khomani San interact more with nature, biodiversity conservation will only benefit from the land restitution in this case if the Khomani San are good environmental stewards. Therefore, this paper uses the contingent valuation method to investigate the values assigned to biodiversity conserved under the various forms of land tenure arrangements by the Khomani San in the Kgalagadi area and compares them to similar valuations by the adjacent Mier community. The proposed conservation programme sought to plant as many native trees, shrubs and grasslands as required to reduce biodiversity loss by 10% in terms of the quantities of each of the selected major species of the area. Despite the fact that the conservation programme has both winners and losers when implemented under any of the three land tenure arrangements considered, the findings suggest that the Khomani San, whose attitudes towards modern conservation have not been evaluated until now, and the adjacent Mier community generally attach a significant economic value to biodiversity in their area. The net economic value for conserving biodiversity under the various forms of land tenure arrangements by the Khomani San ranged from R928 to R4 672 relative to the Mier community's range of R25 600 to R64 000. However, for both communities, in order for all members of the local communities to unconditionally support biodiversity conservation, mechanisms for fair distribution of the associated costs and benefits should be put in place.

Key Words: biodiversity, contingent valuation, Khomani San, Kgalagadi, land restitution

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1. Introduction

In many settings, there is an ecological inter-linkage between the areas inside and outside protected areas. Hansen and DeFries (2007) observed that biodiversity[2] conservation targets are not being met inside protected areas, which are in the front line of conservation, partly because of increasing adverse influence from activities carried out outside protected areas. Consequently, biodiversity conservation ought to take place outside protected areas as well.

Accordingly, the actions of local communities crucially influence the success or failure of biodiversity conservation for two reasons. First, local communities are usually in charge of some areas outside protected areas, which they use to provide for their own livelihoods. In some cases, the existence of perverse incentives detracts them from prioritising activities which complement biodiversity conservation. Second, the same perverse incentives also fuel unfriendly conservation practices by local communities whenever they get access to protected areas as a result of either land restitution or pure encroachment.

Unfriendly conservation practices reduce existing conservation opportunities. Such a leakage of conservation opportunities would need to be plugged before serious effort to get new conservation opportunities outside protected areas is applied. While unfriendly conservation practices coming alongside encroachment are usually easy to prevent by alienating local communities where they do not have user rights in the protected areas such practices might not be so easy to prevent in cases where local communities are co-owners of protected areas as a result of land restitution.

Furthermore, failure to conserve biodiversity outside protected areas will lead to more pressure being put on the park especially where the local communities have resource rights inside as well. Harvesting of natural resources inside the park could potentially have two impacts. Firstly, it could most likely compromise the integrity of biodiversity as compared to regimes of no use, and secondly, it could have a devastating impact in terms of the protected area's ability to attract tourists and generate revenues to plough back into conservation.

[2] According to the Convention on Biological Diversity, "biological diversity" means the variability amongst living organisms from all sources, including, *inter alia*, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD 1992).

In South Africa, land degradation is perceived to be positively correlated with distribution of communal rangelands (Department of Environmental Affairs and Tourism 2010). Wind and water erosion are identified as the main drivers of soil degradation, while changes in species composition, loss of plant cover, and bush encroachment are considered to be the most frequent forms of vegetation degradation. Many communal lands are severely degraded in four provinces including the Northern Cape. For example, the main challenge in the Kgalagadi area in the Northern Cape is that the current levels of harvesting of medicinal plants, wood collection, grazing and hunting are highly likely to result in the depletion of the resources. Such a situation is bad for the area's conservation in general because of the inter linkages between the broader Kgalagadi area and the Kgalagadi Transfrontier Park.

The Kgalagadi Transfrontier Park, located between Botswana and South Africa, encompasses part of the ancestral site of the Khomani San "bushmen"[3]. As part of South Africa's land restitution programme, the Khomani San community was awarded land inside and outside the Kgalagadi Transfrontier Park in May 2002 together with the adjacent Mier community.[4] The South African National Parks (SANParks) was tasked with co-managing the acquired land inside the park on behalf of the local communities as contractual parks. However, given the intimate connection between the land inside and outside Kgalagadi Transfrontier Park entailed by the land restitution deal, conservation of biodiversity needs to be undertaken in the broader Kgalagadi landscape and not just inside the park.

It is clear from the way land restitution claims within protected areas have been handled so far in South Africa that sustainability and biodiversity conservation is as critically important, and that the government is of the view that land claims by individuals and groups must be achieved in the national interest by 'taking into consideration the intrinsic biodiversity value of the land and seeking outcomes which will combine the objectives of restitution with the conservation and sustainable use of biodiversity' (De Villiers 1999; Wynberg and Kepe 1999; Hall-Martin and Carruthers 2003).

Thus, the challenge facing the Kgalagadi area is how the landscape can be managed as a whole in a manner that enhances conservation and complementary land-use practices (e.g. medicinal plant harvesting), and discourage conflicting practices (e.g. excessive stock

[3] The term "bushmen" is generically used to refer to the Khoisan. Culturally, the Khoisan are divided into the hunter-gather San and the pastoral Khoi (Barnard 1992).

[4] In addition, the Khomani San people were awarded additional and special rights in the remainder of the park because they lost more land in comparison to the Mier community during the establishment of the Park. The special rights include commercial development and undertaking of cultural activities (Bosch and Hirschfeld 2002).

farming). The implication of such an approach is that conservation also needs to spread to the communal and municipal lands adjacent to Kgalagadi Transfrontier Park.[5] To ensure success of such an approach there is a need to identify and deal with any factors that militate against sound conservation in the whole area.

Biodiversity has long been regarded as a public good, and for that reason national parks have been dependent mainly on government funding for conservation finance. This implies that, if biodiversity conservation cannot pay for itself, local communities also need compensation for undertaking biodiversity conservation. Thus, in order for local communities to be stewards of biodiversity, they need to draw associated benefits from somewhere – either from conservation itself or some external body. Thus, a question can be raised from the above scenario: is restitution of land under conservation to an indigenous group detrimental for modern conservation? Given that they interact more with nature by harvesting medicinal plants, bush-food and hunting for their livelihoods, biodiversity conservation will only benefit from the land restitution in this case if the Khomani San are good environmental stewards. If conservation does not pay the bill according to the Khomani San (who are now co-owners of the biodiversity in the area) then mechanisms which may include additional economic incentives to them will be needed to ensure that their actions are not detrimental to conservation.

This paper investigates the value that the Khomani San assign on modern conservation under various land tenure and whether they may generally be expected to be good environmental stewards. This is done by determining the economic value assigned to biodiversity conservation on communal land, municipal land and park land by the Khomani San in a contingent valuation study of a plant conservation programme in the Kgalagadi. In addition, the paper compares the valuation of biodiversity by this typical pristine indigenous[6] community to that of an average South African rural community, the adjacent Mier community.

[5] Communal and municipal land importance is not only limited to its indigenous biodiversity, but also because this is where local community live, work, recreate, harvest resources, undertake game and livestock farming (Norton 2002). It is for this reason that it is argued that communal and municipal lands can make a significant contribution to conservation of biodiversity (Kaval, Yao and Parminter 2007).

[6] In South Africa, the term "indigenous people" refers to all African ethnic groups. In this paper, the term "indigenous people" is used to refer to what is referred to as vulnerable indigenous communities in South Africa. The Khomani San were not historically involved in the formal economy. Today, they cannot entirely ignore the cash economy although there are still some who are more traditional, hunters and gatherers. The exposure of the Khomani San to the cash economy and external factors particularly the influence of western value systems, is likely to have resulted in changes to their value systems, resource use, and cultural preferences.

This paper is important because the South African San's attitudes towards modern conservation have not been evaluated until now. Based on the economics of hunter-gather literature, we hypothesize that:

"*The value assigned to biodiversity conservation by the Khomani San people in South Africa differs from similar valuation by the Mier community*".

