NINA Report 17

The effects of congestion of vehicles on the environment – an EIA in the Ngorongoro crater

Results from the scoping process

Jørn Thomassen
Julius Keyyu
Hanne Haaland

NINA
Norwegian Institute for Nature Research




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Norwegian Institute for Nature Research
Tanzania Wildlife Research Institute

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Abstract

Thomassen,J., Keyyu, J. & Haaland, H. 2005. The effects of congestion of vehicles on the environment – an EIA in the Ngorongoro crater. Results from the scoping process - NINA Report 17. 68 pp.

The Ngorongoro Conservation Area Authority (NCAA) faces a great challenge in managing the vehicle congestion in the Ngorongoro crater. They are in need for an assessment of the present situation and realistic plans for mitigating measures and other management actions. The situation is also dealt with in the revised General Management Plan (GMP) for the Ngorongoro Conservation Area (NCA), which soon will be finished.

Tanzania Wildlife Research Institute (TAWIRI) and Norwegian Institute for Nature Research (NINA) collaborate on capacity building, of which Environmental Impact Assessment is one of the tasks. In the capacity building programme it has been decided to use a concrete EIA as a training tool, where different training packages (proposal writing, project managing, reporting etc) are included.

NCAA, TAWIRI and NINA have decided to use the vehicle congestion in the Ngorongoro Crater as the EIA case in the capacity building programme. This report documents the scoping process, conducted in a five days workshop in Karatu 11. – 15. October 2004, supplied with further scoping at meetings in Trondheim later on.

A major challenge in EIA is to identify the limited number of issues to be addressed by the EIA (Beanlands 1988). This process is called scoping and will normally include considerations of impact factors and potential impacts, decision makers, stakeholders, alternatives, access of baseline information, time schedule and also economic frames. The scoping phase in EIA is critical for an optimal use of limited resources in the perspective of personnel, time and economy, and should be accomplished as early as possible in the process.

The participants at the Karatu workshop consisted of various stakeholders: Ngorongoro pastoralist council, COSTECH, Mweka college, NCAA, NEMC, TANAPA, TAWIRI, WD and NINA. Unfortunately, the tourist industry was not able to attend the workshop. Several lectures were given to clarify the situation in the NCA and the workshop process (see appendix). The Adaptive Environmental Assessment and Management (AEAM) was used as a working approach to the scoping.

Out of 13 impact factors assessed, 6 were given priority. 24 Valued Ecosystem Components (VECs) were assessed, 9 were given priority. For each of the VECs a schematic flow chart was constructed and a number of impact hypotheses were formulated and evaluated for each of the VECs. Due to limited resources for conducting the EIA study, further scoping was necessary subsequent to the Karatu workshop. An expert group consisting of representatives from MNRT, TAWIRI and NINA did an additional scoping in Trondheim, Norway 03.11.04. The number of VECs were reduced and/or combined from 9 to 2 VECs, namely: *A. Human aspects (analysis of tourism issues and the Maasai community, related to EIA);* and *B. Ecological aspects (analysis of vehicle impacts on endangered species, carnivores and sensitive habitats)*. For each issue objectives, outputs, activities and budget, time frame and staffing were proposed.

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Sammendrag

Thomassen,J., Keyyu, J. & Haaland, H. 2005. The effects of congestion of vehicles on the environment – an EIA in the Ngorongoro crater. Results from the scoping process - NINA Report 17. 68 pp.

Forvaltningsmyndighetene i Ngorongoro krater området (Ngorongoro Conservation Area Authority (NCAA)) i Tanzania står overfor en stor utfordring i forvaltning og regulering av antall kjøretøyer ned i krateret. De trenger en utredning om status og realistiske anbefalinger om avbøtende tiltak. Problemstillingen tas bl.a. opp i den reviderte forvaltningsplanen for området (General Management Plan (GMP)) som forventes ferdig med det første.

Tanzania Wildlife Research Institute (TAWIRI) og Norsk institutt for naturforskning (NINA) er inne i et 5 års samarbeidsprogram om kapasitetsbygging. Konsekvensutredninger (KU) er et av temaene i dette programmet, og det er bestemt at en konkret KU skal brukes i opplæringen av TAWIRI personell. I tillegg til det konkrete arbeidet med KU legges det i prosjektet inn treningspakker som søknadsskriving, prosjektstyring, rapportering etc.

NCAA, TAWIRI og NINA har valgt ut den høye konsentrasjonen av kjøretøy i Ngorongoro krateret som KU-case. Denne rapporten dokumenterer første fase i KU, et arbeidsseminar om scoping (målfokusering) som ble gjennomført i Karatu, Tanzania 11. – 15. oktober 2004, samt videre scoping i etterkant av arbeidsseminaret.

En hovedutfordring i KU-arbeid er å identifisere et begrenset antall tema som KU skal konsentrere seg om (Beanlands 1988). Denne prosessen kalles scoping og vil normalt bestå av en vurdering av påvirkningsfaktorer og potensielle effekter, beslutningstakere, interessenter, alternativer, type og tilgang på eksisterende informasjon, tidsramme og økonomiske rammer. Scopingen anses som kritisk for en optimal bruk av ressurser som personell, tid og penger, og bør gjennomføres så tidlig som mulig i KU-arbeidet.

Deltakerne på arbeidsseminaret i Karatu bestod av ulike interessenter: Maasai-befolkningen, COSTECH, Mweka college, NCAA, NEMC, TANAPA, TAWIRI, WD og NINA. Turismeindustrien kunne dessverre ikke møte. En rekke foredrag ble holdt for å klargjøre situasjonen i området og arbeidsformen benyttet på seminaret (se appendiks). Adaptive Environmental Assessment and Management (AEAM) ble benyttet som arbeidsmetode ved scopingen.

Av 13 vurderte påvirkningsfaktorer ble 6 gitt prioritet. 24 Verdsatte Økosystem Komponenter (VØKer) ble vurdert, 9 ble gitt prioritet. For hver VØK ble et skjematisk flytkart laget og en rekke påvirkningshypoteser formulert og evaluert. Grunnet begrensede økonomiske ressurser for gjennomføring av KU ble ytterligere avgrensing gjort i etterkant av Karatu-seminaret. En ekspertgruppe bestående av representanter fra MNRT, TAWIRI og NINA gjennomførte denne tilleggsscopingen i Trondheim, Norge, 03.11.04. Antall VØKer ble redusert og/eller slått sammen fra 9 til 2: *A. Menneske aspekter (analyse av turismeforhold og Maasai-samfunnet, relatert til KU);* og *B. Økologiske aspekter (analyse av påvirkninger fra kjøretøy på truede arter, rovdyr og sensitive habitater)*. For hvert tema ble mål, outputs, aktiviteter, tidsrammer og bemanning foreslått.

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Contents

List of acronyms

AEAM	Adaptive Environmental Assessment and Management
COSTECH	Tanzania Commission for Science and Technology
EIA	Environmental Impact Assessment
FBD	Forestry and Beekeeping Division
GMP	General Management Plan
GNP	Gross National Product
IH	Impact Hypothesis
MNRT	Ministry of Natural Resources and Tourism
NCA	Ngorongoro Conservation Area
NCAA	Ngorongoro Conservation Area Authority
NEMC	National Environment Management Council
NGO	Non Governmental Organisation
NINA	Norwegian Institute for Nature Research
NP	National Park
SENEPA	Serengeti National Park
SWRC	Serengeti Wildlife Research Centre
TANAPA	Tanzania National Parks
TAWIRI	Tanzania Wildlife Research Institute
TEK	Traditional Ecological Knowledge
ToR	Terms of Reference
VEC	Valued Ecosystem Component
VSC	Valued Social Components
WD	Wildlife Division

Foreword

This publication is part of the reporting from the collaborative programme in capacity building (2002 – 2006) between Tanzania Wildlife Research Institute (TAWIRI) and Norwegian Institute for Nature Research (NINA). One of the targets in this programme is to provide TAWIRI with an overview and a basic knowledge in Environmental Impact Assessment (EIA) to be prepared to conduct EIAs themselves in the future. In April 2002 thirteen staff from TAWIRI, one from Tanzania National Parks (TANAPA) and one from the Ngorongoro Conservation Area Authority (NCAA) attended a five days EIA training course held at Serengeti Wildlife Research Centre (Thomassen et al. 2003).

NCAA, TAWIRI and NINA have decided to use the vehicle congestion in the Ngorongoro Crater as the EIA case in the capacity building programme. This report documents the scoping process, conducted in a five days workshop in Karatu 11. – 15. October 2004, supplied with further scoping at meetings in Trondheim later on.

The report reflects the different views and opinions from the stakeholders as presented at the workshop, only minor corrections has been done to avoid misunderstandings.

Funding for the capacity building collaborative programme (2002-2006), which includes the EIA work, is provided by NORAD. We will give honour to the participants (representing various stakeholders: Ngorongoro pastoralist council, Tanzania Commission for Science and Technology (COSTECH), Mweka college, NCAA, National Environment Management Council (NEMC), TANAPA, TAWIRI and Wildlife Division (WD), all showing strong willingness to seek new information and assess the potential impacts from vehicle congestion on the ecosystem, including humans in the crater. Jørn Thomassen and Hanne Haaland, NINA, facilitated the workshop.

Trondheim, Norway, 20.02.05

Jørn Thomassen

1 Part I: Background and challenges

A five years collaborative programme in capacity building between Tanzania Wildlife Researh Institute (TAWIRI) and Norwegian Institute for Nature Research (NINA) was established in 2001 (TAWIRI 2002). Part of this capacity building was to train TAWIRI staff in Environmental Impact Assessment (EIA). A training course in EIA was conducted in April 2002 (Thomassen et al. 2003). Thirteen participants from TAWIRI, one from TANAPA and one from NCA accomplished the training. According to the collaborative programme a genuine EIA in Tanzania was to be conducted subsequent to the EIA training.

Ngorongoro Conservation Area Authority (NCAA) faces a great challenge in managing the vehicle congestion in the Ngorongoro crater. They are in need for an assessment of the present situation and recommendations for mitigating measures and other management actions.

In the capacity building programme it has been decided to use an EIA as a training tool, where different training packages (proposal writing, project managing, reporting etc) are included.

These three situations, the capacity building collaboration, TAWIRI's plan to conduct an EIA and NCAA's need for an assessment of the situation and potential solutions of the tourist situation in the crater, have been combined into an EIA with an overall headline: vehicle congestion in the Ngorongoro Crater. Responsible for the EIA is TAWIRI, in close collaboration with NCAA, and with NINA as a supervisor.

This report documents the scoping process, conducted in a five days workshop in Karatu 11. – 15. October 2004, supplied with further scoping at meetings in Trondheim later on.

1.1 Workshop objectives

The main stakeholders of the Ngorongoro Conservation Area (NCA) were invited to participate in the workshop. Based on existing knowledge of the tourist situation, the use of the area by the Maasai people and the ecological status in NCA, the main focus in the workshop was to assess factors and issues being important for managing the tourism challenge in the crater. The main objective was to come up with a fundament for an EIA. The results from the workshop will form the basis for a Terms of Reference (ToR) for the EIA, including a work plan. The main inputs at the workshop are shown in figure 1.

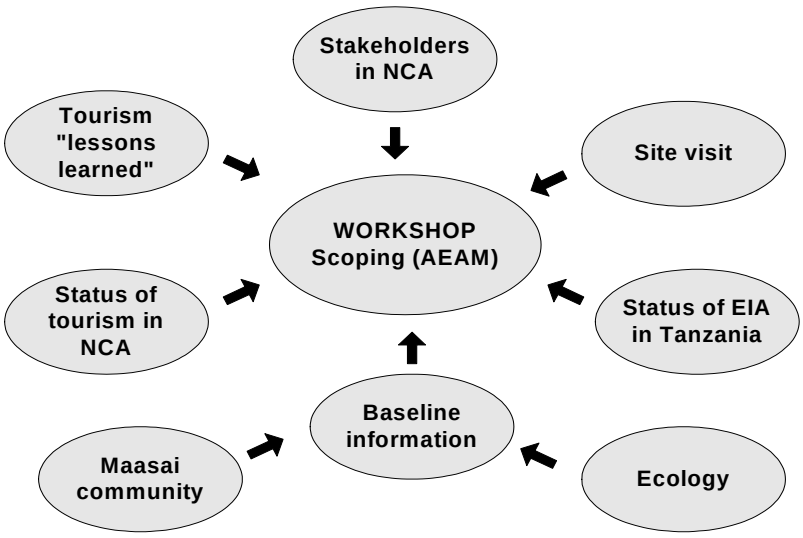


***Figure 1**. Main inputs at the EIA scoping workshop in Karatu.*

1.2 Methodological approach to the EIA scoping

1.2.1 Environmental Impact Assessment as a management tool

The Environmental Impact Assessment can be defined as a formal study process used to predict the environmental consequences of a proposed major development project. It aims to ensure that potential problems are foreseen and addressed at an early stage in the project's planning and designing. In order to achieve this, the assessment findings are communicated to all various groups who will make decisions about the proposed project; the project developers and their investors, planners and politicians.

Like economic analysis and engineering feasibility studies, EIA is a management tool for officials and managers who must make important decisions about major development projects. All developers are familiar with economic and engineering studies. These tools provide the basis for designing robust, economically and viable projects. EIA is now seen as an equally important tool in designing a viable project.

Development projects can encounter serious difficulties due to insufficient considerations taken in relationship with the surrounding environment. Some projects have been found to be unsustainable because of resource depletion. Others have abandon because of public opposition, financially encumbered by unforeseen costs, held liable for damages to natural resources and even been the cause of disastrous accidents. Given this experience, it is clearly very risky to undertake, finance, or approve a major project without first taking into account its environmental consequences and then planning and designing the project so as to minimise adverse impacts.

Guidelines for conducting EIAs in Tanzania have been worked out by the Institute of Resource Assessment, Dar es Salaam, Tanzania in collaboration with the International Institute for Environment and Development, UK, but there are no EIA legislation implemented in Tanzania yet.

Courses in EIA in Tanzania have been developed by the International Institute for Environment and Development and Institute for Resource Assessment (Mwaloysi et al. 1999 a,b,c)

1.2.2 General principles of EIA

Generally and simply spoken, EIA can be thought of as a data management process with the three main components (Wathern 1988):

1. The identification (and possibly collection) of appropriate information necessary for different decisions to be taken.
2. Potential changes in environment and society caused by the implementation of the project must be assessed and compared with the situation without the project (0-alternative).
3. Actual change must be recorded and analysed.

The EIA process vary slightly from country to country, but a generalised picture of the process and principles can nevertheless be generated (figure 2).

1.2.3 The Adaptive Environmental Assessment and Management (AEAM)

One major challenge in EIA is to identify a limited number of issues to be addressed by the EIA (Beanlands 1988). This process is called scoping, and will normally include considerations of impact factors and potential impacts, decision makers, stakeholders, alternatives, access of baseline information, time schedule and also economic frames. The scoping phase in EIA is furthermore critical for an optimal use of limited resources in the perspective of personnel, time and economy, and should be accomplished as early as possible in the process.

One approach is to use an adjusted form of the Adaptive Environmental Assessment and Management (AEAM) concept (Holling 1978, Hansson et al. 1990, Indian and Northern Affairs Canada 1992a, 1992b, 1993, Thomassen et al. 1996, 1998). As an EIA normally shall cover various subjects concerning environment, natural resources and society, different actors and stakeholders will be involved in different phases of the process. Obviously, communication between decision makers, authorities, management, public, consultants and scientists should be accomplished in a very early stage of an EIA, with the objective to scope on important issues in each specific EIA context. AEAM is a participatory process, based on work shops attended by different stakeholder and project holders.

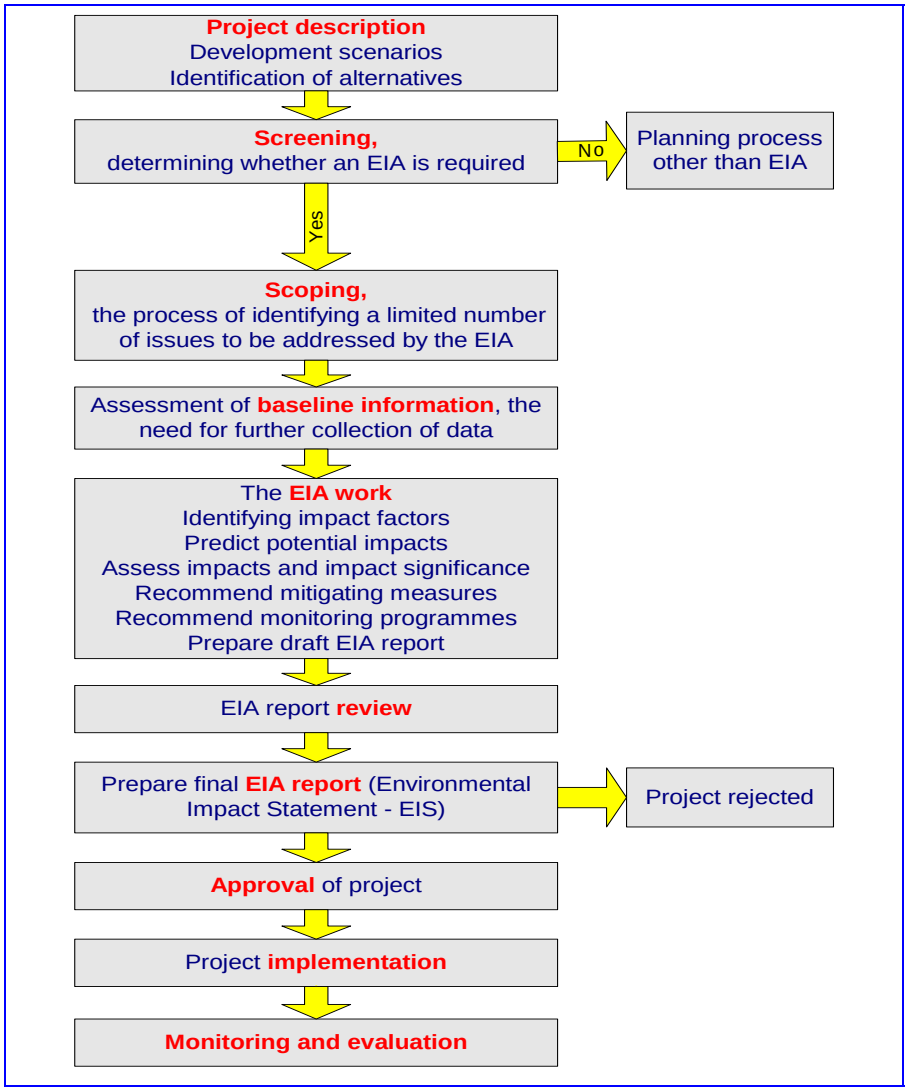


Figure 2. *A simplified picture of the EIA process.*

In AEAM the impact predictions and significance includes the selection and priority of VECs (Valued Ecosystem Components), which can be affected by the development activities. Further, to point out major linkages between the different components in the system, by preparing Schematic Flow Charts, and the impact factors by defining and describing Impact Hypotheses (IHs) (see figure 3). Key statements in every scientific work, as well as in EIA, should be the transparency and possibilities to document and control the process and the choices done. It should be obvious that an open and well-documented process is essential when numerous subjects are rejected as not important enough.

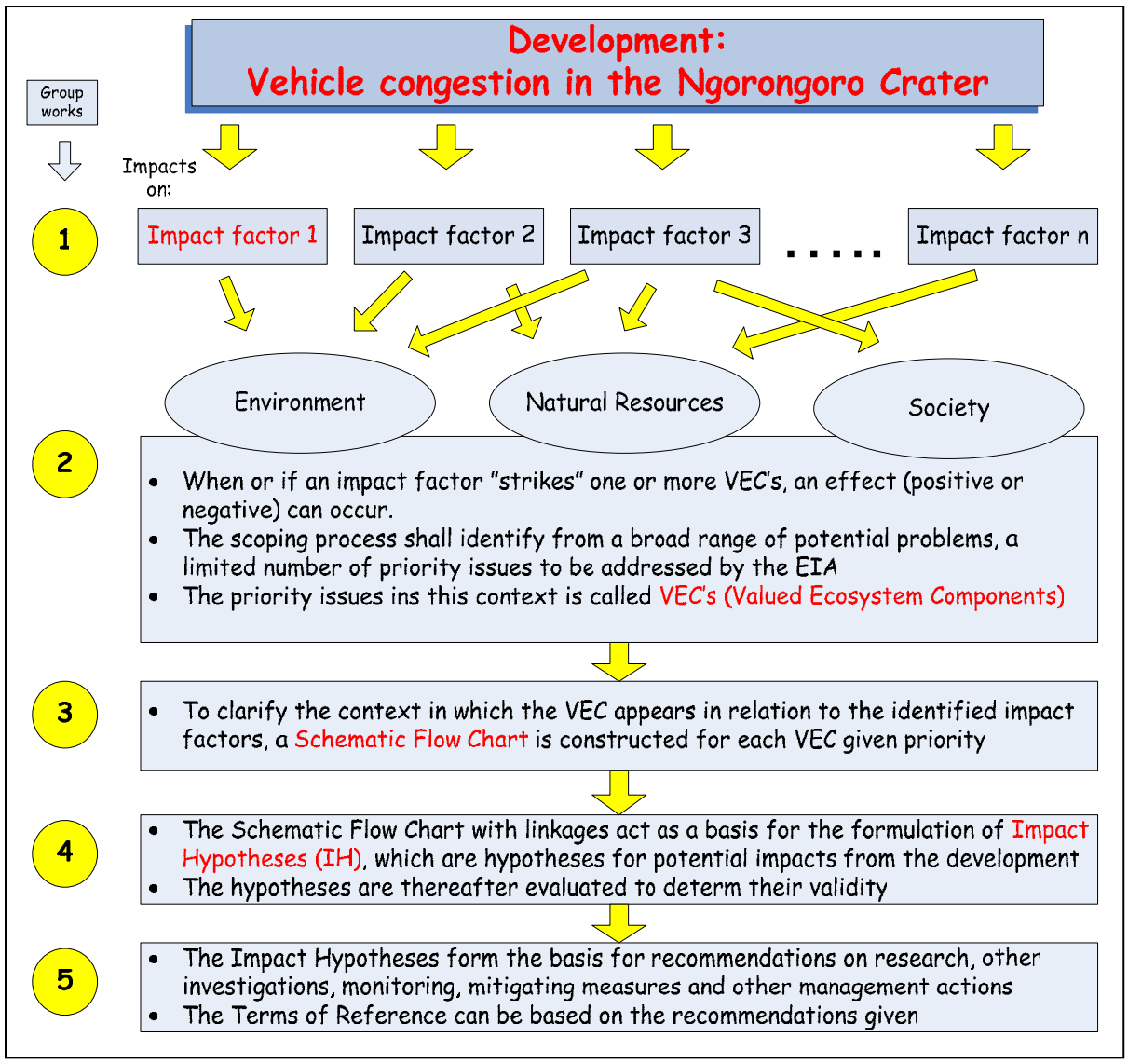


Figure 3. *Schematic picture of the different steps in the AEAM approach used in scoping. The different group works are indicated by the numbers in yellow circles.*

Development description
To make a fundament for the scoping, detailed descriptions of the development plans should be given. In the case of the Ngorongoro tourist congestion, the present situation, problems and challenges concerning the tourist situation with congestion of vehicles in the crater, was given by NCAA in two lectures prior to the first group work (Annex 6.2.5 & 6.2.6).

