A DECISION SUPPORT SYSTEM

FOR MANAGING HUMAN-ELEPHANT CONFLICT

SITUATIONS IN AFRICA

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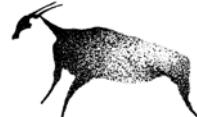
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HUMANS AND ELEPHANTS ARE INCREASINGLY COMING INTO CONTACT!

.…AND IT IS INCREASINGLY A LOCAL POLITICAL PROBLEM
(an example from Zimbabwe)

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CHAPTER 1

USE OF THIS GUIDE

What is human-elephant conflict ?

African elephants sometimes make forays into areas of human settlement and destroy crops, raid foodstores and damage water sources, barriers or other man-made structures, occasionally injuring or killing people in the process. People retaliate by injuring, killing or using deliberate measures to displace elephants. Human-elephant conflict is widespread, having been reported from most of the 37 elephant range states on the African continent (18). The problem occurs across many habitat types, from the wettest rainforests of the Congo basin and West Africa to the driest deserts in Mali and Namibia.

The broad definition of human-elephant conflict (abbreviated HEC throughout this document) adopted by the IUCN/SSC African Elephant Specialist Group (AfESG) is "Any human-elephant interaction which results in negative effects on human social, economic or cultural life, on elephant conservation or on the environment". HEC has been identified as one of the five priority issues in the conservation of the African elephant (54).

There is increasing agreement in conservation and political circles about the need to mitigate the negative effects of this conflict on both humans and elephants. Human-elephant conflict is now mostly taken to mean *direct conflict* as described above (24), but it is part of a complex interaction between people and elephants which in most countries has been going on *in some form* for centuries (19). Unfortunately, present day circumstances in Africa can make it a very difficult problem to address. This guide hopes to make it easier for people faced with addressing the problem to benefit from specialist knowledge that has thus far accumulated on the subject.

Approach used in this guide

This guide is not trying to teach you something by merely giving you factual information. It is designed for you to interact with in order to: 1) help you think about what HEC actually means in your area and 2) help you learn how to counteract that problem. It is written with the assumption that most users are involved in some way with wildlife conservation and may have a management role or at least a management-related role. Most frequent users for example may be protected area managers, officials from a wildlife authority, technical personnel or researchers from conservation or agricultural agencies.

The guide is in the form of a "Decision Support System" (**DSS**). It tries to avoid being a "Decision Making System". A DSS is intended to give *support* to help you decide what to do by *proposing* a series of sequential, logical steps; it does not try to *make* actual management decisions for you (6;10). Material in the guide has been prepared from what is currently known about HEC, which represents the combined efforts of many people. Obviously our knowledge of the problem also needs to grow continuously and like many other aspects of wildlife management, it probably will do so indefinitely. Practising the management of HEC appears to be one of those disciplines that is partly an art and partly a science. This document therefore is a first attempt to bring both applied research and "conventional wisdom" into the active management of a HEC problem in the field situation. It does not purport to be the final authority on the subject which can be applied in all cases.

Language and format used in this DSS

As in any specialist field, a number of frequently-employed terms have begun to emerge in the study and management of HEC. In this document such important terms are italicized and/or emboldened when first used (e.g. ***"complainant"***). Thereafter they are incorporated in normal text. These terms are explained in a glossary at the end of the document

Some terms require clarification before reading the document. ***Counter-measure*** is used to refer to a number of HEC measures that are *categorized* as similar (e.g. "*Traditional"* refers to anti-elephant measures which farmers employ themselves). ***Method*** refers to options within a counter-measure category (e.g. in the Traditional category, things like *Noise, Fire, Watchmen* which farmers use).

Relevant questions or options and their possible answers are often in tabulated form. This makes them easier to read and compare so should assist you in covering many different aspects of addressing the HEC problem. Although questions are in a Yes/No format, the answer may not always be a definite Yes or No. In order that you can keep your own score of answers the tables have an optional check box at the end of each question. Some questions have related sub-questions which appear below them in brackets.

The important thing is the content of the questions and not necessarily the answer. If you prefer you can devise a scoring system of your own to answer questions. It may be useful to write down issues, options and methods on separate sheets of paper and score them by your own system in light of particular circumstances in your area.

Important parts of the document are illustrated in diagrams. These diagrams are fully explained in accompanying text but if some people find the text difficult they can rely more on the diagrams of critical aspects of HEC.

In some places a space has been left blank for writing your own notes. Use this if you wish to keep a permanent record of something about that section in your copy of the document. Likewise where tables are used, extra blank tables are provided for your own additions.

For improved presentation, statements made in the text that are referenced to published work have been numbered in brackets ( ).   A simple "*alphabet – number system*" is used as the reference list format. References which appear in journals or regular publications are shown with names of the publication underlined. References which are singly issued reports or books are italicized. This reference list is by no means an exhaustive one on HEC: the AfESG maintains a continuously updated English bibliographic list on HEC related topics which is partitioned by African country (see Appendix B).
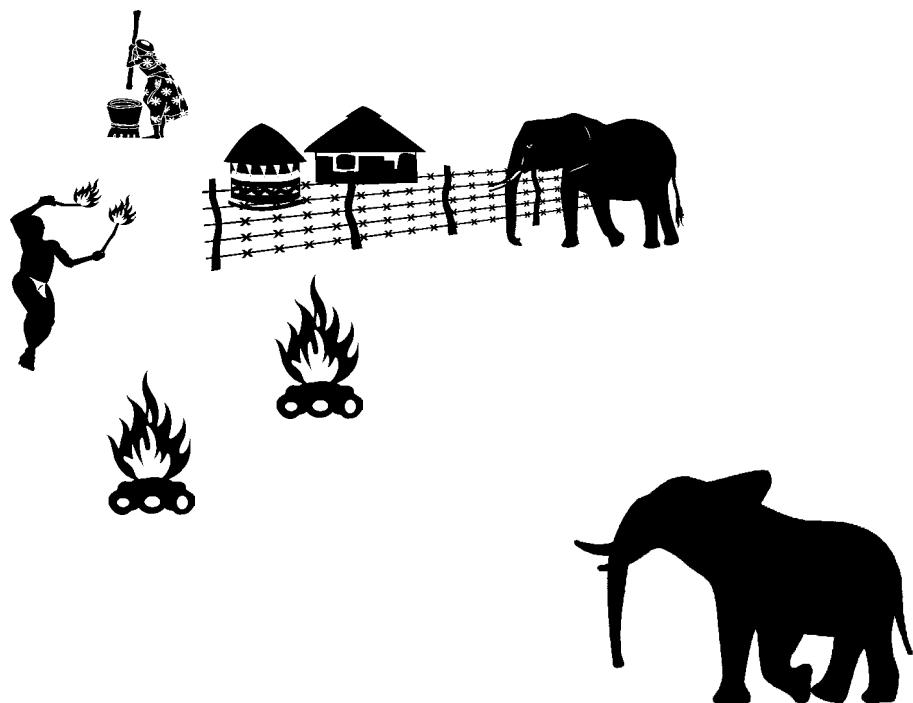
FIGURE 1.1 SCHEMATIC OF THE ARRANGEMENT OF THIS DOCUMENT

Use of this Decision Support System
(CHAPTER 1)

YOU ARE HERE!

What do I need to know before trying to address HEC?
(CHAPTER 2)

What HEC counter-measures have other people used or considered?
(CHAPTER 3)

What principles are common to many HEC situations?
(CHAPTER 4)

How well have HEC counter-measures worked in Africa so far?
(CHAPTER 5)

How do I plan a management strategy for my HEC situation?
(CHAPTER 6)

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CHAPTER 2

GETTING STARTED IN HEC MANAGEMENT: PREPARATORY ISSUES

HEC is a very complex problem that may vary enormously from one area to the next. Although you may be a key player in the HEC issue in your local area, before starting to address it you need to think through a logical sequence of steps like the following:

- Who gave you / gives you information about the HEC problem?
- How reliable is this information?
- Do you really know what the problem is?
- Do you really know who the problem affects and what they think?
- Do you have any idea how to address this problem?
- What constraints will you face in trying to implement your ideas?
- Who else is involved in this problem and how can they help you?

This chapter expands each of these questions by asking you to note down simple Yes or No answers to a number of sub-questions. The idea of such an exercise is to highlight issues contained in the above questions in real -life situations. After looking at these issues (*explained in following Chapters*) you should be able to assess your position in HEC and how you are presently equipped to intervene and address the problem.

Each section in this chapter is numbered and starts with a guiding statement (a **guideline**). The questions associated with that guideline are presented in tabular format. This is to enable the issues to stand out for comparison against each other and for you to be able to keep a record of how they might apply to your situation. Do not feel you have to answer every question as it stands because: the question may not apply to your area; you may not know the answer; a yes/no answer may be inappropriate. The main purpose of the questions is to expose you to the issues and help you to consider those that you may not have been aware of.

Also with this format you can quickly refer back and reconsider a topic or change your mind on an answer. After each table there are short paragraphs labeled as **notes**. These explain relevant experiences that people have encountered while dealing with HEC in African situations. They can be considered hints or suggestions to help you fully answer the main questions. A space for your own notes is provided after each section of questions.

GUIDELINE 2.1

Many different people are interested in elephants or concerned about HEC which can become a controversial subject. Their opinions will correspondingly vary as to how serious the problem is and what should be done about it. To try to obtain a balanced view of the issue, you should consult a range of people (31).

Table 2.1a Sources of information on HEC in your area

HOW DID YOU / DO YOU HEAR ABOUT HEC IN YOUR AREA?	Yes	No
From affected people themselves?		
From a local leader or community representative?		
From a previous wildlife manager?		
From a researcher or technical expert?		
From a written report or via the media ?		
Other?		

Table 2.1b Information which gives you an initial impression

HOW RELIABLE IS YOUR PRESENT INFORMATION ON HEC?	Yes	No
Is it only verbal and anecdotal, often second or third hand? (Do all incidents get reported verbally?)		
Do some incidents get recorded in writing? (Do all incidents get recorded in writing?)		
Is the information reasonably up to date?		
Is there duplication in verbal or written reporting?		
Do you have any 'hard data' on actual damage incidents by elephants?		
Do you think these reports and/or data are reliable?		
Do you think the information you already have is sufficient to manage the HEC problem in your area?		

YOUR NOTES

GUIDELINE 2.2

You need to know how often problems occur. This is because elephant problems vary over time. In farming areas problems are usually seasonal because elephant raids intensify (both in number and severity) as cultivated crops mature (19; 25; 55).

Also you also need to know where problems occur. You cannot expect to be effective in assisting people having elephant problems unless you have some idea of how many incidents occur in different places (19; 20; 25; 56).

Table 2.2a Frequency of HEC problems

DO YOU KNOW IF THERE IS ANY PATTERN TO HEC OVER TIME?		
	Yes	**No**
Do you know how frequently HEC incidents happen? *e.g.*		
(Do you know how HEC incidents vary with season?)		
(Do you have HEC information for one season / several seasons)		
(Do you have this information for one year / several years?)		

NOTE 2.2a
There may be many other factors influencing when incidents occur e.g. water availability, fruiting of wild trees, hunting activity by people, military activity, recent immigration of people (17).

Table 2.2b Distribution of HEC problems

DO YOU KNOW IF THERE IS ANY PATTERN TO HEC DISTRIBUTION?		
	Yes	**No**
Do you know the geographic limit of HEC incidents in your area?		
Do you know if some places are more affected than others?		

NOTE 2.2b
The number and type of HEC incidents are often very variable between years. Therefore to understand the problem it is best if information can be collected over a minimum of about three years (20).

YOUR NOTES

GUIDELINE 2.3

You need to know how bad problems are when they occur. This is because each incident is different . What you want to build up is a picture of the problem *as a whole* over a certain length of time e.g. a number of crop seasons or years (20) .

Table 2.3 Severity of problems

DO YOU REALLY KNOW HOW BAD THE PROBLEM IS?	Yes	No
Do you know what crops are damaged?		
Do you know what other property is damaged?		
Do you know how the incidents vary in terms of damage?		
Do you have any quantitative measure of elephant damage?		
Have people been injured or killed by elephants?		
Do you judge the severity of incidents subjectively?		
Do you have any system for judging how serious an incident is?		
Can you distinguish those directly and indirectly affected?		
Do you think you can put HEC in perspective with other farming problems or security problems in your area over time?		
Would a standardized system of reporting incidents help you to judge the seriousness of the problem?		

NOTE 2.3
If the distribution of incidents varies between years the severity of incidents will likewise probably vary so it will also take more than one annual cycle to build up a true picture of the effects of HEC in your area. But only if you collect the information on HEC with the same effort and in the same way will you be able to compare one year's results against another.

YOUR NOTES

GUIDELINE 2.4

You need to know what affected people themselves think of the elephant problem (12; 15; 16; 20; 31; 33; 38).

Table 2.4 Local peoples' perspective of HEC

DO YOU THINK YOU UNDERSTAND ATTITUDES OF PEOPLE AFFECTED?		
	Yes	No
Do you think people exaggerate elephant problems? *e.g.*		
(Do they report more incidents than actually occur?)		
(Do they report more serious damage than occurs in actual incidents?)		
(Do you think other pests are worse than elephants?)		
Do you think many incidents go unreported?		
Do elephants restrict peoples' travel? *e.g.*		
(Do they sometimes prevent children moving to or from school?)		
(Do they restrict adults from moving around at night?)		
Do elephants restrict peoples' access to water sources?		
Do you think fear of elephants is very real amongst people in the area? *e.g.*		
(Is this fear of physical harm from elephants?)		
(Are there superstitious beliefs about elephants?)		
Do elephants indirectly cause wider social problems? *e.g.*		
(Do some people suffer from loss of sleep?)		
(Do some people suffer cold / heat exposure)		
(Do some people guarding crops suffer from more malaria?)		
(Are job opportunities decreased for some people?)		
Do you think people want to kill elephants *e.g.*		
(for consumption of meat?)		
(for sale of ivory?)		
(for retribution for the damage they cause)		

NOTE 2.4a
The attitude of a person who has been affected by elephant damage may be very different when he/she speaks alone to you as opposed to when that person speaks in the presence of other members of their community (38). It may not be appropriate to ask some of the above questions (Table 2.5) directly to either individuals or meetings of community members since they may easily be antagonized by this approach, which will make your job much harder. You must devise your own way of interacting with people affected by problem elephants and *deduce* from discussions with them whether the above questions can be answered or not.

NOTE 2.4b

The above questions are only to guide you since they are based on the kinds of issues that have been found to be embedded in this problem. Complaints about elephants may disguise more important disaffection with other wildlife-related issues (38). You need to investigate what these could be. When discussing issues connected with problem animals a wildlife manager has to begin by gaining the trust of an affected community.

NOTE 2.4c

Elephants are greatly feared and despised when they behave as problem animals. Affected people often complain bitterly about elephant damage, especially to wildlife officers since in many countries they regard elephants as "government animals". Sometimes this is completely justified, for example where a subsistence farmer has lost most of his harvest in one elephant raid. But the issue can easily become exaggerated or politicized, particularly in local meetings where complainants are surrounded by an audience of people in their own community and when they are speaking to outsiders perceived to have political or other powers.

NOTE 2.4d

People will tend to complain more about elephants than other pests and often in disproportion to the physical damage that elephants cause to crops (17; 18; 38). This may be because living in proximity to elephants can be associated with a number of wider social problems, of which there are several examples above (Table 2.4). We call these issues "*opportunity costs*" because they do represent a cost to people but unfortunately are often very subtle and difficult to quantify or put in perspective against crop damage which is obvious. Economists use a term like this because they would argue for example that farming in a wildlife area may have a benefit (e.g. cheaper land) but other things are *foregone* by farming there (e.g. freedom from travel restrictions; freedom from loss of sleep; poorer employment opportunities) and these definitely represent a cost. It appears there is often a tendency among affected communities to emphasize their elephant problem as involving only crop damage, since they display a reluctance to talk about these 'supplementary' or 'auxiliary' costs. In some places researchers are beginning to suspect that opportunity costs may in fact be extremely important and therefore perceptions about them need to be fully investigated.

YOUR NOTES

GUIDELINE 2.5

When you evaluate the effect of elephants on people in your area, you need to think about the level(s) at which the effects are being felt

Table 2.5 Who is affected?

WHO IS MOST AFFECTED BY THE LOSSES FROM ELEPHANTS?		
	Yes	No
A whole community of villages over a wide area?		
The village where damage occurred?		
A household whose property is damaged?		
The company/organisation that owns the damaged property?		
An individual who owns the damaged property?		

NOTE 2.5a
The social unit at which you perceive most suffering from elephants is probably the level to which you will direct most of your efforts to address the problem.

NOTE 2.5b
There are strong indications that decentralized strategies with involvement of affected communities are more successful at addressing elephant problems than strongly centralized approaches where decisions are all taken outside of the affected area by unknown or unnamed individuals (18; 46; 47).

YOUR NOTES

GUIDELINE 2.6

Management of the problem will be easier if you can identify what sort of elephants in the population may be responsible for problem incidents.

Table 2.6 Elephants responsible

WHAT ELEPHANTS ARE INVOLVED IN HEC IN YOUR AREA?		
	Yes	**No**
Do you know the elephant group sizes involved?		
Are only males involved?		
Are only females and young involved?		
Are mixed herds (males, females and young) involved?		
Are any of these elephants identifiable?		
Does it appear some identifiable ones are regular "*raiders*"?		
Are any movement patterns of these raiders known?		

NOTE 2.6a
It is frequently quite difficult to distinguish individual elephants and particularly so with problem animals since they are active mostly at night. Even researchers intensively studying elephants with high-technology aids like radiocollars and night vision equipment have been unable to distinguish the sex of some elephants at night (22).

NOTE 2.6b
People living near elephants tend to be frightened of them because they are potentially dangerous and so do not often get close enough to the animals to identify them individually with certainty (22;41). But they will nevertheless frequently refer to known 'rogue' elephants which trouble them, whether they can identify them individually or not.

YOUR NOTES

GUIDELINE 2.7

In most HEC sites the nature of the problem is judged subjectively through gauging the tolerance level amongst the people affected. There are very few HEC sites that have adequate, reliable and up to date information that can be regarded as 'hard data', either on the activity of problem elephants or the attitudes of affected people. The chances are your strategy will depend on more, better or more recent information to manage your problem.