No studies exist comparing the values of environmental resources between indigenous people and the general population. This paper will test whether such a hypothesis is supported by evidence from the Kgalagadi area in South Africa.

The rest of the paper is arranged as follows: Section 2 discusses the economic rationale for valuing biodiversity and Section 3 presents the study area and the survey. Section 4 discusses descriptive statistics and results from the study. Section 5 concludes.

2. Economic Valuation of Biodiversity

Ecosystems provide provisioning services, regulation services, support services and cultural services (MEA 2005). These services directly enter into economic processes, for example, as raw materials, food and aesthetic services. Thus, the magnitude of the flow of ecosystem services affects human well-being. The significance of biodiversity to the generation of ecosystem services is now widely recognized (WCMC 1992). As such, it is economically rational to conserve biodiversity because of its contribution to human well-being (Clough 2000).

Successful biodiversity conservation outside protected areas usually requires its integration with other land uses rather than to separate them (Hartley 1997; Kneebone 2000; Kneebone et al. 2000; Norton 2000). There is a need to both accommodate the most economically beneficial use of the land and minimize the negative impact on biodiversity (Kneebone 2000). However, landowners often lack information and evidence about the correct value to use for biodiversity when making land-use decisions. This usually emanates from two circumstances. Firstly, unlike outputs of most other land uses, biodiversity is not usually traded in markets hence landowners fail to appreciate its correct value when comparing it to other activities. Secondly, even where the correct value of biodiversity is known, such values are not wholly appropriable by individual landowners because biodiversity exhibits public good characteristics. All this happens against a background in which landowners individually bear the full costs of their conservation efforts (CBD 2010).

Therefore, in order for biodiversity conservation to be successful outside protected areas, landowners should receive the correct value of biodiversity and subsequently use it in land-use decisions.

The determination of the correct value of biodiversity or other environmental resources is called environmental valuation. Environmental valuation attempts to assign a monetary value on the environmental object of interest. The rationale behind environmental valuation is to understand people's preferences about the environmental object of interest. Most environmental valuation techniques entail the elicitation of willingness to pay (WTP). This is commonly done using the contingent valuation method (CVM), in which respondents are asked about their WTP for changes in environmental good provision in hypothetical scenarios. The use of dichotomous choice (binary or closed-ended) questions has gained popularity over open-ended questions following the NOAA panel recommendations (Arrow et al. 1993). The dichotomous choice format involves asking respondents if they are willing or not to pay an offered amount for a specific environmental change. However, there are circumstances where some variant of the open-ended question format might perform better, for example when the sample size is limited. According to Mitchell and Carson (1989), the payment card method gives respondents some assistance in searching for their valuation. It avoids the starting bid bias of the closed-ended format and maintains the positive features of an open-ended format. A recent study by Hanley et al. (2008) also used the payment card to elicit the WTP for landscape change in a national park.

Most CVM studies deal with environmental public goods. As a result, they restrict WTP to being non-negative. However, some environmental amenities manifest themselves as costs to some and benefits to others. In such cases an appropriate consumer surplus measure which accounts for the loss of utility resulting from an increase in the environmental good provision must be chosen (Clinch and Murphy 2001).[7] Ordinarily, those who lose from an increase in the environmental good provision would want to be compensated and expect to be asked about their willingness to accept (WTA) compensation. However, the NOAA panel strongly recommends against the use of WTA scenarios in CVM studies (Arrow et al. 1993). Thus, the elicitation format should allow respondents who experience a welfare loss because of the proposed environmental change to state a negative WTP in a manner we will show later (Hanley et al. 2008; Muchapondwa, Carlsson and Köhlin 2008). Otherwise the

[7] The most commonly used approach to account for welfare losses in a contingent valuation study has been to make assumptions concerning the negative tail of the WTP distribution, after eliciting the WTP for a change in the provision of a public good/bad.

exclusion of negative WTP may result in an erroneous conclusion with regard to the net social benefits of the proposed change when the total values are estimated (Hanley et al. 2008).

Allowing respondents to state a positive WTP to prevent the proposed changes from going ahead, is one way to include the negative WTP (Clinch and Murphy 2001). An assumption made is that WTP to prevent the proposed changes can be considered as a proxy of the negative WTP (cost in the welfare terms) for the proposed changes. Thus, WTP to prevent the proposed change is assumed symmetric to the WTA to tolerate the proposed change (in the sense of the minimum compensation payment needed to restore people to their utility levels prior to the introduction of the project). Of course, this can only hold as a workable approximation for marginal changes, when the environmental good of interest is easily substitutable and income effects are marginal (Clinch and Murphy 2001; Hanley et al. 2008).

Conservation of biodiversity particularly on communal and municipal lands in a developing country such as South Africa is likely to be viewed as good by some people and bad by others i.e. it produces both winners and losers. Determination of the value of biodiversity from the perspectives of the various stakeholders expected to partake in it will assist to establish the best policy response where biodiversity is under threat (OECD 1999). Given appropriate and adequate economic incentives, landowners can become effective stewards of land as well as the biodiversity linked with it (Kneebone et al. 2000).

3. The Study Area and Survey

a) The Study Area

The Kgalagadi area in question lies in the Siyanda District Municipality of the Northern Cape province of South Africa, bordering Botswana and Namibia. The district is approximately 120,000 square kilometres with large areas in the Kgalagadi dessert. The Siyanda District Municipality is made up of six Local Municipalities, of which the Mier Local Municipality is one. The population density of the Mier Local Municipality is low, with an estimated 8,000 Mier indigenous community households and 320 Khomani San households.

The Mier Local Municipality region is semi-arid and has infrequent rainfall, mostly during summer. Rain mainly falls on the reddish-brown Kgalagadi sands. It is a very hot area;

the temperatures can reach up to 45 degrees in summer. It is generally warm in winter but temperatures can drop to below zero at night (Seymour 2001). There is lack of freshwater in the region. Boreholes are the primary source of water and the water quality is very poor as it is salty. The region is predominantly used for sheep and game farming even though an increasing number of cattle and goats are being introduced, despite the area not being best suited to such livestock.

While the Kgalagadi dessert, including the area inside South Africa, has a physically harsh environment, the Mier Local Municipality region has a rich biodiversity (i.e. wide variety of animals and plants). Biodiversity is considered an asset because of a wide variety of obvious reasons, including its support for the vital and growing nature-based tourism sector, contributions to the diet of rural people and traditional medicines (Cooper et al. 2004). The Mier Local Municipality is located next to the Kgalagadi Transfrontier Park. The total area of the park is 387,991 square kilometres, of which approximately 75 percent is on the Botswana side (Swatuk 2006).

On the South African side, the Kgalagadi Transfrontier Park has five segments: (i) belonging to SANParks and with no local community access, (ii) belonging to SANParks but with Khomani San access for symbolic cultural use, (iii) belonging to SANParks but with Khomani San access for commercial joint venture use, (iv) belonging to the Khomani San but managed as a contractual park with SANParks, and (v) belonging to the Mier community but managed as a contractual park with SANParks.[8] The Mier community and Khomani San agreed to use their land inside the park for conservation, eco-tourism and cultural activities through 99-year contract parks. The agreement can only be terminated after the year 2032, with the cancelling party expected to give at least 3 years unambiguous notice. A Joint Management Board (JMB) comprising SANParks and the two communities' representatives manage the South African side park affairs. SANParks has the obligation to maintain infrastructure related to conservation and the integrity of nature inside the Kgalagadi Transfrontier Park on the South African side (Bosch and Hirschfeld 2002).

The two local communities jointly own *!Xaus* lodge inside the park, which was constructed for them by the government. The lodge is on the border of the Khomani San and Mier contract parks. Since 2007, a private firm called Transfrontier Parks Destination has a concession to run the lodge. The profits generated from the lodge concession are shared

[8] Both contract parks are adjacent to the southern boundary of the park. The Khomani San contract park is close to the Twee Rivieren park entrance while the Mier contract park is adjacent to the Mier community's game farms.

equally amongst SANParks, the Mier Local Municipality (representing the Mier local community) and the Khomani San Community Property Association[9]. The Khomani San and Mier communities are also set to get 10% equity in Transfrontier Parks Destination, through a Trust, after ten years of operation.