Baseline studies
Part of the basis for the scoping will be to give a status and access of the baseline information available. Beanlands (1988) states that baseline studies refers to the collection of background information on the environment and socio-economic setting for a proposed development project, and that a program on baseline studies can be designed around the results of a scoping exercise.

Impact factors
Based on the existing knowledge of the tourist situation in the crater, impact factors from the tourist activity on the ecological and human aspects in NCA were identified and ranked with respect to importance.

Valued Ecosystem Components (VECs)
A *Valued Ecosystem Component* is defined as *a resource or environmental feature that: is important (not only economically) to a local human population, or has a national or international profile, or if altered from its existing status, will be important for the evaluation of environmental impacts of industrial developments, and the focusing of administrative efforts* (Hansson et al. 1990).

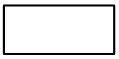
The selection of VECs is probably the most important and at the same time the most difficult step in the process of selection and focusing in the EIA. The critical point is to focus on decision-making, and the VEC concept therefore also should include social, political and economical qualities. Moreover, there are only rooms for a limited number of VECs, which in turn call for high critical sense in the selection process. In the EIA work carried out in the Beaufort Sea Region in Canada (see Indian and Northern Affairs Canada 1992a, b, 1993) the social components of the EIA are treated by defining and describing so-called Valued Social Components (VSC) in addition to the VECs. In our work we have included the society-based concerns in the VEC concept.

Schematic Flow Charts
A S*chematic Flow Chart* is a diagram of boxes and arrows indicating in which context each of the VECs appears, i.e. which type of impact from the proposed activity will affect the VEC and how. Each linkage shall be explained in a brief text following the chart. Hansson et al. (1990) described the content of the flow chart to include the main categories of the physical, biological and possibly also social and political factors influencing the VEC, so-called *system components*, and impacts from the planned activities, called *developments*.

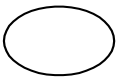
The relationships between the components are called linkages, and so far we will not put great effort into the quantification of these linkages by means of for example energy flow, biomass, importance etc. It is however, important that each linkage in the flow chart is followed by a brief explanation. See Part II in this report for examples of flow charts.

If all the connections between each VEC and the different components on primary, secondary, tertiary.... level should be included in the flow chart, a more or less chaotic picture would occur. Each flow chart, therefore, only comprises the components that are in direct contact with the VEC. The flow chart will form the basis for formulating Impact Hypotheses.

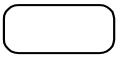
When building up the flow chart we use the following symbols:



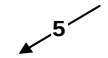
Development: Impact factor



Valued Ecosystem Component (VEC)



System component: Natural factor of importance to the VEC



Linkage, indicating the direction of the impact. Number refers to the explanation

Impact Hypotheses (IHs)
An *Impact Hypothesis* is a hypothesis for testing the possible impact from the activity on the VEC. The impact hypothesis is based on the schematic flow chart and shall be explained and described preferably in scientific terms. The IH is also the basis for recommendations concerning research, investigations, monitoring and management actions, including mitigating measures.

The flow charts and the linkages indicate which activities will influence the VEC directly, or indirectly via the system components. By means of the linkages a series of impact hypotheses can be prepared for each VEC. All IHs shall be scientific documented if possible. In this stage of the process it is important to cover all the impacts that can affect the VEC.

Evaluation of Impact Hypotheses
After the preparation of the IHs, an evaluation procedure is accomplished for each IH, putting them into one of the following categories:

A. The hypothesis is assumed not to be valid.
B. The hypothesis is valid and already verified. Research to validate or invalidate the hypothesis is not required. Surveys, monitoring, and/or management measures can possible be recommended.
C. The hypothesis is assumed to be valid. Research, monitoring or surveys is recommended to validate or invalidate the hypothesis. Mitigating measures can be recommended if the hypothesis is proved to be valid.
D. The hypothesis may be valid, but is not worth testing for professional, logistic, economic or ethical reasons, or because it is assumed to be of minor environmental influence only or of insignificant value for decision making.

We use a standard diagram when listing up the evaluated IHs, one diagram for each IH (see Part II in this report for examples). In the active assessment system, only IHs placed in category B, C and sometimes D are brought forward to the assessment of impacts. Normally, the category C - hypotheses will be tested through research, monitoring or surveys, which also will reflect the different ongoing activities in the «Terms of Reference» for the EIA.

Moreover, it is important that all decisions are explained and that significant references for the decisions are given. In the EIA process it is of significant value to document the different steps and choices against the defined objectives.

Recommendations
As a consequence of the evaluation of the impact hypotheses, several recommendations are normally given.

The needs for research, monitoring and/or surveying
To validate or invalidate the IHs, research, monitoring and/or surveying may be necessary. In this context, it is important to bear in mind the "good enough" - principle and the relevance of decisions. It is also important to describe the needs for data and the methods to be used in testing the hypotheses.

The needs for management actions and mitigating measures
A natural part of an EIA will be to give recommendations concerning management actions and mitigating measures with respect to the proposed activities. It is important not to forget this in the early phase of the EIA-process, as this often will be the most important contribution from the EIA. Recommendations concerning revised plans to mitigate negative effects on the environment and on the society must be done in the early phase of the development.

2 Part II: The Karatu scoping workshop - process and conclusions

2.1 Workshop participants

Participants from several stakeholders attended the scoping workshop (table 1). Of different reasons stakeholders from the tourism industry and the NGOs were not able to participate.

Table 1. *Participants, their profession and institutional belonging at the Karatu scoping workshop in October 2004.*

Name	Profession	Institution
Peter K Metele		Community development -Ngorongoro pastoralist council
Rukia Kitula	Natural resource management	COSTECH
Lazaro Johana	Assistant lecturer	Mweka college
Immaculate Diyamet	Wildlife management and tourism development	NCAA
Boniface Tumbu	Industrial economics	NCAA - MBA finance and banking
Zainabu Sulemain	Wildlife management	NCAA - Research and planning division
Godlove Mwamsojo	Environmentalist/ecologist	NEMC
James Chiragi	Economist	TANAPA
James Wakibara	Ecologist (PhD)	TANAPA
Nicephor Lessio	Wildlife ecologist	TAWIRI
Hassan Nkya	Zoologist/botanist	TAWIRI
Asanterabi Lowassa	Sociologist	TAWIRI
Julius Nyahongo	Wildlife ecologist	TAWIRI
Julius Keyyu	Veterinarian (PhD), project manager	TAWIRI
Richard Lyamuya	Zoology and wildlife ecology-	TAWIRI
Samuel Bakari	Scientist, zoology and wildlife	TAWIRI
Angela Mwakatobe	Scientist, zoology and wildlife,	TAWIRI
Elias Mzee	Wildlife officer	WD - CITES
Kay Kagaruki	Zoology and wildlife management	WD - Selous game reserve
Hanne Haaland	Facilitator	NINA
Jørn Thomassen	Facilitator	NINA

2.1.1 Group composition

The participants were divided into groups, the composition varied according to the tasks to be worked with (table 2).

Table 2. *Group work and group composition at the Karatu scoping workshop in October 2004.*

Tasks	Group no.	Participants
Group work 1: Identifying impact factors from the tourist activity in the Ngorongoro crater	**1**	Peter K Metele, Boniface Tumbu, Kay Kagaruki, Nicephor Lessio, Hassan Nkya
	2	Asanterabi Lowassa, Zainabu Sulemain, Elias Mzee, Julius, Rukia Kitula, James Chiragi
Group work 2: Selecting Valued Ecosystem Components (VEC's)	**3**	Lazaro Johana, Immaculate Diyamet, Godlove Mwamsojo (absent on group work 3), Julius Keyu, Richard Lyamuya, Samuel Bakari, James Wakibara, Angela Mwakatobe
Group work 3: Constructing Schematic Flow Charts **Group work 4:** Formulating Impact Hypotheses (IH) and evaluation of IH's **Group work 5:** Recommendations **Group work 6:** Work plan		*VEC: tourism:* Immaculate Diyamet, Godlove Mwamsojo, James Chiragi, Kay Kagaruki (joined later) *VECs: maasai community and NCA:* Lazero Yohana, Asanterabi Lowassa, James Wakibara *VECs: endangered species, carnivores and herbivores:* Julius Nyahongo, Franael Nko, Elias Mzee, Richard Lyamuya Zainabu Sulemain, Rukia Kitula *VECs: migratory routes, ecosystem health and sensitive habitats* Nicephor Lesio, Julius Keyyu, Hassan Nkya

2.2 Stakeholders

The workshop participants were on individual basis asked to come up with the most important stakeholders in connection with NCA and tourism. Table 3 summarises the stakeholder analysis.

Table 3. *The main stakeholders concerning NCA and tourism as assessed by the workshop participants.*

Sector	Stakeholders
Tourism	Tour operators, tourists, hotels
Other private sector	Contractors
Official bodies	Government of Tanzania, Wildlife Division (WD), COSTECH, NEMC
Management	Ministry of Natural Resources and Tourism (MNRT), Ngorongoro Conservation Area Authority (NCAA), NCA workers
Research	Tanzania Wildlife Research Institute (TAWIRI), Universities in Tanzania, CAWM, MWEKA, Norwegian Institute for Nature Research (NINA)
NGOs	ERETO, World Wildlife Fund (WWF), AWF, Frankfurt Zoological Society (FZS)
Local communities	Maasai community
Media	Journalists

2.3 Scoping results

2.3.1 Impact factors

The vehicle congestion in the crater inevitably lead to impacts on the environment, natural resources and society, and a set of impact factors from the activity can be identified. The participants were asked to assess the main impact factors from the vehicle congestion in the crater, and to give priority to the most important ones. Out of 13 assessed impact factors, 6 were given priority (table 4).

Table 4. *Assessed and selected impact factors caused by vehicle congestion in the Ngorongoro crater.*

Assessed impact factors	Impact factors agreed upon in plenary
Disturbance of vehicles	Disturbance
Disturbance	
Overuse of road network	Traffic overuse
Off road driving	Off-road driving
Increased maintenance of infrastructure	
Spread of zoonotic diseases	Spread of diseases
Improved local and national economies	
Tourist satisfaction and affection is reduced	
Increased pollution	Pollution
Road destruction	
Maasai culture	
Invasive species	Invasive species introduction
Heavy traffic	

2.3.2 Valued Ecosystem Components (VECs)

The main elements or components (VEC's) in the Ngorongoro crater, given the set of impact factors, were identified. The main question was: which elements would be in focus when decisions are to be taken concerning the management of the crater. Nine VECs were given priority. Table 5 summarises the assessments of VEC's in each group, and the priorities agreed upon in plenary.

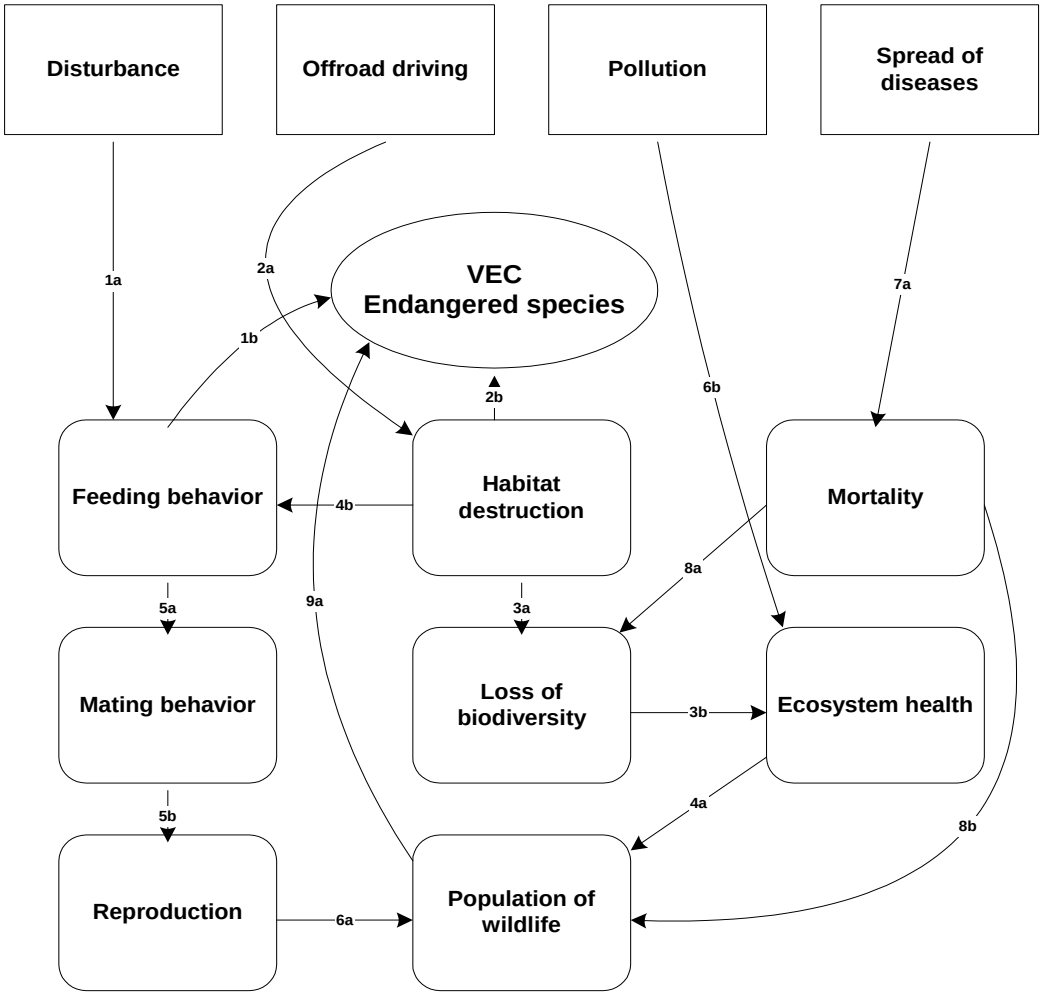
***Table 5**. Assessed and selected Valued Ecosystem Components (VEC's). The VEC's were identified and given priority on the basis of vehicle congestion in the Ngorongoro crater.*

Assessed VEC's	Group 1	Group 2	Group 3	VEC's agreed upon in plenary	Priority, agreed upon in plenary
Carnivores	4			Carnivores	**3**
Carnivores- lions, leopards, spotted hyenas		2			
Endangered species (Black rhino, Elephant, Cheetah)		1		Endangered species	**1**
Rhino	3				
Herbivores	4	6		Herbivores	**7**
Biodiversity of the crater	2				
Ecosystem health			4	Ecosystem health	**8**
Grassland		8			
Sensitive habitats			1	Sensitive habitats	**4**
Sensitive animals species			2		
Migratory route			5	Migratory route	**6**
Catchment areas			3		
Lake Makati		3			
Ngoitoktok Spring		4			
Lerai forest		5			
Maasai community	8		8	Maasai community	**5**
Maasai livestock		9			
Tourism industry	6		6	Tourism	**2**
Tourists	5	7			
Lodges and campsites			7		
Local and National economy	7				
Scenic beauty of the crater	1				
Employment	9			NCA	**9**
NCAA		10			

***Figure 4**. Lions are one of the tourist attractions in the crater. High priority was given to VEC carnivores at the work shop (photo: Jørn Thomassen).*

2.3.3 Schematic flow charts

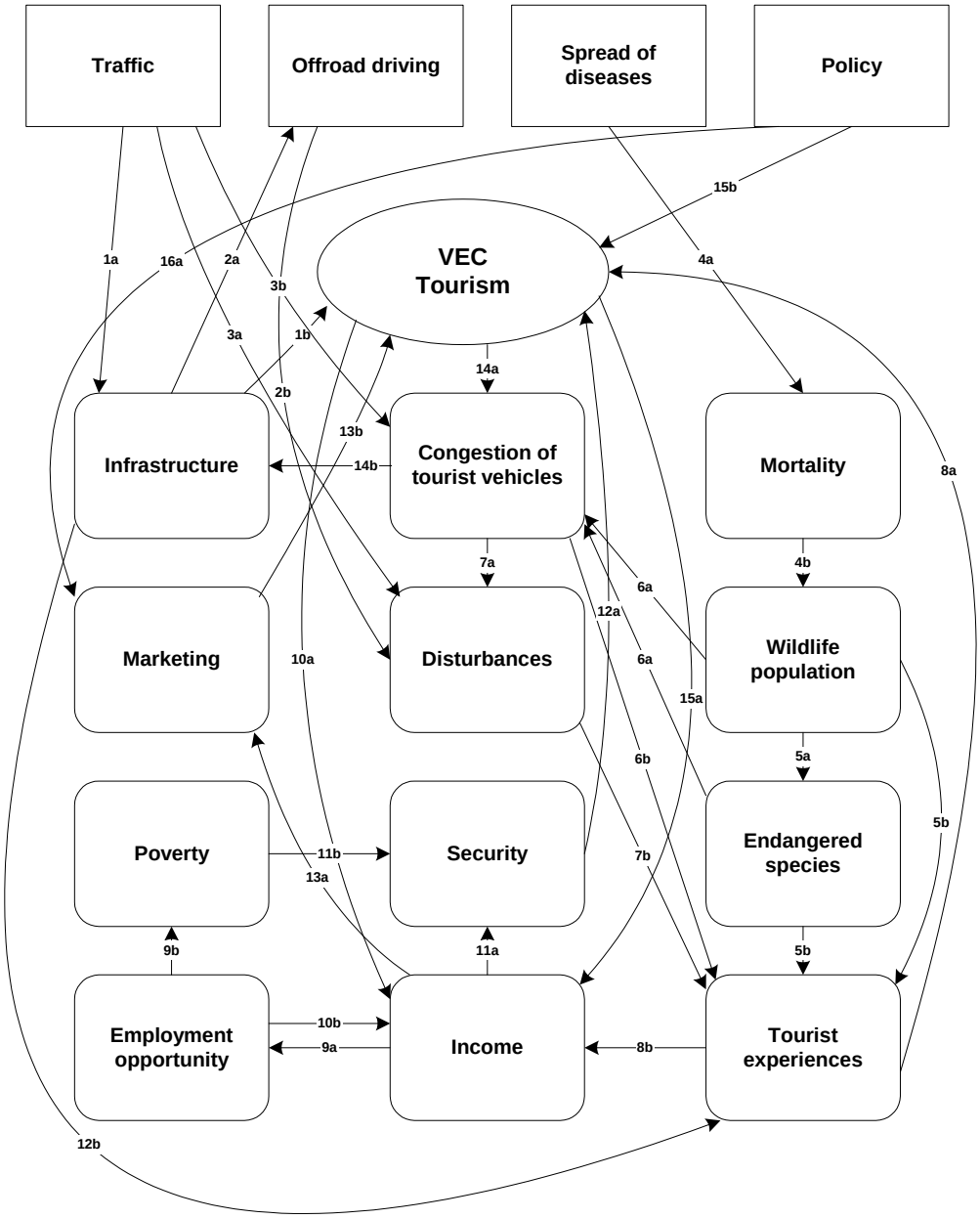
For each of the VEC's given priority a schematic flow chart with explanations was constructed (Figure 5a-i). The flow charts form the basis for the formulation of impact hypotheses.