Table 2.7 More HEC information

DO YOU NEED TO COLLECT MORE HEC INFORMATION IN YOUR AREA?		
	Yes	**No**
About damage incidents only ("**incidents**")		
About the people affected ("**complainants**")		
About the elephants responsible ("**problem elephants**")		
About the elephant population in the area		
About other wildlife conflicts ("**problem animals**")		
About measures which people currently use in HEC		
About measures which could be used in HEC ("**interventions**")		

NOTE 2.7a
Data on HEC not only needs to be collected for several (at least three) annual cycles but has to be collected in a similar ("*standardized*") way. If data are collected by different methods or with different levels of effort they are not *comparable* (20; 37; 38; 40; 56).

NOTE 2.7b
It is relatively easy to collect data or train even unskilled people to do so. But data are of limited value unless they can be analysed and interpreted. This is where some skill is required.

YOUR NOTES

GUIDELINE 2.8

To collect more HEC information you will need extra human resources to help you.

Table 2.8 Human resources to collect information

WHAT HUMAN RESOURCES DO YOU HAVE AVAILABLE?		
	Yes	**No**
Can only discuss issues with individual complainants		
Can discuss issues at meetings of complainants / representatives		
Can delegate staff to attend complainants meetings		
Have someone available who can collect incident data in the field ("**enumerator**" or "**reporter**")		
Can organise training of enumerators using guidelines ("**training package**")		
Have someone who can analyse incident data ("**co-ordinator**" or "**researcher**")		
Have someone who can design a scheme to research several issues associated with HEC in the area ("**researcher**")		

NOTE 2.8
If information on problem elephant incidents is collected by a third party, who is neither the person affected nor the person responsible for addressing the problem, this information is likely to be relatively free from bias.

YOUR NOTES

GUIDELINE 2.9

You need to have a strategy to address the HEC problem in your area. No strategy can be effective unless there is some way of measuring whether it is succeeding or not (4), and some way of changing it if it is not.

Table 2.9   Your strategy for managing HEC

DO YOU HAVE A STRATEGY TO ADDRESS YOUR HEC PROBLEM?		
	Yes	No
Will you address the problem through management action?		
Will you use only the information you already have?		
Is this strategy based on any of the following?		
(Previous experience of HEC in another area?)		
(Formal training from other professionals?)		
(Field knowledge of elephant behaviour?)		
(Intuition?)		
Can you plan and direct this strategy yourself ?		
(Does this mean limited consultation with anyone else?)		
Do you think your strategy will diminish HEC in your area ?		
Is there any way to measure the success of your strategy?		
(Will you personally measure the degree of success?)		
(Will somebody else measure the degree of success?)		

NOTE 2.9
Attempts to manage HEC involve managing elephants as well as people. The human component is largely one of improving 'public relations' between wildlife managers and affected communities (17; 18; 38).

YOUR NOTES

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GUIDELINE 2.10

Your strategy may face some constraints because of the resources you have available and the priorities attached to your job. It is a good idea to think about what your primary role in HEC mitigation will be and what the priorities and roles of other people will be who also have an interest in this problem.

Table 2.10 Your priorities

WHAT ARE YOUR PRIORITIES WHEN GETTING INVOLVED WITH HEC?		
	Yes	**No**
Obligation through formal employment?		
(to protect wildlife?)		
(to manage wildlife?)		
(to enhance agricultural development?)		
(to improve rural peoples' livelihoods?)		
Required to research the problem — from what perspective?		
(wildlife conservation?)		
(agricultural?)		
(effects on humans e.g welfare / livelihoods or safety)		

Note 2.10
HEC management involves elephant populations and human communities as well as the biotic and abiotic environment. You will have to co-operate and work with other people who think differently from the way you do.

YOUR NOTES

GUIDELINE 2.11

Your strategy will also face constraints because of policy restrictions regarding elephants as a species, wildlife in general or land uses which compete with wildlife

Table 2.11 Policy constraints

UNDER WHAT POLICY CONSTRAINTS DO YOU HAVE TO OPERATE?		
	Yes	**No**
Are elephants allowed to be destroyed in your area? *e.g.*		
(Are there stringent conditions for destroying an elephant ?)		
(Can you authorize destruction of an elephant ?)		
(Can you yourself carry out destruction of an elephant?)		
(Is there a "quota" for destroying elephants in your area?)		
Do elephants in your area have any value for legal hunting?		
Do elephants in your area have any value for illegal hunting?		
Do elephants in your area have any value for tourism?		
Do people in your area derive any legal benefits from wildlife?		
Do people in your area derive illegal benefits from wildlife?		
Is there a tenure system governing land occupation and use?		
(freehold)		
(leasehold)		
(communal / occupancy only)		
(other)		
Is there any planning process to develop human settlement?		
Is there a functioning land planning authority?		
(part of central government)		
(part of local government)		
(a traditional leader)		
Do wildlife issues have any recognition in land use planning?		

YOUR NOTES

Conclusion to Chapter 2

Clearly there is a great deal of information about HEC that can be gathered. It may seem an overwhelming task to embark upon, particularly if pressure on you is high and immediate action in the field is really your priority. Remember this guide tries to cover many types of HEC situations and much of it is intended to provide *understanding* of HEC *issues*. Not the all issues mentioned so far will necessarily be applicable to your area.

Also the AfESG has already addressed the whole question of HEC data gathering, especially with respect to topics in Tables 2.7 and 2.8. These are available in the form of other guides (References 20; 21 see Appendix B) which incorporate the *data* mentioned in Tables 2.2; 2.3; 2.6. On the other hand *issues* like those in Tables 2.1; 2.4; 2.5; 2.9; 2.10 and 2.11 are particular to your situation.

YOUR NOTES

CHAPTER 3

COUNTER – MEASURES USED IN HUMAN-ELEPHANT CONFLICT

This section is presented in tabular format. This is to enable the many issues to stand out for comparison against each other and for ease of referral in future.

RECAP ON WHERE YOU ARE IN THIS DSS

Use of this Decision Support System
(CHAPTER 1)

What do I need to know before trying to address HEC?
(CHAPTER 2)

What HEC counter-measures have other people used or considered?
(CHAPTER 3)

YOU ARE HERE!

What principles are common to many HEC situations?
(CHAPTER 4)

How well have HEC counter-measures worked in Africa so far?
(CHAPTER 5)

How do I plan a management strategy for my HEC situation?
(CHAPTER 6)

HEC mitigation methods are listed in tables under ten category headings and coded for ease of reference. In this chapter methods are *listed* but not *discussed*. Each category (table heading) is called a ***counter-measure*** which has subdivisions (table contents) called ***methods.*** Methods merely represent different actions within each category of counter-measure. You can add methods you may know of that have been omitted in the blank table provided. Below each counter measure is a reference to where it is discussed in the following chapter (Chapter 5). In that chapter there is provision for you to make your own further comments and notes and to select methods for possible use in your area.

3.1 COUNTER - MEASURE 1

Traditional anti-elephant methods used by local area residents

CODE: TR
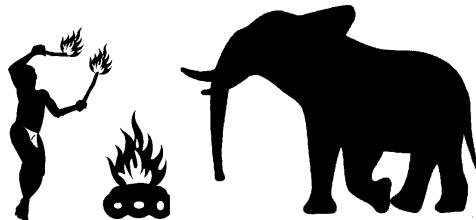
Table 3.1

No.	Method
TR1	Watchmen
TR1.1	(Crop guards sleeping out on platforms in fields)
TR1.2	(Scarecrows)
TR2	Noise in presence of problem elephants
TR2.1	(shouting and drumming)
TR2.2	(banging metal tins or noisy objects)
TR2.3	(cracking whips to imitate gunfire)
TR3	Fire
TR3.1	(fires lit on periphery of fields)
TR3.2	(smoke from burning dried elephant dung)
TR3.3	(burning material thrown at raiding elephants)
TR4	Missiles (e.g. stones, spears) thrown at elephants
TR5	Cleared areas around fields
TR6	Sharp objects on elephant pathways
TR6.1	(sharp stones/nails)
TR6.2	(sharpened wooden stakes)
TR7	Simple barriers on home cut poles or between trees
TR7.1	(bark ropes or string with tins/bells/cloth attached)
TR7.2	(single strand wires)
TR8	Decoy foods for elephants
TR8.1	(unmodified e.g. watermelon, sugarcane, banana)
TR8.2	(adulterated with unpalatable food e.g. chilli seeds)
TR8.3	(adulterated with poison)
TR9	Pit traps for elephants

See discussion 5.1

OTHER TRADITIONAL METHODS THAT YOU KNOW OF:

3.2 COUNTER – MEASURE 2

Disturbance of problem elephants

CODE: DS

Table 3.2

No.	Method
DS1	Weapons fired near raiding elephants
DS1.1	(shotguns)
DS1.2	(rifles)
DS2	Thunderflashes thrown at problem elephants
DS3	Flares discharged near problem elephants
DS4	Lights shone onto raiding elephants
DS5	Trip wire alarms
DS6	Elephant "drives" with aircraft, vehicles or people

See discussion 5.2

OTHER ELEPHANT DISTURBANCE METHODS THAT YOU KNOW OF:

3.3 COUNTER – MEASURE 3

Killing problem elephants

CODE: KL
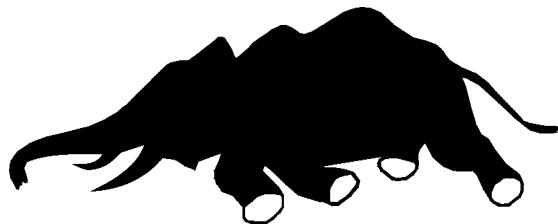
Table 3.3

No.	Method
KL1	Killing of selected problem elephants
KL1.1	(destruction by wildlife authorities)
KL1.2	(destruction by an authorised third party)
KL1.3	(illegal killing)
KL2	Marketing commercial hunts for killing problem animals
KL2.1	(proceeds to central government)
KL2.2	(proceeds to a local governing authority)
KL2.3	(proceeds to local community)
KL4	Depopulation of elephants
KL4.1	(cull a proportion of elephant population)
KL4.2	(eliminate elephant population)

See discussion 5.3

OTHER ELEPHANT KILLING METHODS THAT YOU KNOW OF:

3.4 COUNTER – MEASURE 4

Physical barriers to elephants

CODE: BA
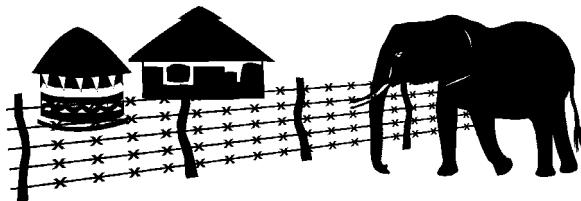
Table 3.4

No.	Method
BA1	Conventional (non-electrified) fencing
BA2.1	Electric fencing using mains electricity
BA2.2	Electric fencing using solar panels and 12 volt batteries
BA3	Fence layout
BA3.1	Fences encircling either elephant range or human settlement
BA3.2	Fences open-ended to deflect elephants from settlement
BA3.3	Fencing a protected area boundary / elephant range (fencing equipment owned and maintained by wildlife authority)
BA4	Fencing scale
BA4.1	Fencing projects at a single household scale (fencing equipment individually owned and maintained)
BA4.2	Fencing projects at a group of households scale
BA4.3	Fencing projects at a village or community scale (fencing equipment owned and maintained by community)
BA5	Trench
BA6	Moat
BA7	Stone wall
BA8	Buffer crops (e.g. tea, tobacco, timber, chilli) around food crops

See discussion 5.4

OTHER BARRIER METHODS THAT YOU KNOW OF:

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3.5 COUNTER – MEASURE 5

Experimental repellents and elephant alarm calls

CODE: RP

Table 3.5

No.	Method
RP1	Olfactory (smell-based) repellents
RP1.1	Capsicum (chilli) sprays and bombs, available commercially
RP1.2	(deployed by field staff of wildlife authority)
RP1.3	(deployed by affected people themselves)
RP2	Smoke from burning chilli seeds
RP3	Chilli-based grease applied to simple barriers
RP4	Auditory (sound-based) repellents
RP4.1	(Ultrasound alarm calls broadcast in conflict area)
RP4.2	(Broadcasting noises of people or livestock)

See discussion 5.5

OTHER EXPERIMENTAL REPELLENT METHODS THAT YOU KNOW OF:

3.6 COUNTER – MEASURE 6

Live capture and translocation of elephants

CODE: TL
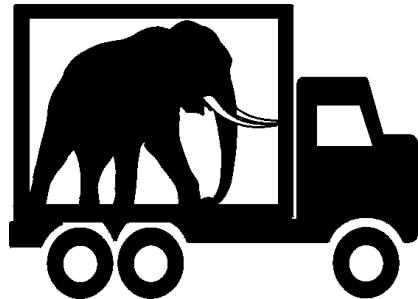
Table 3.6

No.	Method
TL1	Removal of selected elephants
TL1.1	(identified problem individuals only)
TL1.2	(age-sex class of problem individuals)
TL2	Reduce elephant population numbers by capture
TL3	Capture and remove entire population

See discussion 5.6

OTHER TRANSLOCATION METHODS THAT YOU KNOW OF:

3.7 COUNTER – MEASURE 7

Compensation schemes for elephant damage

CODE: CO
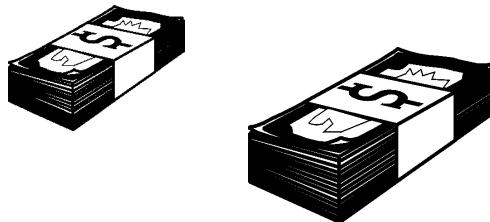
Table 3.7

No.	Method
CO1	Direct
CO1.1	(monetary - linked to elephant damage)
CO1.2	(non-monetary e.g. food aid linked to elephant damage)
CO1.3	(insurance scheme with contributions and claims)
CO2	Indirect
CO2.1	(products from problem elephants destroyed e.g. meat)
CO2.2	(wider benefits from wildlife utilisation programme – see below)

See discussion 5.7

OTHER COMPENSATION METHODS THAT YOU KNOW OF:

3.8 COUNTER – MEASURE 8

Wildlife utilisation programmes which return benefit to local people

CODE: WL

Table 3.8

No.	Method
WL1	Utilisation programme authorised by national wildlife policy
WL1.1	(administered by central government)
WL1.2	(administered by local authority)
WL2	Programme allows non-consumptive use of elephants
WL2.1	(local tourism)
WL2.2	(international tourism)
WL2.3	(domestication of elephants)
WL3	Programme allows consumptive use (killing) of elephants
WL3.1	(allows legal hunting by safari clients)
WL3.2	(allows sale of elephant products)
WL3.2.1	(ivory)
WL3.2.2	(hide)
WL3.2.3	(meat)
WL4	Programme addresses management of problem animals
WL4.1	(elephants only)
WL4.2	(elephants and other problem species)

See discussion 5.8

OTHER WILDLIFE UTILISATION METHODS YOU KNOW OF:

3.9 COUNTER – MEASURE 9

Information gathering to increase understanding of the local ecology of elephants

CODE: IN

Table 3.9

No.	Method
IN1	Data collection only
IN1.1	(with wildlife authority resources only)
IN1.1.1	(involving affected local people reporting only)
IN1.1.2	(using own staff and data collection design)
IN1.1.3	(using trained HEC enumerators in the field)
IN1.1.4	(using AfESG data collection protocol for HEC)
IN2	Data collection and research studies
IN2.1	(with wildlife authority resources only)
IN2.2	(collaboration wildlife authority and local/foreign organization)
IN2.2.1	(involving qualified researchers)
IN2.2.2	(using trained HEC enumerators in the field)
IN2.2.3	(using AfESG data collection protocol for HEC)

See discussion 5.9

OTHER INFORMATION GATHERING METHODS THAT YOU KNOW OF:

3.10 COUNTER – MEASURE 10

Land use changes which may reduce spatial competition between people and elephants

CODE: LU
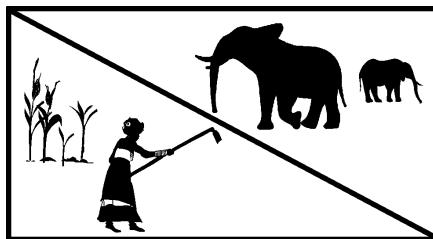
Table 3.10

No.	Method
LU1	Stop human settlement encroaching into elephant range
LU2	Relocate agricultural activity out of elephant range
LU3	Consolidate human settlement pattern near elephant range
LU4	Reduce size of crop fields
LU5	Change location of crop fields
LU5.1	(dwellings and fields in proximity)
LU6	Change cropping regime
LU6.1	(change to crops not affected by elephants)
LU6.2	(diversify into more types of crops)
LU6.3	(use intercropping layout for crops)
LU6.4	(change timing of harvests)
LU7	Reduce dependence of local economy on agriculture
LU8	Create or secure elephant movement routes / corridors
LU9	Secure elephant and human access to different water points
LU9.1	(manipulate water supply to change elephant distribution)
LU9.2	(create salt licks to assist in elephant redistribution)
LU10	Reposition protected area boundary
LU11	Expand protected area for wildlife
LU12	Designate new protected area for wildlife

See discussion 5.10

OTHER LAND USE CHANGE METHODS THAT YOU KNOW OF:

CHAPTER 4

PRINCIPLES INVOLVED IN THE MITIGATION OF HEC

You have been asked questions about how to prepare for the task of managing HEC (Chapter 2). You have also read an exhaustive list of a large number of counter-measures which have been used or suggested against problem elephants (Chapter 3).   Possibly you may be either (a) overwhelmed by the amount of information that has already been given or (b) sceptical that so much information is necessary to address this problem in your area. Remember that this guide is intended or use in many different situations in Africa so it has to try to be comprehensive. For your situation or your area, you may need only a portion of what is discussed.

There are, however, some common *principles* which appear to be emerging in the management of HEC across different situations in Africa. This chapter attempts to outline them. You should keep these principles in mind as you move on to evaluating which mitigation measures may be applicable to your HEC situation (Chapter 5).