The Mier local community lives in the following villages: Askam, Groot Mier, Klein Mier, Loubos, Noenieput, Philandersbron, Rietfontein and Welkom. The Khomani San people live on the following farms: Andriesvale, Erin, Farm 24 and 26 – adjacent to the Park, Miershoop Pan, Scotty's Fort, Uitkoms and Witdraai.[10] There is a need for more conservation to take place in the highly fragile Kgalagadi ecosystem. The Mier Local Municipality has agreed in principle to expand the size of their land under conservation. This involves the Mier Local Municipality managing two of their municipal game farms (Tween Dabas and Loretto) adjacent to the park as a broad-based conservation area before 2012. Thus, some of the municipal land will be set aside so it could be used for other conservation purposes besides game farming. The Khomani San has also agreed to use two of its farms (Farm 24 and 26), which are adjacent to the park, for conservation purposes in addition to their cultural activities. Thus, these farms will act as a buffer zone protecting the Mier contract park, Khomani San contract park and the rest of the Kgalagadi Transfrontier Park (Bosch and Hirschfeld 2002).

b) The Survey

Given that they interact more with nature and that their attitudes are likely to be more important in determining the success of biodiversity conservation in the area, this paper seeks to determine the value that the Khomani San community places on biodiversity conservation in the Kgalagadi area and compare it with that of the adjacent Mier community. To accomplish this, a contingent valuation survey was conducted in the Mier Local Municipality. The data were gathered through face-to-face interviews from August to October 2009 and March to April 2011 respectively.

[9] In 2008, the Khomani San Communal Property Association management committee, which had been in place since the Khomani San acquired the land, was removed after it was found to have mismanaged finances and the Provincial Department of Land Affairs currently administers the Khomani San's finances. However, the Department is working closely with newly elected community representatives.

[10] The Khomani San farms were intended to be used as follows; Andriesvale for housing, Erin for hunting, Farm 24 and 26 for conservation, Miershoop Pan for game farming, Scotty's Fort and Uitkoms for livestock, and Witdraai for cultural purposes. The current situation is that multiple activities including other than those initially intended are taking place on the farms.

The questionnaire sought to get data on household socio-economic characteristics, activities undertaken in the area, relative importance attached to different activities, attitudes towards conservation, rate of participation in conservation and the valuation of biodiversity. The Khomani San and Mier communities living in the Mier Local Municipality were identified as the target population. One hundred randomly selected households, divided equally between the Khomani San and the Mier communities, were interviewed.

The respondents were initially given background information on biodiversity, the general state of nature in their area, the possible costs and benefits associated with biodiversity conservation, and a proposal for a biodiversity conservation programme. The biodiversity conservation programme proposal was as follows: "The government proposes to introduce a conservation programme where as many native trees, shrubs and grasslands as necessary would be planted and protected with the aim of achieving a reduction in biodiversity loss of 10% in terms of the quantities of each of the species. The conservation programme would entail increasing the total amount of land under conservation in the Kgalagadi area. The conservation programme would also entail a mix of reducing the harvesting rate of overall species and the prohibition of destructive harvesting by building on more effective traditional approaches. The proposed programme can be undertaken on either communal land, municipal land or park land[11] with equal biodiversity results. Lack of funding is the main constraint towards implementing the proposed initiative, hence, the need to pay. Whether or not the programme is eventually undertaken is dependent on the aggregate willingness-to-pay (WTP). In view of budget constraints, the programme can be undertaken on only one type of land".

Thereafter, a two-stage approach was used. Firstly, respondents were asked how their households weighed the costs and benefits of the proposed programme on each land type, by considering only those benefits and costs applicable to them.[12] Secondly, depending on their preferences for the programme on each land type, the respondents were asked about the highest amount their household was willing to pay as an annual conservation levy to ensure

[11] In this context, park land refers to either of the contract parks.

[12] Those respondents who indicated that the potential benefits were greater than the potential costs (B>C) were expected to have a non-negative WTP for the conservation programme. Those respondents who indicated that the potential costs exceeded the potential benefits (B<C) were expected to have a non-negative WTP for the avoidance of the conservation programme.

that such a programme was undertaken/avoided[13] on either the communal land or municipal land or park land.[14]

Our approach so far enables the respondents to be classified into distinct categories based on their perceived assessment of the potential benefits and costs associated with the introduction of a conservation project in their area. The challenge is how to deal with the potential zero WTP that may be reported by respondents. This necessary information for handling the zeros will be obtained through a follow up debriefing question. The protest bids (refusal to answer a valuation question or citing zero bids other than for budget constraints reasons) will be omitted from the analysis, as is standard procedure in CV studies. This implies that all zero bids that are cited other than for budget constraints reasons will be treated as valid bids.

The question used to capture this information requires a qualitative choice model. The logit and probit models are the two mostly used discrete choice models (Capps and Cramer 1985). The logit / probit models are usually used where the dependent variable represents a qualitative response such as selecting among a set of discrete choices. Such an approach fundamentally explains a binary decision (dependent variable).

A number of studies have used the probit model-to-model winners and losers in a non-market valuation studies (e.g., Clinch and Murphy 2001; Muchapondwa et al. 2008). Thus, we prefer to use the probit model with linear bids to validate whether the respondents behaved like economic agents. We want to know the characteristics of people who win or lose, and since this is a binary observation, the probit model is applied. We assume a WTP linear function (Muchapondwa et al. 2008):

$$WTP_j = \alpha z_j + \varepsilon_j \quad (1)$$

Where z_j is a linear function of socio-economic characteristics, α is the corresponding parameter vector and ε is a random error term, var (ε) = α^2. In the case of the extreme value (logistical) distribution, the individual j's mean WTP is:

$$\ln(1 + \exp(\alpha z_j))/\beta \quad (2)$$

[13] The logic behind those against the proposed programme willing to pay is that their payment would ensure that they would continue to undertake their current activities without any restrictions. This is because the implementation of the programme would result in some land being set aside exclusively for the programme, and some activities such as harvesting of overexploited medicinal plants might end up being prohibited or regulated.

[14] The respondents had to give three WTP answers in respect of three types of land. The type of land with the highest stated WTP represents where the respondents would like the proposed project to be implemented.

Where β is the marginal utility of money (Köhlin 1995). The mean WTP for individual j is $\alpha z_j / \beta$. The median WTP may also be estimated readily for the normal and extreme value distributions (Clinch and Murphy 2001). A binary decision of whether the respondents considered the proposed conservation project to be either a public good or bad is used as the dependent variable. In these models, the coefficients of the independent variables explain factors that influence the dependent variables, *ceteris paribus*.

The WTP question in the case of implementation of the proposed biodiversity conservation programme on communal land was as follows: "What is the maximum annual conservation levy that your household would be willing to pay to SANParks (the conservation agency) to implement a government conservation programme which seeks to plant as many native trees, shrubs and grasslands on communal land[15], as required specifically to reduce biodiversity loss by 10%? Bearing in mind the other demands on your household income, pick your household's maximum annual conservation levy from the payment card.[16] Note that SANParks would be bound to use the levies so collected towards implementation of this programme only".

In follow up questions, the respondents were asked similar questions supposing that the relevant conservation authorities instead decided to implement the programme on either municipal land or park land. Thus the programme was to be implemented on only one land type due to logistical feasibility. In the event that respondents revealed in the first set of questions that the potential costs of the proposed biodiversity conservation programme exceeded its potential benefits, they were asked in the second set of questions about their maximum WTP to have the proposed biodiversity conservation programme elsewhere.[17] In all cases, the respondents were asked to state reasons for their willingness to pay amounts across the biodiversity conservation programmes on either communal or municipal or park lands.