Endangered species

1a Increased disturbance affect feeding behaviour
1b Affected feeding behaviour have impact on endangered species
2a Off road driving leads to habitat destruction
2b Habitat destruction will affect endangered species directly
3a Habitat destruction leads to loss of biodiversity
3b Loss of biodiversity may affect ecosystem health
4a Effect on ecosystem health may affect wildlife population
4b Habitat destruction may affect feeding behaviour of wildlife
5a Effect on feeding behaviour may affect mating behaviour
5b Effect on mating behaviour may affect reproduction
6a Impaired reproduction may affect wildlife population
6b Pollution may effect ecosystem health
7a Spread of diseases may result in mortality
7b Mortality may affect species of endangered species
8a Mortality may affect biodiversity in the ecosystem
8b Mortality may affect wildlife population
9a When the wildlife population is affected, endangered species may be affected too

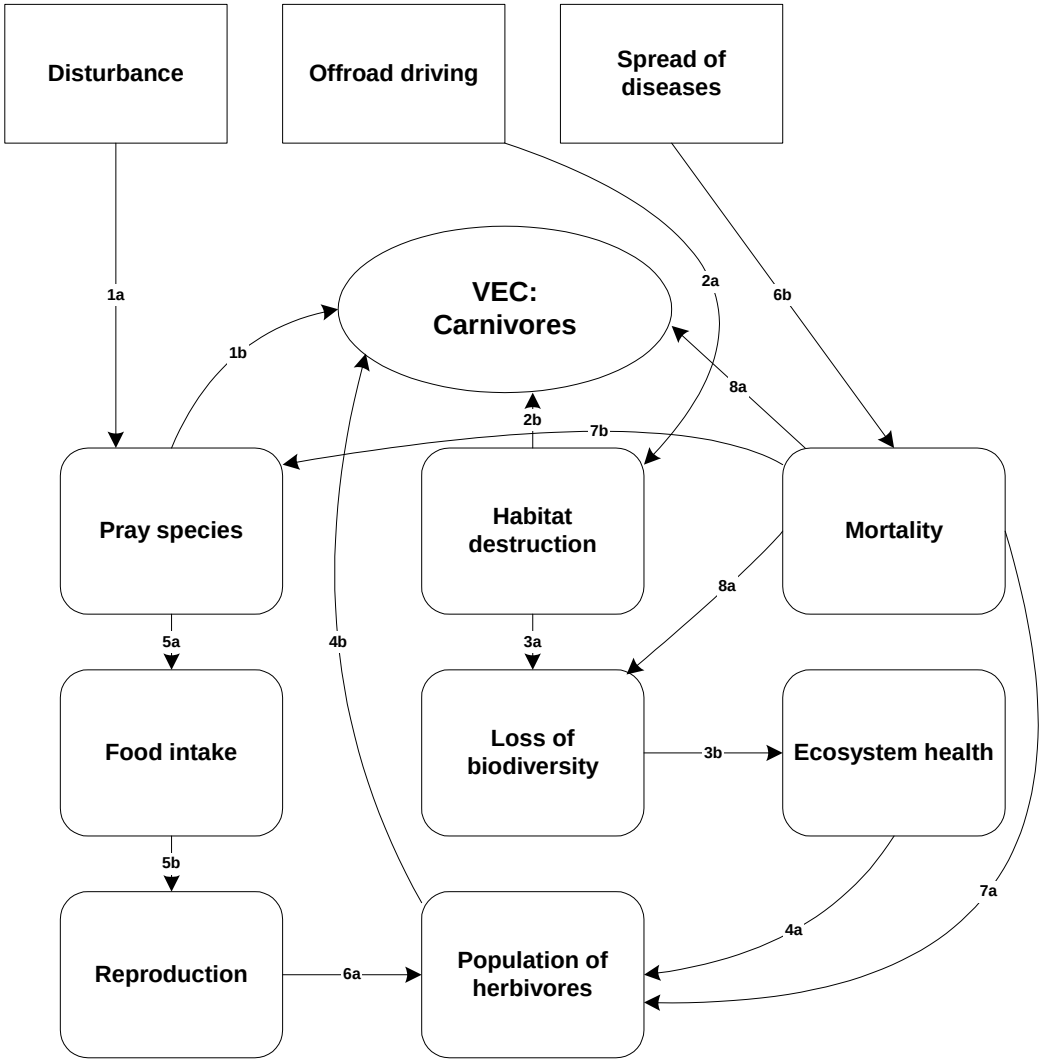
Figure 5a. *Schematic flow chart for VEC Endangered species*



Tourism

1a Increased traffic destroys infrastructure
1b Poor infrastructure reduce tourism
2a Poor roads lead to off road driving
2b Off road driving leads to animal disturbances
3a Increased traffic leads to animal disturbances
3b Increased traffic leads to congestion of tourist vehicles
4a Spread of diseases causes animal mortality
4b Mortality reduces wildlife population
5a Endangered species become more susceptible
5b Reduced wildlife population leads to decline in visitor's experience/satisfaction
6a Few attractions causes congestion of tourist vehicles
6b Congestion of tourist vehicles results in tourist dissatisfaction
7a Congestion of tourist vehicles leads to animal disturbance
7b Animal disturbances restrict wildlife view opportunities/affect visitors satisfaction
8a Dissatisfied tourists will abandon the tourist destination
8b Dissatisfied/fewer tourists will lead to fall in income
9a Less income- less employment opportunities
9b Less employment opportunities results into poverty
10a A boom in tourism industry increases employment opportunity
10b Increase employment opportunity mean increased income
11a Increase income leads to more security
11b Poverty leads to loss of security
12a Loss/availability of security will have an affect on the tourism industry
12b Poor infrastructure affects negatively visitors' experience
13a Increased income leads to good marketing programmes
13b Good marketing programmes lead/increased tourism growth
14a A growing tourism industry results in tourist vehicle congestion
14b Congestion of tourist vehicles results in poor infrastructure
15a A booming tourism industry leads to increased income
15b Good and proper policy boosts tourism industry
16a Good policy attracts more investment, hence affecting marketing strategies

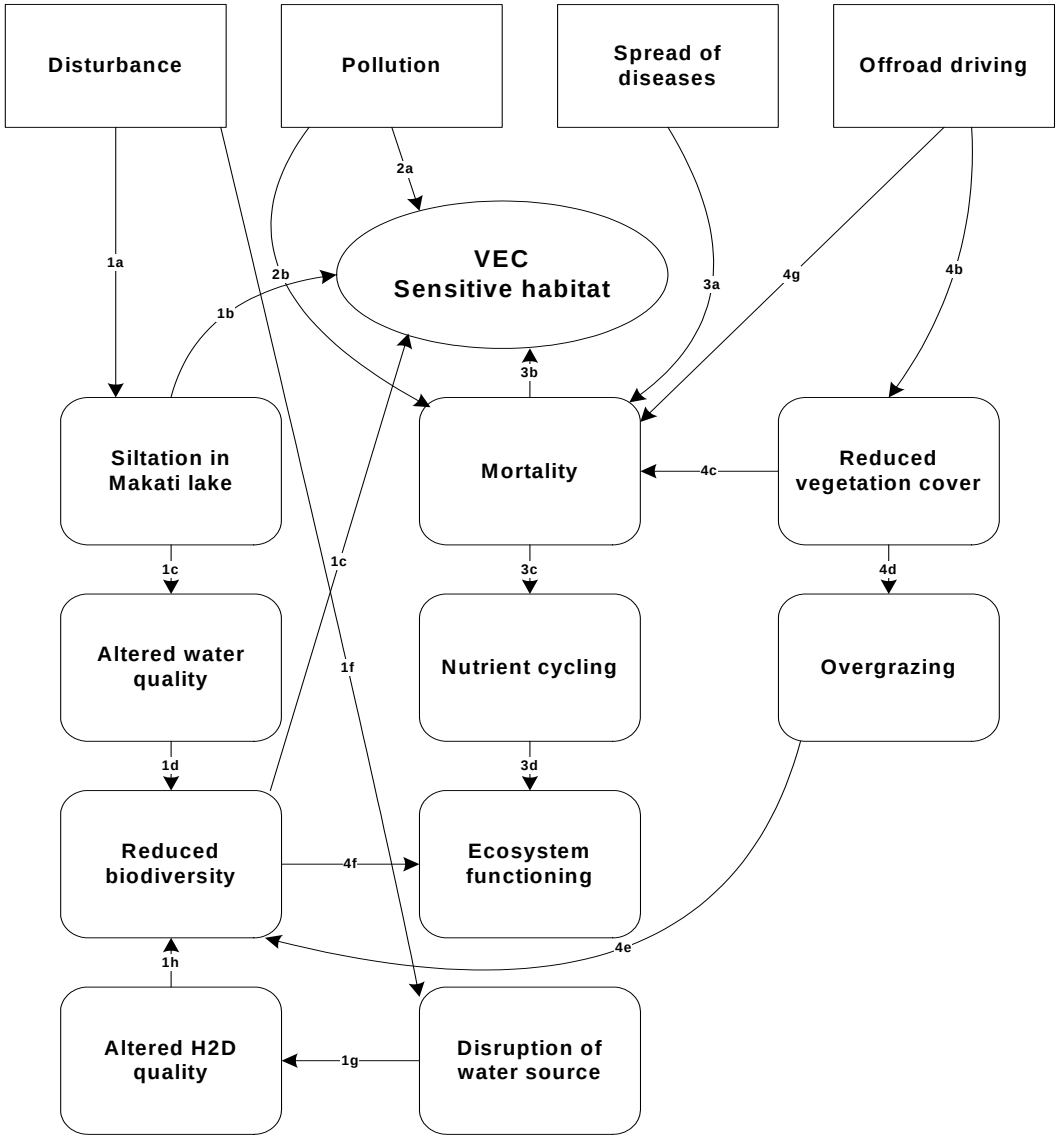
Figure 5b. *Schematic flow chart for VEC Tourism*



Carnivores

1a Disturbance affects prey species and may be very vigilant
1b A vigilant prey species is difficult to be hunted by a carnivore
2a Off road driving causes habitat destruction
2b Affected habitat may affect carnivore population
3a Habitat destruction leads to loss in biodiversity
3b Loss of biodiversity affects ecosystem health
4a Ecosystem health may affect herbivore population
4b Effect on herbivore populations may affect carnivore populations
5a Disturbance reduces food intake of prey species
5b Low food intake impairs reproduction
6a Low herbivore reproduction results into low population
6b Diseases may result in wildlife mortality
7a Mortality may affect population of herbivores
7b Mortality may affect individual prey species
8a Mortality may affect biodiversity

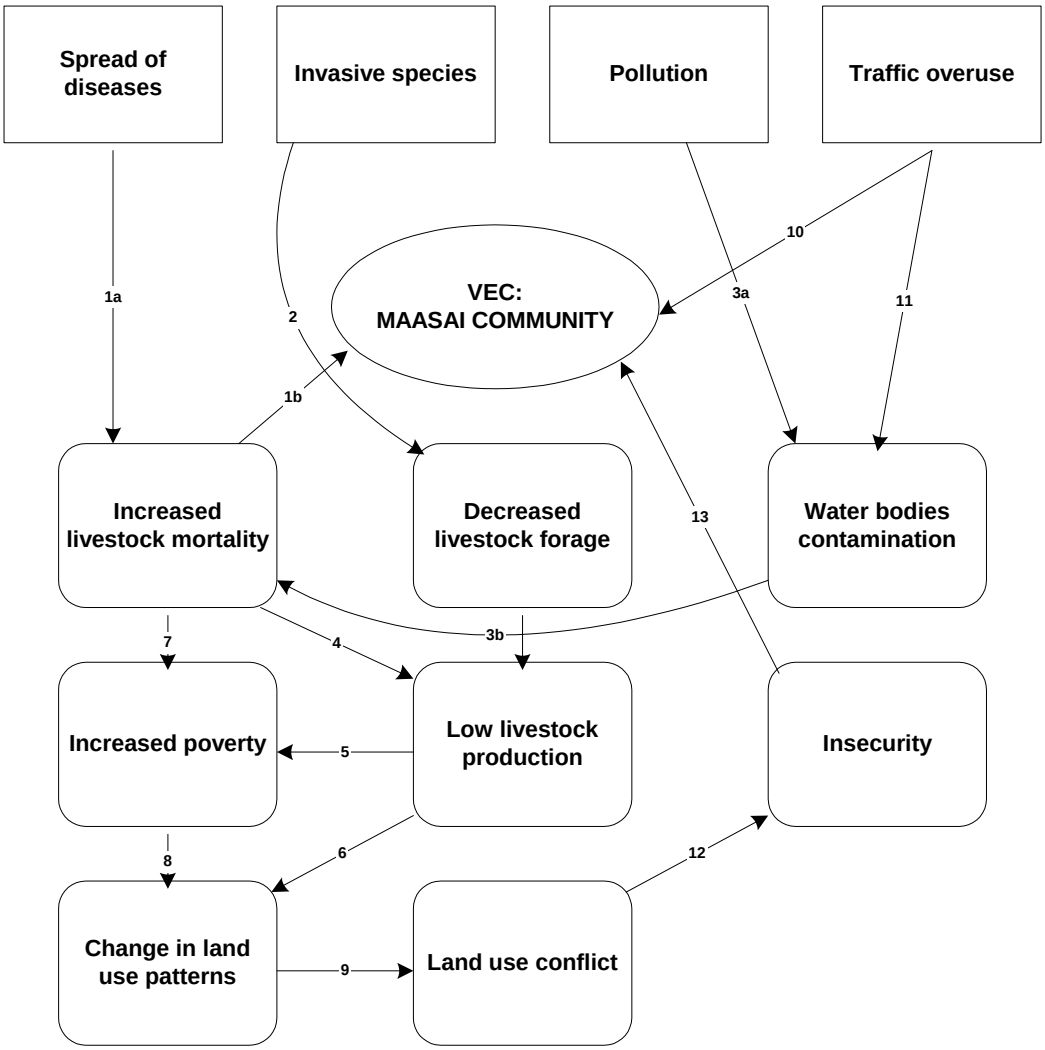
Figure 5c. *Schematic flow chart for VEC Carnivores*



Sensitive habitats

1a Disturbance through heavy trafficking causes erosion, leading to siltation of
1b Siltation causes water quality and quantity----------
1c Siltation has direct effect to the Makati lake (habitat)
1d The universal amount of water causes loss of biodiversity of the Lerai forest
1e Loss of biodiversity affects the sensitive habitat (lake and forest)
1f Disturbance causes disruption of water source
1g Disruption of water source has an effect on the water quality and quantity
2a Pollution has a direct impact on the sensitive habitats
2b Pollution causes mortality of sensitive habitat components
2c Mortality causes loss of biodiversity
3a Spread of diseases causes mortality
3b Excessive mortality has a direct effect on sensitive habitats
3c Mortality contributes to the nutrient cycling
3d Nutrient cycling contributes to the ecosystem functioning
4a Off road driving has a direct effect on the sensitive habitat
4b Off road driving reduces vegetation cover of the area
4c Reduced vegetation cover causes mortality of some animals do to reduced forage and cover
4d Overgrazing occurs in the little remaining rangeland area with forage as a result there is reduced biodiversity
4e) ……reduced biodiversity
4f) Reduced biodiversity results in reduced ecosystem functioning
4g) Off road driving causes mortality especially of insects (?), etc

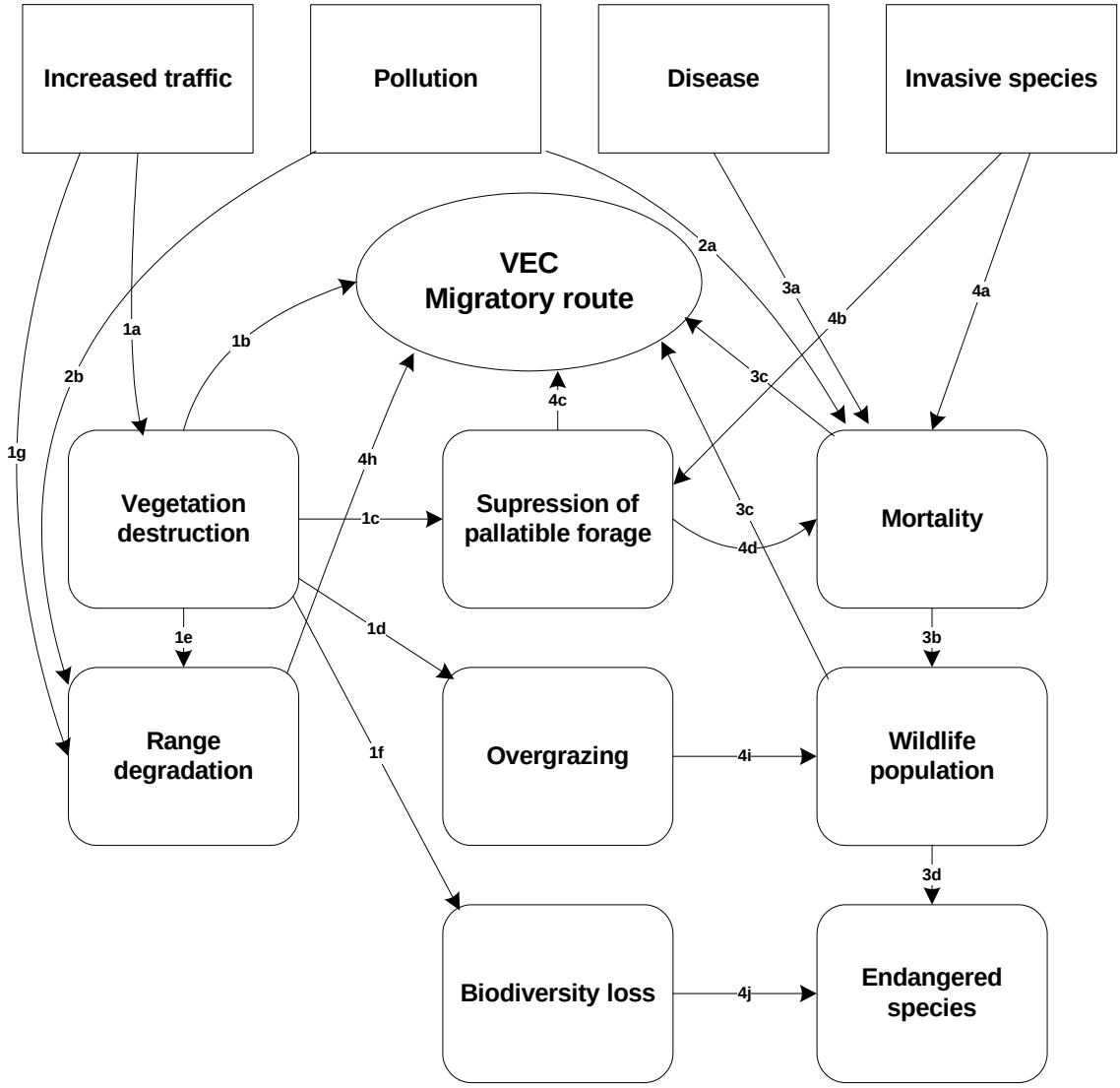
Figure 5d. *Schematic flow chart for VEC Sensitive habitats*



Maasai community

1a Spread of diseases can lead to increased livestock mortality
1b increased livestock mortality will affect Maasai livelihoods
2a Invasive plants will lead to decreased livestock forage
3a Pollution will lead to water contamination of water bodies
3b Contamination of water bodies will possibly cause increased livestock mortality
4a Increased livestock mortality will cause decline in livestock production (milk, meat)
5a Low livestock production will lead to increased poverty
6a Low livestock production may result in changes in land use pattern
7a Increased livestock mortality will lead to increased poverty
8a Increased poverty will lead to change in land use patterns
9a Change in land use patterns will lead to land use conflicts
10a Traffic over use will interfere with Maasai cultural values
11a Traffic over use may pollute water bodies
12a land use conflicts will lead to insecurity
12b insecurity will affect the community welfare