RECAP ON WHERE YOU ARE IN THIS DSS

Use of thIS Decision Support System
(CHAPTER 1)

What do I need to know before trying to address HEC?
(CHAPTER 2)

What HEC counter-measures have other people used or considered?
(CHAPTER 3)

What principles are common to many HEC situations?
(CHAPTER 4)

<div style="border:2px solid black; display:inline-block; padding:4px;">**YOU ARE HERE**!</div>

How well have HEC counter-measures worked in Africa so far?
(CHAPTER 5)

How do I plan a management strategy for my HEC situation?
(CHAPTER 6)

4.1 Are elephants different from other pests?

4.1.1 *Problem elephant behaviour*

Elephants are large and intelligent animals. If individual animals develop problem behaviour they can become very resourceful in both escaping detection and resisting counter-measures. Elephants are not aggressive by nature but individuals do have the *potential* to be dangerous. The chances of any one person's crops or property being damaged by an elephant is often quite small but people are well aware of the *potential* risk i.e. if you are affected there is a chance that the problem will be serious (20; 38). Elephants damage a wide range of food and cash crops and the effect is very obvious and therefore dramatic, unlike for example some damage caused by insects, rodents, primates or wild pigs. Elephants often damage crops in areas where farming yields are marginal and therefore food security is tenuous.

Crop-raiding elephants often show fairly characteristic behaviour patterns. They can easily distinguish the boundary between a 'safe' zone (e.g. a protected area) and a 'higher risk' zone (e.g. a farming area) and their behaviour may vary accordingly. For example, they may move quietly and retreat from humans in a farming area but be more confident and sometimes even aggressive when encountering people just inside their sanctuary. Crop-raiding elephants often actively seek out fields with mature crops and feed on these in preference to fields with immature plants, which they may merely traverse and trample. Therefore crop-raiding incidents tend to peak in number and severity nearer harvest time. Male elephants (bulls or bull groups) tend to take greater risks than females (in cow-calf groups). Bulls are often more persistent or bold, ranging further into farming areas, crop-raiding for more of the year or habituating more easily to counter-measures than cow groups (19). Cow groups with offspring or mixed groups (bulls, cows and calves) do crop raid but seem somewhat more likely to do so at the peak of the growing season in situations close to a natural refuge. This activity pattern appears common in severely range-restricted elephant populations (so-called *pocketed* populations).

There are very few human food crops which elephants will not eat. They consume virtually all cultivated grains, green vegetables and fruits and even eat parts of cash-crop plants such as cotton, cocoa and timber trees. Both wild and domestic fruits can act as a particular attractant for elephants, especially in forest situations. In places where wild trees are retained by farmers for their edible or useful fruit, the variable annual yield of the fruiting species can have a marked influence on problem elephant activity around the farming area. Examples of this are *Vitellaria* (Karite) fruit in the savannas of west Africa and *Ziziphus* (Masau) fruit in riverine fringes of parts of southern Africa.

4.1.2 *The reaction to elephant problems*

Addressing elephant problems requires co-operation and hierarchial decision making at many different levels of government and civil society (see Chapter 6). This hierarchy means that everyone potentially has a different view of elephant problems (Chapters 2, 6) which may vary according to how directly they are affected.

You will probably only be reading this document if you are somewhere in the hierarchy of decision-making or somewhere else outside the direct effects of problem elephants on your livelihood. It is thus particularly useful to try to gain insight into the views of those *directly* affected at the human interface with an elephant population and more importantly, why these people may hold such views. People studying the social effects of elephants have attempted to do this.

A recent research project (38) investigated how elephants rank in the spectrum of agricultural pests and why they attract so much criticism when many other smaller pests (e.g. rodents, birds, bushpigs, baboons, monkeys) actually do far more damage to stored or growing food crops. If all the factors involved in tolerance to wildlife pests are gathered together and tabulated (38) it is much easier to appreciate the perspective of affected people towards problem elephants (Table 4.1)

Table 4.1 **Factors influencing local tolerance to wildlife pests (those applicable to elephants are emboldened)**

<<< INCREASING <<< TOLERANCE		INCREASING>>> INTOLERANCE >>>
SOCIO-ECONOMIC FACTORS		
Abundant	Land availability	Scarce
Abundant, inexpensive	Labour availability	Rare, expensive
Low	Capital and labour investment	High
Various	Alternative income sources	None
Varied, unregulated	Coping strategies	Narrow, regulated
Small	Size of discussion group	Large
Subsistence	Type of crop damaged	**Cash or famine crop**
Community, group	Social unit absorbing loss	**Individual, household**
Low	Potential danger of pest	**High**
High	Game value of pest	**Low**
ECOLOGICAL FACTORS		
Small	Pest size	**Large**
Early	Raid timing relative to harvest	**Late**
Solitary	Pest group size	**Large**
Cryptic	Damage pattern	**Obvious**
Narrow, one crop	Pest's crop preference	**Any crop**
Leaves only	Crop parts damaged	**Fruit, tuber, grain, pith**
Diurnal	Circadian timing of raids	**Nocturnal**
Self-limited	Crop damage per raid	**Unlimited**
Rare	Frequency of raiding	**Chronic**
<<< INCREASING <<< TOLERANCE		INCREASING>>> INTOLERANCE >>>

For these reasons you can see why elephant damage, irrespective of its actual extent, can become a very political problem (18). This means that HEC resolution necessarily has a large component of dealing with people and these 'public relations' can be very difficult for a wildlife manager. There is a whole social dimension to the question of problem elephants.

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4.2 Principles of intervention in HEC

4.2.1 *The responsibility for action*

People directly affected by problem elephants, particularly subsistence agriculturalists, cannot be expected to deal with these animals on their own. In many African countries the law prevents anyone except those employed in the wildlife authority from dealing with elephants and in the remainder of countries only those with permission from the wildlife authority may do so. This can exacerbate elephant problems since in many cases affected communities see the resolution of elephant problems as solely the obligation of the government or its wildlife authority.

In practice wildlife authorities cannot possibly succeed against problem elephants if affected people merely sit back and wait for all their elephant problems to be solved. Affected people themselves have to make an effort (e.g. employing traditional methods – see Chapters 3; 5) and truthfully reporting the nature of the problem. Likewise the wildlife authority has to openly and fully discuss relevant issues with affected people so as to foster their trust.

4.2.2 *The 'psychology' of HEC management*

Directly affected communities often expect a complete solution to all incidents involving problem elephants. This is unrealistic. It is impossible for management action to prevent all damage from any elephant at any time and people planning elephant control strategies should not create the expectation of a total solution. A politician may want to talk about solutions but for a wildlife manager it is far better to commit to *addressing* the problem. Because it is unlikely that HEC can ever be totally eliminated where elephants and people live in proximity to one another, the management objective should therefore be not necessarily to eliminate the problem but to reduce it (18).

A 'tolerance level' to all problems, including HEC, exists in most communities. If a person can influence wildlife management in an area he/she can potentially influence both the physical problem of HEC and the tolerance level of affected people (18). Such a manager must expect to be equipped to use the dual strategy of working with both elephants and people (17; 38).

From the outset in HEC management it is useful to consider the relative importance of elephants as a pest species and encourage all other people involved to do so. Recent research has revealed why problem elephants can be so despised by rural dwellers (Table 4.1) and why complaints about this species are often in disproportion to the obvious losses they cause (17; 38). Not viewing elephant problems in isolation is important. Putting them in context with the

many other social and farming problems associated with survival in rural Africa helps to ease the relationship between wildlife managers and complainants.

It is probable that in many HEC situations the potential physical danger or actual inconvenience to daily activities caused by elephants is a greater reason for the degree of complaint than crop damage (see Table 2.4 and sections 2.4; 2.5). Fear and inconvenience translates for example into restrictions on peoples' free movement in and around their villages, something that they greatly resent.

In any community strong protests usually come from people who are vociferous by nature while many others bear similar problems with little complaint. This means a false impression of elephant problems can easily be gained. The only way to overcome this is to have an independent or unbiased method of getting access to the relevant information.

4.2.3 *Multiple interventions in HEC*

A useful collective term for *any* action employed *at any level* to try to address a problem like HEC (whether a counter-measure or a method) is an **intervention**. Managers working with HEC have shown that one intervention alone will never adequately take care of HEC. Several very different measures have to be employed *simultaneously in combination*. The logic behind this is that each action may help a little but would not, on its own, be sufficient to make much difference to the HEC problem. On the other hand, acting together, the whole *package* may be more effective than the sum of its individual constituent parts. This is called **'synergy'**. It probably works because although problem elephants are very resourceful, if their intentions are hindered or blocked in several different ways, most of them may give up trying.

The problem though is that there are so many possible interventions and they are so different from one another (Chapter 3) that it is difficult for many people to perceive them acting together as a package (18). Initially it may be best to select only a few interventions, use them and monitor their effectiveness, discarding those that do not work (see Chapter 6). You can always return to the list of options and invoke another action. Different combinations of methods may need to be tried until a fairly successful combination is found which suits the local conditions

As far as possible interventions should be put in place in good time, i.e. well ahead of the period when serious problems are expected. Elephants resident near human settlement may continually 'monitor' human activity and test the defences and resistance offered against them in very subtle ways. This occurs even in what people regard as the 'off-season' e.g. when crops are not being grown or are still immature. Examples of being prepared are keeping some simple, low-cost measures in place all year round (watchmen; simple barriers) or keeping power in electric fences at all times and maintaining security of stored

food (e.g. secure grain storage). Failure to keep up timely defences can result in far greater challenge from problem elephants during the peak conflict season.

4.2.4 *Information gathering in HEC management*

In Chapter 2 an underlying theme was the likely deficiency of information in most HEC sites. Unfortunately, in most human-elephant conflict situations in Africa the extent of the problem has not been monitored systematically or measured quantitatively. Therefore judgement of conflict intensity has often had to rely on the a simple 'barometer' of tolerance to elephants by affected local communities i.e. the attitudes of people (15, 20).

While the level of social tolerance to problem elephants is very important for a wildlife manager to try to gauge, it is usually essential to at least be able to decide what problem elephant activity actually involves and quantify it, *even if the latter can only be done very crudely.* Because HEC can only be reduced, not eliminated, a very important principle in dealing with it is to have some measure of its intensity before and after interventions designed to address the problem. This way some measure of success or failure of the interventions can be gained.

Intensity may be open to wide interpretation. In the kind of situation where HEC is encountered in practice, intensity can be derived from a combination of three things: *distribution; frequency; severity* (see Chapter 2). Simple, well-organized data collection systems can collect information on elephant damage incidents over large areas at low cost. Summarizing these data annually gives a picture of the distribution, frequency and severity of incidents in an annual cycle. If the information gathering effort is repeated over a number of annual cycles the *natural variation* in problem elephant activity is likely to be recorded. Obviously if this is done, an overall assessment of the problem is likely to be much more reliable.

(i) *A data collection system*

A simple system of data collection can be set up using enumerators to record details of problem elephant activity (Chapter 2) (21; 25; 55; 56). An enumerator visits the site of a problem elephant incident and records what was damaged and when. An example of the basic information required is detailed on a single page form (Table 4.2).

This form is not a definitive example that must be adhered to in all situations. It gives an indication of the sort of information that (a) is needed from a simple data collection system as well as (b) can be used by a more investigative research study. The form can be adapted to suit any local conditions – i.e. it can be changed, expanded or reduced. This example comes from work in Zimbabwe

where it was found convenient to restrict all information from each separate problem elephant incident to one side of an A4 size piece of paper.

This type of data collection depends on the setting up of a reporting scheme to cover your HEC zone. Enumerators have to be trained and supervised so that data are collected *systematically* (Table 2.9; 2.10). A full explanation of how such a system works is given in two documents (References 20 & 21 now in Appendix B as: AfESG Available Products 2 & 3) which are available from the AfESG or on its Internet Website (see contact details Appendix B). Such schemes necessarily involve some effort but the benefits from them are well worthwhile.
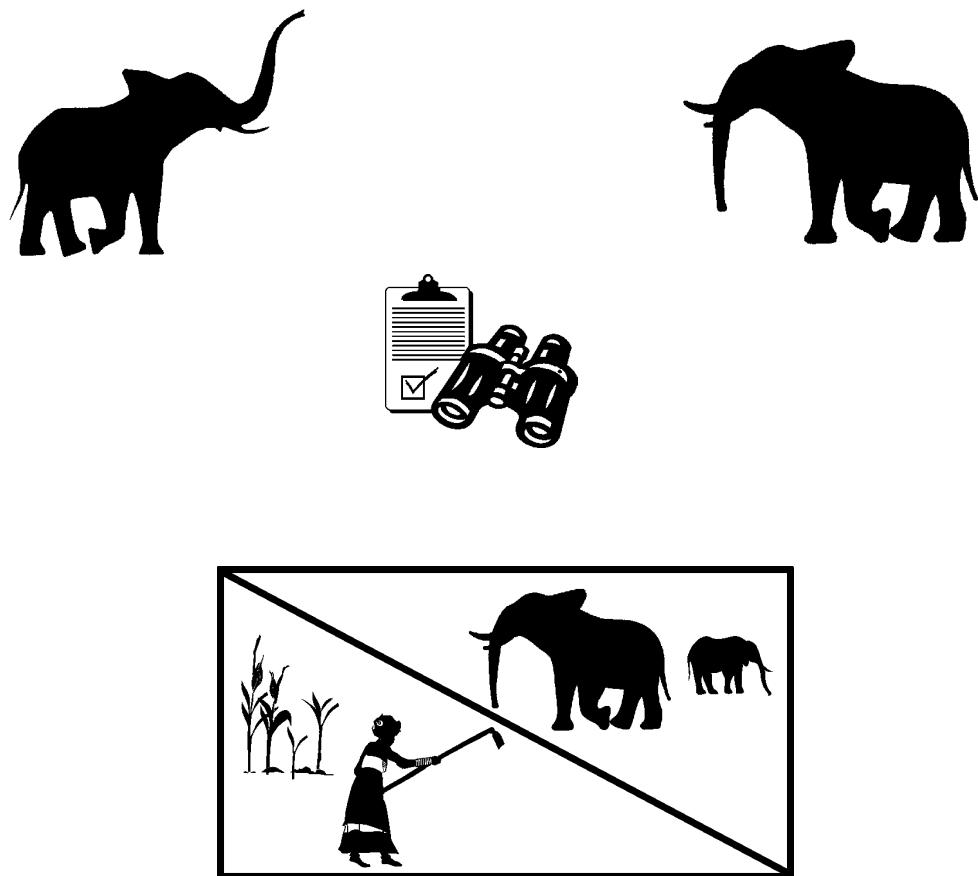
TABLE 4.2

ELEPHANT DAMAGE REPORT FORM

REGION ………….. …….….. …………… …………… …………… **FORM No.** …………... ………..…..
DISTRICT …………… …….….. …………… …………… …………
SUBDIVISION ………. …………… …………… …………
VILLAGE …………. …….…. …….…………… **REFERENCE FOR EXACT LOCATION**……. …………... …………..
ENUMERATOR NAME …………. ………….. ………… **DATE OF INCIDENT** …………. …………..
COMPLAINANT(S) NAME(S) …………. …………. …………. …………. …………... …………… …………..
…………… ………….. …………. …………. …………... …………… …………..
DATE OF COMPLAINT …………. ………..…..

CROP	DAMAGE	QUALITY	BEFORE	DAMAGE		AGE	OF	CROP
		(Tick	one	category)		(Tick	one	category)
CROP	TYPE	GOOD	MEDIUM	POOR		SEEDLING	INTERM.	MATURE
CROP 1	…………..	…………...	…………	…………		…………...	…………	…………
CROP 2	…………..	…………...	…………	…………		…………...	…………	…………
CROP 3	…………..	…………...	…………	…………		…………...	…………	…………
CROP 4	…………..	…………...	…………	…………		…………...	…………	…………
CROP 5	…………..	…………...	…………	…………		…………...	…………	…………

DIMENSIONS OF TOTAL FIELD WHERE DAMAGE OCCURRED
LENGTH …………... ……….. …………... PACES or METRES or OTHER MEASUREMENT (SPECIFY)
WIDTH …………... ……….. …………... PACES or METRES or OTHER MEASUREMENT (SPECIFY)

DIMENSIONS OF ACTUAL DAMAGED PORTION OF FIELD
LENGTH …………... ……….. …………... PACES or METRES or OTHER MEASUREMENT (SPECIFY)
WIDTH …………... ……….. …………... PACES or METRES or OTHER MEASUREMENT (SPECIFY)

OTHER	DAMAGE	TICK	AND	SPECIFY	DETAIL		
FOOD STORE		…………...	…………...	…………...	……………	…………...	…………… ……………
WATER SUPPLY		…………...	…………...	…………...	……………	…………...	…………… ……………
THREAT TO LIFE		…………...	…………...	…………...	……………	…………...	…………… ……………
HUMAN INJURY		…………...	…………...	…………...	……………	…………...	…………… ……………
HUMAN DEATH		…………...	…………...	…………...	……………	…………...	…………… ……………
OTHER (SPECIFY)		…………...	…………...	…………...	……………	…………...	…………… ……………
		…………...	…………...	…………...	……………	…………...	…………… ……………

ELEPHANTS INVOLVED NUMBER **ELEPHANT SIGN** (Tick)
GROUP SIZE (TOTAL) …………...
Adult Male (if known) …………... TRACKS ONLY …………... …………...
Adult Female (if known) …………... ANIMALS VISUAL …………... …………...
Immature animals (if known) …………... OTHER (Specify) …………... …………...

YOUR COMMENTS: …………... …………... …………... …………… …………... …………… …………..
…………... …………… …………… …………... …………… …………... …………… …………..
…………... …………… …………… …………... …………… …………... …………… …………..

Was This Report Forwarded?
To Whom? …………... …….…..………... Where? …………… …………... …………... …………...
When? …………... …….…..………... How? …………… …………... …………... …………...

Even reading through information on simple forms like this may enable a busy manager to establish a pattern of what HEC in his area involves. The most important point is that the incident is recorded by a third party and not taken from the verbal account of a directly affected person, so it should be reasonably free from *bias*. If data are free from bias and collected by a similar method over a reasonable period of time they can be very useful for investigating a problem (they can be termed *hard data*).