[15] Suppose that logistical arrangements determine that it is only feasible to implement the project on communal land.

[16] This study used the payment card method with 13 bids ranging from R0-R4, 000. In addition, provision was made for any respondents who might have wished to state any other amount not shown on the card.

[17] This suggests that if they do not want the programme, it has to be taken elsewhere and that they should contribute to the costs of its implementation there (or its prevention from their area). Thus, they would be paying for remote conservation as opposed to intimate conservation.

c) Descriptive Statistics from the Survey

Table 3.1 presents the descriptive statistics of the households surveyed.[18] Where the respondents were household members other than the heads their responses were interpreted as coming from the heads themselves.

Table 3.1: Descriptive Statistics from the Survey

	Khomani San	*Khomani San*	*Mier*	*Mier*	*Full Sample*	*Full Sample*
Variable	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Household size	5.37	3.09	5.59	3.03	5.48	3.057
Ever visited the park (1=Y, 0=N)	0.77	0.42	0.73	0.45	0.75	0.43
Age of household head	46.84	15.15	47.79	14.35	47.32	14.73
Gender of head (1=M, 0=F)	0.60	0.49	0.63	0.49	0.62	0.49
Years Lived at Property	10.10	9.14	16.49	12.83	13.30	11.57
Education Years of Household Head	4.98	3.62	5.9	3.97	5.44	3.82
Work for wages[19] of Household Head	0.32	0.47	0.21	0.41	0.27	0.44
Self Employed (1=Y, 0=N) of Household Head	0.23	0.42	0.54	0.50	0.39	0.49
Knowledgeable about the effects of biodiversity loss (1=Y, 0=N)	0.58	0.50	0.67	0.47	0.63	0.48
Household Income (Rands)	26 400.00	28 462.98	43 500.00	80 977.30	34 950.00	61 144.84
Primary responsibility (1 = Government, 2 = SANParks, 3 = community, 4=donors, 5 = all stakeholders	3.44	1.39	3.25	1.388	3.33	1.37
Relationship to nature (1 = service of man, 2 = steward of nature, 3 = nature independent, 4 = equal rights)	3.37	0.88	3.21	0.92	3.23	0.97
Can compromise own living for biodiversity (1=Y, 0=N)	0.81	0.39	0.77	0.42	0.83	0.39
Collects firewood (1=Y, 0=N)	0.80	0.40	0.33	0.47	0.57	0.50
Uses medicinal plants (1=Y, 0=N)	0.77	0.42	0.25	0.44	0.51	0.50
Bush Food Collection (1=Y, 0=N)	0.54	0.50	0.20	0.40	0.37	0.48

[18] This sub-section splits the analysis by ethnic groups, namely the Khomani San people and the Mier Community, each with a sample size of 100. The sample size of 100 should be understood in the context of the small population sizes of indigenous people. The Khomani San have a total estimated population of 320 households, thus 100 represents a fair representation. It is in this context that the Khomani San sample size in this study is considered adequate. The reason for splitting by ethnic groups was due to the two groups being distinct. Splitting will therefore give us valuable insight into the kind of economic incentives schemes that may be appropriate to each group.

[19] Codes; 1 = yes & 0 = no. These codes were also used for the following variables; self employment, firewood collection, medicinal plant usage, bush-food collection, involvement in livestock farming, game farming, agriculture, hunting, making crafts, take part in activities in a Municipal land, activities inside the park, decide if to participate, home part of nature, protect environment and substantial reduction.

Involved in Livestock Farming (1=Y, 0=N)	0.46	0.50	0.96	0.21	0.56	0.50
Involved in Game Farming (1=Y, 0=N)	0.06	0.24	0.13	0.34	0.10	0.29
Growing plants and trees in the household's plot (1=Y, 0=N)	0.03	0.17	0.10	0.30	0.07	0.25
Involved in legal hunting	0.24	0.43	0	0	0.23	0.42
Make Crafts	0.13	0.34	0.12	0.33	0.13	0.33
Activities on Municipal Land (livestock farming, firewood collection, medicinal plants harvesting and bush-food collection)	0.14	0.35	0.41	0.49	0.28	0.45
Activities inside Contract Park	0.65	0.48	0	0	0.33	0.47
Decides if to Participate	0.50	0.50	0.53	0.50	0.52	0.50
Home Part of Nature	0.86	0.35	0.84	0.37	0.85	0.36
Protect Environment	0.83	0.38	0.76	0.43	0.79	0.41
Substantial Reduction	0.75	0.44	0.76	0.43	0.76	0.43
No. of Observations	100	100	100	100	200	200

The majority of the Khomani San respondents were males (i.e. 60%). Unemployment is very high among these respondents, with only 32% having jobs, while 23% were self-employed. This is unlike in the Mier community where almost everyone report some kind of employment especially self-employment. Thus, the livelihoods of the majority of the Khomani San have to be supported from the natural environment or grants from the government. The Khomani also indicated that they did not have access to electricity. It is therefore not surprising that all the respondents indicated that they were involved in the collection of firewood. The Camelthorn tree is the only large tree in the area; hence, it is the most harvested.

Harvesting of this tree for commercial purposes is prohibited. Despite efforts to ensure that this unique dry land species continues to thrive, some locals continue to harvest it for commercial purposes due to lack of jobs and/or income generating activities in their area. Harvesting of medicinal plants was the second most popular activity that took place in the area with 77% saying that they were involved in this activity. This was followed by collection of bush-food (54 %), livestock farming (46 %), permitted hunting (24 %) and making of crafts (13 %). This information is evidence of how heavily dependent the Khomani San people are on nature. An overwhelming majority (86%) indicated that they did not hunt, grazed their livestock, collected bush-food or harvest firewood on municipal land.

About 77% of the Khomani San respondents had visited the park sometime in the past, prior to the time the survey was carried out. This is important because it means that most respondents had an idea of what conservation aimed to achieve. This is particularly critical

for the Khomani San people given that most respondents had not even completed primary education. Their main reason for visiting the park was to undertake traditional and cultural activities. Of the activities undertaken by the Khomani San inside the Park, only a few indicated that it was for harvesting of medicinal plants. The traditional doctors were the main harvesters of medicinal plants inside the contract park.

About 83% of the Khomani San respondents said they took part in pro-environmental activity in their homes. Their pro-environmental activity mainly involved keeping their homes clean and planting flowers. This is essential because it indicates that the respondents are interested in looking after the environment. All that required is to find ways to take this a step further by investigating how to motivate people to adapt the same attitude with regard to native biodiversity efforts.

When asked whether they would physically volunteer their own labour to take part in any conservation activity inside their communal land, on municipal land and inside their contractual park, 78%, 66% and 63% said yes respectively. Most said yes to a conservation activity inside the communal land because they felt that the benefits would directly accrue to them. Some of those who said no were due to old age or ill health. Given their resource rights inside the contract park, it was surprising that it had the lowest willing participants. Nonetheless, the magnitude of the difference between the two categories is marginal.

The same question was also asked to the Mier respondents, 83%, 70% and 78% said yes. In contrast to the Khomani San, volunteering inside the park had the second highest willing participants after communal land. It is however encouraging that, an overwhelming majority would be prepared to volunteer on both communal and municipal land, as this is where loss of biodiversity usually happens. This information is critical because it shows that most people are already positive about conservation.

A majority of 53% of the Khomani San respondents had partial knowledge of what would happen if they were to be a significant degradation of the environment because of their overexploitation of resources. Food insecurity was the most cited impact that would result because of significant degradation. Only 27% of respondents were well informed about the potential impact of degradation. Despite only 58% having an idea about the potential impact of overexploitation, about 81% said they would compromise their living situation to conserve the environment.