Figure 5e. *Schematic flow chart for VEC Maasai community*

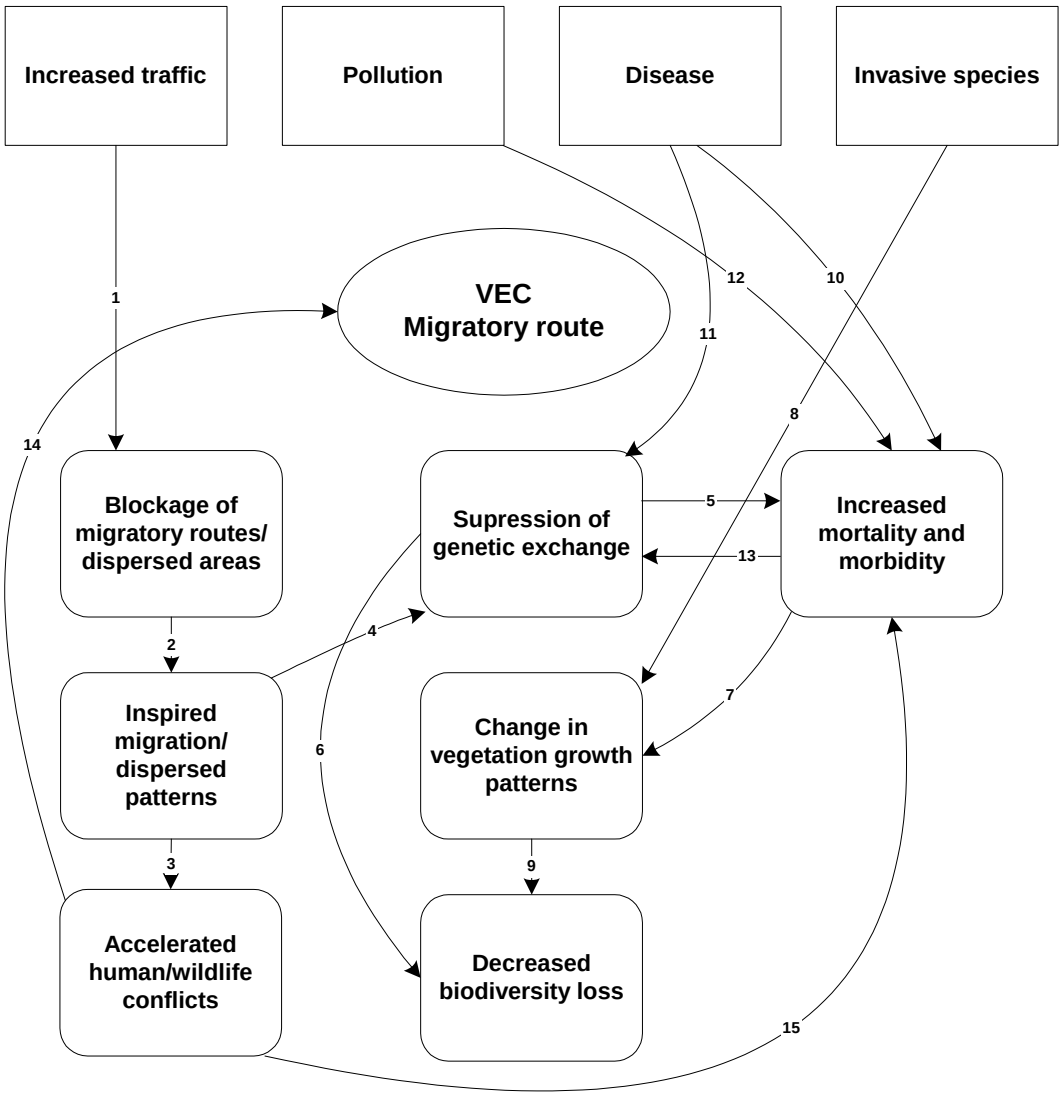


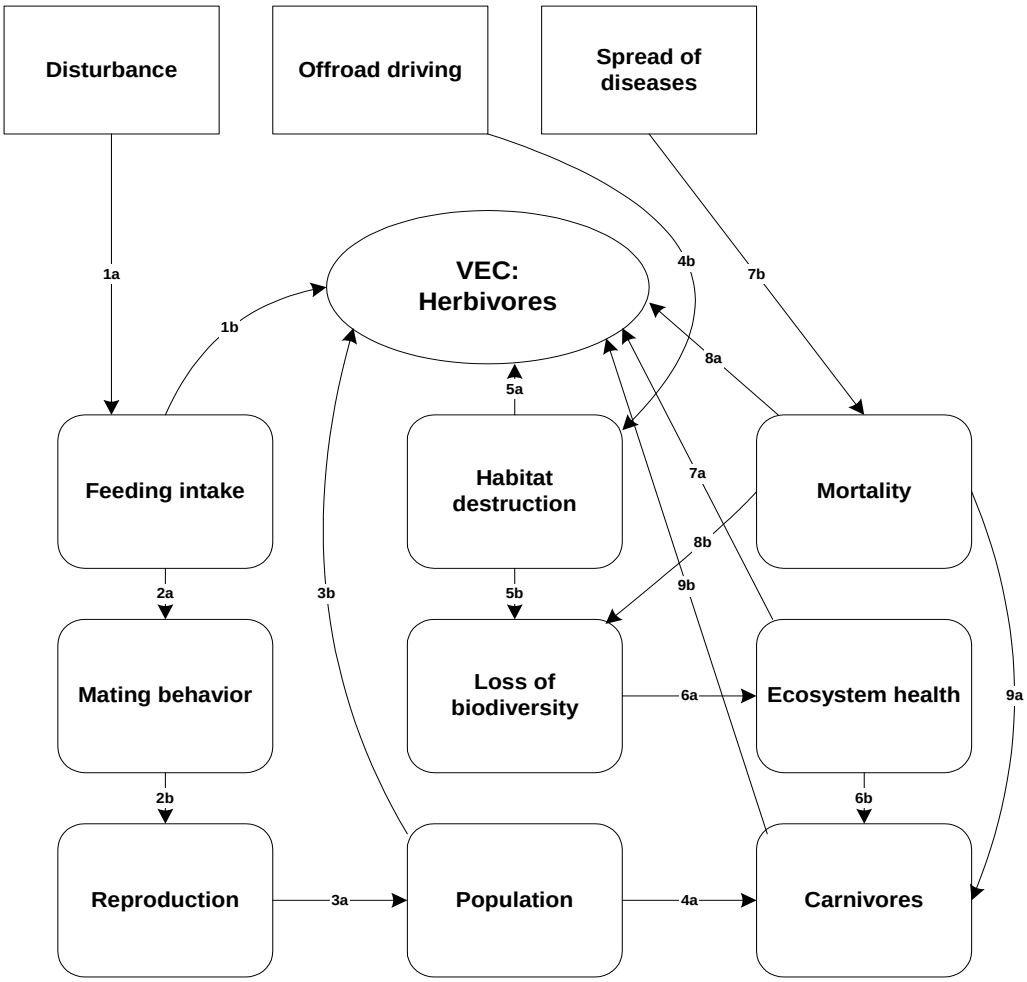
Migratory route (version 1)

1a Increased traffic has a direct effect on vegetation
1b Destruction of vegetation has effect on migratory route
1c Vegetation destruction will lead to suppression of palatable destruction
1d Reduced vegetation leads to overgrazing
1e Vegetation destruction leads to range degradation
1f Vegetation destruction will lead to biodiversity loss
1g Increased traffic will lead to range degradation through erosion and pollution
2a Pollution has direct effect on health of animals and can lead to increased mortality
2b Pollution has a direct effect on the health of range land
3a Diseases have direct concretion to death of animals
3b Mortality reduces population of animals
3c The migration is affected by reduced number of animals
3d The population is reduced too much for migrations
4a Toxic species lead to mortality of animals
4b Invasive species have direct effect on palatable forage
4c Change of migratory route
4d Animals forced to feed on poisonous forage (invasive species)
4e High concentration of animals on area with palatable forage
4f Overgrazing has direct effect to the range
4g Range degradation results to biodiversity loss
4h Range degradation effects the migratory route
4i Overgrazing causes loss of wildlife
4j Biodiversity loss leads to endangered species

Figure 5f. *Schematic flow chart for VEC Migratory route*

Flow chart for Migratory route was revised, no explanations were given.

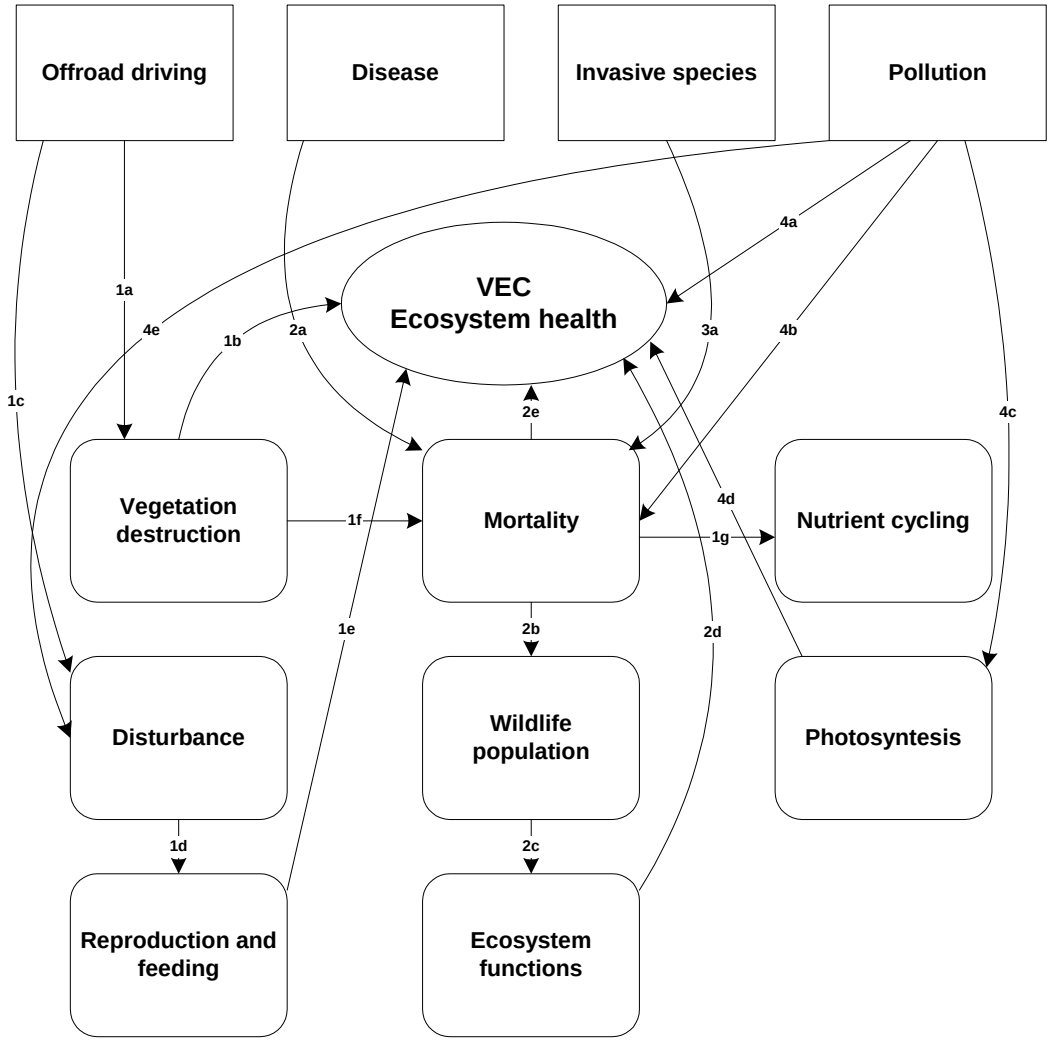




Herbivores

1a Increased disturbance reduces the feed intake of herbivores
1b Reduced feed intake may affect herbivores
2a Reduced feed intake may affect mating
2b Reduced mating activities affect reproduction
3a Low reproduction leads to low population
3b Due to low population the number of herbivores declines
4a Carnivore population will be affected by the low herbivore population
4b Off-road driving causes habitat destruction
5a Habitat destruction affects herbivores directly
5b Habitat destruction leads to loss of biodiversity
6a Loss of biodiversity affects ecosystem health
6b Ecosystem health affects carnivore population
7a Ecosystem health affects herbivore populations
8a Mortality may affect herbivore population
8b Mortality may affect biodiversity
9a Mortality may affect carnivore population
9b Affected population of carnivores may affect herbivore population

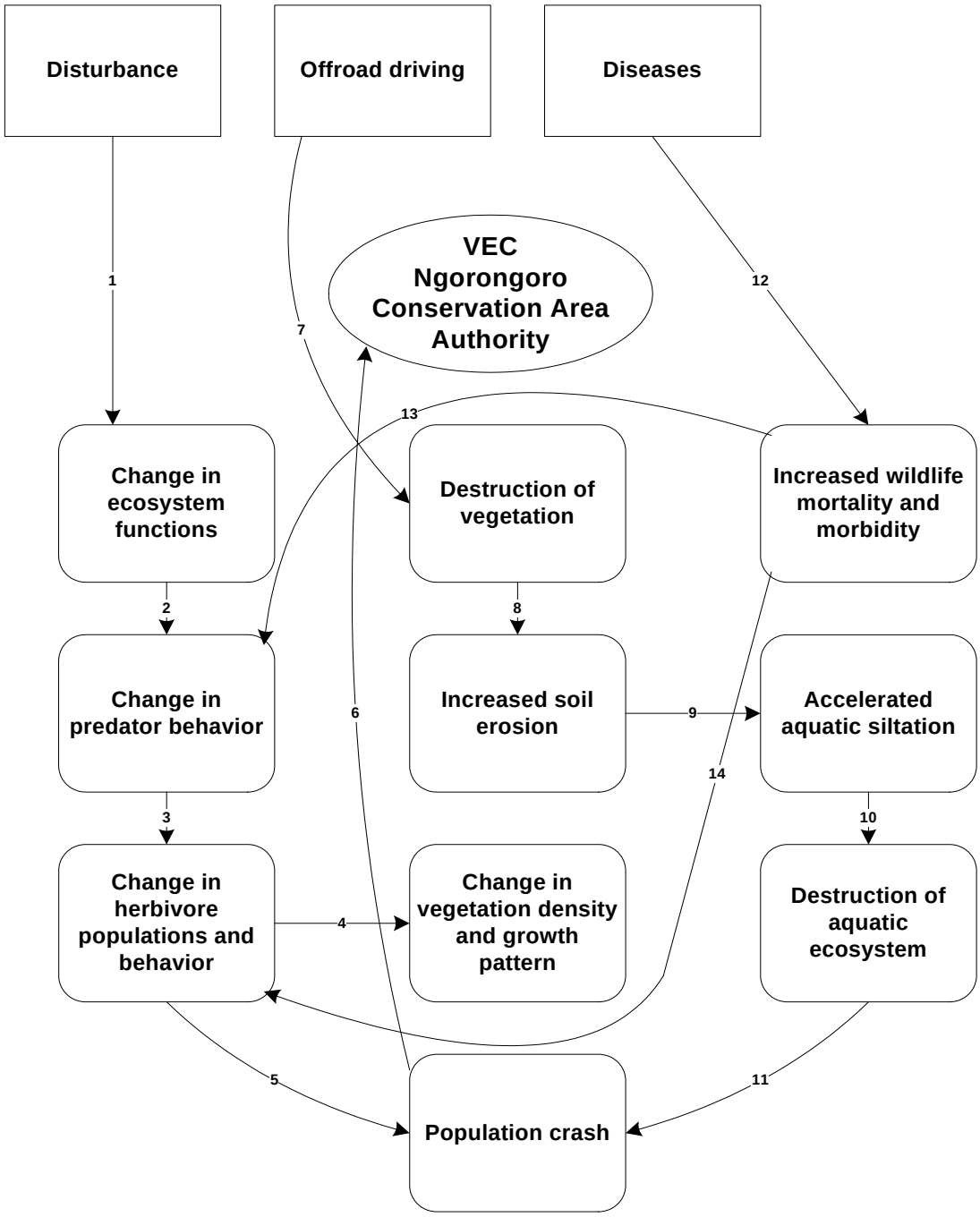
Figure 5g. *Schematic flow chart for VEC Herbivores*



Ecosystem health

1a Off road driving has direct impact on vegetation
1b Vegetation destruction affects ecosystem health
1c Off road driving causes disturbance to animals
1d Disturbance affects reproduction, feeding behaviour of animals
1e Interfered reproduction and feeding behaviours affect ecosystem health
1f Vegetation reduction leads to mortality through malnutrition
1g Mortality contributes to the nutrient cycling of the ecosystem
2a Diseases lead to direct death of animals
2b Decreased no of animals due to mortality causes reduced wildlife population
2c Decreased wildlife population results in poor ecosystem functioning
2d Poor ecosystem functioning affects ecosystem health
2e Mortality leads to poor ecosystem health
3a Poisonous invasive species causes animal mortality
4a Pollution affects ecosystem health
4b Pollution causes mortality
4c Pollution reduces photosynthesis which leads to ecosystem health
4d Noise pollution leads to disturbance of animals leading to change in animal behaviour

Figure 5h. *Schematic flow chart for VEC Ecosystem health*



NCAA

1a Disturbance will lead to damage in ecosystem functions
2a Change in ecosystem functions will lead to change in predator population and behaviour
3a Change in predator populations and behaviour will also change herbivore population behaviour
4a Change in herbivore populations and behaviour will lead to change in vegetation density and growth patterns
5a Changes in vegetation density and growth patterns will lead to wildlife population crash
6a Wildlife population crash will lead to a deterioration of NCA's natural environment
7a Off road driving will cause destruction of vegetation
8a Destruction of vegetation will lead to increased soil erosion
9a Increased soil erosion will cause accelerated aquatic siltation
10 Accelerated aquatic siltation will lead to destruction of aquatic ecosystems
11 Aquatic ecosystems destruction will lead to wildlife population crash
13 Increased wildlife mortality and morbidity may lead to change in predator population and behaviour
14 Increased wildlife mortality and morbidity may also lead to change in herbivore population and behaviour

Figure 5i. *Schematic flow chart for VEC Ngorongoro Conservation Area Authority*

2.3.4 Impact Hypotheses (IHs), evaluation of IHs and recommendations

Fourteen Impact Hypotheses were formulated, and research or other investigations were recommended to validate/invalidate the IHs, summarised in table 6. See appendix 6.1 for group work report forms, including explanations, rationale and all recommendations given.

Table 6. *VEC's with corresponding IH's, categorisation of the IH's and recommendations to validate or invalidate the IH's.*

VEC: 1. Endangered species				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
1-1	Congestion of tourist vehicles may affect the activity pattern of endangered species.	C	Data can be obtained from field observation at the presence of these endangered species on how the animal react in the presence congested vehicles.	Long term monitoring on how the endangered species react with the increase of tourist vehicles.

VEC: 2. Tourism				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
2-1	Increased traffic volume will cause destruction of environment in the crater and ruin the tourism attractions leading to reduction in number of tourists	C	• Traffic carrying capacity of the crater • Measurement of emission and noise levels against WHO standards • Effect of habitat destruction due to off road drive • Changes in animals behaviour due to continued disturbances • Effect of increased traffic volume on social aspects (economic issues, cultural issues, tourist satisfaction) • Conduct case studies on lessons learned from similar cases	**Monitoring** • Emission and noise levels against WHO standards • Trend of traffic volume • Fluctuation of income to NCAA, Tour operators, Hotels and lodge, Local communities • Current status of tourist attractions **Surveys** • Appropriate roads network in the crater • Changes in cultural aspects and values • Level of tourist satisfaction • Loss of critical habitat and species • Change in animals behaviour • Identification of other tourist attractions
2-2	The outbreak of diseases will lead to decline in number of tourists in the crater	C	• Type of communicable diseases that are likely to happen • Potential sources and pathways of diseases • Impact of diseases on tourism in the crater	**Monitoring** • Rate of disease outbreak • Quantity of disease vectors **Surveys** • Identification of prevailing diseases in the region.
2-3	Appropriate policy framework sets enabling environment for quality tourism	C	• Pertinent policy issues • Identification of gaps and overlapping areas	**Monitoring** • Policy implementation **Surveys** • Conduct study on appropriate policy framework

VEC: 3. Carnivores				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
3-1	Increased congestion of tourist vehicles reduces hunting success per unit effort spent by carnivore	C	Data can be obtained from field observation during the hours of congestion and time where there are not congestions i.e. only researcher and anti-poaching unit vehicles are present. The data can be compared to other areas where the congestions are very high i.e. Masai Mara Natural Reserve and areas where the congestions are low i.e. Western Serengeti	Long term monitoring of flight distances of different species of herbivores in the crater and outside the crater is recommended.

VEC: 3. Carnivores				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
3-2	Spread of zoonotic diseases can be influenced by congestion of tourist vehicles at the picnic sites and thus affect carnivores direct and indirect.	C	Data can be obtained from field observation at these picnic sites during the hours of congestion to monitor if the facilities are properly used.	Long term monitoring on how the tourist facilities are used at these picnic sites are recommended.
3-3	Congestion of tourist vehicles at a kill may elevate the feeding time of the carnivores increasing inter and intraspecific competition.	C	Data can be obtained from field observation at the kill where time taken when the animal start feeding and also breaks due to coming vehicles will be recorded. The time when the animal finish eating, or crowded by other carnivores will also be recorded.	

VEC: 4. Sensitive habitats				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
4-1	Soil erosion will cause siltation of water bodies leading to alteration of water quality and quantity	C	Impact of siltation in crater water bodies	Monitoring of water quality and quantity in space and time in the crater

VEC: 5. Maasai community				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
5-1	Traffic overuse in the crater will change the socio-cultural values of the Maasai community.	B	Impact of tourist congestion on the socio-cultural values of the Maasai community.	Compare socio-cultural values between Maasais in close interaction and not interacting with tourists.
5-2	Invasion of exotic plants will cause change in land use patterns among the Maasai community.	D	Assessment of the status of exotic plant species in NCA	Establish small scale experimental plots for monitoring the spread of selected exotic plant species
5-3	Increased livestock mortality will reduce income of the Maasai community	C	Impact of mass livestock mortality on the income of the Maasai community	Compare the income between households affected and not affected by disease-related massive loss of livestock within NCA.

VEC: 7. Herbivores				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
7-1	Spread of zoonotic diseases can be influenced by congestion of tourist vehicles at the picnic sites and thus affect herbivores.	C	Data can be obtained from field observation at these picnic sites during the hours of congestion to monitor if the facilities are properly used.	Long term monitoring on how the tourist facilities are used at these picnic sites are recommended.

VEC: 8. Ecosystem health				
IH no.	**Impact hypothesis**	**Category**	**Recommended research**	**Recommended monitoring/surveys**
8-1	Pollution from increased traffic will deter plant photosynthesis and therefore weaken ecosystem functioning causing tourist dissatisfaction.	C	Data can be collected to determine the effect of dusts and emissions form vehicles to plants.	Monitoring of numbers and distribution of vehicles in the crater in order to assess traffic emission and dust on the attraction points.
8-2	Outbreak of diseases in NCA causes wildlife mortality leading to poor ecosystem functions	C	Impact of a disease outbreak on the number and distribution of wildlife	Monitoring of wildlife health should be carried out.

No IHs were formulated for VEC Migratory route and VEC Ngorongoro Crater Area Authority (NCAA).

2.3.5 Further work

On the basis of the Impact hypotheses and recommendations given for each IHs, the workshop participants started with building up work plans for each of the VECs in the EIA. Due to shortage of time, this work was not finished at the workshop, and it was decided that the facilitators should

complete the scoping process and prepare the ToR, including a work plan for the EIA, in collaboration with TAWIRI and NCAA.

The workshop also realised that it would be impossible to conduct all the recommended studies within the time- and economical frames given. Consequently, a further scoping was conducted at a meeting between TAWIRI, MNRT and NINA in Trondheim in November 2004 (see Part III in this report).

Figure 5. *The Maasai community was selected as an important VEC at the work shop (photo: Jørn Thomassen).*

3 Part III: the Trondheim meeting 03.11.04 – further scoping and conclusions

3.1 Background

A collaboration between NCAA, TAWIRI and NINA on the EIA: *Vehicle congestion in the Ngorongoro crater*, has been established with three main objectives:

- To get practical training in conducting EIA for the TAWIRI staff
- To use the EIA as a project in the capacity building programme between TAWIRI and NINA. Several training packages will be included in the EIA project.
- To produce a prioritised EIA for NCAA, for use in the management of the NCA.