Data from this kind of system meet the criteria needed to establish a reliable picture of problem elephant activity. Such good field data need never be wasted; even in situations where no interventions are employed or tested. Data reliably collected by an enumerator on forms like this (often called *raw data*) can often be used subsequently (even many years later) by a social or biological researcher to answer more complex questions. Or they could be used as a baseline against which later interventions can be tested.

A very important point is to record the incident locations with consistent accuracy. Whatever system is used (e.g. map co-ordinates, GPS co-ordinates; numbering fields and villages) does not really matter but it must be consistent and able to be clearly understood at a later date. Another important point is that there should be some way of judging the seriousness of problem elephant incidents. Suggested criteria for doing this are mentioned later (section 5.9) but fully explained in the AfESG data collection protocol document (Reference 20, see Appendix B).

(ii) *A research programme*

Data collection is not the same as research and a clear distinction should be made between the two. Data collection merely *gathers* information. While this is of course essential in addressing almost any problem, information has to be *interpreted*. If you research a problem you set out a pre-determined plan for an investigation to follow. Intelligent questions are asked about the problem beforehand (these may be framed as **hypotheses**) and study areas are demarcated for collection of pre-specified data if the whole area cannot be covered (i.e. **sampling** may be used). The data are then processed (*summarized and analysed*) usually by methods agreed upon before the collection began. Obviously this requires, at least in a supervisory role, a person or people who have been trained.

Most conservation problems need basic research. This is mainly for the simple reason that there are broadly speaking, two kinds of problem. Before any investigation there is a *perceived problem*. After investigation there may (or may not be) an *actual problem*. The actual problem usually turns out to be different from or more complex than, the perceived one. Most forms of elephant management cannot really be justified without some field data (14) and with HEC there are opportunities for multi-faceted research Examples of these are:

- *Research to increase understanding of the local ecology of elephants* (e.g. 3; 19; 22; 32; 34; 37; 45; 49; 49; 52; 53). HEC does not have to be seen as a 'stand –alone' issue and the study of it can be combined with other aspects of elephant research and management (see section 6.1).

- *Research to investigate attitudes of people affected by problem elephants and other problem wildlife or pests* (e.g. 12; 15; 16; 17; 31; 33; 36; 37; 38; 47; 48). Putting elephant problems in context with those from other pests (12; 13; 33; 43) greatly simplifies the management of HEC.

- *Research to study agricultural production and land use systems which are affected by elephants* (e.g. 1; 2; 3; 19; 30; 34; 47).   Present and future HEC in any area has more to do with local human land use than any other factor. (see section 5.10). Sampling designs and analysis methods for HEC research should be based to a large extent on spatial variables (18; 19; 44).

Research into HEC is relatively new and our understanding of its many aspects, although incomplete, is nevertheless increasing steadily (17; 18; 38). Most of the contents of this document have been possible only because of such research effort. Research is often perceived by managers as expensive, complicated or merely for the interest of 'boffins' who have little understanding of practical problems. This is a fallacy. With the right people and an efficient design the return for research effort can be very cost-effective and long-lasting. It may be difficult to think of research *as being a counter-measure on its own* in HEC but it is really an integral part of almost any necessary 'package' of counter-measures.

A typical scenario in HEC management is where a busy wildlife manager does not have the time to address the issue adequately. Under local public pressure he will take some action, but will often admit to having to do so on the basis of intuition rather than information. If he contracts an investigation of the problem to a researcher, he will free himself of the investigative burden attached to the local HEC issue. The researcher will design a study, assemble a team of people if necessary to collect the data and analyse the information so that conclusions and recommendations can be produced. The manager will then be able to make *informed decisions* about HEC mitigation on the basis of the study's results (14).

The above principles of maximizing information gathering in HEC are illustrated in a simple schematic (Figure 4.1). The desired output of this logical and thorough process is shown: evaluating the elephant problem, not in isolation, but in the context of realities faced by wildlife conservation and peoples' survival.

Figure 4.1 **INFORMATION INPUTS NEEDED AT A HUMAN-ELEPHANT CONFLICT SITE** (Schematic)

DATA COLLECTION   **RESEARCH**

DAMAGE BY PROBLEM ELEPHANTS   CONFLICT ZONE

WHAT?   WHERE?   WHEN?   HOW BAD?   COMPLAINANT

INDIVIDUAL INCIDENT FORMS

Elephant ecology	Human socio-economic issues	Agriculture; Natural Resources; Land use

INCIDENT SUMMARIES				
	YEAR 1	YEAR 2	YEAR 3	TOTAL
Area 1				
Area 2				
Area 3				
Area 4				
Area 5…etc.				
TOTAL				

	YEAR 1	YEAR 2	YEAR 3	ALL
REPORTS				

THE ELEPHANT PROBLEM EVALUATED IN CONTEXT

CHAPTER 5

EVALUATING THE EFFECTIVENESS OF ELEPHANT COUNTER-MEASURES

In this chapter the ten categories of counter-measures listed in Chapter 3 are evaluated in explanatory text, using knowledge that has accumulated to date. Initially the same tabulated form for presenting methods is retained but now symbols are inserted in the tables to indicate the results each method may have yielded in practice. The criterion chosen to evaluate the effectiveness of a method (only one can be shown because of space constraints) is its duration of effect (short-term versus long-term effectiveness). Thus:

✓ = method tried and evaluated with some agreement
? = untried method or unknown effect

Such simple judgement is a very crude way of evaluating complex issues and there are almost certainly many results you will not agree with. This format is really employed to illustrate the following:

- The full range of HEC management options
- What progress there has been in HEC study to date
- How few methods have been rigorously evaluated

Remember to keep the following in mind when reading the tabulated information:

- methods ineffective in one HEC area may be effective elsewhere (18)
- it depends who measures "effectiveness" and what they mean by it
- there are probably many cases where a method has been tried but the results are not widely known

More important than the tables are the comments offered thereafter. Advantages and disadvantages of methods are discussed and explanatory facts are provided in text. Both these are the result of accumulated experience in dealing with HEC situations to date. The idea is that from a wide range of options, you have to consider, *in the light of the experience of others*, which options might be applicable for dealing with HEC *in your area of operation*. Your position might involve work at a ***site*** (i.e. a physical conflict zone on the ground) or a position in the hierarchy of decision making (Fig. 6.1; Table 6.1), possibly physically remote from a site, but which nevertheless may influence HEC mitigation activities in several sites.

After the explanatory text follows an annotated summary of the advantages and disadvantages of the counter-measure and a rating on its 'public relations value'. Finally there are blank tables in each category for you to select methods that might be applicable to your area and additional space for your notes.

RECAP ON WHERE YOU ARE IN THIS DSS

Use of this Decision Support System
(CHAPTER 1)

What do I need to know before trying to address HEC?
(CHAPTER 2)

What HEC counter-measures have other people used or considered?
(CHAPTER 3)

What principles are common to many HEC situations?
(CHAPTER 4)

How well have HEC counter-measures worked in Africa so far?
(CHAPTER 5)

| YOU ARE HERE! |

How do I plan a management strategy for my HEC situation?
(CHAPTER 6)

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5.1 Traditional Anti-Elephant Methods Used By Local Area Residents

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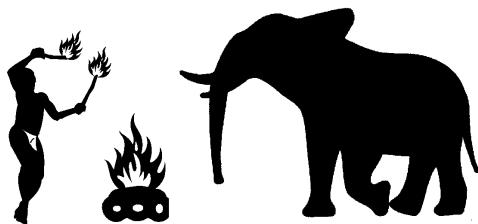
Traditional counter-measures against elephants can be regarded as *'self-defence'* measures by people. It is recommended that farmers always do try to repel elephants by using some traditional methods.

Table 5.1

TR	Method	Effectiveness	
No		**Short**	**Long**
TR1	Watchmen		
TR1.1	(Crop guards sleeping out on platforms in fields)		?
TR1.2	(Scarecrows)	?	
TR2	Noise in presence of problem elephants		
TR2.1	(shouting and drumming)	✓	
TR2.2	(banging metal tins or noisy objects)	✓	
TR2.3	(cracking whips to imitate gunfire)	✓	
TR3	Fire		
TR3.1	(fires lit on periphery of fields)	✓	
TR3.2	(smoke from burning dried elephant dung)	✓	
TR3.3	(burning material thrown at raiding elephants)	✓	
TR4	Missiles (e.g. stones, spears) thrown at elephants	✓	
TR5	Cleared areas around fields		?
TR6	Sharp objects on elephant pathways		
TR6.1	(sharp stones/nails)	?	
TR6.2	(sharpened wooden stakes)	?	
TR7	Simple barriers on home cut poles or between trees		
TR7.1	(bark ropes or string with tins/bells/cloth attached)		✓
TR7.2	(single strand wires)		✓
TR8	Decoy foods for elephants		
TR8.1	(unmodified e.g. watermelon, sugarcane, banana)	?	
TR8.2	(adulterated with unpalatable food e.g. chilli seeds)	?	
TR8.3	(adulterated with poison)	?	
TR9	Pit traps for elephants		

Experience with traditional methods

The evaluation of such traditional methods has to be rather subjective and farmers or people employing them are probably themselves the best judge of their success. In general terms, most traditional methods have been considered vulnerable to failure in the longer term because of *'habituation'* (22; 40; 41; 42). Habituation means animals appear to learn that the method causes no serious harm to them and thus, after a period of exposure, simply ignore it. In scientific language this is clearly expressed as "diminished response to a stimulus after repeated exposure". Elephants are very intelligent animals and problem elephants can exhibit very persistent and resourceful pest behaviour. Some of these 'specialists' seem to be able to gauge the level of threat presented by various self-defence methods after relatively short exposure.

There is, however, evidence that traditional counter-measures do work to some degree since places where no self-defence is applied become more seriously affected (25; 38; 41). They do seem to help where elephant *'challenge'* is not too severe. Researchers in one area of Zimbabwe have recently been assisting subsistence farmers to apply a package of very low-cost traditional measures (58). They divided farmer-based elephant control measures into three categories, monitoring and evaluating these combinations for effectiveness:

- *Vigilance methods*: clearing five metre swathes in the vegetation around crop fields; farmer co-operation on strategic placement of watchtowers and rotation of crop guards to man them; use of whistles by guards; placing cowbells on string fences.

- *Passive methods*: use of fires on field boundaries at identified entry points for elephants; making 'brickettes' of dried elephant dung mixed with ground up chillies and burning these at night to create a noxious smoke; mixing chilli pepper oil with grease and smearing the grease on string fences; planting chillies as an unpalatable 'buffer crop' around food crops.

- *Active methods*: using whips (made of tree bark) to imitate gunfire; use of firecrackers thrown towards elephants approaching the fields.

It is very difficult to quantify the reactions of elephants to the above methods, especially when several are used in combination. But the key to deterring elephants seems to be the use of combinations of methods since reliance on one or two individual methods is particularly vulnerable to failure. Villages in the above project area were least affected when the maximum combination of methods was used. Another way of gauging success in this type of project is to note to what extent new or improved traditional methods are copied by farmers outside a project's 'target' villages. Elephant deterrence based around the growing of chillies as a buffer crop and use of chillies as a deterrent has had the added benefit that surplus production can be sold by farmers for cash. More detail on buffer crops is given in section 5.4.

Injuring elephants using sharp objects in the ground or shooting at them with home-made guns or small calibre ammunition is not recommended since wounded elephants can become aggressive, sometimes making unprovoked attacks on people. The use of poison baits is likewise discouraged as unethical against both elephants and other non-target species.

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Summary of traditional methods

Advantages
- Can be applied by the land occupier
- Cheap to apply
- Do have some effect
- Most are not fatal to elephants

Disadvantages
- Problem elephants do habituate to most methods
- Many methods must be used in combination
- Danger to people using active methods near elephants

Public relations value
Not applicable (this idea applies to outside assistance e.g. by a wildlife authority)

</div>

Select possible TR methods for use in your area	Effectiveness?	
	Short	Long

YOUR NOTES ON TRADITIONAL METHODS

5.2 Disturbance Of Problem Elephants

CODE: DS

Disturbance is a very widely used counter-measure, usually the first to be tried if wildlife authorities are called on to supplement the traditional methods used by rural people.

Table 5.2

DS	Method	Effectiveness	
No		Short	Long
DS1	Weapons fired near raiding elephants	✓	
DS1.1	(shotguns)	✓	
DS1.2	(rifles)	✓	
DS2	Thunderflashes thrown at problem elephants	✓	
DS3	Flares discharged near problem elephants	✓	
DS4	Lights shone onto raiding elephants	✓	
DS5	Trip wire alarms	?	
DS6	Elephant "drives" with aircraft, vehicles or people	✓	

Experience with disturbance

Creating a disturbance is often quite successful to begin with but after several applications, can become noticeably less effective, especially if the same problem elephants are involved (22). Although elephants can distinguish between the presence of local people using their own traditional methods of disturbance (Table 5.1) and wildlife personnel who use more sophisticated devices, after some exposure persistent problem elephants appear able to gauge that the latter methods also present relatively low levels of threat.

In areas where crop-raiders are particularly persistent even shooting them in the rump with shotgun pellets has resulted in the animals soon learning that this is only an inconvenience and therefore retreating only temporarily or just out of range. In a few of the worst affected sites in Africa extraordinary scenes have occasionally been witnessed at the peak of the crop growing season when very bold crop-raiding elephants stand their ground and continue feeding while encircling groups of people throw burning logs at them or discharge heavy calibre rifles over their heads from very

close range. Occasional hardened offenders have been known to enter a rural homestead and chase people indoors before breaking into grain stores.

Disturbance by discharging firearms near elephants is often used where these animals are very valuable from the conservation or economic point of view and wildlife authorities are reluctant to destroy them. One study tried to quantify the effect of presence and absence of 'disturbance hunters' on elephant crop-raiding in Malawi (3). No reduction was recorded in areas where hunters were present. Presumably the explanation is habituation, a phenomenon widely referred to in the literature from other conflict areas (12; 25; 40; 41; 42; 50)

Driving elephants away from a conflict area by employing massive disturbance through the use for example, of helicopters, vehicles and large teams of people on the ground, has been occasionally attempted. The problem with this technique is that the return of elephants must be permanently prevented over a large area, something which only a very expensive and well-maintained barrier (see section 5. 4) can achieve.

<table>
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Summary of disturbance methods

Advantages
- Relatively cheap to apply
- Do have some effect
- Non fatal to elephants

Disadvantages
- Can be dangerous due to proximity of elephants and their reactions
- Generally have to be applied by trained wildlife personnel
- Problem elephants do habituate to most methods

Public relations value
- Moderate

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</table>

Select possible DS methods for use in your area	Effectiveness?	
	Short	**Long**

YOUR NOTES ON DISTURBANCE

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5.3 Killing Problem Elephants

CODE : KL
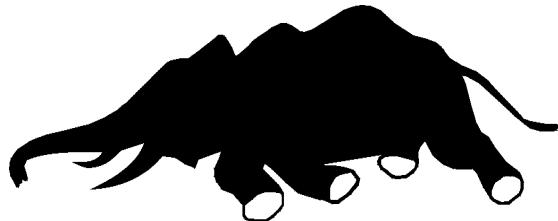
An almost universal initial demand from human communities affected to any degree by HEC is that problem elephants should be destroyed. Thus killing is a problem elephant control method that has been applied for many years over much of Africa (22; 46; 47).

Table 5.3

KL	Method	Effectiveness	
No		Short	Long
KL1	Killing of selected problem elephants		
KL1.1	(destruction by wildlife authorities)	✔	
KL1.2	(destruction by an authorized third party)	✔	
KL1.3	(illegal killing)	✔	
KL2	Marketing commercial hunts for killing problem animals		
KL2.1	(proceeds to central authority)	✔	
KL2.2	(proceeds to local authority)		?
KL2.3	(proceeds to local community)		?
KL4	Depopulation of elephants		
KL4.1	(cull a proportion of elephant population)	✔	
KL4.2	(eliminate elephant population)		✔

Experience with killing problem elephants

Killing an elephant represents what affected people see as retribution for problems that elephants cause and is also very popular because it usually provides the additional bonus of free meat. When carried out by wildlife authorities it is a relatively cheap and quick control method. Since it is popular with both wildlife authorities and affected people, killing has been widely employed as a 'quick fix' solution (25; 46; 47). In previous times in some traditional societies, a hunter was appointed by the affected community to kill problem elephants under tribal law (33; 40). This is possibly why the idea of killing being one of the first and often the only action to be taken, is so entrenched.

Although there may be some temporary effect, in many conflict areas problem elephants continue to be destroyed every year without any apparent overall reduction

in their activity. The practice has become almost a ritual in some conflict areas. As the phenomenon of problem elephants has been studied for longer periods by researchers in the field, possible evidence to explain the ineffectiveness of killing may be accumulating. It appears that almost any elephant population has what may be termed a 'problem component' (22). As animals comprising this component are removed, others replace them. The problem component thus remains.

An example of evidence for this 'component theory' is illustrated by results of radiotracking an individual elephant after a control shooting incident (Fig 5.1). In this conflict site HEC has been severe and elephants have been repeatedly destroyed for decades. Wildlife managers often maintain that killing an elephant 'teaches' others to avoid entering farming areas. The example given here clearly does not support this view.

A second problem is the correct identification of individual problem elephants (see section 2.6). Even well-organized researchers with technological aids like radiocollars and night vision equipment have great difficulty sexing and identifying all individual animals at night when most elephant raiding occurs. Claims by local area residents that culprit elephants can be subsequently and surely identified in daytime are often unfounded.

The persistence of elephant raiding almost everywhere problem elephants have been destroyed, in some cases for periods extending for decades, would seem to justify a reassessment of the thinking surrounding this issue. Also the rising appreciation of elephants across Africa (whether aesthetic, ecological or financial) has led to further doubt about the wisdom of relying only on killing as a control measure.

Because killing apparently has so little effect on bull elephants, in the past a practice employed by some wildlife managers was the shooting of young cows from herds near the conflict area. This was said to have a longer deterrent effect through higher social disturbance of elephant groups who rapidly moved away. Although there may be truth in this argument, again there are inherent problems with using this technique. Many conflict areas, especially those densely settled by people, now have very few females present because cow elephants with calves tend to avoid the disturbance near human settlement.   Also because of long generation times in the breeding of elephants, it takes a very low mortality of adult females to adversely affect the reproductive performance of an elephant population, so the removal of females has to be very limited if there is an objective to conserve the species.

