

A Cost-Benefit-Analysis: Project “Kruger National Park (KNP)”

submitted by
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1. Understanding the context: Context analysis

Kruger National Park (KNP) is the oldest and largest national park in South Africa. The extent of KNP is of 2 million hectares. It is characterized by an unrivaled diversity of life forms and significant historical and archaeological sights. The park is crossed by five major rivers and the natural flooding pattern within the rivers generates a great deal of riparian habitat diversity, important for many animals and plants. Furthermore, rivers are valuable water resources for domestic water supply, irrigation farming, industrial and mining developments.

KNP was established to protect wildlife of South African Low veld and is a world leader in advanced environmental management and policies. KNP's Strategic Adaptive Management system encompasses a vision statement along with an agreed-upon desired ecosystem state that the park staff strive to manage for. More specific actions include projects related to terrestrial, wilderness and aquatic conservation, researches and services by scientific groups. The KNP is a popular touristic destination with around 950,000 visitors each year, recognized under the UNESCO Man and Biosphere Program. An Environmental Education Program is carried out also by the park which currently engages with over 72000 learners, 3200 non school community members and 1800 educators annually. Programs like this exist since 1952. All indigenous people, tourists, employees and the communities around the park, who are involved in community projects, benefit from the existence of the KNP.

Many of the KNP's ecosystem services and goods are marketed. First of all, the park provides visitors with sightseeing, recreational activities, handmade souvenirs by indigenous people/others, food, as well as with the chance of experiencing inhabiting in a wild environment (nature-based tourism). Other marketed goods are medicinal plants and herbs and sales of flora and fauna. All products of tourism industry generated 30 million SAR exclusive VAT, for 2010-2011 (total SANpark's income). Non-marketed goods are composed by the air quality, the water, the sub-tropical climate (necessary for biodiversity) and rainfalls (necessary for rivers and dams filling). The wealth of indigenous knowledge of flora and fauna of South Africa is an important non-marketed good too and the mopane worm (picked by indigenous) is an important source of protein.

The subsistence of the KNP generates externalities, both positive and negative. Air quality which provided from flora benefits also ecosystem out of KNP. We can also observe human capital development, employment opportunities, income augmentation for the country and the locals and that it provides humanity with valuable information. Other positive externalities are group learning dynamics due to considering different stakeholders. As for negative externalities, we have to mention that tourism can increase local prices and lead to inequalities between groups, it also can create dependencies for the local services (intensified through seasonal tourism), air travel producing greenhouse gas emissions, increasing demand for water, vehicle traffic affecting wildlife and the ecosystem. Other negative externalities are the impact of the presence of wild species inside KNP, that might affect cattling activities outside the Park. Stagnant waters also cause diseases such as "Malaria" which easily spread out in the air by mosquitoes. Grants, conservation fees (included in visitors' tickets) and donations benefit the KNP ecosystem, as well as tourism and tourists as individuals, indigenous and communities nearby KNP and are provided by foundations, tickets, private sector and government.

2. With-project and without-project scenario

a) Without-project-scenario

Two very important aspects of the KNP are the five major rivers (water resource, habitat diversity, farming, etc.) and the approximately 950,000 visitors each year (enable local economy, money to protect the park). The rivers are already negatively impacted before entering the park. The water abstraction for irrigation and drinking water purposes by dam structures as well as the different types of land-use degrade the ecological status (quality and quantity) of the river water. The KNP location is perpendicular to the east west orientation of the rivers. That means that the KNP is the receiver of any ecological disturbances occurring at the upstream areas. The fact that the boundaries of the catchment areas are 100 km or more outside, upstream of the park to the west, necessitate an integrated river water management policy for the whole river system from the headwaters at least to the east boundary of KNP.

Furthermore, tourism has a bad effect on the ecosystem and increases land degradation. Tourist agencies try to offer safaris combined with luxury – on cost of nature. The result: Luxury hotels within the park, which offer comforts such as swimming pools and air-conditioning. Other problems are caused through the high numbers of tourists who intrude the park in heavy vehicles and disturb ecosystems tranquility.

b) With-project-scenario

The new scenario of an **improved river management system** and at the same time the establishment of an **ecological friendly tourism** shall improve the status of the ecosystem, the water quality, the livelihood of especially poor stakeholders and reduce the degradation of land by changing some of impact environments such as water supply, tourism or forest which will could be involve together to provide all ecosystem in KNP.

Following measures will be taken: Composition of an experts group consulting on traditional cultivation techniques, design of cultivation areas, providing of the right seeds to cultivate, control of the dams - releasing water flow necessary for the life of the KNP ecosystem as indicated by scientists, water sample collection periodically to assure the clearance of the rivers, periodical sample collection of the land to assure that there are all the important elements allowing fertility, regulation imposing the compliance of practices of industries and also fines, information to indigenous and other local cultivators on how to use proper organic matters. Measures to establish eco-tourism are: decreasing the numbers of buildings/cars inside the KNP, set eco-standards for the remaining hotels and cars who want to pass through the park , broaden environmental education for the poor stakeholders and tourists, decreasing the maximum size of visitor groups and including the local companies and indigenous people more in the tourism industry.