The scoping workshop was conducted in Karatu 11. – 15. October 2004, using the AEAM approach. Six impact factors and 9 Valued Ecosystem Components (VEC) were given priority. 14 Impact Hypotheses (IH) were formulated, and research or other investigations were recommended to validate/invalidate the IHs.

NCAA has started the work with revising the General Managing Plan (GMP) for the NCA, and both initiatives (revision and EIA) should communicate and get mutual benefit from each others work.

3.2 Conclusions from the Trondheim meeting – further scoping

3.2.1 Project organisation

Project leader/responsible in TAWIRI: Julius Nyahongo
Project leader in NINA: Jørn Thomassen

Supervision human aspects: Bjørn Kaltenborn, NINA
Supervision ecological aspects: Sigbjørn Stokke, NINA

3.2.2 Important tasks

TAWIRI will take contact with NCAA to:
- get an overview of existing guidelines, GMPs and other steering document important for the EIA work
- establish good contact with NCAA and get a contact person at NCAA
- discuss the proposed plan (scoping report with conclusions made at the Trondheim meeting) for the EIA with NCAA and get an agreement for conducting the EIA
- explore the possibilities to raise some funding from NCAA for the concrete tasks to be conducted in the EIA (human/ecology investigations)

TAWIRI will:
- in collaboration with NINA work out a time schedule for the EIA
- in collaboration with NINA work out a financial plan for the EIA

3.2.3 Further scoping and conclusions

- Discussions on the Trondheim meeting, based on the draft results from the scoping workshop, concluded with: five VECs are given priority in the EIA study (the 5 VECs given highest priority at the scoping workshop):
- *Human aspects* consisting of VEC Maasai community and VEC Tourism

- *Ecological aspects* consisting of VEC Endangered species, VEC Carnivores and VEC Sensitive habitats
- Group work and discussions were made concerning the investigations on the VECs and suggestions/recommendations were given:

Suggestions/recommendations for human aspects

Key issues to be investigated

1. Tourism carrying capacity of NCA,
2. Quality of tourism experience,
3. Visitors preference and satisfactions,
4. Attitude of tourists and local community towards management authority and conservation
5. Marketing strategies

Proposed methodologies

1. Questionnaires (different levels); 200- 300 questionnaires
2. Interviews to various stakeholders, including focus on strategic issues
   - Tourists
   - Lodges and hotels owners
   - Tour operators
   - Maasai communities
3. Observations (different behaviours)
4. Literature review
5. Assess organisation structure of NCAA (room for environmental issues)

Budget and financing (consultative meetings between TAWIRI and NCAA)

1. Partly from MNRP (BHWI and NCA-MNR Sub Components)
2. And other sources including NINA and TAWIRI
3. NCA-MNR Sub Component + other sources from within NCAA

Meetings to be organized by TAWIRI and NCAA under the technical support of NINA

1. Present inception report (Concept paper)
2. Inform the stakeholders on the matter
3. Obtain additional inputs

The methodological preparation will be done as soon as possible, actual implementation of the EIA planned in July – October 2005/2006. It is important to integrate inputs from the EIA work with the revision process of the NCA – GMP.

Suggestions/recommendations for ecological aspects

1. To get an overview of the existing literature relevant for the topics
2. To get an overview of ongoing projects in the crater relevant for the topics
3. Endangered species and carnivores as VECs can be combined together during studies of the effect of vehicles o n animals (by using the distance approach we can detect whether animals are responding to the road or not). This will be cheaper than using GPS collars
4. The monitoring of the habitat can be done during execution of the above study. The survey team can sample water at predefined sampling sites along the transect line while doing the transect on animal studies
5. There should be a close contact with NCAA, so that they can support financially the EIA studies

6. It is important to know or earmark what will be the output for these studies, their usefulness to NCAA, so the studies have to be strategic

Expected outputs

1. Animal avoidance of the road can be detected in time and space
2. Variation in water quality can be linked to influx of tourists
3. Density of species can be tract on a monthly/yearly basis
4. This information can be used to make recommendation on tourist activities
5. The monitoring activities should be carried forward by NCAA

3.3 Further work

The recommendations from the Karatu scoping workshop and from the Trondheim meeting were the fundament for the EIA work plan (see chapter 4). TAWIRI and NCAA need to discuss the proposed plan and come to an agreement, including the funding issues. The revised and agreed plan will act as the Terms of Reference for the EIA.

Figure 6. *Rhinos are among the most threatened species in the crater - included in the VEC Endangered species (photo: Jørn Thomassen).*

4 Part IV. Proposed work plan for the EIA-work in 2005

4.1 Introduction

Based on the above mentioned recommendations, a working group from NINA (consisting of Bjørn Petter Kaltenborn, Sigbjørn Stokke, Grayson Mwakalebe and Jørn Thomassen) worked out a proposed annual work plan for the EIA in 2005. The plan has to be integrated with the revision process of the NCA – GMP. The focus of the EIA will be on two main issues which will be closely integrated, namely human aspects and ecological aspects.

4.2 Part A: Human aspects: Outline for an analysis of tourism issues and the Maasai community, related to environmental impact assessment

4.2.1 Objectives

To conduct a study among visitors to Ngorongoro Crater with special focus on visitor experience and satisfaction, as well as perception of environmental conditions and impacts. It will also include a qualitative study of perceptions of tourism in the Maasai community. The study will be harmonised with part A2 and B of this EIA and the output is tailored to the specific needs of the EIA in NCAA.

4.2.2 Outputs

Information on visitors experience and satisfaction to be used in the EIA and the GMP of NCA, including recommendations on mitigating measures and revision of policy framework. The survey will be reported in a technical report - a joint publication between TAWIRI, NCAA and NINA.

4.2.3 Activities

Field work and data collection
The study shall be conducted as a field based survey carried out during the dry season in 2005. Data will be collected through structured surveys administered to visitors staying at the lodges in the area. Respondents will be asked to complete the questionnaire on site. We estimate a need for approximately 500 respondents to achieve a reasonably representative sample. Data collection can be carried out by TAWIRI and NCAA staff, possibly with some assistance from staff at the lodges. The data will have considerable interest as input to marketing, so it is recommended that lodges which cooperate in the study are provided the results free of charge once the data is analysed. NINA staff will assist in designing and implementing the field study as well as analysis of the data set. Another part of the study will consist of a series of qualitative, semi-structured interviews in Maasai households focusing on the impacts (positively and negatively) of tourism development in NCAA.

Since the existing knowledge base on tourism in NCAA only includes visitation statistics (i.e. time of visit and nationalities, there is a need to obtain a basic overview of the tourism population as well as issues of particular interest to the EIA focus As the NCAA is in the process of reviewing the General Management Plan for the crater, a visitors' survey is currently being conducted. However this survey does not address the issues of particular interest to to the EIA focus, thus there is a need to address these separately. Such a survey will need to include questions on socio-demographic characteristics (age, gender, nationality, income etc.), aspects related to planning of the trip to Serengeti (sources of information, previous experience), travel characteristics, experience preferences (type and extent of experiences people seek during a trip, e.g. wildlife, culture, wilderness etc.), attitudes towards management and environmental

conditions, perceptions of impacts and environmental changes, and satisfaction with different aspects of the trip. These categories of information will be weighted somewhat differently, with most emphasis on those aspect related to social carrying capacity, i.e. the quality of the visitor experience.

Data processing:
Once the questionnaires are completed and collected, all the data will be entered into SPSS database and processed by TAWIRI in cooperation with NCAA and NINA.

4.2.4 Budget, time frame and staffing

Task	Resources	Time frame	Output	Responsible
Research design and questionnaire construction	6 man days NINA, 6 man days TAWIRI	March-April	Questionnaire and sampling design	Bjørn Kaltenborn, NINA & Lowassa, A, TAWIRI
Implementation of study in NCAA, pilot sample	3 man days NINA, 5 man days TAWIRI	April -May	Pilot test of questionnaire	TAWIRI & NCAA (assistance from NINA)
Design and implementation of Maasai household study	3 man days for NINA, 15 man days for TAWIRI	April – May	Qualitative data set	TAWIRI & NCAA (assistance from NINA)
Main data collection phase	25 man days 1 vehicle per diem TAWIRI staff	May – August	500 completed questionnaires	TAWIRI & NCAA
Data analysis and reporting tourism and Masai study	30 man days TAWIRI, 8 man days NINA	August - October	Technical report	TAWIRI

4.3 Part B: Ecological aspects: Outline for an analysis of vehicle impacts on endangered species, carnivores and sensitive habitats

4.3.1 Objectives

Study the impact of tourism on endangered animal species and sensitive habitats in the Ngorongoro Crater. The study will focus on large carnivores, elephants and rhinos and their reactions to variable levels of tourist influx. The quality of water reservoirs will be monitored in relation to tourism activity and precipitation. This study will be conducted in close liaison with EIA in NCAA.

4.3.2 Outputs

This study will increase present knowledge about the spatial and temporal distribution and density of target species in the Crater. Information regarding sensitive species and their repulsion (or attraction) from tourist routes in relation to tourist activity will be available. Finally, this study will increase our knowledge of water quality and in particular if it varies according to tourist activity. The study is a joint collaboration between TAWIRI, NCAA and NINA and will be reported in a technical report - a joint publication between the three institutions.

4.3.3 Activities

Field work and data collection
This study will be based on information obtained from a grid of systematically spaced lines or transects superimposed on the tourist routes in the bottom of the crater. All information regarding density, repulsion and water quality will be achieved by driving along these transects. Each

transect will have a length of 1 km and they will be spaced by intervals of 1 km. All transects will be permanently "marked" by recording GPS-positions of their start- and end points. All sampling of data is conducted by the use of a pickup that travel along transects with two observers standing at the backside. The observer standing at the right hand side at the back of the pickup cover a sector of 180 degrees to the right side whereas the other observer cover the left-hand side in the same manner. When an object is spotted, the vehicle is halted, and the observer immediately record the distance to it with a rangefinder. Then the angle of the road and the angle of the straight line between the observers and the object are measured, relative to true north, with the rangefinder's internal compass or a conventional one. Density estimates per species at particular sites and their comparable change of responses to tourist vehicles can then be computed and visualised by the use of the recorded information. Water quality samples will be collected during transect-driving according to descriptions in Dr. Emmanuel Gereta's PhD-theses (thus, comparisons can be made if requested).

Transects should at least be surveyed 4 times a year and during each survey transects should be repeated 4 to 5 times. A pickup with driver and two experienced observers are needed to complete the survey. Several staff-members from TAWIRI have received training in transect driving and should be obvious candidates for this study. One vehicle, two binoculars, one handheld GPS, a rangefinder (covering the range 0 – 1000 m.) and a compass to record direction relative to true north are needed to complete the study. It is important that data sampling is synchronised with peaks and troughs of tourist influx. Hence, information on this issue from NCAA staff is critical for the applicability of the outcome. Data collection can be done by TAWIRI and NCAA staff. NINA staff will act as consultants during the study.

Data analyses
All data will be entered into an excel worksheet after each survey period. Data will be exported from excel in proper format into the Distance software for detailed analyses of transect information regarding animal densities, responses to tourist influx levels and distribution of species. Visual FoxPro will be used to manipulate data and to perform special statistical tasks. Data processing should be executed by TAWIRI staff in liaison with NCAA and with NINA as consultant. Water samples will be analysed by Prof. Yunus Mgaya of the Univeristy of DSM in collaboration with Dr. Emmanuel Gereta of TANAPA.

4.3.4 Budget, time frame and staffing

Task	Resources	Time frame	Output	Responsible
Study design	6 man days NINA, 6 man days TAWIRI	March - April	Transect locations and length, forms for data sampling, water sampling sites	Sigbjørn Stokke NINA, Grayson Mwakalebe TAWIRI, Eivin Røskaft, NTNU
Implementation of survey	15 man days TAWIRI (NCAA), 3 man days NINA	April - May	Adjustment of methodology	TAWIRI, NCAA, consultancy from NINA/NTNU
Data collection, 4 main surveys a 4-5 days	48-60 man days TAWIRI (NCAA), 1 vehicle all time,	May – (November)	Raw data	TAWIRI, NCAA
Data analysis and reporting	30 man days TAWIRI, 16 man days NINA	November - December	Report and suggestions for management	TAWIRI, consultancy from NINA/NTNU and Emmanuel Gereta, TANAPA

4.4 Part C: Synthesis and preparation of Environmental Impact Statement

4.4.1 Objectives

To conduct an EIA in the Ngorongoro crater by combining the results from the studies on the Human aspects (Maasai community and tourism issues) and on the Ecological aspects (endangered species, carnivores and sensitive habitats) in connection with vehicle congestion in the Ngorongoro crater.

To increase the capability of TAWIRI to conduct Environmental Impact Assessments, including project planning and management, application and proposal writing and network planning and management.

4.4.2 Outputs

An Environmental Impact Statement on impacts from vehicle congestion on the Maasai community, the tourist industry and on prioritised ecological issues in the Ngorongoro crater and the surroundings. Important outputs are well-founded recommendations on further investigations, mitigating measures and other management actions to achieve a sustainable management of the NCA. The study will be reported as an EIS - a joint publication between TAWIRI, NCAA and NINA.

Selected staff of TAWIRI trained in project management and EIA.

4.4.3 Activities

Project planning and management
The Environmental Impact Assessment work will consist of several tasks associated with the accomplishment of the EIA and with capacity building of TAWIRI. The most important are:

- Prepare a work plan for the study including an economic plan. The work plan will be based on the scoping report, discussions with NCAA and TAWIRI and include important milestones, activities and reporting routines.
- Staffing of the project including necessary personnel outside TAWIRI
- Establishing a project coordinating group consisting of central personnel from TAWIRI and NCAA, and prepare a mandate for the group.
- Seeking for additional funding if necessary (a project proposal writing course will be conducted for TAWIRI staff). NCAA and the tourism industry should be relevant in this connection
- Reporting project activities according to agreed reporting plan
- Informing important stakeholders on project activities and the rationale for the EIA study
- Preparing a dissemination plan to be used under and after the EIA study
- Writing the Environmental Impact Statement

Data processing
The results from project A and B will be used together with other relevant information to assess the likely impacts from the tourist congestion in the crater. In order to rank and assess the impacts, the project will seek an interdisciplinary approach and valuing the impacts along three scales: time, space and perturbation magnitude.

4.4.4 Budget, time frame and staffing

Task	Resources	Time frame	Output	Responsible
Prepare a work plan	5 man days, NINA, 10 man days TAWIRI	January - February	Work plan document	Bjørn Kaltenborn, NINA Julius Keyyu, TAWIRI
Staffing of the project	2 man days, TAWIRI	February		Julius Keyyu, TAWIRI
Establish a project coordinating group	2 man days, TAWIRI	February	Written mandate	Julius Keyyu; TAWIRI
Seek for additional funding	5 man days, NINA 10 man days, TAWIRI	February - March	Applications and funding	Jørn Thomassen, NINA; Julius Keyyu, TAWIRI
Report project activities	3 man days, NINA 10 man days, TAWIRI	2005	Progress reports	Jørn Thomassen, NINA, EIA responsible, TAWIRI Project A responsible, TAWIRI Project B responsible, TAWIRI
Inform important stakeholders	5 man days, TAWIRI	April October	Better understanding of the project	EIA responsible, TAWIRI
Prepare a dissemination plan	1 man day, NINA 2 man days, TAWIRI	May	Better understanding of the NCA management	Jørn Thomassen, NINA EIA responsible, TAWIRI
Write the EIS	15 man days, NINA 30 man days, TAWIRI	November - December	EIS report	Jørn Thomassen, NINA EIA responsible, TAWIRI

4.5 Terms of Reference and annual work plan for the EIA study

The Terms of Reference for the EIA study will be based on the above proposed 2005 annual work plan and will be presented as a separate document later when the final clarifications and agreements is done.

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6 Annexes

Annex 6.1 is a documentation of the results from the workshop. Annex 6.2 is a summary of the presentations given at the workshop, only minor corrections have been done to avoid misunderstandings. Notes from a site visit at the Sopa Lodge can be found in annex 6.3, and the tentative workshop programme in annex 6.4.

6.1 Report forms from the group works at the Karatu scoping workshop

6.1.1 Group work 1 – Impact factors

Group no. 1

No.	Impact factor	Priority
1	Heavy traffic	1
2	Pollution	4
3	Vehicle disturbances	2
4	Off road driving	3

Explanation for impact factors given priority (use additional sheets if necessary)

1. Heavy traffic: dust, change of animal behaviours
2. Vehicle disturbances: Infant security jeopardised
3. Off road driving: soil erosion, reduction of vegetation cover
4. Pollution: Emission from vehicles, oil spills due to breakdown of cars, etc, noise, wastes from tourists

Group no. 2

No.	Impact factor	Priority
1	Disturbance of vehicles	1
2	Over use of road network	2
3	Off-road driving	7
4	Increased maintenance of infrastructure	6
5	Spread of Zoonotic diseases	5
6	Improved local and national economies	4
7	Tourists satisfaction and affection is reduced	3
8	Increased pollution	8

Explanation for impact factors given priority (use additional sheets if necessary)

1. Change in animals behaviour
   - Animals become tame or may run away for shy animals like rhino, cheetahs and leopards
   - Affect feeding, hunting and mating
   - Migratory routes
   - Flight distance
   - Impairment of territoriality
2. Soil compactness and erosion
3. Destruction of vegetation
4. Road maintenance cost and tourists facilities in the crater increases
5. Congestion of vehicles at picnic sites with limited facilities such toilets may lead to people not complying with hygienic rules and regulations.
6. More vehicles in the crater correlates positively with increase in revenue due crater fees
7. Congestion of vehicles to an attracting object at a particular time will bore other at the periphery
8. Emission from vehicles exhaust leads to air pollution and engine sounds cause noise pollution

Group no. 3

No.	Impact factor	Priority
1	Diseases	4
2	Off road driving	2
3	Road destruction	5
4	Pollution	3
5	Disturbance	1
6	Maasai Culture	7
7	Invasive species	6

Explanation for impact factors given priority (use additional sheets if necessary)

- Habitat destruction and biodiversity loss

- Animals and tourists disturbance – alter animal behaviour and poor visitors experience
- Increased exhaust gases
- Chances of zoonoses
- Mortality and mobility levels
- Introduction of new species and suppression of indigenous species
- Vehicle volume destroy roads
- Increases traffics increased maintenance costs
- Raise economic expectation of the Maasai community

6.1.2 Group work 2 – Valued Ecosystem Components (VECs)

Group no. 1

No.	Assessed Valued Ecosystem Components (VEC) - name	Priority
1	Rhino	3
2	Carnivores	4
3	Scenic beauty of the crater	1
4	Local and National economy	7
5	Maasai community	8
6	Employment	9
7	Herbivores	4
8	Tourism industry	6
9	Tourists	5
10	Biodiversity of the crater	2

Yes: Explanation for VECs given priority (use additional sheets if necessary)

1. Scenic beauty of the crater: The unique natural of the crater is itself an attractive and a very rare phenomenon in the world.
2. Biodiversity of the crater: A wide variety of flora and fauna that maintains the ecological functioning of the area.
3. Rhino: The only area where free ranging rhinos are found in huge concentration in Tanzania. Rhino is listed in the Appendix I of CITES
4. Carnivores and Herbivores: Black manned lions, large groups of buffaloes and wildebeests, etc.
5. Tourists: Important component in the tourism industry.
6. Tourism industry: Generation of revenues to all stakeholders. Promotes peace, stability and friendship among nations.
7. Local and national economy: Growth of satellite settlements around the conservation area e.g. Karatu; and contribution of revenue to GDP through tax.
8. Maasai community: The principal stakeholders of the NCA and the no.1 conservators of the crater.
9. Employment: Employees of NCAA, Tourism industries including the hotels, tours and tour operators, etc.

Group no. 2

No.	Assessed Valued Ecosystem Component (VEC) - name	Priority
1	Endangered species (Black rhino, Elephant, cheetahs)	1
2	Carnivores- lions, leopards, spotted hyaenas	2
3	Lake Magadi	3
4	Ngoitoktok Spring	4
5	Lerai forest	5
6	Herbivores	6
7	Tourists	7
8	Grassland	8
9	Maasai livestock	9
10	NCAA	10

Explanation for VECs given priority (use additional sheets if necessary)

1. They are under CITES list of endangered species as such recognised internationally and also they are beautiful to see.
2. They are tourist attractions if something wrong happen to their population numbers, it will affect tourism in the Crater
3. Hot spot where source of necessary minerals vital for animal health.
4. Fresh water necessary for drinking for wildlife as well as tourist use. A home for fresh water fishes.
5. Provide source of forages for elephants. Water catchment area. Provision of shade for wildlife.
6. Herbivores are sources of tourist attraction and source of food for carnivores.
7. Tourists bring in money, employment and different culture.
8. Food for herbivores, habitats to many creatures, attractive (especially during rain season) soil cover and camouflage for most predators.