INADEQUATELY FENCED BOUNDARY

April 9th 21:00

April 8th 12:00

NATIONAL PARK

April 10th 15:00

River

AGRICULTURAL AREA

April 11th 09:00

Radiocollared Elephant
April 7th 21:00
Killed Elephant

April 11th 21:00

April 12th 03:00

1 Km
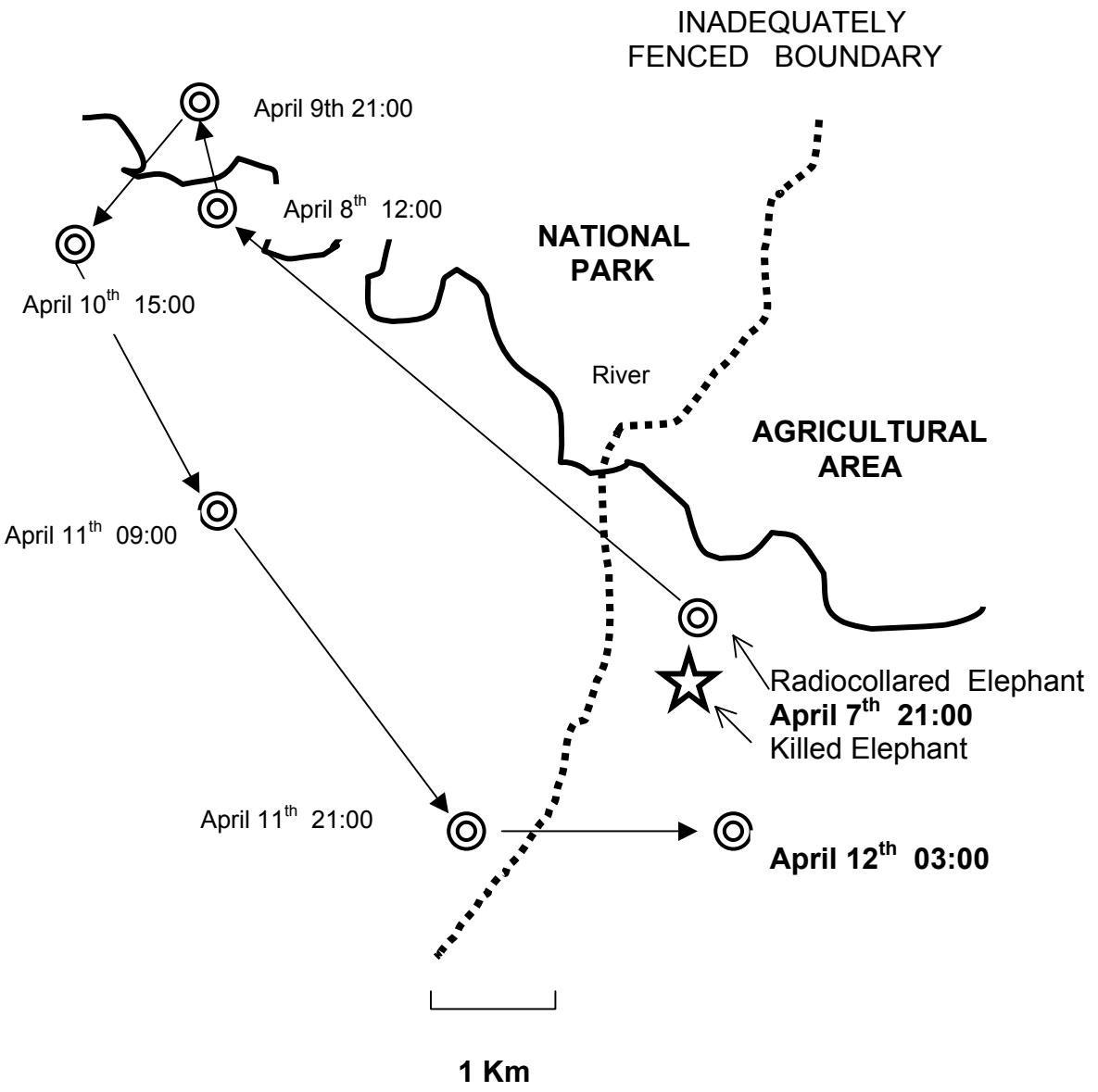
Figure 5.1 Movements of a radiocollared male elephant tracked by a researcher in Zimbabwe. One of the elephant's group mates was shot dead in the farming area on 7th April. The animal returned initially to the sanctuary of the adjacent National Park but four nights later (April 11th/12th) was crop raiding again in the farming area close to where the shooting took place. April is the peak of the harvest season. (Redrawn with permission from Osborn 1998 [41])

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Most countries have national laws relating to the protection of elephants (47; 54). In certain counties (e.g. Gabon [33]; Namibia [40]; Zimbabwe [25; 46; 47]) wildlife authorities have drawn up protocols to regulate the killing of problem elephants, largely replacing traditional laws and trying to restrict this action to extreme cases of HEC. These protocols may include conditions such as: the identification of a culprit animal (25; 33); destruction of crop raiders only within1km of fields (25); written consent from a local authority contracting a professional hunter to kill an elephant (25; 40; 46). .Also 'compromise' protocols which allow killing for example of very aggressive elephants or individuals proven as habitually problematic are in place in a number of countries(47). More detail on marketing problem elephants on commercial hunts is explained in section 5.8

Even where elephant killing protocols are in place, the degree of adherence to them in the complex structure of decision-making (see Fig 6.1; Table 6.1) can be rather variable in practice. And unfortunately even when adhered to, the process involved in granting permission can impose undue delays in situations which often require immediate action. .

Summary of killing

Advantages
- Relatively cheap and quick to apply
- Temporary effect
- High public relations value in affected communities

Disadvantages
- Has to be done by trained personnel
- Dangerous activity
- Difficult to identify culprit animals with certainty
- Little deterrent effect on other raiders

Select possible KL methods for use in your area	Effectiveness?	
	Short	**Long**

YOUR NOTES ON KILLING

5.4 Physical Barriers To Elephants

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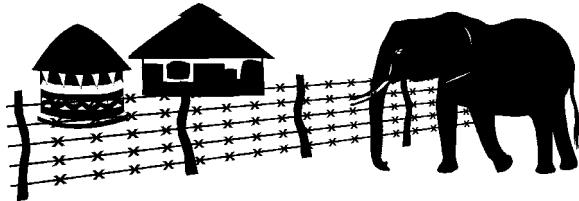
Barriers, although an expensive option, are seen by many people as potentially a permanent solution to an elephant problem. Many types of barrier have been tried against elephants but in practice their success has often fallen well below expectation, primarily because of maintenance deficiencies.

Table 5.4

BA	Method	Effectiveness	
No		Short	Long
BA1	Conventional (non-electrified) fencing		?
BA2.1	Electric fencing using mains electricity		✔
BA2.2	Electric fencing using solar panels and 12 volt batteries		✔
BA3	Fence layout		
BA3.1	Fences encircling either elephant range or human settlement		✔
BA3.2	Fences open-ended to deflect elephants from settlement	✔	
BA3.3	Fencing a protected area boundary / elephant range		?
	(fencing equipment owned and maintained by wildlife authority)		?
BA4	Fencing scale		
BA4.1	Fencing projects at a single household scale		?
	(fencing equipment individually owned and maintained)		?
BA4.2	Fencing projects at a group of households scale		?
BA4.3	Fencing projects at a village or community scale	?	
	(fencing equipment owned and maintained by community)	✔	
BA5	Trench	✔	
BA6	Moat	✔	
BA7	Stone wall		✔
BA8	Buffer crops (e.g. tea, tobacco, timber, chilli) around food crops	✔	

Experience with elephant barriers

There is often a temptation to put up elephant barriers anywhere where conflict is severe. But barriers are not appropriate for all situations. There must be sufficient prior knowledge of the damage caused by elephants to justify *both* the considerable expense of constructing a barrier *and* the commitment to continual maintenance that

any barrier requires. Carefully planning the layout and design of fences for example, is especially important for non-target species (26). The local ecology and movement pattern of elephants must be reasonably well known since disregarding established movement routes may put a fence under such severe challenge that the maintenance demand cannot be met. Commercial fencing contractors or people with relevant experience should always be consulted when erecting wildlife fencing.

As a general rule for fencing, the smaller the project the less it costs and the better it works. An encircling fence layout is best since it avoids 'funnelling' elephants around the open end of a fence. Enormously expensive fencing projects have failed completely against elephants (44; 55) by disregarding the simple observation that elephants encountering a barrier will merely walk along it until they reach the end. This of course exacerbates problems for people who live near the end. Problem elephants appear not to be 'deflected' from their target; the only option is to identify that target and keep them out. Thus a small, encircling fence around a valuable resource (e.g. an irrigated field, a water point or a food storage facility) has the best chance of success both in terms of reduced elephant damage and overall cost-effectiveness (25; 40; 55).

Electric fencing technology is simple and definitely deters elephants - if it is continuously under good management. Fences need electrification in most savanna elephant ranges or where raiders are determined and persistent (25; 51; 55). Fences may not need electrification as much in the forest elephant range where elephants appear not to be so persistent at raiding (34). The expectation is that a fence will eliminate elephant problems. This is never true in practice. Some elephants that are 'habitual fence breakers' do exist and these may need to be removed or eliminated if they can be individually identified (22; 51).

Maintenance is the number one problem with any type of fencing. A fence is only as good as its maintenance which has to be continual and meticulous. Collective maintenance of an electric fence by a rural community has often failed because it involves a long chain of responsibility which easily collapses at the weakest link (55). Even in countries where wildlife management schemes operate at a local level, the results of electric fencing projects have often been disappointing for reasons almost always attributable to maintenance deficiencies (55). This is an institutional problem not a technological one, so with improved discipline it can be rectified.

The most serious maintenance problems with electric fences are nearly always in the power supply, especially if this involves the use of solar panels and batteries, as opposed to mains electric power which is seldom available in rural areas. Vandalism and theft of components not only inactivate the fence but frequently create the knock-on effect of the maintenance requirement outstripping its budget, leading to total collapse of the project (47;55). Keeping vigorous growth of vegetation clear of a fence line in the growing season is a perennial problem. Vegetation contact causes power leakages and overgrowth conceals the fence from being an obvious barrier to elephants

Constant high voltages in fences will deter most elephants but low voltage, a frequent manifestation of poor maintenance, may merely irritate a determined elephant that may then destroy a section of the fence. Strategies that might be able to overcome maintenance deficiencies in fences designed to deter elephants are being considered and tried at present. These include:

- Very stoutly constructed and thus expensive fences which act as a barriers even if the power supply is interrupted

- Private sector involvement in routine fence maintenance. Private sector wildlife fencing projects are generally successful and sustainable

- Simple designs (e.g. one or two strands situated 1-1.5 metres above ground). This arrangement is often used in traditional fences (see section 5.1) With an electric fence low specification makes construction cheaper, routine maintenance including clearance of vegetation easier and allows smaller, non-target animals to pass unhindered.

- Small, individually-owned fencing projects for example protecting one household's fields and dwellings. These can be electrified with small power units and the fence layout can be changed according to crop rotation.

An evaluation of several year's usage of anti-elephant fencing under various management regimes in Zimbabwe is particularly informative (55). In that country the models for constructing elephant fences are (in order of size of project):

Around a field (Crop protection fence only)
Around a household and its fields (Household fence)
Around a community and its facilities - school, clinic church etc (Community fence)
Around an elephant range or along an elephant/people interface (Extended barrier)

Ditches and moats have been used against Asian elephants with somewhat limited success. They have had very little application in Africa (3). Problems with ditches or trenches are the massive investment to construct and maintain them because of their fragility and extreme vulnerability to soil erosion. Elephants learn to kick in the sides and cross trenches and are undeterred by narrow stretches of water. Also expensive to build, stone walls have been quite effective in parts of Kenya (50; 51), particularly if used as a strong base for a simple electric fence. Unfortunately the application of stone walls to many other areas is limited by insufficient quantities of useable stone.

Buffer crops relatively unpalatable to elephants (e.g. tea, timber ,tobacco, sisal, chilli) have been planted around food crops in some places to try to protect the latter. In one study that examined this critically (3) no beneficial effect was noted, apparently because elephants simply traversed the buffer crop to reach their target crop beyond. Spines on sisal are no deterrent and elephants have been recorded eating the plant (26). Timber plantations of tree species exotic to Africa (e.g. *Pinus* spp) have also

suffered considerable commercial damage in Kenya. This is both by trampling saplings and serious debarking of adult trees.

Summary of barriers

Advantages
Can be a more permanent solution
Clearly demarcate land use and so can assist land zonation (section 5.10) or law enforcement

Disadvantages
Expensive to build
Useless unless maintained meticulously for ever
Can be expensive to maintain
Very vulnerable to theft of vital components
Foreclose land use options by creating abrupt divisions ("hard edges")

Public relations value
High among potential beneficiaries.
Popular with financial donors because barriers represent tangible assistance

Select possible BA methods for use in your area	Effectiveness?	
	Short	**Long**

YOUR NOTES ON BARRIERS

5.5 Experimental Repellents And Elephant Alarm Calls

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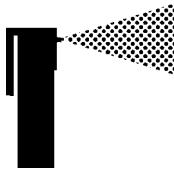
Interest in olfactory (smell-based) repellents against elephants has centered around the irritant in chillies (*Capsicum* spp). Auditory (sound-based) deterrents remain experimental.

Table 5.5

RP	Method	Effectiveness	
No		Short	Long
RP1	Olfactory (smell-based) repellents		
RP1.1	Capsicum (chilli) sprays and bombs, available commercially	✔	
RP1.2	(deployed by field staff of wildlife authority)		?
RP1.3	(deployed by affected people themselves)	?	
RP2	Smoke from burning chilli seeds	?	
RP3	Chilli-based grease applied to simple barriers		?
RP4	Auditory (sound-based) repellents		
RP4.1	(Ultrasound alarm calls broadcast in conflict area)	?	
RP4.2	(Broadcasting noises of people or livestock)	?	

Experience with olfactory and auditory repellents

Capsicum-based animal repellents first achieved success in reducing bear attacks on humans in North America. When olfactory repellents began to be applied to elephants (41) a similar product to commercially available sprays was used. In sprays manufactured to repel carnivores or human criminals the active ingredient of chillies (*capsaicin*) is extracted with solvents, mixed with an oil base and pressurized in aerosol containers. When the aerosol is released, an 'atomised' spray cloud persists in the area for some time, producing an extremely irritant effect on any exposed mucous membranes (eyes, mouth, respiratory tract).

Experimentally it has been shown that elephants do not like to make contact with an irritant substance like capsicum but there are considerable problems with routinely applying this using any form of 'delivery technology' like a pressurized aerosol spray in the rural agricultural situation in Africa (41; 42). Elephants appear to have sensors at the end of the trunk which may detect irritant substances, therefore apparently preventing their inhalation and subsequent contact with sensitive mucous membranes.

Any vapour-based repellent is wind-dependent so accidental exposure of people is a continual problem. Simpler application methods like noxious smoke from burning chilli seeds are presently being tested against crop-raiding elephants (section 5.1). Similarly chilli-based grease is also being tested. This is able to overcome the problems of airborne delivery but does require some sort of barrier on which to deploy it (section 5.1). Another suggestion has been to shoot the capsicum irritant at problem elephants in encapsulated liquid form (like a paint ball). The delivery technology for this has experienced some problems.

Elephants make a range of calls, some of which are audible to humans and some of which are not (infrasound). On-going research is categorizing these calls. It has been proposed that if calls which cause alarm or flight can be recorded and played back in HEC areas they might deter problem elephants. Unfortunately the technology to produce this is very complicated and the equipment required very expensive (35). These constraints will probably preclude its widespread application. The possibility of habituation has also been noted by researchers in this field.

Simpler applications of auditory deterrents have been occasionally tried, but only experimentally. In a Maasai pastoralist area of Kenya the sounds of domestic cattle and cowbells were broadcast near herds of elephants (31). Cow-calf groups reacted and retreated more vigorously than bull groups. Another experiment in Namibia recorded elephant distress calls and tested the effect of playing these back on low-cost tape recorders to deter crop-raiding elephants (40). Results were poor and interestingly did not deter small groups of crop-raiding bulls.

Experimental design and rigorous testing of olfactory and auditory methods is particularly problematic, firstly because of inherent doubts about the technology and secondly because assessment of the reaction from elephants necessarily has to remain largely subjective.

Summary of repellents

Advantages (olfactory methods)
No long term harmful physical effects on elephants
Low-tech chilli-based methods can be produced locally

Disadvantages (olfactory methods)
Sprays relatively expensive
Spray deployment requires training of people
Spray deployment required within close range of elephant
For sprays and smoke the direction of effect is wind-dependent
Vapours temporarily irritant to people and other wildlife on accidental exposure
Effects difficult to quantify and evaluate.
May require 'aversive conditioning' of elephants to associate repellent with human settlement.

Public relations value
Moderate

Select possible RP methods for use in your area	Effectiveness?	
	Short	**Long**

YOUR NOTES ON REPELLENTS

5.6 Live Capture And Translocation Of Elephants

CODE: TL

In some situations translocation of live problem elephants has been proposed as a possible solution to killing them, an option especially attractive to the opponents of elephant destruction.

Table 5.6

TL	Method	Effectiveness	
		Short	**Long**
TL1	Removal of selected elephants		
TL1.1	(identified problem individuals only)	✔	
TL1.2	(age-sex class of problem individuals)	?	
TL2	Reduce elephant population numbers by capture	?	
TL3	Capture and remove entire population		✔

Experience with translocation

Individual elephants can be immobilized relatively easily by specialist people (23) but if translocation is to be undertaken, the subsequent safe transport of such huge animals is a complicated logistical exercise costing large sums of money (9; 23; 29; 39). Unfortunately, even if the money and resources can be found, translocation as a strategy to reduce problem elephant activity faces a number of serious drawbacks.