When asked who they thought was primarily responsible for conserving nature in the Kgalagadi area, 43% said that it was the community itself. Those who felt that it was a

responsibility of all stakeholders accounted for 37% and 14% said it was the government's responsibility. Most described their relationship with nature as that of man and the natural environment having equal rights, 62%. The remaining 21% were of the view that man was the steward of nature. A minority of 25% of Khomani San respondents indicated that they would relocate if they were to be a substantial degradation on the environment.

As is the case with the Khomani San, a large majority of the Mier respondents (63 %) were males. Unemployment levels (those actively looking for work) were also very high among this group, at 79%. However, the Mier's household income was significantly higher than that of the Khomani San households. About 66% of the Mier were involved in livestock farming. The 79% unemployment figure comes from those involved in livestock farming as they indicated that they were involved solely in livestock farming due to lack of jobs. They indicated that they would prefer to work and have livestock at the same time as their livestock sizes were very small.

In contrast to the Khomani San, all the Mier community members had access to electricity; hence, only 33% were involved in firewood collection. However, firewood collection was the second most undertaken activity among this group, followed by medicinal plant harvesting and bush food collection at 25% and 20% respectively. Lack of grazing land was a challenge facing the Mier given their heavy dependence on livestock farming. A small proportion of respondents (24%) indicated that they also collected firewood on municipal land.

An overwhelming 73% of the Mier respondents had visited the park in the past. Their reason for visiting the park was mainly for recreational reasons. Unlike the Khomani San people, the Mier pay an entrance fee[20] whenever they visit the park. When asked if they participated in any pro-environmental activities in their homes, 76% said yes. The pro-environmental activities that they undertook mainly involved planting of trees (flowers) and maintaining their homes by keeping them clean. This is important as it shows that the respondents are interested in looking after the environment. This can be taken a step forward by finding ways to motivate them to have the same approach with regard to native biodiversity efforts.

The amount of education years of the household head fluctuated among the Mier respondents from 0 years (those that never attended school) to 12 years (those that completed

[20] The Khomani San people do not pay entrance fees because of having special "resource" rights inside the park. As a result, they have a separate entrance point to the park so they can go for meetings in the park.

Matric – finished high school). Only 2% of the respondents finished college education. Most of the respondents (55% and 31 %) had partial and full knowledge respectively about the impacts of a significant degradation on the environment due to overgrazing or overexploitation.

When asked who was primarily responsible for conserving the environment, 44% of the Mier said it was the community, 31% said it was all stakeholders and 16% felt that it was a government responsibility. They were also asked how they best defined their relationship with the natural environment; slightly more than half (53%) said that man and the environment had equal rights, while 28% indicated that man was the steward of the environment. An overwhelming majority of 76% of respondents indicated that they would still leave in the area even if they the environment was to degrade substantially.

It is clear from the discussions above that both ethnic groups are to varying degrees heavily dependent on nature as a source of livelihood. Once we obtained background socio-economic information from the respondents, we then asked them three contingent valuation questions about their willingness to pay for native planting of trees, shrubs and grasslands on either communal land, municipal land and inside the contractual park.

4. Results and Discussion

a) Validity and Reliability Tests

The conventional CVM survey asks respondents to state their WTP for a commodity in monetary units based in a hypothetical scenario. The technique is prone to bias because of its reliance on a hypothetical scenario. It is for this reason that it is critical that the CVM study should entail assessing the credibility of the estimates. In the case of this study, the assessment consists of construct/theoretical tests.

In addition to the validity, it is desirable to test for reliability of results. The objective of testing for reliability is to see if the results can be replicated by running the technique under exactly the same conditions. When the technique is repeated, the difference in the results should be statistically insignificant (Hanley and Splash 1993). Our validity test entails estimating the determinants of respondents WTP. Knowledge of the characteristics of those households who are likely to consider the project in question as bad could assist in terms of designing incentive schemes that may motivate them to enhance biodiversity in the area.

One of the objectives of this study is to explain the factors that theoretically influence the dependent variable and expectations in terms of their associated signs. Such an analysis sheds light on the robustness of the study. From a policy point of view, the identification of such factors shed some light to the type of appropriate compensation incentive schemes that may be suitable for the landscape in question.

Since we are dealing with household-level data, household characteristics such as age of household head, education level, household's annual taxable income, knowledge about consequences of biodiversity loss, having visited the park in the past and participating in some pro-environmental activities at home are expected to be vital in explaining the households' WTP for the proposed conservation project.

It is logical to think that households that have visited the park at some point in the past would view planting of trees, shrubs and grasslands as good. One of the main objectives behind parks is to create awareness about biodiversity conservation. Having visited the park in the past is more likely to help one to relate positively with conservation and associated secondary benefits such as job creation and contribution of tourism in the area.

Older people are more in contact with nature, are more likely to have experienced environmental degradation over time, and because of having experienced changes with regard to accessing certain resources, are expected to view conservation of biodiversity as essential. Household's heads with higher education are expected to comprehend the urgency to protect nature. The Khomani San's indigenous knowledge of medicinal properties is expected to influence WTP.

The level of knowledge that households have with regard to the consequence of a significant degradation of the environment due to overexploitation is expected to influence people's view about conservation in the area. Household heads with some knowledge about what might happen if there is a significant degradation of the environment are expected to view the proposed programme as a public good. Households that take part in pro-environmental activities such as planting of trees in their homes are expected to be in favour of the proposed project.

Household income is expected to be critical in explaining WTP for the proposed project. Income levels in the area are relatively low and as a result, people are generally dependent on nature for a wide variety of activities (e.g., livestock farming, medicinal plant harvesting and bush-food resources). However, households with low income are expected to be the most affected by the impact of biodiversity loss in the area, as compared to those with

relatively higher income levels, *ceteris paribus*. The type of activities undertaken on communal land, and whether one undertakes them either on the municipal land or inside the park will influence how people perceive the conservation project in question on different types of land.

The probit model results of whether planting of trees, shrubs and grasslands is good are set out in the table 4.1 below. Figures in parentheses are standard errors.

Table 4.1: Determinants of Favouring the Proposed Conservation on Different Land Types

Probit Regression			
	Dependent Variable: *Willing to physically volunteer own labour*[21]		
Number of obs = 200	*On communal land*	*On municipal land*	*Inside the park*
Variable	**Coef. and *standard errors***		
Mier Dummy	-0.5572 (0.4761))	0.0553 (0.3524)	-0.5829 (0.4305)
Household size	-0.0879 *** (0.0412))	-0.0243 (0.0348)	-0.0495 (0.0375)
Visited the Park	0.2937 (0.2990)	0.0452 (0.2574)	0.1154 (0.2793)
Age of household head (HH)	-0.0370 *** (0.0106)	-0.0308 *** (0.0090)	-0.0233 *** (0.0096)
Gender of HH	-0.2179 (0.2771)	0.2032 (0.2354)	0.2836 (0.2411)
Years lived at current area	-0.0082 (0.0113)	0.0105 (0.0097)	0.0010 (0.0105)
Employed	-0.7963 *** (0.2949)	-0.3893 (0.2498)	0.0006 (0.2701)
Self Employed	0.1700 (0.3482)	-0.0489 (0.2772)	0.2592 (0.3183)
Decision about participation	-0.1364 (0.2771)	0.4283 (0.2317)	0.0084 (0.2557)
Education of household head	-0.0324 (0.0370)	-0.0804 *** (0.0340)	-0.0281 (0.0339)
Household income	0.0000 *** (0.0000)	-0.0000 0.0000	0.0000 (0.0000)
Home part of Nature	-0.3159 (0.3567)	-0.4656 (0.3183)	0.1598 (0.3097)
Participate in pro-environmental	0.3244 (0.3321)	-0.0722 (0.2859)	0.6552 *** (0.2896)
Knowledge about degradation	0.1688 (0.3155)	0.3832 (0.2618)	0.0894 (0.2672)

[21] The willingness to volunteer physical labour in the proposed project is proxy to seeing the project as a public good.