9. Increase of which exceeds carrying capacity and hence headache to Management. Exchange of diseases between livestock and wild animals. 10. Without them nothing exists

Group no. 3

No.	Assessed Valued Ecosystem Component (VEC) - name	Priority
1	Sensitive habitats	1
2	Lodges and campsites	7
3	Catchment areas	3
4	Tourism	6
5	Sensitive animals species	2
6	Migratory route	5
7	Maasai community	8
8	Ecosystem health	4

Explanation for VECs given priority (use additional sheets if necessary)

1. Ngoitoktok spring, Lake Makat, crater plains and Lerai forest are important for food, shelter water and refugee.
2. Rhino, cheetah, lions, leopards etc are rare, few and sensitive to disturbance hence attract vehicle congestion.
3. Northern Highland Forest Reserve is a major source of water to the crater and may cause siltation if mishandled.
4. Diseases, invaders and pollution affects animals and people's health.
5. Migration reduces chances of inbreeding, improving energy flow and nutrient cycling.
6. (a) Mass tourism has a negative impact to the environment; (b) source of income to Tour Operators, Lodges, Maasai community and NCAA
7. Improper waste disposal, noise etc results to pollution.
8. Source of income and altered social – cultural values

6.1.3 Group work 3 – Schematic Flow Charts

The Flow Charts are presented in part II, figure 5, in this report

6.1.4 Group work 4 and 5 – Impact hypotheses

Group no.: 1

VEC: Carnivores	**IH no: 1**
Impact hypothesis: Increased congestion of tourist vehicles reduces hunting success per unit effort spent by carnivores	**Impact factor(s):** Disturbance
Explanation: Prey species have got specific flight distance for every species of carnivores as well as for vehicles. Addition of these two factors may increase the vigilance of prey species which may affect the hunting success of a predator. However, such congestion of vehicles may draw attention of a predator that was in a hunting mood and thus loose the track.	
Category: C	
Rationale:. Impact of tourist vehicle congestion on the hunting success of the carnivore in NCA is not currently known.	
Recommended research: Data can be obtained from field observation during the hours of congestion and time where there are not congestions i.e. only researcher and anti-poaching unit vehicles are present. The data can be compared to other areas where the congestions are very high i.e. Maasai Mara Natural Reserve and areas where the congestions are low i.e. Western Serengeti	
Recommended monitoring and/or surveys: Long term monitoring of flight distances of different species of herbivores in the crater and outside the crater is recommended.	
Recommended management actions: Control of congestions is highly recommended	
Recommended mitigating measures: Training of tour operators/drivers on the possible effect of congestion of vehicle on wildlife behaviour. Increase penalty for negligence one.	
Literature cited:	

Group no.: 1

VEC: Carnivores	**IH no:2**
Impact hypothesis: Spread of zoonotic diseases can be influenced by congestion of tourist vehicles at the picnic sites and thus affect carnivores direct and indirect.	**Impact factor(s):** Spread of diseases

Explanation: Facilities at the picnic sites can only accommodate a certain number of tourists at a given time. Increase in numbers of tourist per unit time at these sites may results in improper use of these facilities and some who are negligence may decide not to wait and then go around/ outside the toilets for instance, and may pollute the environment. This can result in the spread of zoonotic diseases that may then affect carnivores direct by contracting the disease or indirect by scavenging the affected carcass.
Category: C
Rationale: Enough information on how congestion of vehicles at picnic sites and how that may influence the spread of zoonotic diseases that in turn affect the carnivore population is lacking in literatures as well as in the NCA.
Recommended research: Data can be obtained from field observation at these picnic sites during the hours of congestion to monitor if the facilities are properly used.
Recommended monitoring and/or surveys: Long term monitoring on how the tourist facilities are used at these picnic sites are recommended.
Recommended management actions: Control of congestions at one picnic site is highly recommended
Recommended mitigating measures: Educating tour operators/drivers and tourists on proper use of tourist facilities provided at different places in the crater. Negligence individuals should be highly penalized
Literature cited:

Group no.: 1

VEC: Carnivores	**IH no:3**
Impact hypothesis: Congestion of tourist vehicles at a kill may elevate the feeding time of the carnivores increasing inter and intraspecific competition.	**Impact factor(s):** Disturbance
Explanation: A carnivore set off hunting if it feels to be hungry. This activity needs a lot of energy which have to be compensated when the hunting is successful. Soon after hunting success animal needs to eat very quickly to avoid inter and intra specific competition. The coming vehicle will draw attention of the feeding carnivores as such it will stop feeding for some time. If this continue where at every short period of time , a new vehicle comes, the necessary time required for the animals to feed elevated and this may loss of carcass due to competition	
Category: C	
Rationale: Currently the information on the effect of congestions of vehicles at a kill and how this influence the feeding time of a carnivore in the crater is not known, although Kleptoparatism competition between spotted hyenas and lions in the crater has been documented.	
Recommended research: Data can be obtained from field observation at the kill where time taken when the animal start feeding and also breaks due to coming vehicles will be recorded. The time when the animal finish eating, or crowded by other carnivores will also be recorded.	
Recommended monitoring and/or surveys:	
Recommended management actions: Control of congestions at animal kill is highly recommended	
Recommended mitigating measures: Educating tour operators/drivers and tourists to avoid disturbing the feeding carnivores should be emphasized. Negligence individuals should be highly penalized	
Literature cited:	

Group no.: 1

VEC: Herbivores	**IH no: 4**
Impact hypothesis: Spread of zoonotic diseases can be influenced by congestion of tourist vehicles at the picnic sites and thus affect herbivores.	**Impact factor(s):** Spread of diseases
Explanation: Facilities at the picnic sites can only accommodate a certain number of tourists at a given time. Increase in numbers of tourist per unit time at these sites may results in improper use of these facilities and some who are negligence may decide not to wait and then go around/ outside the toilets for instance, and may pollute the environment. This can result in the spread of zoonotic diseases which may then affect herbivores direct by contracting the disease.	
Category: C	
Rationale: Enough information on how congestion of vehicles at picnic sites and how that may influence the spread of zoonotic diseases that in turn affect the herbivore populations is lacking in literatures as well as in the NCA.	
Recommended research: Data can be obtained from field observation at these picnic sites during the hours of congestion to monitor if the facilities are properly used.	
Recommended monitoring and/or surveys: Long term monitoring on how the tourist facilities are used at these picnic sites are recommended.	
Recommended management actions: Control of congestions at one picnic site is highly recommended	
Recommended mitigating measures: Educating tour operators/drivers and tourists on proper use of tourist facilities provided at different places in the crater. Negligence individuals should be highly penalized	

Group no.: 1	
VEC: Endangered species	**IH no:5**
Impact hypothesis: Congestion of tourist vehicles may affect the activity pattern of endangered species.	**Impact factor(s):** Disturbance
Explanation: Endangered species like rhino are very rare and difficult to be seen. When the rhino, for instance, appear to graze close to tourist route, every tourist vehicle will come close to be able to see the rare animal. In most cases these rare species are very shy as such they will tend to move away and will not continue grazing in the area. This may force the animal to change its activity pattern.	
Category: C	
Rationale: Enough information on how congestion of vehicles at the presence of endangered species affects the activity pattern of the endangered species in the crater is currently lacking in the NCA.	
Recommended research: Data can be obtained from field observation at the presence of these endangered species on how the animal react in the presence congested vehicles.	
Recommended monitoring and/or surveys: Long term monitoring on how the endangered species react with the increase of tourist vehicles.	
Recommended management actions: Control of congestions of tourist vehicle close to endangered species	
Recommended mitigating measures: Educating tour operators/drivers and tourists on the possible change in endangered species behaviour as a result of congestion of tourist vehicles. Negligence individuals should be highly penalized	
Literature cited:	

Group no.: Maasai	
VEC: Maasai community	**IH no:1**
Impact hypothesis: Traffic overuse in the crater will change the socio-cultural values of the Maasai community.	**Impact factor(s):** Traffic overuse
Explanation: Tourist congestion increases socio-cultural interaction between the Maasai community and the Tourists.	
Category: B	
Rationale: This problem is already documented therefore needs management actions. Additional surveys needed to further monitor the situation**.**	
Recommended research: Impact of tourist congestion on the socio-cultural values of the Maasai community.	
Recommended monitoring and/or surveys: Compare socio-cultural values between Maasais in close interaction and not interacting with tourists.	
Recommended management actions:	
Recommended mitigating measures:	
Literature cited: Paul Fisoo (2001) Socio-cultural impact of tourism: Case study of Ngorongoro Conservation Area. Diploma Dissertation, CAWM, Mweka.	

Group no.: Maasai	
VEC: Maasai community	**IH no: 2**
Impact hypothesis: Invasion of exotic plants will cause change in land use patterns among the Maasai community.	**Impact factor(s):** Invasive species
Explanation: Large scale spread of introduced unpalatable plant (e.g. *Getula* & *Bidens*) species will force the Maasai community to abandon traditional grazing lands in search of alternatives.	
Category: D	
Rationale: Exotic plants may spread at low rate necessitating long time to monitor, hence costly.	
Recommended research: Assessment of the status of exotic plant species in NCA**.**	
Recommended monitoring and/or surveys: Establish small scale experimental plots for monitoring the spread of selected exotic plant species.	
Recommended management actions: Establish a program for controlling introduction of exotic plants into NCA.	
Recommended mitigating measures: Strict inspection of vehicles entering NCA for seeds and cuttings. Morrum for road construction/maintenance should be excavated from within NCA.	
Literature cited: NCAA Proceedings on Rhino Conservation Workshop (2003)	

Group no.: Maasai	
VEC: Maasai community	**IH no: 3**
Impact hypothesis: Increased livestock mortality will reduce income of the Maasai community	**Impact factor(s):** Diseases
Explanation: Diseases may result into mass mortality of Maasai livestock.	
Category: C	
Rationale: Livelihood of Maasai community depends mainly on livestock. It easy to collect data.	

Recommended research: Impact of mass livestock mortality on the income of the Maasai community.
Recommended monitoring and/or surveys: Compare the income between households affected and not affected by disease-related massive loss of livestock within NCA.
Recommended management actions:
Recommended mitigating measures:
Literature cited:

Group no.: 1

VEC: TOURISM	**IH no: 1**
Impact hypothesis: Increased traffic volume will cause destruction of environment in the crater and ruin the tourism attractions leading to reduction in number of tourists	**Impact factor(s):** Traffic
Explanation: The current traffic volumes (250 vehicles per day) is large, and have potential for releasing emissions (dust and fumes), high rate of road destruction, off road drive, generate noise, disturb animals and increase in number of accidents.	
Category: C	
Rationale: Data to ascertain the level of the emissions, traffic carrying capacity, noise, the magnitude of disturbance, off road drive incidences and rate of accidents is lacking.	
Recommended research: • Traffic carrying capacity of the crater • Measurement of emission and noise levels against WHO standards • Effect of habitat destruction due to off road drive • Changes in animals behaviour due to continued disturbances • Effect of increased traffic volume on social aspects (economic issues, cultural issues, tourist satisfaction) • Conduct case studies on lessons learned from similar cases	
Recommended monitoring: • Emission and noise levels against WHO standards • Trend of traffic volume • Fluctuation of income to NCAA, Tour operators, Hotels and lodge, Local communities • Current status of tourist attractions **Surveys:** • Appropriate roads network in the crater • Changes in cultural aspects and values • Level of tourist satisfaction • Loss of critical habitat and species • Change in animals behaviour • Identification of other tourist attractions	
Recommended management actions: • Control traffic volume • Review rules and regulations • Adopt and apply best practices from lessons learned from similar situations • Develop and deliver awareness program on the effect of increased traffic volume to tourists and the public	
Recommended mitigating measures: • Introduce booking system to limit number of vehicle for crater game drive to reduce traffic volume and emissions • Diversify and promote other tourism attractions to reduce congestion (high rate of road destruction, off road drive, generate noise, disturb animals and increase in number of accidents)	
Literature cited:	

Group no.: 1

VEC: TOURISM	**IH no: 2**
Impact hypothesis: The outbreak of diseases will lead to decline in number of tourists in the crater	**Impact factor(s):** Spread of diseases
Explanation: • Some tourists may have diseases that can easily be transferred to other tourist through contact or air. • There is a possibility of outbreak of communicable diseases between human beings and animals (TB, Diarrhea, somatic diseases etc) • The coexistence of livestock and wild animals in the crater creates good environment for transfer of diseases between wild and tamed animals (eg. Canine distemper, foot and mouth disease).	
Category: C	

Rationale: Currently there is no enough information on types of diseases and the rate of infection.
Recommended research: • Type of communicable diseases that are likely to happen • Potential sources and pathways of diseases • Impact of diseases on tourism in the crater
Recommended monitoring • Rate of disease outbreak • Quantity of disease vectors **Surveys:** • Identification of prevailing diseases in the region.
Recommended management actions: • Strengthen veterinary services at NCA • Enforce the game viewing rule that defines distance of 200m between human and wild animals • Enforce the rule that restricts tourists to remain in vehicles • Develop and deliver awareness program on disease management to tourists and the public • Establish trust fund for disease control
Recommended mitigating measures: • Scheduling of livestock movement in the crater • Train staff on basic wildlife health and diseases
Literature cited:

Group no.: 1

VEC: TOURISM	**IH no: 3**
Impact hypothesis: Appropriate policy framework sets enabling environment for quality tourism	**Impact factor(s):** Policy
Explanation: Tourism development depends on the quality of various policies including Wildlife management, Environmental, Investment, Tourism and macro-economic policies.	
Category: C	
Rationale: Most of the tourism related policies in Tanzania are not well coordinated as such there are a number of overlapping areas and gaps that need to be addressed through policy reviews.	
Recommended research: • Pertinent policy issues • Identification of gaps and overlapping areas	
Recommended monitoring: Policy implementation **Surveys:** Conduct study on appropriate policy framework	
Recommended management actions: Formulate investment guidelines to define permitting criteria and environmental standards for NCA	
Recommended mitigating measures:	
Literature cited:	

Group no.: 3

VEC: ECOSYSTEM HEALTH	**IH no: 1**
Impact hypothesis: Pollution from increased traffic will deter plant photosynthesis and therefore weaken ecosystem functioning causing tourist dissatisfaction.	**Impact factor(s):** Pollution
Explanation: Dust and emissions from vehicles cover leaf surfaces leading to blockage of leaf pores and chlorophyll important for photosynthesis. Impaired photosynthesis will lead to reduction of range cover causing loss of biodiversity the important to tourist attraction.	
Category: C	
Rationale: Data can be collected to determine the effect of dusts and emissions form vehicles to plants.	
Recommended research: Determination of the effect of dusts and emissions from vehicles on photosynthesis.	
Recommended monitoring and/or surveys: Monitoring of numbers and distribution of vehicles in the crater in order to assess traffic emission and dust on the attraction points.	
Recommended management actions: - NCAA to diversify tourist attraction points. - NCAA should find ways of reducing vehicles and enforced laws on speed limits in the crater.	
Recommended mitigating measures: NCAA to review the pricing system for vehicles intending to enter to creator	
Literature cited:	

Group no.: 3

VEC: ECOSYSTEM HEALTH	**IH no: 2**
Impact hypothesis: Outbreak of diseases in NCA causes wildlife mortality leading to poor ecosystem functions.	**Impact factor(s):** Diseases

Explanation: Disease explosion in protected areas do affect biodiversity negatively thus disrupting ecosystem functioning.
Category: C
Rationale: Data can be collected before and after an outbreak of disease
Recommended research: Impact of a disease outbreak on the number and distribution of wildlife.
Recommended monitoring and/or surveys: Monitoring of wildlife health should be carried out.
Recommended management actions: Reduce domestic animals - wildlife interaction.
Recommended mitigating measures: • Maasai pastoralists be educated on the importance of cattle vaccination • NCAA staff to be trained on wildlife and domestic animal health for early warming
Literature cited:

Group no.: 3

VEC: **SENSITIVE HABITATS**	**IH no: 3**
Impact hypothesis: Soil erosion will cause water bodies leading to alteration of water quality and quantity.	**Impact factor(s):** Disturbance
Explanation: Changes in water quality and quantity are associated with alteration of biodiversity and hence altering ecosystem functioning.	
Category: C	
Rationale:	
Recommended research: Impact of siltation in crater water bodies	
Recommended monitoring and/or surveys: Monitoring of water quality and quantity in space and time in the crater	
Recommended management actions: NCAA should give a priority in protection of catchment areas.	
Recommended mitigating measures: NCAA should see the possibility reducing the use of sensitive areas by tourists.	
Literature cited:	

6.1.5 Group work 6 – Work plan drafts

The work with building up work plan drafts for each VEC were started, but not finished at the work shop. The Terms of Reference and the 2005 annual work plan for the EIA study in will be presented as a separate document later.

Figure 7. *The tourism industry is the fundament for the economical income in NCA. View into the crater from Sopa lodge (photo: Jørn Thomassen).*

6.2 Presentations given at the workshop

6.2.1 Status of EIA in Tanzania

By Godlove U.J.Mwamsojo, NEMC

History of EIA Concept

- USA formulated the first National Environment Protection Act (NEPA) in 1969 following serious industrial pollution - Established EPA
- Stockholm conference on Human and Environment of 1972 - need to protect environment
- The Brundtland report on Sustainable development of 1987: - rely of health environment
- Resolution of Ministerial Conference of African States of 1995 - internalisation of EIA in legal framework of participating countries.
- RIO Conference 1992: Paragraph 17 of RIO:- EIA as an important tool in the determination of potential adverse impacts of all development projects
- More emphasise on the important of EIA during the World summit of 2002 - Johannesburg

Development Profile in Tanzania

- 1983 – NEM Act was enacted
- 1990 - Vice President's Office established
- 1992 – Division of Environment established
- 1997 – First draft of EIA guidelines and procedures proposed
- 1997 – National Environmental Policy approved
- 1997 – NEMC established EIA directorate
- 2003 – Amendments on draft EIA guidelines and procedures
- 2004 – National Environmental Management Bill
- Sectoral Policies approved after 1980s: Including Forestry, Wildlife, Industries, Fisheries, Bee-keeping, Tourism, Lands, Roads, Water etc.

Guidelines

- Developed in 1997
- Reviewed 2003
- Approved for use although not binding
- Will get legal backing when the Environment Act is operational

Steps according to guidelines

- Registration
- Screening
- Scoping
- Impact assessment (significant analysis, evaluation of alternative, mitigation measures, management and monitoring plan, Decommissioning plan)
- Reporting
- Review
- Decision making

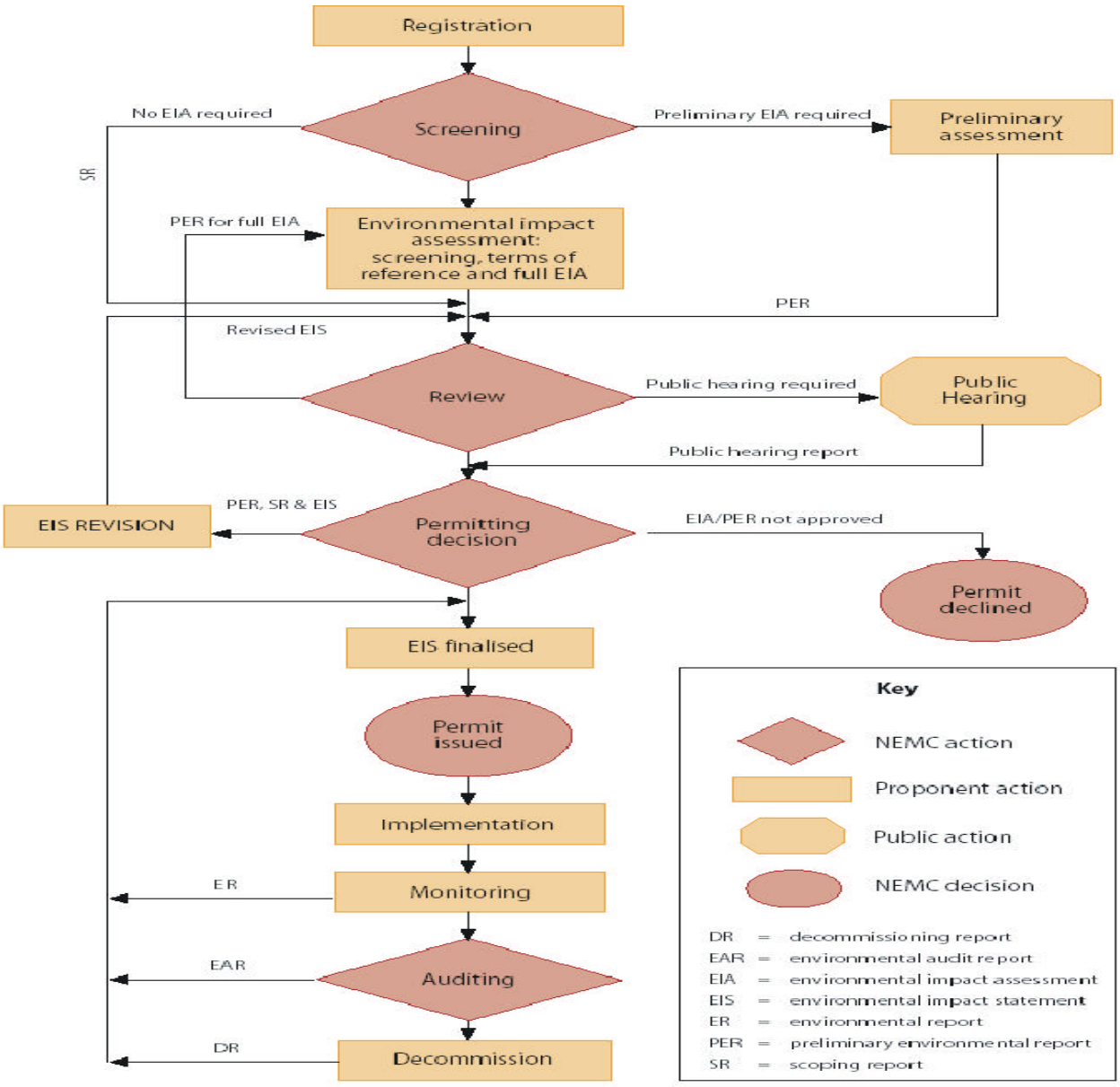
Other Guidelines

- EIA Guidelines for Road Sector - Being tested
- EIA Guidelines of National Parks
- EIA guidelines of Marine Parks and Reserves
- Guidelines for Mariculture Development
- Guidelines for Coastal Tourism
- Environmental Checklist for Agriculture, Wildlife, Water, Energy, Tourism,

Legal framework

- Among Acts that support EIA in Tanzania include
  - NEM Act of 1983 established NEMC
  - Mining regulations 1998
  - Fisheries Act 2003
  - Forestry Act 2002
  - Marine Parks and Reserves Act 1994

The EIA process in Tanzania



Environment Management Bill 2004

- First reading 4 August 2004.
- Public review 11 Oct 2004,
- Second reading 28 Oct. 2004
- Part 81 - EIA shall be mandatory to all projects with adverse impacts

- Para 191 - Penalty of between Tshs. 50,000 and 50,000,000 or imprisonment of between 3 months and 7 years or both.