Firstly, as with killing, these are the correct identification of culprits and the probable replacement of the removed problem animal with another problem animal from within the same population, thereby effectively making the translocation exercise a waste of time, money and effort (22). Secondly, it is impossible to be certain that the problem may not in fact be exported with the animal or that the problem animal will not return to its former range (22). A third issue that has emerged with elephant translocation in practice is welfare concerns of the animals in transit, which even the closest supportive veterinary care has not always been able to address (23; 39). If unanticipated delays occur on long road journeys the resulting hot, cramped conditions can cause unacceptable stress and even death of translocated elephants.

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Reduction of elephant numbers in an area (e.g. by capture and translocation) may not necessarily mean that problem elephant activity will be reduced. This is because there is quite good evidence to suggest that levels of problem elephant activity are more dependent on the behaviour of individual animals than on the local elephant density (18; 19).

There are cases where translocation of problem elephants has been reasonably successful in Kenya, Zimbabwe and South Africa (29) but the distinction in these cases is that these are often *restocking* exercises – i.e. translocation to new range away from agricultural areas where elephants are wanted for tourism purposes. At one location in Kenya some elephant bulls were captured and translocated because they were destroying an important habitat in a tourist zone. Several other elephant bulls left the area of their own accord once these apparent 'ringleaders' had been removed.

Summary of translocation

Advantages
Not fatal to elephants

Disadvantages
Very expensive
Skilled personnel required
Problem may be exported with elephants
Problem may recur with other elephants
May distort elephant population structure

Public relations value
? may vary between residents of 'source' area and 'receiving' area

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Select possible TL methods for use in your area	Effectiveness?	
	Short	Long

YOUR NOTES ON TRANSLOCATION

5.7 Compensation Schemes For Elephant Damage

CODE: CO
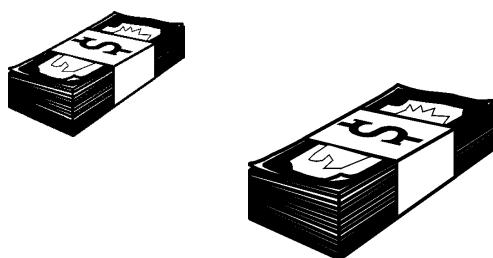
It is a natural human reaction to demand compensation for property which has been destroyed, especially if the perpetrator is an animal that effectively belongs to the state. Demands for monetary compensation are often amongst the first to be made by communities affected by problem elephants, and mostly at the same time as demands to kill them.

Table 5.7

CO	Method	Effectiveness	
No		Short	Long
CO1	Direct		
CO1.1	(monetary - linked to elephant damage)	✔	
CO1.2	(non-monetary e.g. food aid linked to elephant damage)	?	
CO1.3	(insurance scheme with contributions and claims)		?
CO2	Indirect		
CO2.1	(products from problem elephants destroyed e.g. meat)	✔	
CO2.2	(wider benefits from wildlife utilisation programme)		?

Experience with compensation schemes

In discussions about HEC within any forum, the issue of monetary compensation for losses caused by elephants is frequently raised and often overshadows discussion of the many other measures which can be used to mitigate HEC. Examination of the compensation issue has been separately undertaken by the AfESG and revealed many failures in cases where it has been tried. This issue is so topical that the discussion below has been posted on the AfESG internet site (see Appendix B). The following is a summary of experiences with compensation schemes in several countries and a synthesis of what these experiences tell us.

Actual experiences with compensation

Gabon

A nationwide survey of elephant crop raiding in Gabon interviewed nearly 3000 families in 218 villages. This study (33) took about a year and is the largest survey of its kind in Africa. In the wide-ranging discussion and clear recommendations contained in the report, the author did not mention the issue of compensation for elephant damage.

Ghana

A conference to discuss the country's most severe elephant problem around a forest national park identified 14 measures, including compensation, that could be used to mitigate human-elephant conflict in some way (2). The idea of monetary compensation was not adopted in the recommendations, which focussed mainly on changing agricultural practices on farms around the park boundary.

Kenya

Compensation for damage by wildlife was paid under a national policy until 1989. In that year payments for crop damage were suspended because the system became unworkable. Widespread cheating on claims, high administration costs and lack of disbursable funds were cited as the main reasons for failure (50). Compensation for human injury or loss of life remain, but in practice are viewed as woefully inadequate by victims' families (e.g. because payouts fail to keep pace with inflation) and almost unworkable by administrators (e.g. because assessment is done by a semi-autonomous wildlife authority whereas payouts are the legal responsibility of a workmen's compensation scheme in a separate ministry of Government).

Southern Africa

Southern African counties are acknowledged to have wildlife policy environments which enable considerable experimentation with wildlife management measures at local level.   In a recent review of policy and management of problem elephants in six countries of that region (47), only one retained compensation for elephant damage (Botswana). The following experiences with compensation schemes are from southern Africa:

Malawi

In well-monitored trials in the 1980s adjacent to a large protected area, the payment of compensation was demonstrated to have no beneficial effect on improving relations between wildlife authorities and neighbouring farmers (3).

Zimbabwe

A compensation scheme was tried by one district but abandoned when the number of claims quadrupled in the second year of operation (46). Apart from vastly exceeding the expenditure budgeted for payments, this increase suggested that either bogus claims were being submitted or that farmers had reduced efforts to defend their crops. Significantly, the year of cessation (1991) was the third year that this district was

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allowed by central government to implement a locally-administered programme of wildlife utilisation and retain the revenue gained from it. The district simply could not afford the scheme and compensation has not been revived to date despite considerable growth of the programme and its associated revenue.

Botswana
Botswana is a relatively wealthy country and compensation for wildlife damage is paid under a government policy. Payment is limited to damage caused by five species of which the elephant is the main one. In the 5 years since this scheme has been in place, approximately US$1.13 million (US$227 000 per year) has been disbursed.

A sociologist researching the compensation issue in Botswana recently articulated several problems. Most villagers and wildlife officials consulted indicated that the amount of compensation was disproportionately low compared to the value of damage and that it was disbursed too slowly. Officials added that while the compensation scheme appeases some public suffering from wildlife conflict, it is not effective in preventing conflict and/or encouraging harmonious relations between affected communities and the wildlife authorities. They noted that when certain species were taken off the compensation list, the reported conflict incidents of that particular species decreased, but those for other compensatable ones increased. The only real benefit identified by wildlife officials was that the scheme ensured incidents of wildlife conflict were reported and this helped to identify regions which are most affected by human-elephant conflict.

Synthesis of experiences with compensation

The cases evaluated showed that compensation schemes apparently suffer from degrees or combinations of the following deficiencies:

- Inability to decrease the level of the problem (because the cause of the problem is not being addressed)
- Reduction in the incentive for self-defence by farmers (which can even exacerbate the scale of the problem)
- Cumbersome, expensive and slow administration (because of the need to train assessors, cover large areas, have stringent financial controls etc.)
- High potential for considerable abuse or blatant corruption (through bogus claims, inflated claims etc.)
- Absence of sufficient funds to cover all claims
- The scheme potentially having no end point.
- Unequal disbursements (e.g. to only some victims) causing disputes or social problems
- Inability to compensate for unquantifiable 'opportunity costs' (see section 2.4) borne by people who are affected by the *threat* of problem elephants.

The major conceptual flaw in a monetary compensation process for elephant damage is that, unlike most other counter-measures, it only addresses the symptoms and not the cause of the problem (3; 25). The only advantage noted in one country which still officially pays compensation to farmers (Botswana) is that the scheme helps to highlight serious HEC areas.

While it appears there has been little success in applying monetary compensation for elephant damage, the AfESG does not reject the idea of compensation in all circumstances. Compensation in the form of basic foodstuffs is an accepted way of relieving the effects of natural disasters, for example floods or drought.   Once HEC was systematically studied by researchers, it was discovered that it usually only seriously affects relatively few people in a community (20).

If such people can be identified and fair assessments of their plight made without cheating, there may be a place for locally-administered relief schemes which involve foodstuffs rather than money. There is one example of this from a region in Burkina Faso where agricultural authorities assess crop damage by elephants and the victims are provided with millet grain to the estimated value of the loss. In practice this scheme is unable to reach farmers very far from the main administrative centre and there has only been enough money to provide this service in three years out of the preceding decade.

Other forms of replacement may be appropriate where other types of elephant damage occur, for example to water supplies, food storage facilities, livestock or fences. Insurance schemes for elephant damage are presently only an idea, since unfortunately there are no known examples from which to offer comment.

It is debatable whether the indirect methods listed above actually constitute compensation but they are included for completeness. Elephant meat is a very popular by-product of killing (section 5.3) and can often be a motivation for elephant destruction (Table 2.4). Wildlife utilisation schemes are discussed below (section 5.8)

Select possible CO methods for use in your area	Effectiveness?	
	Short	Long

YOUR NOTES ON COMPENSATION

5.8 Wildlife Utilisation Programmes Which Return Benefit To Local People

CODE: WL

Wildlife utilisation in the legal and therefore controlled sense has been practiced in some form in Africa for decades. In recent times this has been considerably expanded into a new paradigm which attempts to give local communities some control over the wildlife resources with which they coexist. Elephants are often central to these programmes because they have very high potential value, which can be turned into benefits but are simultaneously responsible for a large number of problems, which can legitimately be regarded as costs.

Table 5.8

W L	Method	Effectiveness	
No		Short	Long
WL1	Utilisation programme authorised by national wildlife policy		
WL1.1	(administered by central government)	?	
WL1.2	(administered by local authority)		?
WL2	Programme allows only non-consumptive use of elephants		
WL2.1	(local tourism)		?
WL2.2	(international tourism)		?
WL2.3	(domestication of elephants)		?
WL3	Programme allows killing of elephants		
WL3.1	(allows legal hunting by safari clients)		?
WL3.2	(allows sale of elephant products)		?
WL3.2.1	(ivory)		?
WL3.2.2	(hide)		?
WL3.2.3	(meat)	?	
WL4	Programme includes problem animal management		
WL4.1	(elephants only)		?
WL4.2	(elephants and other problem species)		✓

Experience with wildlife utilisation programmes

Ideas and schemes to change aspects of protectionist wildlife management began in southern Africa in the 1970s and 1980s, representing a major philosophical shift in conservation. Most countries of southern Africa now have policies which allow controlled, consumptive utilisation of wildlife (culling, cropping, hunting) (5; 8; 11; 48; 55), ideas which are increasingly being adopted in other regions of Africa. A feature of such policies is the devolution of some responsibility for wildlife management from central government to local government or community level (8; 36; 48).

These programmes now encompass more than just animals and are collectively known by the acronym *CBNRM* (Community Based Natural Resource Management). In many CBNRM programmes, elephants are simultaneously the most valuable asset for revenue generation and the most problematic species involved in conflict with people (5; 18; 25; 46; 47; 48). Most elephant populations therefore require some sort of management in locally-based wildlife programmes and the more pro-active and participatory this can be, the better.

In the early stages of these programmes rural people were happy to be the beneficiaries but still expected central government agencies to control the problem side of wildlife as before. After some years, elephants as a flagship species in both benefits and costs greatly widened the debate on the whole spirit of conducting these programmes. Central government had to point out that ceding their authority for wildlife to local government meant that this was to be in terms of *both* benefits and costs and that local government institutions therefore had only one choice - get used to this idea and do *all* their own wildlife management. Once the idea that the good comes with the bad was understood, ways of combining problem elephant control and legitimate elephant utilisation then became an obvious strategy in this policy environment.

In this vein an innovative scheme being used in southern Africa is the sale of problem elephants on safari hunts (25; 46; 47; 48). These are cheaper than normal hunts because the trophies may not be as good, but benefit from such hunts can be returned directly to affected communities suffering HEC. The meat from an elephant shot on control is given to local villagers and the revenue from hunting fees and sale of any elephant products (e.g. hide) is returned to the local community's funds. This has great public relations value amongst communities affected by problem elephants while combining elephant control with hunting helps to reduce offtake from the population (46). Of course if non-consumptive uses of elephants (principally tourism) can be developed, this may have enormous benefit to local communities via for example, employment creation or revenue sharing with protected areas.

The ideas surrounding CBNRM are all intuitively beneficial. The pitfalls however are myriad, making CBNRM difficult to put into practice in real life. Complex and long-term partnerships are required between wildlife authorities, local authorities, the private sector and local citizens. That process is not easy. A pre-requisite is a clear policy on

the legal and illegal use of wildlife which preferably mentions elephants specifically and which usually has to be formulated at a national level (11; 36; 48).

Even where CBNRM programmes are in place there is a fundamental difficulty which their proponents frequently encounter. This is the apparent injustice that depredations of wildlife pests are always borne by individuals, whereas CBNRM benefits usually accrue to a wider community (18; 40) (see Table 2.12). This means negative attitudes to wildlife can take a considerable time to change, even in the face of reduction in levels of conflict (40).

Surprisingly, even people who are seriously affected by conflict with elephants often have an appreciation that elephants do need to be conserved. They are not against the presence of elephants *per se*; they just want HEC in their area to be minimized. As experience with CBNRM has built up there are strong indications that if CBNRM addresses problem elephant management at the same social level as benefit is supposed to accrue from elephant utilisation, there is some chance of success (18; 47). Local community participation in human-elephant conflict mitigation is now seen as essential.

Many additional costs of conflict are unquantifiable to an individual (so called 'opportunity costs' like fear, restriction on travel, loss of sleep, more risk of malaria, lost job opportunities - see Table 2.4). Nevertheless, of any counter-measure CBNRM has the best chance of addressing this problem, especially if through active local participation it incorporates a cost-benefit approach to wildlife species like elephants which are both potentially problematic and valuable.

Summary of utilisation schemes

Advantages
Conservation of other wild species and ecosystems
Revenue generation in areas unsuitable for agriculture
Involvement of people affected by elephant problems in the solutions

Disadvantages
Long term and complex process
Dependence on enabling policy and legislation at higher administrative levels

Public relations value
Potentially high if scheme well administered; potentially low if not well run.

Select possible WL methods for use in your area	Effectiveness?	
	Short	Long

YOUR NOTES ON WILDLIFE UTILISATION

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5.9 Information Gathering Effort

CODE: IN

Information gathering is fundamental to addressing HEC and should considered one of the first courses of action. Although information *per se* does not act against elephants directly or alleviate affected people's suffering materially, the gathering of it is so integral to facilitating a coherent HEC strategy that it can be considered a counter-measure on its own.

Table 5.9

IN	Method	Effectiveness	
No		Short	Long
IN1	Data collection only		
IN1.1	(with wildlife authority resources only)		
IN1.1.1	(involving affected local people reporting only)	?	
IN1.1.2	(using own staff and data collection design)		?
IN1.1.3	(using trained HEC enumerators in the field)		?
IN1.1.4	(using AfESG data collection protocol for HEC)		?
IN2	Data collection and research studies		
IN2.1	(with wildlife authority resources only)		?
IN2.2	(collaboration wildlife authority and local/foreign organization)		✔
IN2.2.1	(involving qualified researchers)		✔
IN2.2.2	(using trained HEC enumerators in the field)		✔
IN2.2.3	(using AfESG data collection protocol for HEC)		✔

Experience with information gathering

The importance of gathering information in the management of HEC was initially highlighted in Chapter 2 and has been dealt with in more detail in Chapter 4. The differences between data collection (essential) and research (optional but recommended) and the ways that the tabulated options (above) can be carried out are partially explained in Chapter 4 (see section 4.2.4) but more fully in a separate AfESG document (Reference No 20, see Appendix B Nos. 2 & 3). Refer to these parts of the document for explanatory text and to the box summary below.

One of the main functions of a data collection system for problem elephant incidents is to act as a *filter* by distinguishing serious incidents from minor ones. Serious ones are those that might require a timely reaction from wildlife management authorities (e.g. see discussions in sections 4.2.4 and 5.3). If decisions on the seriousness of incidents have to be made in the field, obviously some guidelines or *criteria* need to be applied. These criteria are fully explained in the separate documents referred to above (Appendix B) but here it may be worth mentioning those used in Zimbabwe in conjunction with an elephant damage report form (Table 4.2). In that country enumerators notify relevant authorities if they record the following:

- a person killed by an elephant
- a dangerous or wounded animal remaining close to habitation
- repeated, severe crop-raiding occurring in the same place
- destruction of an entire standing crop belonging to one household
- an incident in which livestock has been killed
- damage to property such as a food store or water supply

Summary of information gathering

Advantages
Identification of site-specific HEC problems
Potential to evaluate long term HEC solutions
Improved conservation of other wild species and ecosystems

Disadvantages
Longer term effort required (2-3 years)
Organisational skills needed
Expense
Not appreciated as valuable by many people

Public relations value
Potentially high if built into study design from the start

Select possible IN methods for use in your area	Effectiveness?	
	Short	**Long**

YOUR NOTES ON INFORMATION GATHERING

5.10 Land Use Changes Which May Reduce Spatial Competition Between People And Elephants

CODE: LU
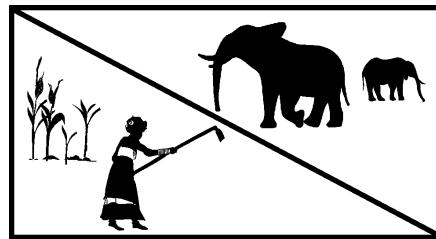
Because of enormous differences between the many sites of HEC, there are few guiding principles in the process of land planning, except that it is probably the most fundamental and therefore most desirable of all counter-measures to combat elephant problems, with the best chance of overall, long-term success (18; 47; 48).

Table 5.10

LU	Method	Effectiveness	
No		Short	Long
LU1	Reduce human settlement encroachment into elephant range		✓
LU2	Relocate agricultural activity out of elephant range		✓
LU3	Consolidate human settlement pattern near elephant range		✓
LU4	Reduce size of crop fields		✓
LU5	Change location of crop fields		
LU5.1	(dwellings and fields in proximity)		✓
LU6	Change cropping regime		
LU6.1	(change to crops not affected by elephants)		?
LU6.2	(diversify into more types of crops)		?
LU6.3	(use intercropping layout for crops)		?
LU6.4	(change timing of harvests)	?	
LU7	Reduce dependence of local economy on agriculture		✓
LU8	Create or secure elephant movement routes / corridors		?
LU9	Secure elephant and human access to different water points		✓
LU9.1	(manipulate water supply to change elephant distribution)		?
LU9.2	(create salt licks to assist in elephant redistribution)		?
LU10	Reposition protected area boundary		?
LU11	Expand protected area		?
LU12	Designate new protected area		?