Main activities on communal land			
Livestock farming	-0.0289 (0.3161)	-0.2939 (0.2754)	0.0078 (0.2835)
Hunting	-1.0613 *** (0.4029)	-0.2118 (0.3944)	-0.7036 (0.3666)
Medicinal plant harvesting	0.1037 (0.4006)	0.0786 (0.3153)	0.3244 (0.3564)
Collection of bush-food	0.9424 *** (0.3797)	0.6499 *** (0.2957)	0.7345 *** (0.3125)
Firewood collection	0.1617 (0.3648)	-0.3833 (0.3040)	0.5700 (0.3278)
Game Farming	-0.0140 (0.5059)	-0.0665 (0.4021)	0.0439 (0.3907)
Crafts	-0.7216 (0.4020)	-0.6934 (0.3989)	-0.4208 (0.3943)
Activities on municipal land	0.6767 (0.3785)	0.5709 *** (0.2807)	0.3222 (0.3237)
Activities inside the park	0.6663 (0.4239)	-0.0197 (0.3443)	0.4696 (0.3687)
Substantial Reduction	-0.2451 (0.3259)	0.1868 (0.2490)	-0.3984 (0.3080)
Primary responsibility	-0.0917 (0.2875)	0.0647 (0.2232)	0.1440 (0.27110
Define relationship to nature	-0.3275 (0.3136)	-0.1667 (0.2444)	-0.7138 *** (0.2674)
Compromise livelihood to conserve	-0.4489 (0.3145)	-0.3600 (0.2768)	-0.0329 (0.2896)
B>C (Communal land)	0.5921 (0.4322)	-0.0533 (0.3794)	0.2656 (0.4249)
B>C (Contractual Park)	0.3167 (0.3861)	-0.0173 (0.3441)	0.0415 (0.4074)
B>C (Municipal land)	0.7272 (0.4271)	0.9150 *** (0.4255)	0.8096 (0.4653)
Constant	2.4504 *** (1.0008)	1.7795 *** (0.8482)	-0.0857 (0.9557)

***=5% level of significance

The results, *ceteris paribus*, suggests age and collection of bush-food resources are significant factors that influence people's perceptions about the planting of trees, shrubs and grasslands on communal land, municipal land (land owned by the municipality) and as well as on perceptions inside the contractual park. The Khomani San people in particular have resource rights inside the park, and harvesting of medicinal plants, walkabouts and collection of bush food are already some of the activities that they undertake in the park. Those involved in these activities would directly benefit more; hence, it is not surprising that households that took part in collection of bush-food resources are more likely to view the proposed project as a public good. These households have lower income, hence, their heavy

dependence on bush-food. This is in line with our expectations that households that derive their livelihoods from on-farm activities that may be positively affected by the proposed project were to be more likely to be in favour of a conservation project on communal land. The results suggest that older household heads are less informed about conservation of biodiversity.

Another point that stands out in these results is that household size was influential to people's perceptions about the proposed conservation project on communal land. Households with many members have a higher probability of viewing implementation of the project on communal land as a public bad. This may be because bigger households are probably involved in collecting firewood on municipal land where there is little or no monitoring at all. The implementation of the project could limit their harvesting hence it is undesirable. Other factors that were influential with regard to implementation of the proposed project on communal land include employment, household's annual taxable income and hunting.

Households that were involved in hunting have a higher probability of seeing the proposed programme as undesirable. The negative sign of the hunting coefficient implies that those involved view the project as going to impose further restrictions on those involved in this activity. Thus those involved in hunting perceive the project as a public bad. Given that the Mier Local Municipality region is characterized by high unemployment and low household income levels, the employment status and income levels mattered. The negative sign of both the coefficients implies those employed and households with low income levels perceive the project as a public bad.

Furthermore, the view that the benefits of conserving biodiversity exceeded associated costs on municipal land influenced the positive view towards the proposed project on municipal land. The impression that can be drawn from these results is that the level of education can change the view of those who perceive the proposed project as a public bad, as this is mostly borne out of low education or lack knowledge on the issue. Although only a minority of people viewed the project as a public bad on municipal land, it is important that attempts should be made to convince them that the project is indeed beneficial in the long-term. This would increase the likelihood of the project succeeding, as the community would be involved as a collective. Education levels of households' heads are significant as they comprehend the urgency to protect nature better. Moreover, undertaking of some communal activities on municipal land such as bush food collection was an important factor that determined perceptions about conservation on municipal land.

Households that participated in some pro-environmental activities at home viewed the project as a public good. This is because they expect to directly benefit from the implementation of the project inside the park. Although only the Khomani San people have resource rights, implementation of such a project could lead to job opportunities, and it is in this regard that both groups (local communities) would benefit as they are given preference. Another point that stands out is that the view regarding the statement that best defines the individual's relationship to the natural environment influenced the negative view towards the proposed project in the contractual park.

The results from the table above suggest that the Mier people are not in favour (volunteering own labour to take part in conservation) -public bad, of the implementation of the proposed project on municipal land. However, the results give insight into the factors that influence their views. This information is important and should be taken into consideration when designing an incentive scheme should the project be extended to municipal land.

One critical observation from these analyses is that those who want to contribute labour also have a WTP>0. It is on this basis that the problem of those people who would want to pay but in non-cash forms is not encountered in this study. Thus, money WTP is not biased downwards. The motivation of having the Mier dummy variable is to check and compare for any systematic differences between the Khomani San and the Mier. This variable is not significant in any land tenure regime, suggesting that factors that influence the indigenous people's WTP are statistically not different from those of non-indigenous people.

b) Willingness-To-Pay for Planting of Native Trees Shrubs and Grasslands

In addition to reporting the mean and median WTP according to ethnic groups, this sub-section goes further by reporting according to those who are in favour of the proposed conservation project and those against the project. WTP analysis to support planting programmes is split into three areas. The table below shows the WTP for and against the proposed initiative.

Table 4.2: Annual WTP for and against Proposed Conservation on Communal Land, Municipal Land and inside the Contract Park

Conservation Support (B>C)		Against Conservation (B<C)	
KHOMANI SAN	*MIER*	KHOMANI SAN	*MIER*

	Mean WTP	Median WTP	*Mean WTP*	*Median WTP*	Mean WTP	Median WTP	*Mean WTP*	*Median WTP*
Communal Land WTP	60.60 (n=92)	15.00 (n=92)	146.45 *(n=83)*	*25.00 (n=83)*	70.63 (n=8)	10.00 (n=8)	85.59 *(n=17)*	*75.00 (n=17)*
Municipal Land WTP	38.42 (n=79)	5.00 (n=79)	70.06 *(n=88)*	*5.00 (n=88)*	7.31 (n=21)	5.00 (n=21)	15.83 *(n=12)*	*10.00 (n=12)*
Contractual Park WTP	30.89 (n=79)	15.00 (n=79)	40.27 *(n=74)*	*15.00 (n=74)*	7.00 (n=21)	5.00 (n=21)	55.96 *(n=26)*	*15.00 (n=26)*

The full sample size for each group is 100 (N=100). Almost all the Khomani San respondents supported conservation on communal land, while 79% were in favour of such an initiative on both municipal and inside the Park. The mean WTP of R60.60 for supporting the conservation of biodiversity on communal by the Khomani San people represented 0.23% of their mean annual income. A point to note is that although the mean WTP to prevent the initiative from being implemented (negative WTP) is higher (R70.63, which represents 0.27% of their mean annual income) relative for support, the former group represents a minority of 8% of the total Khomani San respondents. In contrast, the Mier preferred implementation of the initiative on municipal land, with88% WTP, while 88% and 74% would support it on communal land and inside their contractual park respectively. While the mean WTP in support of planting of trees, shrubs and grasslands on communal land by the Mier is R146.45 (0.33% of their mean annual income) the mean WTP to prevent the programme from being implemented is R85.59 (negative WTP), which represents 0.20% of their mean annual income.