EIA Practices in Tanzania

- EIA is a relatively new concept in Tanzania
- The Development of EIA system is still at an infant stage
- However awareness on the importance of EIA is growing fast
- A number of EIA studies have been undertaken during the past 20 years mainly to fulfil donor requirements.
- Donor driven – pressure from lending governments or financial institutions
- Started in the 1980s
- More studies in 1990s
- 21st Century – EIA has increasingly become a normal inclusion in a list of permission applications by developers

EIA Performance

- Good improvement – quality
- Local EIA courses including university/colleges curricula- available
- NEMC prepared EIA training Manual - about 15 trainers recruited locally
- Institutionalisation of EIA at local government level - by NEMC
- No. of Experts- increasing
- Knowledge base – expanding – to include GIS and modelling methods - UCLAS
- Association with foreign consultants - AIAEA, IAIA, CIANEA
- Number of development proposal for which EIA have been undertaken is increasing very fast

Constraints

- Lack of legislation requiring mandatory EIA – partly solved
- Qualified and experienced practitioners still few
- Rush to the profession – resulting in poor quality job
- Low level of understanding on part of developers and general public
- Lack of clear representation at local government level
- Less remunerations
- inadequate environmental standards
- Still EIA reports lie on the shelves – not yet adequately applied
- The affected community is informed not involved - scoping exercise not effective
- Inadequate information/data (including their quality) – lead to poor reports
- Limitations of knowledge on EIA methods
- NEMC capacity to facilitate the process - review is still weak

Future Perspective

- The new legislation will make EIA process more vigilant
- Environmental standards, procedures and guidelines to be in place
- More people to be aware
- More experts gaining experience
- Need for local association and forum on EIA issues
- More demand from NEMC in terms of quality

6.2.2 Capacity building NINA – TAWIRI and EIA

By Jørn Thomassen, NINA

Environmental Impact Assessment - training

- TAWIRI staff trained in EIA by June 2002 (A1)
  - Conducted in April 2002 (5 days course); Case: AEAM approach on tourism in Serengeti
  - Report in December 2003
  - Report in three sections; A: theoretical platform, B: AEAM step by step, C: results from the group works

A possible way ahead: "Learning by doing"

- Collaborating institutions: TAWIRI, NCAA and NINA
- Idea: Use one specific EIA project as a basis for capacity building.
  - Connect necessary training packages to the EIA work.
  - Include several of the main activities from the TAWIRI-NINA five year capacity building programme.
  - In principle: carry out the EIA work (and the training) within the economical frames given in the capacity building programme (NORAD funds).
  - Seek additional funding when necessary.

The purpose of conducting an EIA in NCA:

- Part of the capacity building efforts between NINA and TAWIRI
- EIA is part of the capacity building
- An EIA is a project with all its components - project steering and management
- NCAA will get an EIA - with a possible objective:

Objective: To establish a sound fundament for a sustainable management of the NCA based on the Ecosystem Approach, which includes:

- combination of economy and ecology
- conservation and management within the limits of their functioning
- objectives for ecosystem management should be set for the long term
- changes is part of the ecosystem
- seek the balance of conservation and use of biological diversity
- seek and use all relevant sort of information
- include all relevant sectors of society and scientific disciplines

6.2.3 EIA of vehicle congestion in the Ngorongoro crater, Tanzania - scoping by use of AEAM

By Jørn Thomassen, NINA

What is an EIA?

- According to the International Association for Impact Assessment (IAIA 1999), an EIA can be defined as: "The process of identifying, evaluating and mitigating the biophysical, social and other relevant effects of development proposals prior to major decisions beeing taken and commitments made".

Essential in the EIA process is scoping:

- " To identify the issues and impacts that are likely to be important and to establish Terms of Reference for EIA" (IAIA 1999)

The EIA process:

- Project description

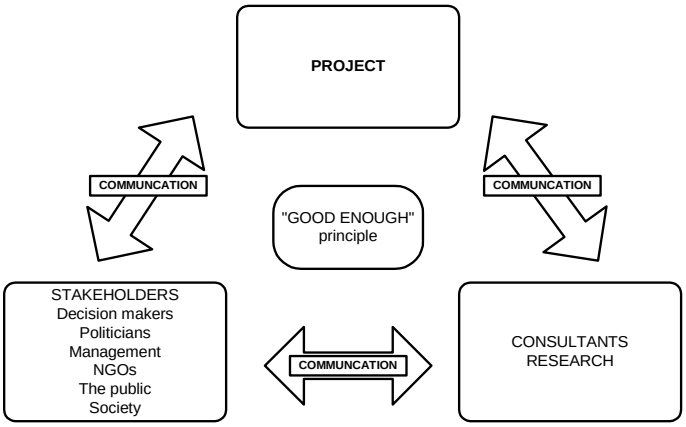
- Screening
- Various checklists (WB, EU); EU: Annex I: EIA has to be carried out; Annex II: EIA to be assessed according to a defined set of criteria
- Scoping
- Baseline information
- The EIA work
- EIA report review
- Review routines vary from country to country. Norway: public hearing
- EIS report review
- EU: EIS review checklist. Norway: public hearing
- Implementation and Monitoring and evaluation

Challenges in EIA
- A process situated in the area between politics, management and research - and the public
- Stakeholders, sometimes with antagonistic view and interests
- Limited resources in terms of money
- Short time limits
- Information available limited
- This calls for:
  - Communication and a defined process
  - An “intelligent simplification” of a complex problem
  - Prioritisation
  - Interdisciplinary approach

Scoping, practise
- Guidelines and check lists (ex. WB, EU ++)
- Matrixes (ex. Leopold matrix: 88 environmental parameters along one axis and 100 different project activities along the other, giving a total of 8800 cells. For each combination of an environmental parameter and a project activity 2 numbers between 1 (lowest) and 10 (highest) are assessed, one for the magnitude and one for the importance!
- GIS based scoping (layers of thematic maps).
- Expert based scoping
- Participatory processes (AEAM, LFA ++), where different stakeholders meet to conduct the scoping
- A combination of these

Scoping, requests
- Different stakeholders should participate
- Clear guidelines for the accomplishment of the scoping process
- Conducted as early as possible in the EIA
- Clear documentation of the process and all decisions made (scoping report)
- Transparent process which is possible to re-examine
- Basis for resource allocation in the EIA (time, economy and man-hours)
- Basis for the Terms of Reference (ToR)
- Adaptive with possibilities to intercept changes and adjustments in the project throughout the project life cycle
- There is a growing recognition and acceptance that the efficiency and the quality of the EIA, largely depends on a good and focused scoping process

Communication:



What is the AEAM - method, or approach?

- Adaptive Environmental Assessment and Management (Holling 1978)
- A participatory and systematic process in the EIA-work, with the objective to:
  - ensure a sound scoping process and give a solid fundament for the further EIA work
  - identify the most important impact factors, based on the different project activities
  - select the most important components (Valued Ecosystem Components (VECs)) the EIA work shall focus on, based on decision making and the “good enough” principle
  - identify potential impacts (Schematic Flow Charts and Impact Hypotheses) the project can have on these components
  - recommend research, investigations and/or mitigating measures as a consequence of these impacts

- The AEAM - method is further characterised by:

  - A strong priority on every step in the process, where all choices are documented and can be controlled
  - A process based on workshops, where resource people with different interests in the project participate (multi-stakeholder approach)
  - A discipline on the workshops where the relevance for decision making and the “good enough” principle are the leading guides, and where the participants are focusing on significant environmental effects and key issues
  - A dynamic process where evaluation, further development and adjustments are key words, and where new information and knowledge concerning the potential consequences of the project can alter the focused issues

- Through this approach one can obtain:
  - Focusing on the most important and relevant issues for decision makers
  - Optimal use of resources concerning time, personnel and economy
  - Communication, interdisciplinary basis and understanding between the stakeholders
  - Conflict reduction through ownership of the project and the process
  - Scientific and qualitatively good process which is transparent, and well documented
  - Good basis for recommendations concerning research, monitoring and mitigating measures
  - Good basis for the different stakeholders to realise and understand the cost components of the EIA

From every development project a set of impact factors can be identified, described and selected

- Important with precise description of the project plans in time and space

- The description level of an impact factor will vary according to the project
- Select an operational level of the impact factor

Example to illustrate this:
- Goal: economical growth; can lead to: Lodge construction --> Increased tourism --> Increased no. of vehicles --> Increased erosion --> Habitat destruction --> Reduced no of animals --> Reduced no of tourists etc…...
- Increased disturbance --> Reduced no. of animals --> etc. etc.
- Reduced conditions for the Maasai people --> etc. etc.

Valued Ecosystem Component (VEC)
- A VEC is the focal component in the EIA and can be defined as a resource or environmental feature that:
- is important (not only economically) to a local human population, or

In this category we find features from traditional economic resources to peoples experience of nature (ex. outdoor recreation, hunting, fishing), and even the value of peoples knowing that a species or area remains intact.
- has a national or international profile, or

The value or feature of a resource or feature has to be evaluated wider than on a local perspective. That means that its value can first appear in a national or international context. This criteria should catch up areas, habitats or species included in international conventions, national parks, sanctuaries or other protected areas. Endangered species will also fall within this criteria.
- if altered from its existing status, will be important for the evaluation of environmental impacts of industrial developments or other encroachments and the focusing of administrative efforts.

This criteria covers resources (species) and features of an ordinary biological/ecological character. The traditional ecosystem approach is included in this criteria.

- A popular definition of a VEC is " a factor that gives the politicians headache if something wrong happens to it"
- A VEC is a resource or environmental feature to be focused on in the EIA work.
- The VEC is selected on the basis of political and scientific evaluation, and can be species, groups of species, processes, natural resources or "interests".
- The selection of a limited number of VECs is probably the most important and at the same time the most difficult part of focusing in the EIA-work
- The critical point in the selection is to focus on decision making, and the VEC-concept therefore should include social, political and economical qualities as well as environmental features
- Examples of VECs: Tourism industry, Tourists, Maasai community, Local employment, Wildebeest, Carnivores, Lion, Cheetah, Leopard, Herbivores (or single species), Vegetation cover, Biodiversity, Ecosystem function

A schematic flow chart is a diagram of boxes and arrows indicating the context in which the VEC appears.
- I.e what sort of impacts will affect the VEC and how.
- Every linkage should be explained in a brief text following the chart.
- Each flow chart comprises only the main components that are in direct contact with the VEC.

Impact hypothesis (IH) is a hypothesis for a potential impact from the activity on the VEC
- IH is based on the schematic flow chart
- IH shall be explained scientifically including citation of literature

- IH will form the basis for recommendations concerning research, investigations, monitoring and evaluation and management actions including mitigating measures

After the preparation of the IHs, a screening procedure is made for each IH, putting them into one of the following categories:
*A. The hypothesis is **assumed not to be valid.***
*B. The hypothesis is **valid** and already verified. Research to validate or invalidate the hypothesis is not required. Surveys, monitoring, and/or management measures can possible be recommended.*
*C. The hypothesis is **assumed to be valid**. Research, monitoring or surveys is recommended to validate or invalidate the hypothesis. Mitigating measures can be recommended if the hypothesis is proved to be valid.*
*D. The hypothesis **may be valid**, but is not worth testing for professional, logistic, economic or ethical reasons, or because it is assumed to be of minor environmental influence only or of insignificant value for decision making*.

- A standard report form is used for the evaluated IHs
- Only category B and C hypotheses are normally given priority in the assessment system (but category D hypotheses must be assessed
- Recommendations: normally will category C-hypotheses be tested by research, monitoring or other investigations
- Recommendations concerning management actions or mitigating measures are also given in the same diagram
- All decisions shall be explained and significant references for the decisions shall be given
- NB! Each IH on a separate form
- Several IHs for each VEC

Group work philosophy:
- Limited time will normally expose 90% (+/-) of important issues and arguments, and hopefully lead to an agreement on at least what are the agreements/disagreements.
- First 10 minutes: Brainstorming around the theme
- Time in between: Discussions, agreements, conclusions
- Last 15 minutes: Preparation plenary presentation

6.2.4 Tourism and conflict - a general overview

By Hanne Haaland, NINA

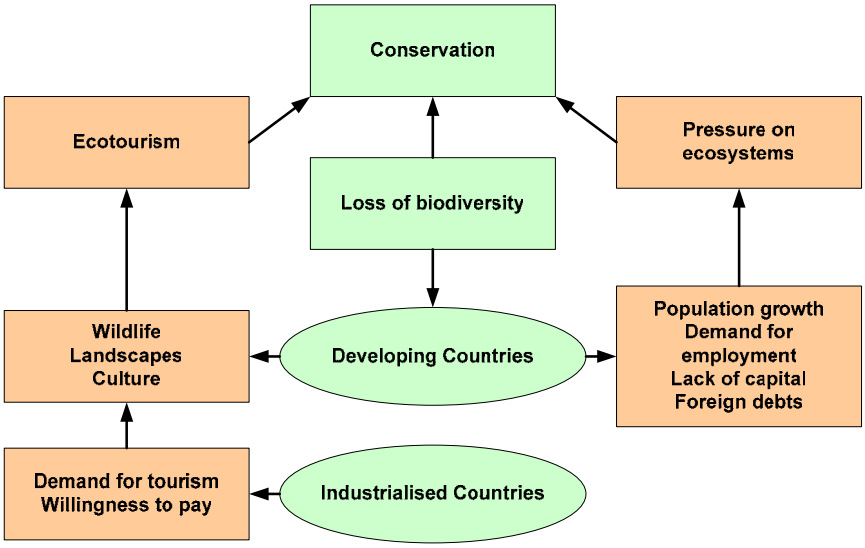
Tourism- a growing industry

- Generates 11 percent of global gross domestic product (GDP)
- Employs 200 million people
- Transports nearly 700 million international travellers per year – a figure expected to double by 2020
- Considered one of the largest, if not the largest, industries on the planet
- The world's fastest growing industry

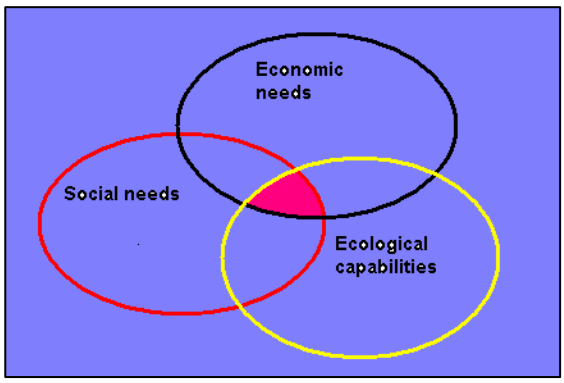
Tourism in developing countries

- Tourism growing faster in the developing world than elsewhere
- Tourism is a principal export of the 49 least-developed countries
- Between 1999 and 2000 the growth of international travel to developing countries was 94,4 %
- Africa's share in this volume is low – approximately 4 %

Biodiversity and tourism



Sustainability



Dependence on tourism

	Tourist receipts (mill. US$)	GNP per capita (US$)	Tourism receipts per resident (US$)	Tourism receipts as % of exports
Tanzania	259	120	10	41
Kenya	454	280	15	24
Thailand	7664	2740	130	14

The growth of nature based tourism
- Nature based tourism: 40 - 60 % of total tourism, 10 - 30 % annual increase
- Nature based tourism in many forms; ecotourism, nature tourism, green tourism, sustainable tourism
- Reflects a growing social concern about the quality of natural environment and effects of tourism

Tourism potential
- A common assumption that tourism generates economic growth
- Important earner of foreign exchange
- Infrastructure
- Job creation
- Tourism perceived as a panacea for rural crisis worldwide

Possible benefits from tourism:
- Poverty alleviation
- Communal development
- Cultural development
- Environmental protection and conservation

A potential for conflict inherent in tourism
Tourism impacts:
- Social
- Environmental
- Economic
- Cultural
- Political

A range of interests involved:
- National governments
- Multinational companies
- Private sector interests
- Local authorities
- Ethnic groups/interest groups
- Community interests

Potential conflict areas:
Tourism and the communities:
- Lack of or limited local involvement in tourism development
- Lack of cooperation between affected communities and tourism operators
- Limited benefit sharing
- Local loss of access to former resource base or to areas of spiritual importance
- Conflicts over land or common pool resources
- Forced removal of people for conservation and tourism purposes
- Cultural commercialization and the question of authenticity

Tourism and the local economy:

- Tourism brings increased demand for goods, services and facilities in the areas where it develops
- Increasing prices of local resources; eg land and rising foreign dominance of land markets
- Local vulnerability to factors beyond local control - eg political instability, currency fluctuations, natural disasters
- Seasonal character of jobs
- Leakage of revenue – if local people do not benefit, they will seek other alternatives

Tourism and the local environment

- Ecotourism and sustainable tourism aim to minimize negative environmental impacts- yet a potential for conflict and environmental costs:
  - Habitat changes and fragmentation
  - Disturbance of wildlife
  - Soil erosion and vegetation changes
  - Pollution
  - Technical structures, irreversible esthetical changes
  - Wilderness image
  - Different local interests concerning the use of resources (eg poaching)

Tourism destinations and the "congestion of tourists"

- General growing demand for quality products
- Tourists "voting with their feet" – seeking out destinations with positive reputation
- Differing expectations to the product; can produce conflict between

-Managers and tourists / recreationists
-between different tourists engaged in same activity
-between recreationists engaged in different activities

Reducing the potential for conflict: Tourism management, monitoring and control

- Cooperation with local communities and interests
- Ensuring local participation in projects
- Aiming for local legitimacy concerning resources use and management decisions
- Developing management plans for tourism sites
- Implementation of management plans
- Monitoring of visitors impact (environmental and social)
- Assessment of ecological and social carrying capacity – limits of acceptable change (LAC)
- Tourist carrying capacity: how many is too many?
- Conducting tourists surveys as a bases for management and area development
- Zoning of area for different uses
- Diversifying the visitor experience (eg through adding cultural aspects)

In search of the magic balance:

- Protected areas and local communities can benefit from tourism – but - Poorly managed tourism can also destroy the attractiveness of an area

6.2.5 Tourism in the Ngorongoro Crater, status, impacts, challenges and goals

Prepared by RPU of NCAA, October 2004

Introduction
The Ngorongoro Conservation Area (NCA) covers some 8292 km^2. It is situated in Ngorongoro District, in Arusha Region. The Conservation area was established in 1959 as a multiple land use area, designated with three key responsibilities:

- The Conservation of Wildlife and other natural resources
- Promotion of Tourism
- Protection of the interests of indigenous Maasai pastoralists

In 1975, Ngorongoro Conservation Area Authority was formed through Cap.413 and replaced, the Ngorongoro Conservation Unit as a parastatal organisation. Though a parastatal, Ngorongoro Conservation Area Authority still continued with its original roles and responsibilities.

It's geographical location is very unique .To the west, the area is bordered by Serengeti National Park; to the South by lake Eyasi escarpment and the agricultural communities of Karatu, Oldeani and Mbulumbulu; and to the north by the Loliondo Game Control Area, the Salei plains and the Lake Natron Basin.

Unique features of NCA include the Ngorongoro Crater, a caldera of about 311 square kilometres at the centre of NCA, and the burning issue of our workshop today. The Ngorongoro Crater is the home of a variety of wild game and birds, including rhinos and flamingos. Above all it has got very spectacular scenery, which seems threatened and needs the service of EIA specialists of your calibre to put forward intervention measures to ensure its sustainability.

There are several other attractions in the NCA, but for practical purposes of our discussion /workshop let us limit ourselves to the Crater in the NCA in the context of the three issues above.

The Environment Challenge

The role of NCA
The interaction between environment and development is as old as development itself. Human activities and the use of natural resources have affected the environment since time immemorial.

Equally, the state of the environment has limiting implications to social and economic development. The state of the environmental wealth, that is the stock of natural assets such as forest resources, soil and minerals and fresh water and marine resources, constitute the limiting factor for human existence.

In Ngorongoro, Prospects for increased income is derived from a fertile physical environment and tourism since cattle and wildlife need adequate grazing land. When it gets extremely very dry, pastoralist move to graze in the forests. Satellites photos taken a few years ago attest to forest degradation. So clearly, we have environmental degradation resulting from several factors: a slight increase of livestock population coupled with fast increase of population result in reduced livestock per capita. On the other hand a combination of a declining livestock per capita coupled with increased cultivation in the area have led to reduced NCA large Herbivore carrying capacity (Runyoro, April, 2004, current and prediction of future land use in the NCA)

Clearly then, environmental degradation in NCA and particularly in the Crater has led to widespread poverty among pastoralists and is a threat to the very flora and fauna which we need for our continued sustenance and development.

The role of the society in NCA in environmental preservation
The indigenous people have realised that conserving the environment is a prerequisite for their economic and social development. All efforts are being taken to reduce environmental degradation and hence poverty. However, environmental policy in NCA does not focus exclusively on protection of the natural resources at the expense of humanity. The livelihoods of the people is assured through a share in tourism benefits that assure the communities get about 25% of NCA Tourism revenues every year. Of the 25%, an average of about 12%is directly disbursed to the PC accountant. The remaining 13% is indirectly delivered to the pastoralists through provision of social services, food security and communication.