Experience with land use planning

Because it is so heavily dependent on national policy and prevailing economic conditions, wildlife managers may regard land use planning as a topic far from their control. They may, however, be able to influence perspectives and decisions if they are part of some consultative or participatory process. Many HEC–related problems are characterized by the fact that they often bring heated debates to the fore about important land use issues. Because of this, when dealing with HEC dialogue must be maximized between agricultural, conservation and administrative interests, whether these be in the form of authorities, organisations or individuals (18).

Many of the above examples of land use changes (Table 5.10) can be encouraged, implemented, monitored and evaluated entirely locally by dialogue and consultation between wildlife managers, local officials and local people. In a policy environment without some legitimate form of local participation in wildlife management this can be difficult. In places where wildlife utilisation programmes (section 5.8) have been accepted, the incorporation of wildlife needs into local land use decisions can obviously be easier.

What one is trying to achieve through such land management is a *co-existence* between people and elephants (28), with low levels of direct conflict. HEC is merely the direct and obvious negative part of a larger and more complex human-elephant interaction process. The only general similarity between vastly differing sites of such interaction across Africa is that the basis of the direct conflict problem appears to be much more spatial (i.e. how people and elephants are distributed) and temporal (season dependent) as opposed to numerical or density dependent (how many people and elephants live close together) (19; 28; 44). The above land use changes have often been recommended (2; 3; 18; 19; 30; 33; 44; 47; 50) but as yet it is probably too soon to see documented results from methods which take time to implement and evaluate. But these methods have been offered by practitioners precisely because they are the most likely to address the spatial basis of an HEC problem. Broadly, these methods do the following:

- LU1 – 3: reduce the conflict interface between elephants and people
- LU4 – 6: facilitate defence against problem elephants
- LU5 – 7: make agricultural production more efficient
- LU8 – 12: modify some movement of problem elephants

It is important to remember that HEC is a *two-way process* so the negative effects on *both* humans *and* elephant populations should be addressed. At least as many elephants in Africa may live in unprotected areas as do in protected areas. But the proportion of the whole *species range* which remains unprotected across the continent is much higher (80%) than that which is protected (20%). Managing HEC successfully is essential to conserving the many unprotected populations but is a major issue on the boundaries of many protected ranges as well.

Land planning should certainly be considered and preferably be included in addressing any HEC situation. Its objective, simply stated, should be how to *accommodate* elephants within the prevailing and future land use plans (18; 28). The positive side of dealing with a difficult HEC problem is that it can often be an *entry point* for much wider conservation action, eventually involving many other issues beyond those usually associated with elephants.

Summary of land use planning

Advantages
Potential long term HEC solutions
Improved conservation of other wild species and ecosystems

Disadvantages
Long term effort required (slow return on effort)
Organisational skills needed
Expense
Government support necessary at all levels
Enabling policies and legislation required

Public relations value
Potentially high and long-lasting

Select possible LU methods for use in your area	Effectiveness?	
	Short	**Long**

YOUR NOTES ON LAND USE PLANNING

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Table 5. 11   Summarize Your Provisional Choices of Interventions

Now that you have read about the experiences of others, in the table below (or even better, in similar tables you make yourself on separate sheets of paper) you can summarize all your choices of interventions into a *provisional* list for your HEC situation or area. Remember the order or the way in which counter-measures and methods are listed in this guide does not imply any priority of one over another. Finalise your choices only after reading the next chapter (Chapter 6).

| CODES USED ABOVE (Chapters 3 / 5) | | | | YOUR OWN METHODS (Chapter 3) | |
Choices	1	2	3	4	1	2
TR						
TR						
TR						
TR						
DS						
DS						
KL						
KL						
BA						
BA						
BA						
BA						
RP						
RP						
TL						
TL						
CO						
CO						
WL						
WL						
WL						
IN						
IN						
IN						
LU						
LU						
LU						
LU						
LU						

YOUR NOTES

CHAPTER 6

A MANAGEMENT PLAN FOR HEC IN YOUR AREA

Probably the best way to address the HEC issue in your area is to formulate a management plan. This does not have to be long or complicated. This document tries to cover many options for use in a wide variety of African situations. Your particular HEC problem may be fairly simple and so it may only need to draw on a small proportion of what you have read or what follows. But your situation could change, so it is wise to be aware of the existence of more than you might presently need. In this final section of the guide you should try to understand the *principles* of drawing up any *management plan* so you can apply and adapt aspects of it to your situation, using what you consider relevant from other people's experiences and adding your own knowledge.

RECAP ON WHERE YOU ARE IN THIS DSS

Use of this Decision Support System
(CHAPTER 1)

What do I need to know before trying to address HEC?
(CHAPTER 2)

What HEC counter-measures have other people used or considered?
(CHAPTER 3)

What principles are common to many HEC situations?
(CHAPTER 4)

How well have HEC counter-measures worked in Africa so far?
(CHAPTER 5)

How do I plan a management strategy for my HEC situation?
(CHAPTER 6)

<div style="border:2px solid black; display:inline-block; padding:8px;">

YOU ARE HERE!

</div>

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The following basic steps should be involved in the production and operation of any wildlife management plan (4; 7):

1. Setting a goal and clear objectives
2. Gathering relevant information
3. Providing projections of future trends and needs
4. Considering practical limitations and operational constraints
5. Describing feasible options which may meet the objectives
6. Selecting preferred options
7. Monitoring and evaluating actions taken
8. Revising the management plan and/or the objectives

This chapter takes you though the process following this logical sequence of steps. The guidance is more general than the content of previous chapters, which means you have the flexibility to adapt the plan to your circumstances.

6.1 Step 1 of management plan: Goal and Objectives

6.1.1 *The decision-making structure in HEC*

It is essential to ask yourself why you want to embark on this plan and whether other people involved are likely to agree with you. You will not be the only person involved in decision-making about HEC. Keep in mind the chain of responsibility for making decisions about HEC and where you fit into it. A schematic of such a decision structure is given below (Fig 6.1; Table 6.1). This diagram and table illustrate what can be termed a '*generic*' or general, example. It is only an example - don't be concerned if decisions in your country do not operate exactly like this.

A major distinction in the HEC decision-making process is whether the person works in a situation near the problem area or remote from it. Note that at the level of the conflict site (labelled 'elephant range' in Fig 6.1) the people involved (local officials, protected area mangers, villagers, researchers etc.) are of course more closely associated geographically. This means that consultation amongst them can be regular and therefore, if they develop reasonably good working relationships, decisions they arrive at are likely to be made by consensus.

Outside the elephant range the structure of decision-making is generally more hierarchial (e.g. within Government) so decisions more likely to be passed down in the form of instructions. In the opposite direction within the hierarchy, results of actions are conveyed by reporting to superiors. The difference between decision-making in a hierarchial and a consensus-based structure is clearly enormous. This in itself can amount to a major management problem in HEC if those working at the conflict site are at odds with those working outside it.

6.1.2 *Agreeing on the goal*

Whatever the perceived amount of HEC there is in your area, there is unlikely to be much disagreement from any of those involved that it is a problem needing attention. But an overall goal needs to be stated since this is the point at which *everybody* has to aim. The important aspect about the goal is to get absolute agreement about it, since it should not be changed. For example, you may feel the goal should stated as HEC *reduction* because, if you agree with what was discussed in Chapter 4, *elimination* is probably unrealistic. In this example stating "reduction" gives you more flexibility than specifying "elimination".

6.1.3 *Background to setting objectives*

A HEC management strategy needs to meet both human and elephant objectives but exact aspects of such a strategy may be constrained by policies and regulations in your country. However, setting clear objectives will greatly simplify the difficult process of balancing human and elephant needs in any given situation.

A schematic example illustrates a process of trying to define objectives and major constraints (Fig 6.2). Again, do not be concerned if this seems foreign to your situation – it is merely an example operating in a hypothetical country with a HEC problem. This format only illustrates principles involved in management thinking and you can put your own objectives and constraints into a similar kind of diagram. Here the choice of objectives has been made by trying to separate issues into logical categories dealing with both elephants and people. There are broadly speaking, three categories in the discipline of wildlife management to deal with elephant-related issues: conservation, sustained yield and control (7). What requires most attention is the actual levels of damage suffered, which can for example conveniently be divided into crop damage and other damage (to property and people themselves – i.e. injuries and deaths). What HEC managers are also very concerned with is how they can influence the negative interaction between humans and elephants, which of course mainly depends on peoples' attitudes to wildlife.

Practical constraints to your HEC mitigation plan may be very numerous and there is not space in this diagram to list many possible examples (finance, trained staff, vehicles, field equipment, research facilities, communication difficulties, lack of information, terrain etc.) Only some major constraints relating to policy are shown e.g. the killing of problem elephants (see section 5.3) and the existence of wildlife utilisation schemes (see section 5.8).

The whole business of managing elephants in the African situation can be extremely difficult. Elephants in your country may be simultaneously valuable (and therefore in need of protection) and problematic (therefore requiring control). But the law in many countries has difficulty adequately expressing regulations that address these

sometimes contrasting objectives. Wildlife laws receive little attention in many African countries and are frequently outdated, having been made before recent major shifts in attitudes to wildlife conservation and human empowerment (section 5.8). If you are a wildlife manager dealing with HEC, you may find yourself trying to balance conservation of elephants as a species, removal of elephants as a nuisance and legal utilisation of elephants under certain approved management programmes all at the same time. This is no easy task if:

1. national laws appear to conflict with some of these actions
2. different groups of people are applying pressure on you in different directions
3. you are often expected to operate in a situation with little logistical support

Simply stated, theoretically, the dilemma is that elephants have both benefits and costs and what you are trying to do as a manager is balance these in some sort of compromise, using the limited resources at your disposal.

6.1.4 *Incorporating other problem wildlife species*

This cost-benefit argument may apply to other problem animal species as well and you might consider incorporating other species into a problem elephant management strategy or, if elephants are not the dominant problem species, vice – versa. Incidents by other potentially dangerous problem species that people may justifiably require help with (e.g. buffalo, hippopotamus, lion, hyaena, leopard and crocodile) can very easily be incorporated into the same data collection system for elephants (56) (Chapter 4) and managed by employing some of the same counter-measures (Chapter 5). A frequently-used acronym in African countries for this type of wildlife management work is PAC (Problem Animal Control).

FIGURE 6.1

**TYPE OF DECISIONS MADE IN DEALING WITH
HUMAN-ELEPHANT CONFLICT**

POLITICAL

GOVERNMENT
MINISTER

STRATEGIC

DIRECTORATE
OF
WILDLIFE AUTHORITY

CO-ORDINATION

REGIONAL
WILDLIFE OFFICE

ELEPHANT RANGE

[PROTECTED AREA / LOCAL AUTHORITY AREA]

TACTICAL

WARDEN

ECOLOGIST

RESEARCHER

LOCAL OFFICIAL

TRADITIONAL LEADER

PERSONAL

VILLAGE RESIDENT
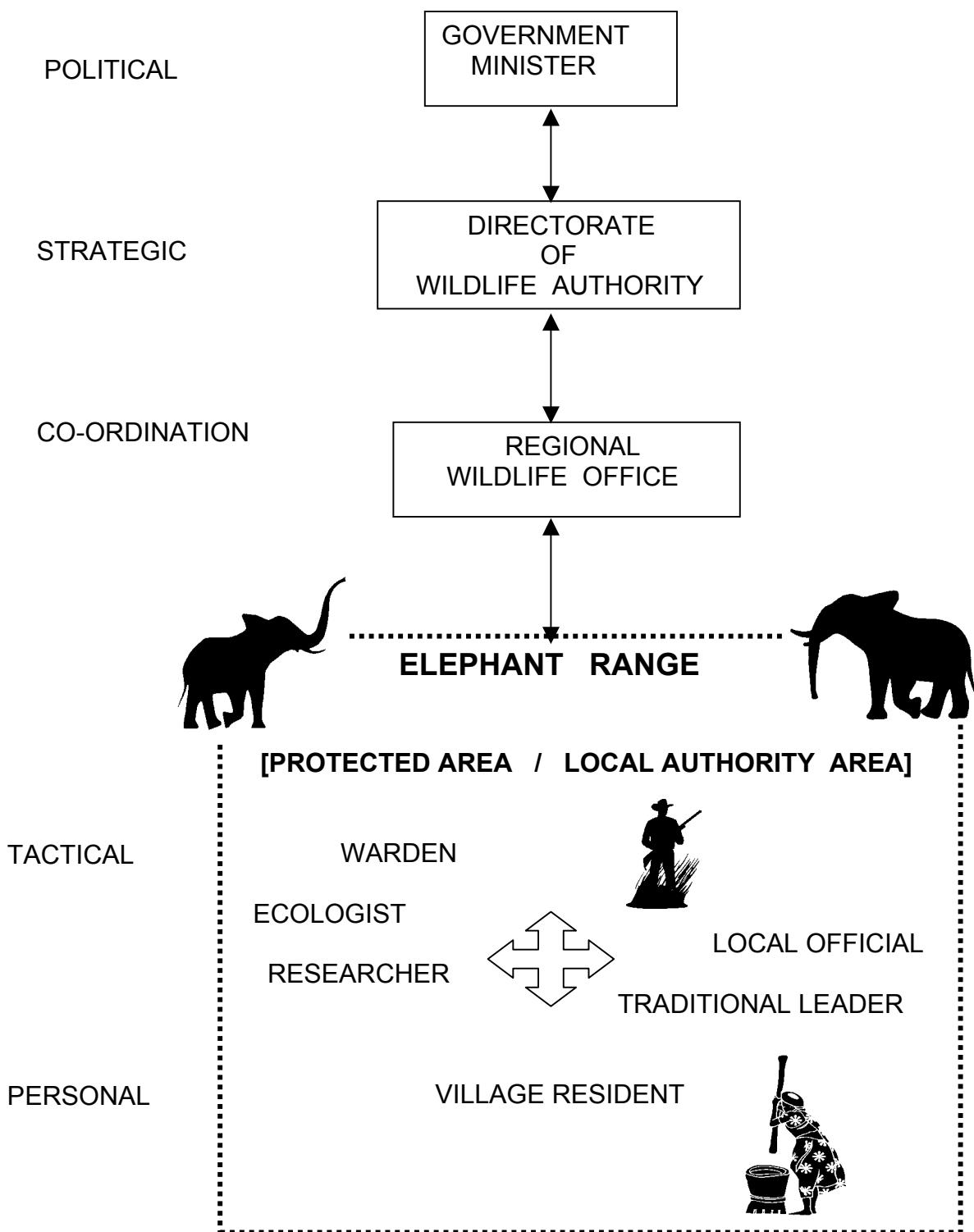
Table 6.1

EXAMPLES OF HUMAN-ELEPHANT CONFLICT MANAGEMENT DECISIONS

TYPE OF DECISION	EXAMPLES
POLITICAL (Govt Ministry)	Policy on wildlife utilisation and CBNRM Policy on legal hunting of elephants Policy on killing problem elephants
STRATEGIC (Wildlife Dept. HQ)	Integrating elephant control with law enforcement Setting quotas for problem elephant destruction
CO-ORDINATION (Wildlife Sub-office)	Allocation of equipment to elephant problem areas Allocation of staff and budgets to field stations
TACTICAL (Park Warden)	When and with whom to hold community meetings Where to consider erecting a fence When and where to destroy a problem elephant
PERSONAL (Village Resident)	How to change farming methods What traditional deterrents to use against elephants

FIGURE 6.2 **SETTING OBJECTIVES AND CONSIDERING CONSTRAINTS IN A HEC MANAGEMENT PLAN**

EXAMPLE OF
A GOAL

**REDUCE
HUMAN-ELEPHANT CONFLICT
BY ACCOMMODATING HUMAN
AND ELEPHANT NEEDS**

Conservation of elephant populations	Income from elephant populations	Control of problem elephants	Crop damage by elephants	Other damage by elephants	Human attitudes to wildlife

EXAMPLES OF
OBJECTIVES

Start	Improve	Maintain	Reduce	Stop

EXAMPLES OF
MAJOR CONSTRAINTS

Killing or removal of problem elephants allowed	Killing or removal of problem elephants not allowed	Wildlife utilisation schemes operating	No wildlife utilisation schemes operating

EXAMPLES OF
OUTPUTS

MANAGEMENT PLAN

HEC ONLY	ALL ELEPHANT -RELATED ISSUES	ALL PROBLEM WILDLIFE SPECIES

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6.1.5 *The tendency to politicize HEC*

Many people are involved directly or indirectly in HEC decisions as a result of their many different roles in elephant management. In the past all these people have tended to look at HEC as a problem in isolation, frequently becoming exasperated that there appears to be no solution (18). The danger of isolating HEC as a 'stand-alone' issue is that it is then open to political exploitation and controversy (54). In certain African countries HEC has indeed become a very considerable "political football" at local and even national level (1; 12; 16; 18; 38; 48; 54).

As we learn more about managing elephants in the modern conservation context there appears to be a way out of this restricted point of view and its consequences. It is recommended that people at all levels of decision-making appreciate a simple, strategic conceptual approach that can greatly assist them. This is regarding HEC mitigation as *just one of several activities that are involved in managing elephants* and not as an isolated issue in itself (17). In elephant populations of conservation concern or priority, the process of HEC mitigation should be carried out alongside similar 'obligations' associated with elephant conservation, for example:

- census of elephants
- intelligence work on illegal elephant killing and ivory poaching
- law enforcement and measuring the impact of law enforcement efforts on elephants
- management of important habitats in the elephant range
- research on elephant populations

Actively integrating HEC mitigation into other, routine elephant management activities does help counteract the tendency for it to be singled out for excessive political attention. Incorporating HEC into an overall plan which deals with all aspects of managing elephants helps decision-makers put it in a more realistic perspective as just one of the many elephant issues in their country (54). When the possible 'solution areas' for HEC begin to overlap with those of other elephant management issues, these decision-makers start to appreciate that HEC may not be as intractable a problem as it first appears. HEC is now a much more integral issue in elephant range states which have recently embarked on management plans or programmes for elephant conservation at a national level.