The project's implementation will take around ten years in long term of development, which is long enough to fix any management errors and to enhance techniques. After completion of the project, these practices will become a basic part of state policy and the SANs Parks policy.

All of these measures will be rather costly and to great parts will have to be carried by the tourists visiting the park. Hence, these costs will reflect in higher entry prices and higher prices for accommodation inside the park (taxes). Subsidies must be given to cultivators for having training from experts towards more traditional tillage practices as well as ecosystem friendly practices.

The benefits from the implemented project are: the achievement of a good ecological status for the whole river system which can secure the high quality of a number of ecosystem services such as good quality for drinking water, sustaining ecosystem biodiversity, reversing land degradation, proper irrigation water, land fertility, agricultural growth, livelihood enhancement. Furthermore, by

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including extra taxes on accommodation fees we expect to turn a percentage of the accommodation demand outside the KNP so as to underpin local economy more than before and at the same time to achieve an overthrow of land degradation. The necessary costs for the implementation of the project come from services manning with experts, mechanisms installed in dams for water retention control, conduct of special environmental courses for tourists and stakeholders and acquisition of the necessary tools for checking soil fertility and river waters health status.

3. The present value of future benefits

a) Survey amongst the stakeholders

In order to deduce the total value of KNP we conducted a survey amongst potential visitors of KNP (questionnaire attached) based on the Contingent Valuation Method (CVM). Although in our case tourism plays a dominant role, we felt this method is too focused on this single aspect. CVM on the contrary, allows to combine both use and non-use values.

In conducting the survey, we were specifically interest in the recreational and “health” (wider meaning) service which our chosen ecosystem provides in the light of the above indicated measures and the increase in prices for tourists. Our objective was to determine the visitors' willingness to pay for the ecosystem's service.

As a real survey amongst stakeholders was not possible given the limitations in time and resources, we conducted a pilot study amongst friends and potential visitors to KNP. We grouped our questionnaires (35 responses in total) in three nationalities: German (5 respondents), Greek (10 respondents) and Thai (20 respondents). This allows us to compare two European and an Asian state as well as states with different backgrounds and preconditions. Although, these three states have very distinguished political, economic, environmental and cultural characteristics, we noted that the given answers are of the same logic and this survey represented as international stakeholders for the most. We attribute this fact in the general acceptance of the KNP as an area in the world unique in its kind. Respondents' ages are between 20 and 70 years old, with a more densely sample between 25-50 years old. The majority of the responders own a bachelor's degree and another majority is in the income variance which is up to 30,000 \$ and in the household size (< 100m²). The first two majorities do not necessarily correspond to each other. Most of the respondents would pay for their accommodation 60\$-100\$ per night, which is a reasonable amount.

While the first part of the questionnaire asked for basic data of our respondents, the second part focused on more projects –targeted questions, such as a question related to an increase in the conservation fee imposed to visitors of the KNP. Our survey shows that the majority of the sample could afford such an increase but as for rural population sample none increasing is affordable for them. In a valid sample, a correlation between the home country's economic living standard of the visitors and the willingness to pay higher fees probably would be even more obvious in a valid sample. The last two questions evaluate the importance of the new scenario. Despite income, age, nationality, gender or even the general willingness on preserving nature, 100% of the sample would support in substance the new scenario.

According to our survey results¹, stakeholders showed a very positive tendency of paying more at present in order to conserve KNP for the future. This indicates that intergenerational equity is valued high by the stakeholders. Considering the high value for future generations, we decided to apply a relatively low discount rate of DR = 3 %.

We backdated this choice for the discount rate in European Union's Commission guide to cost-benefit analysis on investment projects. The guide suggests the use of a social discount rate of 5.5% for the Cohesion countries and 3.5% for the others. We reflected on the high intergenerational value deriving from this project and we agreed on using a SDR of 3% which is further lower than the EU suggests. Maybe it is a moderate discount rate for this project but we thought it was safer than other choices which could lead in the “tyranny of discounting”.