While the mean WTP in support of the project on municipal land and inside the contract park by the Khomani San was R38.42 and R30.89 respectively (0.15% and 0.12% of their annual household income), the mean against the project in these areas is R7.31 and R7.00 – negative WTP (0.03% of their annual income respectively). In the case of the Mier, their WTP on municipal land and inside the park is R70.06 and R40.27 respectively (0.16% and 0.09% of their annual income), while the mean for those against the initiative are R15.83 and R55.96 (0.04% and 0.13% of annual household income).

The median WTP in support of planting trees, shrubs and grasslands on communal land, municipal land and inside the park by the Khomani San people are R15.00, R5.00 and R15.00 respectively (which represents 0.06%, 0.02% and 0.06% of their median household annual income). The median WTP against the programme on the communal land is R10 (which represents 0.04 of their annual household income). Furthermore, the median WTP against is R5 both on municipal land and inside the park, which accounts for 0.02% of their median annual income.

As for the Mier, the median WTP in support of biodiversity conservation is R25 (0.06% of median annual income) on communal land, R5 on municipal land (0.01% of their median annual income) and R15 inside the park (0.03% of their median annual income). The median WTP to prevent the programme is R75 (0.17% median annual income) on communal land, R10 (0.02% of median household income per annum) on municipal land and also R15 (accounts for 0.03% of median income per year) inside the contract park.

Overall, the majority of respondents from both groups were willing to support the proposed conservation initiative on communal land, municipal land and inside their contractual park. Both groups were WTP the highest amount (in terms of the Mean and Median WTP) for planting of trees on their communal land. This implies that both communities are similar in that they assign more value when they control the asset. The main reason for WTP more on communal land as compared to on municipal land and inside the contract park was that they felt that they would directly get more benefits. These results suggest that the respondents from both groups would prefer the proposed project to be implemented on communal land. Given the intimate connection to the restored land both inside and outside the park, the land claim deal will only prove to be good for biodiversity conservation if the local communities will be good environmental stewards.

A decision has to be made about how to identify the outliers, as well as what to do with them. As an alternative to omitting outliers, the problem they cause is often addressed by the use of a median rather than a mean WTP (Hanley and Splash, 1993). The median WTP measure was preferred because of the presence of outliers in the data. The Mier respondents were WTP just under two times more in annual levies (R25) than the Khomani San (R15) in terms of being in favour of biodiversity conservation in their communal area. However, when adjusted for annual median household income, there are no differences between the two groups WTP. It is clear that the median values alone presented a biased picture.

A similar biased picture was true with regard to the magnitude of WTP in support of biodiversity enhancement on municipal and inside the contractual park between the two groups. According to the median WTP values, the Khomani San are WTP equal amounts in annual levies for conservation on municipal land and inside the park. However, when adjusted for median annual household income, the Khomani San were actually WTP to pay two times in annual levies for conservation on municipal land and inside the park respectively.

The same logic also applies when comparing the negative WTP for biodiversity enhancement between the two groups. The Mier were WTP just under eight times more than the Khomani San to prevent the project. Although this difference is still significant, adjusted household median income suggests that the Mier were actually WTP just over four times more in levies per annum than the Khomani San to prevent the programme in the park. . The Mier were WTP twice the amount to prevent the proposed planting of trees on municipal land. However adjusted median income estimates suggests that the Mier and Khomani San were WTP the same in annual levies to stop conservation on municipal land. In the case of the contract park, the Mier were WTP three times more than the Khomani San to prevent the project. Adjusted household median income suggests that the Mier were actually WTP just under two times more in levies per annum than the Khomani San to prevent the programme in the park.

Adjusted median households income analysis suggests that there was a significant difference in the magnitude of both the positive and negative WTP for planting of trees, shrubs and grasslands in all designated areas. The difference between the Khomani and Mier is significant and should be taken into consideration when designing the type of economic incentives schemes needed in the area. The breaking down of WTP according to ethnic groups and preferences for and against biodiversity conservation has given us valuable insight into an in-depth understanding of the differences in WTP values and the magnitude of the negative WTP against biodiversity enhancement schemes in the area.

We took the analysis from table two a step further by estimating the total WTP for those in support and those against the implementation of the planting of trees, shrubs and grasslands in the designated areas. To do this, a cost-benefit analysis is applied to determine the net worth of biodiversity enhancement. As started earlier, an overwhelming majority of the Khomani San people (92%) support conservation on communal land, 79% on municipal land and inside the park respectively. About 83% of the Mier respondents are in favour of the

programme on communal land and 88% were WTP to support the initiative on municipal land, while 74% were in favour of a similar project inside the contract park.

Table 4.3: The Benefit-Cost Analysis for Biodiversity Conservation

	Preferences	*N*	*Sub-population*	*Median WTP*	*BCA*
Khomani San					
Communal Land	B>C	92	0.92*320=294.40	15	R 4 416.00
	B<C	8	0.08*320=25.60	-10	R -256.00
		100	320		R 4 672.00
Municipal Land WTP	B>C	79	0.79*320=252.80	5	R 1 264.00
	B<C	21	0.21*320=67.20	-5	R -336.00
					R 928.00
		100	320		
Contractual Park	B>C	79	0.79*320=252.80	15	R 3 792.00
	B<C	21	0.21*320=67.20	-5	R -336.00
		100	320		R 3 456.00
MIER					
Communal Land	B>C	83	0.83*8000=6640	25	R 166 000.00
	B<C	17	0.17*8000=1360	-75	R -102 000.00
		100	8000		R 64 000.00
Municipal Land WTP	B>C	88	0.88*8000=7040	5	R 35 200.00
	B<C	12	0.12*8000=960	-10	R -9 600.00
		100	8000		R 25 600.00
Contractual Park	B>C	74	0.74*8000=5920	25	R 88 800.00
	B<C	26	0.26*8000=2080	-15	R -31 200.00
		100	8000		R 57 600.00

The results from the table above suggest that the gainers from the proposed programme of planting of trees, shrubs and grasslands would benefit more significantly as compared to

the losers. The net worth for conserving biodiversity by the Khomani San on communal land is marginally higher than inside the park and significantly higher than on municipal land. The difference in the net worth in different areas among the Mier was similar to that of the San, with a net worth on both communal land and inside the park been significantly more than on municipal land. Interestingly, the Mier preferred implementation of the project on municipal land, followed by on communal land and on the contractual park respectively. Nonetheless, it is perhaps not surprising that the net worth for both groups (local communities) was significantly less on municipal land relative to other areas, as they do not have any land rights there. Overall, more people would significantly benefit from conservation of biodiversity in the Kgalagadi area. The fact that majority are in favour of the programme is a good argument for biodiversity conservation in the Kgalagadi landscape as a whole. The results from the table show that the respondents have a significant WTP for biodiversity in the area as a whole, therefore reflecting their value for biodiversity conservation.

c) The role of Economic Incentives in Biodiversity Conservation

One of the main concerns raised by policy-makers is that although they are aware of the importance and contributions of conserving biodiversity, their efforts are undermined by its undervaluation or lack of it, which ultimately results in overexploitation. This study provides this value (assigned by local communities living adjacent to the park) by taking into consideration both winners and losers because of the implementation of the proposed project. In the context of this study, the net worth for conserving biodiversity in the Kgalagadi landscape is larger, which implies that conservation of biodiversity might be enhanced through planting of trees, shrubs and grasslands on communal land.

The estimation of the value of biodiversity conservation in this study does not only provide this particular value, but also highlights issues that need to be addressed to achieve sustainable resource use. Lack or inadequate economic incentives have being identified as one of the main reason for biodiversity loss.

Economic incentives refer to mechanisms that change the behaviour of actors with respect to economic choices by altering their economic conditions. They can be positive or negative. Positive economic incentives reward actors for complying with required actions while negative economic incentives punish actors for non-compliance. There are two main types of incentives, namely direct and indirect. Direct incentives can be either financial or

other inducements and indirect incentives are a combination of variable and enabling incentives (Knowler 1999).