Clearly then, for both NCAA and society, there is undoubted conviction that neither economic development nor environmental conservation should be compromised for the sake of the other as their fates are related. The societies in NCA are now good advocates of sustainable development that is preserving NCA for future generations.

Tourism status
Tourism not only provides materials benefits, it also brings cultural pride, a sense of ownership and control, and through diversification, reduced vulnerability. The creation of the NCA pastoral Council has been a good move to realize this objective

(i) Tourism income
NCAA's tourism income has been on the rise. It is an economic activity, which is generating income for improved living standards and economic development for all stakeholders. By generating revenue, tourism has provided the opportunity for investment in environmental preservation/conservation. In NCA the conservation of Olduvai and paleontological finds, attest to the demands of the tourism economy that they be conserved. In this way tourism as we have seen previously is an advocate of positive environmental actions.

(ii) Tourist arrivals
Tourism volumes over the last four decades except for about 8 years between 1977 and 1984, when the East Africa community collapsed and when the cooperation was revived respectively between Tanzania Uganda and Kenya have been on the increase (see figures of tourists visiting NCA). From the above analysis tourism practised in NCA is mass tourism imported from a neighbouring country.

Mass tourism has the following limitations:
1. Environmental insensitivity since the overriding objective is to achieve high visitation numbers.
2. Inherent conflict with the conservation of wildlife and their habitat .In this sense it even limits planning and renders useless management plans for protected areas. NCAA is currently revising its management plan to make it cope with the advent of the devastations caused by mass tourism.
3. Negative Cultural impacts on the indigenous people. Very often it is insensitive to fragile cultural situations.
4. It doesn't benefit economically the local communities whose resources are being exploited unless measures are put in place to that effect.
5. In the long run, this form of tourism exceeds the limits of acceptable changes resulting in negative impacts (environment, soci-economic, cultural etc). At a certain point in time, the destination declines. The tragic end is that tourists abandon the area for other prime areas. This form of tourism is therefore not sustainable

Figure 1 (lack)

The above figure summarises the evolution of the Tourism Product Life Cycle Concept: A destination is discovered i.e its resources are perceived to be valuable and or attractive, they are made increasingly available, demand grows and the destination booms, the resource becomes maximally exploited, the resource product becomes less competitive /attractive /valuable, the destination declines and may even die. Demand disappears or the resource is exhausted.
Contemplating this scenario leads to the key question: Is there life after Tourism in NCA?

(iii) Construction/Tourism Infrastructure
Growth of tourism in NCAA has brought with it the construction of accommodation facilities and accompanying infrastructure. e.g Sopa lodge, Ngorongoro Wildlife Lodge, Ngorongoro Crater lodge, Serena lodge and the dormant Rhino lodge.

This has led to aesthetic degradation of the landscape and sites, where the style and architecture is not in harmony or on a scale with the natural environment or with the traditional or surrounding buildings.

Other negative Impacts:
- Congestion and overbooking of tourist amenities and infrastructures
- Environmental damage
- Reduced quality services
- Reduced quality of visitors experience for the tourists.
- Pollution effects such as noise and air pollution due to motor traffic
- Poor waste disposal due to the absence of adequate or malfunctioning of treatment or disposal facilities.

It is understood that the area within 36km radius of any hotel in a park is always severely impacted, both from the view of visitors experience and natural resource as they tend to concentrate near the hotel to save fuel and maximise profits.

This then demands that NCAA adopts sustainable tourism development or Ecotourism, by opening other tourist attractions. These are Empakai and Olmoti Craters, Lake Eyasi escarpment, Nasera Rock to name a few.

(iv) Tarmac road and improved infrastructure
Some evaluation needs to be done to estimate the Impact of the Makuyuni – Ngorongoro Road on conservation of the environment in Ngorongoro now and in future.

The Interests of Society
- In all its plans NCAA insists on the principles of good governance, which include rule of law, participatory approach, equity, transparency and accountability.
- The indigenous Maasai are not only Stakeholders but also close partners in whatever NCAA does through their Postal Council.
- Schools roads, food handouts to the poor, School fees to the poor families are all examples to this effect.

References
1. Runyoro, V, April 2004: “Past, Current and Prediction of future land use in the NCA” Board Paper.
2. URT, 2000, Integrated Tours Master Plan.
3. NCAA, 2004 Tourism Brochures

6.2.6 Baseline information on status of knowledge of effected environment and society

Prepared by RPU of NCAA, October 2004

Status of knowledge of effects of impact factor on environment and society

Introduction
We assume that by now based on the findings in Paper 1 of this workshop you all know what NCA is and what it stands for in the field of tourism in Tanzania, Therefore, our immediate objective now is to re-examine the effects of the degradation of the environment in NCA and then zero down to the Crater which as we have already mentioned is the primary concern of this workshop.

Positive and Negative Impacts of Tourism in NCA
Because of an increase in Tourism volumes as pertaining to increase in Tourist arrivals and the concomitants rise in tourism receipts NCA has experienced both positive and negative impacts. These c an be summarized as:

- Economic
- Political
- Social – cultural
- Environment and
- Ecological

Economic Impacts of Tourism
International Tourism though an invisible export, brings in foreign currency to
the destination country and area, contributing directly to the current account of the balance of payments. Like other export industries, this inflow of revenue creates business turnover, household income, employment and government revenue [Archer and Fletcher, 1998]. This is what NCAA is doing in collaboration with the local communities through organized walking safaris, where besides provision of donkeys and guides, villages along the routes get a sizeable share of the camping fees also.

Domestic tourism has somewhat similar effects upon the host regions. Whereas however, international tourism brings flow of foreign currency into a country domestic tourism redistributes domestic currency spatially within the boundaries of a country. From the viewpoint of a tourist region within a country, however, domestic tourism is a form of invisible export. Money saved in other regions is spent within the host region creating additional business, revenue income, jobs and revenue to local government.

Moreover, tourism seems to be more effective than other industries in generation of employment and income in the less developed and outlying regions of NCA, where alternative opportunities for development are more limited.

The development of tourism in NCA has led to the requirement for improved infrastructure. A good tarmacked road has already reached Lodoare gate and is certainly going to increase the influx of tourists to NCA. In most cases however these facilities are indivisible for they serve the local population as well.

Thus in NCA as it is in many countries highway and airfields, constructed primarily to cater for tourism, now provide an access to wider markets for many locally produced goods. [Archer and Cooper. 1991: 74].

The only problem with assessing economic impacts has been to distinguish tourism induced events from other agents of change; and get what the situation was before tourism intervened.

Infact, the difficulty of quantifying the environmental and social impacts of tourism has delayed the development of impact methodologies. This workshop is called upon to address this issue.

Costs to Society associated with Tourism

Opportunity Costs
There are costs however associated with tourism. The real cost to society of employing resources and factors of production in any one sector, including the construction and operation of hotels and other associated tourism services, is the value of the output, which could have been obtained from their use in other sectors of the economy [Archer and Cooper, 1991:77]

- These costs can be found out by the use of project appraisal techniques
- Tourism expenditure for example is measured by the use of the multiplier concept. This can either be the output – output multiplier or Income multiplier.

The output –output multiplier is some value by which the initial change in tourist expenditure must be multiplied in order to estimate total change in output.
The income multiplier is a value that, when multiplied by the change in tourist expenditure will estimate the total change in household income.
Economists, environmentalists and sociologists in this workshop could attempt suitable analytical models for this.

Political Impacts of Tourism
Neo colonial type of development imposed upon emerging nations. Taking of power from the local and regional levels and concentrating them into the hands of multi-national companies. Vivid examples include:
- Giving more lucrative and respectable posts to expatriates who possess expertise and experience while the lower paid more menial jobs go to the local indigenous people.
- Contact between people of different backgrounds is not always beneficial and may in some cases generate additional cultural and moral stress.

There is therefore need for political scientists to work with tourism. Practitioners, to avoid misinterpretations of the role of tourism in economic development.

Social – Cultural Impacts of Tourism
- Destruction of the cultural heritage or
- Distortion of the local culture through up staged authencity, over commercialization of cultural features and traditions, such as dances and costumes, religious ceremonies arts and crafts.
- Destination turning into a caricature of itself.
- Exploitation of local culture and customs to satisfy the visitor, sometimes at the expense of local pride and dignity.
- The introduction of Cultural Bomas in NCA was meant to curb this.
- Importation of crime, prostitution gambling and drug trafficking leading to deterioration in moral standards.

Environmental and Ecological Impacts of Tourism
Excessive and badly planned tourism development affects the physical environment of destinations.
.
- Hotels of alien design that don't blend into the local environment
- Excessive use of the crater leading to congestion on the crater floor. There is heavy traffic on the crater rim and floor resulting in noise and exhausts emissions. This has affected wildlife distribution on the crater rim, pushing both buffaloes and elephants into the crater floor. The result is that there are more animals in the Crater increasing more than can be supported by the habitat.

- The fact that livestock has to go down for salt licks makes the scenario even more complicated to manage in future.
- Vehicular traffic in the crater is now becoming a major and serious issue leading to serious ecological impacts around sighted animals.
- Sensitive animals respond by sitting down or hiding resulting in restricted movement
- Restricted movement has affected hunting and reproductive behavioural of the animals.
- In some cases individual animals are forced to abandon their kills due to continuous heavy vehicle pressure. See appendices 4 through 7 attached.
- As a consequence there is increasing soil compacts and trampling following the loss of vegetation cover;
- Many vehicle leading to off-road driving.
- Land use practices in NCA, and environmental impact whereas pastoralism is compatible with conservation, cultivation and conservation are mutually exclusive. Scattered cultivation has improved to serious farming resulting in a total of 10,000 acres to date (see appendix 3). No doubt persistent cultivation remains the most serious land use conflict within NCA.

Reasons for this conflict are:
- Falling livestock to human ration (see appendix 3)
- Lack of alternatives leading to increasing demand for grain
- Decline in livestock to human ratio is caused by rapid rise in the human population compared to a slow growth rate in the livestock population due to high mortality rates (see appendix 3).
- Human population growth rate is 3.5% per annum so that in year 2025 if the current trend will continue 51656 acres will be cultivated appendix 3b below)

Excess Carrying Capacity
Researches have shown that NCA has a carrying capacity to accommodate 250,925 large herbivores units (LHU = 250Kg).

Population estimates for large herbivores units in Ngorongoro in 1994 averaged 218,865 units. Of these 127524 LHUs were Livestock and the remaining 91,341 LHUs were wildlife. In 2002 livestock population was estimated to be 129,231 cattle and 173,364 goats and sheep, which amounted to 147,519 LHUs. Add this to the present 91,341 LHUs of Wildlife; the number of LHUs was already above carrying capacity by 19,995 LHUs. Therefore NCA had no capacity to allow the current population of 60000 to own 6LHUs as recommended by ERETO. For this could mean 360,000 LHUS, a figure well above the established NCA carrying capacity.

Recommendations:
- Start educational programmes geared towards introduction of improved breeds that yield more milk and meat.
- Improve markets for livestock and its products that will lead to destocking and increased incomes
- Look into other alternatives that will compliment existing strategies to ensure the balance between conservation and human needs.
- Remove Immigrants outside NCA
- Control Immigrants

Other Tourism Impacts of interest.
- Impacts on geological exposures, minerals and fossils
- Impacts on soil in NCA
- Impact on water resources in NCA
- Impacts on vegetation (NHF)
- Impacts on sanitation & waste disposal
- Aesthetic impacts on landscape

Tourism statistics

The relationship between human population, livestock population, livestock per capital and cultivation land between 1977 and 2002

Year	Human Population	Livestock Population	Livestock Units per Capital	Cultivated land in Acres
1997	16,705	150,345	9.0	Scattered Cultivation
1978	17,982	125,874	7.0	Scattered Cultivation
1980	14,645	146,450	10.0	Scattered Cultivation
1984	-	-	-	Scattered Cultivation
1987	22,637	158,459	7.0	1305
1988	26,743	133,715	5.0	Not available
1994	42,508	127,524	3.0	6,000
1999	52,000	140,400	2.0	9,000
2002	59,858	149,645	2.5	10,000

Source: Runyoro April 2004 “Past, current and Prediction of Future Land use in the NCAA.

Predictions of human population, livestock population livestock per capital and cultivated area between 2007 and 2025

Year	Human Population	Livestock Population	Livestock Units Per Capital	Cultivated land in acres
2007	67,698		2.3	27,079
2002	80,642		2.0	32,257
2017	98,071		1.7	39,228
2022	116,479		1.5	46,592
2025	129,140		1.4	51,656

Total Number of Vehicles and Tourist in the Crater (Lemala & Seneto Gates), 1999.

Year 1999	No. of Vehicles	Non resident	Residents	Citizens	Total Visitors	Average/ Vehicles
January	2429	8168	189	2833	11190	4.6
February	2626	9195	152	3042	12389	4/7
March	2820	6128	135	2261	8524	3.0
April	1056	3254	150	1485	4889	4.6
May	808	2795	183	1447	4125	5.1
June	1964	6076	159	2545	8780	4.5
July	3177	10459	301	3954	14714	4.6
August	3599	12084	267	4640	16991	4.7
September	2409	8229	168	3499	11896	4.9
October	2463	8248	180	3116	11544	4.6
November	1744	6086	159	2278	8523	4.8
December	1745	5222	174	3004	8400	4.8
Total	**26,840**	**85,994**	**2,217**	**33,804**	**121,965**	**4.5**

Source: NCAA Tourist and RPU Departments 2002.

Total Number of Vehicles and Tourists in the Crater (Lemala and Seneto Gates), 2000.

Year 2000	No. of Vehicles	Non resident	Residents	Citizens	Total Visitors	Average/ Vehicles
January	2412	7762	289	3046	11097	4.6
February	3027	10553	103	3611	14267	4.7
March	2042	7045	99	2593	9737	4.7
April	1271	399927	233	1539	6128	4.8
May	1111	3620	109	2839	5268	4.7
June	2335	7283	272	4302	10394	4.4
July	3793	12673	267	1259	17242	4.5

August	3994	13988	276	3790	15523	3.8
September	2718	9446	107	3882	13343	4.9
October	2814	9647	211	2788	13740	4.8
November	1896	6417	237	4747	9442	4.9
December	2540	7704	308	36364	12759	5.0
Total	**29,953**	**100,065**	**25,11**	**36,364**	**138,940**	**4.6**

Source: NCAA Tourism & RPU Departments 2002.

Summary of vehicles and visistors in the crater in 1999 and 2000.

Year	No. or Visitors in the Creator	No. of Vehicles in the Creater	Average no. of vehicles per month	Average of No. of vehicle per day	Average no. of people per vehicle
1999	121,965	26,840	2237	75	4.5
2000	138,890	29,958	2496	83	4.6

Source: NCAA Tourism & RPU Departments 2002.

Planning calendar for crater vehicle decongestion programme.

Date	Activity	Responsible
13/02/2001	Meeting between NCAA and tour operators	NCAA Tourism Department
16/02/2001	Meeting between NCAA and Resident Hoteliers	NCAA Research and Planning Unit, Tourism and management of Natural Resources Department
Mid-February, 2001	Compilation and drafting of the Plan	
March 2001	Review and more comments of meeting's participants	NCAA Research and Planning Unit
Late March	Presentation of the draft plan to the management and the workers council executive committee	NCAA Research and Planning and Tourism department
Early April 2001	Presentation of the plan to NCAA Workers Council	Conservator
Mid – April 2001	Presentation of the draft plan to the Board committee conservation, tourism Research and Planning	The Board Committee Secretariat
Later April 2001	Presentation of the draft plan to the Board	Conservator
June 2001	Circulate the plan inform all the stakeholders of the proposed changes	Conservator
January 2001	Implementation	All implementers as per approved plan

6.3 Notes from a site visit at the Sopa Lodge

By Hanne Haaland, NINA

Since some of the workshop participants had not visited the area a trip to the Ngorongoro crater was included in the workshop programme. After some hours of game driving in the crater the group visited Sopa Lodge. The lodge is located on the rim of the crater, close to the Lemela road which can be used for both descending and ascending from the crater.

The director and the acting director of the Sopa Lodge gave a brief introduction to the history of the hotel, its capacity and the number of visitors throughout the three different seasons. Low season is from April 1st to the end of June, high season is during Christmas, New Year and January, during Easter and from September to December. Peak season is February, July and August. This year there has been little variation in the seasons and the number of visitors has been high throughout the seasons.

The hotel opened in 1992 and can accommodate between 190 and 200 guests in 97 rooms. The average visitor stays for one night and spends two days in the crater. However, there are also a few tourists that return on an annual basis or that will spend more than two days in the crater. According to the management some visitors spend only the morning in the crater whilst others will go down twice during the day or spend the entire day game viewing. On the whole they refer to their guests as being very satisfied with the experience of visiting the crater, although there has been some complaints concerning the limited sights of lions in the area. Most tourists are said to be very environmentally aware and very concerned with the impacts of tourism in the area in the sense that they point to how more hotels should not be constructed. According to management few tourists complain about the number of vehicles in the crater. During peak season, as many as 80 vehicles can come from Sopa lodge into the crater during a day.

During the brief discussion following the information from management an idea was launched that proposed having a separate company or the NCAA to provide the vehicles to be used for entering the car. Management was quite positive to this area but pointed to the problem of tour operators selling complete packages covering all parts of the trip except for accommodation. Thus, little is left in the hands of local actors.

The lodge management had not conducted any visitors' satisfaction surveys among guests. However, the NCAA is currently conducting a visitors' service survey and forms as distributed to the lodge visitors. Management was willing to distribute other surveys if required.

The Sopa Lodge management provides no written information to raise the tourists' environmental awareness or their knowledge of the crater ecosystem. However, through daily interaction with their visitors the management have the opportunity to transmit such information. The current director has recently entered the position, but has 12 years of experience as a hotel manager in Victoria Falls. Thus, he expressed his awareness of the potential problem of overcrowding and vehicle congestion and welcomed preventive action. Regarding tourist motivation for visiting the area the management believed game viewing to be the main attraction, but that other activities could be developed.

There is currently no formalised cooperation – eg through associations- between the different tourist lodges in the Ngorongoro crater.

6.4 Tentative programme October 11. –15. 2004

Scoping workshop on EIA: Vehicle congestion in the Ngorongoro crater, Tanzania.
Some changes in this tentative programme were done.

Facilitators: Jørn Thomassen and Hanne Haaland, NINA

Monday, October 11, 2004

Time	Issues	Responsible
1100-1110	Opening remarks	Julius Keyyu, TAWIRI
1110-1120	EIA and capacity building; the idea behind this workshop	Jørn Thomassen, NINA
1120-1130	Presentation of the participants	All
1130-1145	Status of EIA in Tanzania, history, guidelines, legislation etc.	TAWIRI, MNRT
1145-1215	Brief introduction to the EIA process: Project description, impacts and impact factors, screening procedures, decision makers and relevance, the ”good enough” principle, baseline information, the role and importance of scoping, Terms of Reference	Jørn Thomassen
1215-1245	The AEAM concept	Jørn Thomassen
1245-1300	Discussion	
1300-1400	Lunch	
1400-1430	Tourism and conflicts – a general overview	Hanne Haaland, NINA
1430-1500	Tourism in the Ngorongo crater, status, impacts, challenges and goals [1)]	NCAA
1500-1530	Discussion	
1530-1615	Baseline information: Status of knowledge of affected environment and society; status of knowledge of effects of impact factors on environment and society [1)]	NCAA

1) ***Important:*** *The description of the tourism situation in and around Ngorongoro has to be specific and detailed enough. The problem or activity has to be defined: what, when, where and how – pointed.*

Tuesday, October 12, 2004

Time	Issues	Responsible
0900	Departure for site visit to Ngorongoro crater (Seneto descent road)	NCAA
	In the crater: Information on the site – tourism problems, challenges and possible solutions. Game drive.	NCAA
Lunch	In the crater	
1500-1600	Visit at Sopa Lodge? Short briefing by the Sopa lodge staff.	NCAA/Sopa lodge staff
1600	Departure for Karatu	NCAA

Wednesday, October 13, 2004

Time	Issues	Responsible
0900-0915	Introduction to group works 1, 2 and 3	Jørn Thomassen
0915-1015	Group work 1: Impact factors	All
1015-1100	Plenary presentation group work 1, conclusions	
1100-1120	Morning break (tea/coffee)	
1120-1300	Group work 2: Valued Ecosystem Components (VECs)	All
1300-1400	Lunch	
1400-1445	Plenary presentations group work 2, conclusions	All
1445-1615	Group work 3: Schematic flow charts (tea/coffee at 1600)	All
1615-1700	Plenary presentations group work 3, conclusions	All

Thursday , October 14, 2004

Time	Issues	Responsible
0900-0915	Introduction to group works 4, 5 and 6	Jørn Thomassen
0915-1030	Group work 4: Impact Hypotheses (IHs) and evaluation of Impact Hypotheses	All
1030-1050	Morning break (tea/coffee)	
1050-1130	Group work 4, cont……	All
1130-1230	Plenary presentation group work 4, conclusions	All
1230-1300	Group work 5: Recommendations	All
1300-1400	Lunch	
1400-1500	Group work 5, cont……	All
1500-1545	Plenary presentations group work 5, conclusions	All
1545-1600	Summing up, discussion	
1600-1615	Tea/coffee	
1615-1730	Group work 6: Terms of Reference; Preparing a work plan	All

Friday, October 15, 2004

Time	Issues	Responsible
0900-1030	Group work 6: Terms of Reference; Preparing a work plan, cont……..	All
1030-1045	Morning break (tea/coffee)	
1045-1130	Plenary presentations, group work 7, conclusions	All
1130-1200	Further work, implementation of ToR	Jørn Thomassen
1200-1215	Closing remarks	Julius Keyyu
1215-1315	Lunch	

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