¹ For the detailed survey results see the attached Excel sheet.

b) Cost-Benefit Analysis – Calculations²

	YEAR 1 (PRESENT)	YEAR 2	YEAR 3	YEAR 4
BENEFIT	970000	1144600	1350628	1593741
DISC.RATE %	3%	3%	3%	3%
DISC.FACTOR	1	0,97	0,94	0,92
PV	970000	1110262	1269590	1466242

WITH-PROJECT SCENARIO				
	YEAR 1 (PRESENT)	YEAR 2	YEAR 3	YEAR 4
BENEFIT	970000	1144600	1350628	1593741
COSTS	130000	27000	0	0
NET BENEFIT	840000	1117600	1318768	1556146

WITHOUT-PROJECT SCENARIO				
	YEAR 1 (PRESENT)	YEAR 2	YEAR 3	YEAR 4
BENEFIT	230000	253000	278300	306130
COSTS	18000	23000	26000	5400
NET BENEFIT	212000	230000	252300	300730

INCREM. NET BENEFIT	628000	887600	1066468	1255416
PV OF INCR. NET BENEFIT	628000	860972	1002480	1154983

ECONOMIC NPV	3646434,8608	POSITIVE=WORTH UNDERTAKING
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Our new scenario has consequences in the wider KNP society since it makes sharp interventions on indigenous lives as well as on KNP's existence. The project implementation results in very important non-marketed impacts, as we have already mentioned. That was a difficulty in the execution of the projects' Cost Benefit Analysis (CBA) because of lack of monetization of non-marketed impacts. On the other hand, we backdated on Week 5-CBA ELD document, where it suggests (when the case study concerns on a national park) that we need : a)for benefits, to use number of park visitors times the entrance fee per visitor and b) for costs, to use number of park employees times labour wage. Although, we can find information to extract the benefits, the research for relevant costs data was not fruitful. That was the most serious problem we faced, when we started conducting the CBA. Thus, we used information from the implementation of relevant eco-sustainable projects on South Africa and taking financial data (costs of these projects and revenues from tourist

² For further information please see the references listed at the end of this report.

activities) from the last year's annual South African Parks report.³ We transferred this information to our "With-project Scenario", assuming that our scenario would have similar results. Therefore, we based the benefits on the mentioned revenues from shops and restaurants, filling stations, tourists' accommodation, trails etc and from conservation entrance fees adding them a percentage of 18% growth each year.

For the "Without-project scenario" we used reduced revenues adding them a growth percentage of 10%, just in purpose to underline the differences and the "worth undertaking" of the new scenario.

The project's Net Present Value is positive. The investment and our proposed scenario are worth undertaking and therefore clearly recommended by our team. Regarding the execution of a Sensitivity Analysis, we consider as important variables: financial and administrative transparency, rate of inflation, size of area and climate change. In addition, a good communications policy makes stakeholders understand the approach opted for in the new scenario and ensures continued support.

This leads to the next question of projects and policies that could intervene in the scenario. In the first instance, the project stands or falls with the support of the various stakeholders – tourists, who have to accept higher entry fees and hotel costs, policy makers, who have to stand behind the project and are willing to vouch for it against opposition and indigenous people who support the cause of environmental friendly living. The current focal point of South Africa's *National Department of Tourism* on what the ministry calls *Responsible Tourism* surely is a step in the right direction. This approach is also addressed in the South Africa's national tourism strategy. An additional policy/project could be a project for teaching indigenous how to save water more efficiently and another project for providing indigenous with local dispensaries in order to prevent diseases and extent life expectancy.

³ See the references listed at the end of this report.

4. References

Annual Report (2012-2013), South African National Parks (SANsParks)

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ADDING INFORMATION:

WITH-PROJECT

We suppose that the following programs are not implemented in the actual case study. On the contrary they are a part of the new scenario:

Programs (data taken from SANsAParks report 2013):

1. Working for water- COST: 100000 (million R)
2. Working for Land-COST:30000 (million R)
3. Environmental Monitors- 20000(million R)
4. People & Parks- 7000 (million R)

On the 1st year with-project costs are included programs 1+2 costs. For the 2nd year costs, we sum the costs of program 3+4.

Benefits for with project scenario come from:

1. Revenues of SANsParks from shops+restaurants+filling station sales- REVENUES: 230000 (million R)
2. Tourism (accommodation, driving, trails)-REVENUES: 500000(million R)
3. Conservation entrance fees- REVENUES: 240000(million)

TOTAL REVENUES= 970000 R

Sans parks revenues have a growth of 18% per year. So we develop benefits as follows:

YEAR 1=970000, YEAR 2=970000+18% x 970000, YEAR 3= YEAR 2+ 18% X YEAR 2, etc.

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WITHOUT PROJECT

Programs (data taken from SANsParks report 2013)

1. Working for Land:Rehabilitation- COST: 18000
2. Eco-furniture-COST: 23000
3. Working for the coast – COST: 26000
4. Working for Wetlands- COST: 5400

In this case we suppose that it is implemented one program/year.

Concerning the benefits of without project scenario, we suppose that we have revenues only from shops/restaurants/etc which are 230000 R.

We suppose we have a lower growth of 10%.

BENEFITS: YEAR 1= 230000, YEAR 2= 230000+ 10% X 230000, etc

DISCOUNT FACTOR

Chosen discount rate= 3%

Discount factor = $1 / (1+3\%)^{n-1} = 1 / (1+ 0,03)^{n-1} = 1 / 1,03^{n-1}$, where there is “n” we fill with the number of year we refer.

Present Value= DF x Benefit (per year)