Variable incentives are intended among others to influence the behaviour of the supplier and the demanders. Enabling incentives are those policy instruments and institutional arrangements that form a conducive environment for the productivity and consumption of goods and services. Examples of enabling incentives with regard to natural resource use in the case of communities that live adjacent to national parks and national parks themselves include provision of land and resource rights, information and education.

Economic incentives play a pivotal role in nature conservation at all levels of society, particularly at community levels (Emerton 2001). The use of incentives is an attempt to induce effective and sustainable use of the natural resources. It is highly likely that local communities particularly those that live within close proximity to national parks will only be willing and able to use natural resources in a sustainable way if they were to have significant tangible economic benefits accruing to them. The fundamental idea behind economic incentive in biodiversity is to change people's behaviour with regard to natural resource management. Economic incentives require the identification, and overcoming of the broader economic conditions and forces that influence people to degrade the environment.

Many studies show that economic incentives have been used worldwide in different forms with mixed results. Empirical evidence shows that if the appropriate economic instruments are implemented, the desired behaviour that is consistent with enhancement of conservation can be achieved. Setting up of economic incentives is complex, difficult, varies across different areas, communities and cultures. It is vital that conservation is economically desirable to local communities in a way that will improve household welfare as well as nature.

The role that economic benefits bring to protected areas such as national parks and their surrounding areas, as well as the contribution of economic incentives in conservation is now widely acknowledged. The need to include economics among a mix of other disciplines is required for a successful management of protected areas. While it is acknowledged that a wide-variety of benefits of many services offered by biodiversity are difficult for individual users to capture as they exhibit public goods characteristics, economic incentive schemes have evolved over time. Furthermore, it is vital that the point at which the market failure affects the participants' ability to capture the full economic benefits of conservation be comprehended.

Property rights are frequently applied as economic incentives for local communities who normally use natural resources or live in biodiversity landscapes. The awarding of community property rights in protected areas is gaining popularity (Emerton 2000). The community property rights have already been allocated to Khomani San people and Mier community. The rights to use the land under this regime are exclusively assigned to all members of the Khomani San and Mier community in their respective areas.

The application of appropriate valuation tools is a key element of policies that aim to correct the "perverse" incentives of societal actors. The estimation of the value of biodiversity is an essential precondition to the internalization of this value in decision-making (CBD 2010). This is useful and worthwhile, as it may assist to convince decision-makers of the need to conserve biodiversity (Vorhies 2010). In addition, by raising awareness among societal actors of the values of biodiversity, valuation can also act as an incentive measure in its own right (CBD 2010).

Thus, understanding of the values of biodiversity is a critical step forward, as these values illustrate that conservation brings a variety of economic benefits and therefore justifies the need for policy makers to arrange funding for biodiversity programmes such as the one proposed in this study.

5. Conclusion

Our study contributes in addressing the degradation problem by providing the kind of information that shields some light as to which incentive mechanisms are likely to be feasible, in addition to estimating the net value of changes in biodiversity for different areas of the Kgalagadi landscape for different ethnic groups. Determination of the net worth demonstrates local community's preferences as to the area where the proposed project should be implemented.

Environmental degradation arises due to a combination of institutional failures, market failures and policy failures. All these failures are interdependent (Bulte 2003). Failure to allocate appropriate economic values to biodiversity is one of the most important factors underlying causes of biodiversity losses (Thies 2000). The value of biodiversity represents what we as a society are willing to trade off to conserve natural resources (Pascual et al. 2010). Conservation is critical for sustainable development, as it is in the value of the natural

resources that individuals may begin to comprehend the role to conserve them for future uses (Duffy, Corson and Grant 2001).

Lack of property rights has being identified widely in the literature as one of the main driving factors for biodiversity loss. Enabling incentives in the form of the provision of land and resource rights have been awarded to the local communities in the Kgalagadi area. These indirect incentives seem not to be adequate, because of a public good characteristic associated with them.

The main challenge is that the rights were not given to private individuals; hence, it is highly unlikely that these incentives will work efficiently. The continued loss of biodiversity in the Kgalagadi landscape proves that the causes are rooted in socio-economic and institutional factors. Incentive schemes that seek to address these driving factors are crucial if at all, this trend is to be reversed. It is critical that the culture and livelihoods of the local communities are taken into consideration if at all conservation initiatives are to succeed.

In the Kgalagadi area, people continue to harvest the endangered Camelthorn tree for both household and commercial use, despite the ban on the latter activity. One of the reasons for not complying with the ban is because of lack of job opportunities in the area and the need to generate income. The economic benefit from this continued unsustainable activity outweighs other alternative conservation choices. As long as this trend holds, the greater economic and financial benefits gained from degrading such environmental (tree) resources rather than conserving them, local communities are unlikely to change their unsustainable economic activities. The need for additional incentive schemes in the Kgalagadi area is critical now more than ever before seeing that the area has different stakeholders with varying degrees of dependence on nature.

The harvesting of medicinal plants, collection of bush-food, hunting and livestock farming are some of the most popular activities that are undertaken in the area as a whole. Destructive harvesting of medicinal plants, together with overgrazing remains a serious concern. The people in the Kgalagadi area are directly heavily dependent on natural resources, and are therefore given their socio-economic conditions, likely to overexploit the resources if at all further incentive systems are not implemented.

The fact that an overwhelming majority of respondents view implementation of the proposed conservation project as a public good in all areas is evidence that they is a significant interest on their part to address biodiversity loss in their region. Given the budget constraints, the people indicated that they would prefer that the project be implemented on

communal land. This is a positive sign, as this is primarily where the resources are being overexploited. The relevant authorities should take advantage of these positive perceptions about conservation by creating the environment that will encourage the local communities to use their resources in a more sustainable way.

Despite high unemployment in the area and the low household income levels, most people were willing to pay to support sound conservation initiative. Many people had partial knowledge about the negative impact of biodiversity loss to their livelihoods, despite the low levels of education. Most of the knowledge about nature came from traditional knowledge. For example, a large number of respondents who indicated that they harvested medicinal plants indicated that they were aware that at times their harvesting techniques were destructive and were willing to adopt environmentally friendly ways of harvesting if only there knew how.

The findings suggest that South Africa's Khomani San, whose attitudes towards modern conservation have not been evaluated until now, and the adjacent Mier community generally attach a significant economic value to biodiversity in their area. The net worth for conserving biodiversity conservation on various resource tenure regimes by the Khomani San ranged from R928 to R4 672 relative to the Mier's R25 600 to R64 000. However, in order for all members of the local communities to unconditionally support biodiversity conservation, mechanisms for fair distribution of the associated costs and benefits should be put in place.

Most importantly, our study has demonstrated that although the Khomani San are new to the money economy, their value of biodiversity conservation on different land tenures is no different from that of an average South African community –in the case of our study, the Mier community. The difference reported in terms of net worth is mainly attributed to the significant differences in population sizes between these two distinct groups with the Khomani San having a significantly lower size relative to the Mier. The real value can be seen in terms of annual WTP for and against planting of native trees, shrubs and grasslands on various land tenure regimes.

This paper has demonstrated that indeed the proposed conservation initiative does lead to winners and losers, even in situations where the people are heavily dependent on nature. One would have easily made an assumption that given the levels of dependence that it was logical and reasonable to assume that all would benefit. The identification of both gainers and losers has serious policy implications. The findings of this study suggest that the respondents have a significant willingness-to-pay for biodiversity on communal land, municipal land and

inside the park, which reflects their value for biodiversity conservation. These results further illustrate that gainers from the proposed conservation programme would benefit more significantly than the losers implying that the local communities could be trusted to support biodiversity conservation if mechanisms for fair distribution of the associated costs and benefits are put in place.

In general, the findings in this paper show that the proposed project has passed a cost-benefit assessment test. Failure to incorporate the negative WTP into the cost-benefit analysis would have amplified the magnitude of the net worth and/or most likely lead to a significant number of protest bids.

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