In Fig. 6.2 take a pencil and trace the path(s) that you think is(are) most appropriate to your situation(s). Alternatively make copies of the whole page containing the diagram and trace different paths on each diagram before you decide on a final version. You could for example trace one path per objective or trace one path per constraint. This process is best done in consultation with other decision-makers where each person can have both an opportunity to make the decisions themselves and discuss their opinions with colleagues.

6.2 Step 2 of management plan: Information gathering

Consult Chapters 2, Chapter 4 and section 5.9 for the explanations on what is needed to begin to address information gathering in HEC. Revisit the tables in Chapters 2 and 5 and reconsider what you initially marked as applicable to your situation. Settle on some revised choices.

6.3 Steps 3 – 4 of management plan: Future needs, practical limitations and constraints

These are largely dependent on conditions in your country and local area so you will have to set them out according to the resources (e.g. financial, staff and equipment) you have at your disposal.

6.4 Step 5 of management plan: Options to meet objectives

Consult Chapter 3 for a list of possible actions. Remember you are probably going to have to select a number of very different measures which constitute your actions and use them *over very variable time scales*. These actions together constitute your possible 'package' of measures to mitigate HEC. This is a first selection process so you should select ALL those which you feel could be used in your area AT SOME STAGE.

Consult Chapter 5 for an evaluation of these actions, based on the experience of others to date. Reconsider the options again which you marked in Chapter 3, now that you have read more about the advantages and disadvantages of various actions. Settle on some revised choices

6.5 Step 6 of management plan: Selecting preferred options

The logic behind selecting options

In this guide the many possible options for addressing HEC are classified into categories (called *counter-measures*) that are further sub-divided into actions (called *methods*). Each counter-measure is very dissimilar to the next and even within one counter-measure huge differences in methods are obvious. But as we have seen, many dissimilar actions may have to be selected for possible simultaneous use in your situation, so that they can act together as a package. The logic behind this is that each action may help a little but would not, on its own, be sufficient to make much difference to the HEC problem. On the other hand, acting together, the whole package may be more effective than the sum of its individual constituent parts. This is called 'synergy' (see Chapter 4). It probably works because although problem

elephants are very resourceful, if their intentions are hindered or blocked in several different ways, most of them may give up trying.

This is the theory but how will we do this selection in practice, especially when there are a huge number of possible interventions? One way is to employ what are called *decision aids,* if you feel they can help. These methods use *key words* to summarize the issues involved and *rank* them so as to prioritize them for action.

6.5.1 Using a matrix to help make decisions

One way to approach the often difficult choice of many management actions using key words and ranking is to make a two-way table called a ***matrix***. Formats may be like the ones below in which you enter your preferences or those discussed with colleagues. Making these sorts of tables (***matrices***) may greatly assist you in what actions you will take because all your own possible actions are displayed before you and ranked against each other. They can really help to organize your thoughts.

Initially you do not have to select many interventions when doing these exercises. Do not feel you have to select something from every counter-measure category (in Chapters 3/5). It may be best to select a few interventions, discuss them extensively with colleagues and people involved in the HEC problem and reassess you choice thereafter. An informative exercise is to get everyone involved in HEC in your area to each fill in such tables and then compare their results. Of course these people should have been provided with sufficient prior background information to know what they are choosing.

If you are able to go ahead and implement interventions immediately in the field situation then select a small combination, use them and monitor their effectiveness (section 6.6), discarding those that do not work. You can always return to the list of options and invoke another action.

(i) **Decision aid No 1: Time Scale Assessment**

In Chapter 5 one way that interventions were evaluated was according to their time scale of possible success. Listing interventions in a concise format may make them easier to compare but be aware that it does not represent reality - any evaluation in this way is an *oversimplification*. Some methods within each counter-measure were thought to act more in the short-term and some more in the long-term (Chapter 5). But generally some counter-measures had more long-term methods in them. For example where an urgent, suddenly occurring or long-neglected HEC problem needs rapid results, short-term measures may be more appropriate. But as challenge from problem elephants is often continuous, long-term interventions are usually preferable in HEC.

The ten counter-measures discussed in Chapter 5 are abbreviated below (traditional; disturbance; killing; barriers; repellents; translocation; compensation; wildlife utilisation; information and (land use planning) and classified as having predominantly short or long-term effects. If you find this time scale division useful, ***make tables similar to those below (Tables 6.2a; 6.2b) and do the following:***

- Change or discard some headings if you like (*the columns*)
- Insert what methods are appropriate in your area
  (*e.g. use codes as in Chapters 3 / 5*)
- Include items from your previous notes
  (*e.g. from blank tables in Chapters 3 and 5*)

Table 6.2a   Choices of short-term interventions

Conflict zone name:				(codes as used in Chapters 3 / 5)	
Short-term interventions for HUMAN-ELEPHANT CONFLICT (*examples*)					
	Traditional	**Disturbance**	**Killing**	**Repellents**	**Translocation**
Intervention1	TR1.1	DS1.1	KL2.2	RP2	_
Intervention2	TR5	DS2		RP3	
Intervention3	TR7	DS4			
Intervention4					
etc……..					

Note: the above choices are examples only - your choices will differ

Table 6.2b   Choices of long-term interventions

Conflict zone name:				(codes as used in Chapters 3 / 5)	
Long-term interventions for HUMAN-ELEPHANT CONFLICT (*examples*)					
	Land Use Planning	**Information**	**Utilisation**	**Barriers**	**Compensation**
Intervention1	LU1	IN2.2	WL2.2	BA2.2	CO1.3
Intervention2	LU3	IN2.2.2	WL3.1	BA4.2	
Intervention3	LU6.4	IN2.2.3	WL4.2		
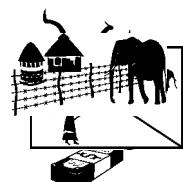
Intervention4	LU7				
etc……					

Note: the above choices are examples only - your choices will differ

(ii) Decision Aid No 2 : An Objective/Action Matrix

One type of matrix used in management decisions is called an ***objective/action matrix*** (7). If you use this you should directly relate the choice of HEC interventions available to the objectives that you have set out (Step1 above) in your HEC management plan.

You may substitute the objectives (column headings) in this example (Table 6.3) with ones relevant to HEC in your area and score them against your own list of time-categorized actions. In this example the actions are again subdivided into short- and long-term interventions so as to preserve the line of thinking from the previous exercise. Objectives do not have to be mutually exclusive because there is a lot of overlap in HEC mitigation issues. The important thing is to state objectives clearly. You may have many objectives initially but when you see how much expensive or time-consuming action needs to be taken to meet them you may have to cut them down.

Table 6.3   An Objective / Action Matrix

	OBJECTIVES (*Examples*)			(codes as used in Chapters 3 / 5)		
ACTIONS	Improve farmers ability to deter elephants	Improve farmers incentives to change crop types grown	Strengthen political support for CBNRM schemes	Keep low budget for PAC	Reduce elephant damage by 70% in two years	Reduce future dependence on agriculture
Short term						
Intervention1	TR1.1	LU6.1	CO1.1	DS1.1	IN2.2	LU6.2
Intervention2	TR5	LU6.2		DS2	LU6.1	LU9
Intervention3	TR7.2	LU6.3		KL1.2	TL1	
Long term						
Intervention1	BA4.1	LU7	WL1.2		BA4.1	WL2.2
Intervention2	LU6.4	LU10	WL3.2.2		LU9	LU2
Etc……						

Note: the above choices are examples only - your choices will differ

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(iii) **Decision Aid No 3 : A Feasibility/Action Matrix**

Another decision aid is called a *feasibility/action matrix* (7). This can be done once you have decided what actions you *want* to take, for example in Decision Aids 1 and 2 (Tables 6.2; 6.3) above. As HEC mitigation measures have to be used in combination you could first of all possibly *make up numbers of packages of the above actions* thus:

Table 6.4a   Intervention packages

Examples of HEC intervention packages (codes as used in Chapters 3 / 5)				
Package 1	LU1	IN2.2	WL2.2	BA2.2	CO1.3
Package 2	LU2	IN2.2.2	WL3.1	BA4.2	-
Package 3	LU6.1	CO1.1	DS1.1	IN2.2	-
Package 4	BA4.1	LU7	WL1.2	LU9	IN2.2

Note: the above choices are examples only - your choices will differ

Now you should score each package against feasibility criteria in a matrix, for example using: Y = Yes;   N = No; ? = no information*. You can use your own criteria but here some of the general ones used in management plan development are given (column headings). Rank the criteria left to right in order of importance so that if a package fails against a criterion there is no point in considering it further*.

Table 6.4b   Feasibility / Action Matrix

	Examples of: **FEASIBILITY CRITERIA**					
CONTROL OPTIONS	Technically possible	Practically feasible	Economically desirable	Environ-mentally acceptable	Politically advantageous	Socially acceptable
Package 1	Y	Y	Y	N		
Package 2	Y	Y	N			
Package 3	Y	N				
Package 4	Y	Y	?	Y	Y	?
etc….						

Note: the above choices are examples only - your choices will differ

In this example Package 3 can be easily disqualified as impractical and Package 2 disqualified on the grounds of economics. Package 4 would seem to be the one of choice at this stage while Package 1 could perhaps be considered if environmental concerns were adequately addressed.

(iv) Decision Aid No 4: A Pay -Off Matrix

A final example of a decision matrix is known as a ***pay-off matrix*** (7). It differs from other matrices because it includes the option of doing nothing (***a control***). A control is ranked against the *outcomes* of various actions or strategies like the packages above. What makes this matrix even more useful is that **the different packages of interventions that you decided upon can be applied to different levels of problem elephant challenge and the likely outcomes compared.**

There are not many HEC situations where it can be argued that nothing at all *should* be done but this might be an unavoidable reality (e.g. if there are no resources). Where this matrix then becomes useful is for instance if a decision has to be taken between sites. Perhaps the resources available to you do not permit you to take any action in sites with few problems (low levels of elephant attack). In serious HEC sites you could try to justify using your more expensive Package 4 (above) while in an area with moderate HEC you might get away with the cheaper Package 1. The respective outcomes of this example are shown emboldened in the table.

Table 6.5: A Pay-Off Matrix

	ACTIONS			
		Elephant control strategy (examples)		
	Do nothing (Package 0)	Package 4	Package 1	Package 2
ELEPHANT ATTACK LEVEL				
LOW (L)	**Outcome L0**	Outcome L4	Outcome L1	Outcome L2
MEDIUM (M)	Outcome M0	Outcome M4	**Outcome M1**	Outcome M2
HIGH (H)	Outcome H0	**Outcome H4**	Outcome H1	Outcome H2

Note: the above choices are examples only - your choices will differ

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These matrices are presented in sequence as an example. You do not have to use them in this way. You can use just one on its own or in a different sequence or, if you prefer, not at all. They merely illustrate ways to facilitate management decisions when you have many possible options.

These matrices may look complicated but if you use the principles therein to make ones that suit conditions in your area, you will easily understand their value. Exercises like this simplify the production of a more formal written management plan and record the present justification behind it, for reference at a later date. Using simple aids like these to organise one's thoughts in advance of taking any management action can actually make the difference between success and failure of a whole strategy.

If you find working with matrices too long or difficult a process some simpler guidelines are now given. Broad classification of management constraints and broad recommendations for types of HEC interventions in these different real-life situations can be depicted in a simple schematic (Fig 6.3). In effect the options here (counter-measure categories only) are put through a series of *filters* (common constraints). Again, be aware that this portrayal may be over-simplistic. The recommendations therein are based on knowledge to date and the author's views. They are not definitive and you do not have to adhere to them. You should consult Chapter 5 and make up your own mind about whether or not to use the different interventions listed.

This diagram tries to illustrate your possible options in another format, this time emphasizing what are often the major practical constraints to managing HEC in the African elephant range states. *If you have gone through the above matrix exercises, you could compare the outcomes thereof with the options presented here.*

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FIGURE 6.3 **THE USE OF HEC INTERVENTIONS UNDER PRACTICAL CONSTRAINTS**

HUMAN-ELEPHANT CONFLICT INTERVENTIONS

Use in ALL HEC situations	Use if POLICIES allow	Use if FINANCES allow	TRY TO DEVELOP	Doubtful value

	Use in ALL HEC situations	Use if POLICIES allow	Use if FINANCES allow	TRY TO DEVELOP	Doubtful value
SHORT-TERM MEASURES	DATA COLLECTION TRADITIONAL DISTURBANCE	KILLING (Hunts)	REPELLENTS TRANSLOCATION		COMPENSATION
LONG-TERM MEASURES	LAND USE PLAN	LAND USE PLAN UTILISATION	LAND USE PLAN RESEARCH BARRIERS	LAND USE PLAN RESEARCH UTILISATION	

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6.6 Steps 7 – 8 of management plan: Monitoring, evaluation and revision

It is pointless taking any action under a management plan unless performance can be (a) monitored and (b) evaluated. There has to be a way of measuring progress towards the objectives and goal, even if circumstances and the participants in the plan change over time. Have a look at a simple schematic example of the theory in a management plan process (Appendix A) and think about how you could adapt or apply these principles to your HEC situation. Note that there are evaluations at different time scales, in this case annually and five-yearly. Evaluation through 'lessons learnt' is the vital *feedback loop* through which any management plan can be altered and so *kept alive* over time.

But what can actually be used to measure progress and therefore to decide on the degree of success in a management plan? With a problem like HEC, once we have an idea of what the problem actually is (Chapter 2) we look for ways to intervene and decrease its incidence (Chapters 4; 5). One simple way to measure if an action (or more usually a set of actions combined) has resulted in a reduction is by comparing a "before and after" measurement. The following (Table 6.6) are suggestions of *variables* that might quantitatively measure 'before and after progress' in mitigating HEC.

If you are going to follow this methodology you will have to decide what constitutes "before" and "after" in your particular situation. It may not be possible to do extensive surveys in your area to establish what constitutes the "before action" scenario. In this case you may simply have to start to take action and simultaneously monitor progress by measuring variables like those below (Table 6.6). If you then look at *the trend* at intervals from the time you started (e.g. per month; per crop season; per year) in certain places (e.g. per village area; per km of park boundary; per hectare of crop) you will get some idea if you are succeeding or not. Remember that for the results to be comparable the effort put into recording the information that you use must be *standardized, continuous and of consistent quality*.

Using the latter approach follows the principles of what is known as "**adaptive management**" (14) by integrating data collection with management action and constantly evaluating progress through 'lessons learnt' (Appendix A). With this approach, there is seldom the opportunity for an experimental "control" *per se* (i.e. one with no **treatment** to use as a comparison, as in Decision Aid No. 4), so management action has to be designed in such a way that managers will learn *equally from success or failure* (4; 14).

Table 6.6   Quantifying actions taken in HEC management

Method	Your notes / choices
Very simple methods	
Number of households using traditional deterrents	
Number of incident reports from farmers / residents	
Methods using wildlife authority records	
Number of patrol nights by field staff	
Amount of ammunition expended by patrols	
Number of elephants officially destroyed on control	
Number of elephants unofficially destroyed on control	
(suspected from use of firearms by villagers)	
(suspected from other causes e.g. poison)	
Number of boundary crossings by elephants	
Number of crop fields visited by elephants	
Number of fence breaks by elephants	
Number of people injured or killed by elephants	
Methods needing some research input	
Number of elephant damage incidents in area (e.g. by unit time or unit area or unit population) (20)	
(per month / year / cropping season)	
(per village)	
(per household)	
(per km^2 of conflict zone)	
(per hectare of cultivation)	
(per type of crop)	
Number of serious damage incidents (20) (using AfESG data collection protocol) (20)	
Damage score on crops destroyed (using AfESG data collection protocol) (20)	
Area of crop losses to elephants	
Monetary value of crop losses to elephants	
Monetary value of all losses to elephants	
Ranking of elephants against other pests (37; 38)	
Attitude assessments of affected people	

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6.7 The Way Forward With This DSS

6.7.1 *HEC management: a tall order*

Dealing with problem elephants and the effects they have on people is one of the most difficult scenarios faced by wildlife managers in Africa. Appreciating, planning, funding and implementing packages of widely differing individual counter-measures against problem elephants becomes a complex discipline, effectively as much an art as a science. The IUCN AfESG is a body of technical experts working on issues affecting African elephants all over the continent and it has identified HEC (and specifically assisting the reduction of it) as one of the priorities for conserving this species. As an organization the AfESG is mandated to provide "technical facilitation" to people responsible for the conservation of the African elephant. Because recent years have seen a massive rise in the interest surrounding HEC and concern about it, the AfESG has taken up the challenge by spearheading an initiative to assist those directly able to ameliorate the problem, whether they be in conservation agencies, government departments, donor organizations, academic institutions or the private sector.

6.7.2 *Why this DSS?*

Up to now many such people have been trying to address HEC problems in their own countries and wildlife areas often starting from scratch, usually with limited resources and frequently working in isolation from others who could help discuss useful ideas and experiences. The task is hard enough anyway but such a scenario can make the chances of success almost impossible. This document is a first attempt to gather together from many sources the material that any interested individual or group may need for the huge task of addressing HEC. By being exposed to the experiences of others through this Decision Support System (DSS), people involved in trying to address HEC will hopefully not be starting from the beginning and not have to feel they are on their own.

6.7.3 *The future of this initiative*

Like any model, this DSS should now evolve through the experiences of those who use it (6;10). If it is to be improved it requires feedback from you, the practitioner, to the technical facilitator, the AfESG (Appendix B). Please make a note of the AfESG contact persons in your region and feel free to communicate both your comments on this initiative and your experiences with HEC mitigation in the field. Your active contribution will benefit affected people, other wildlife managers and the African elephant itself.

GLOSSARY of TERMS

TERM	DEFINITION
Adaptive management	changing management actions on the basis of evaluating the results of previous actions
Challenge	(of problem elephants) the level of attack
Circadian	Daily
CBNRM	Community-Based Natural Resource Management
Complainant	the person whose property has been damaged
Control	an experiment with no treatment
Counter-measure	category of action (divided into various methods)
Culprit	(of problem elephants) the individual responsible
Enumerator	person who collects data on elephant damage incidents
Generic	a general or typical example
Habituation	diminished response to a repeated action
Hypothesis	a statement which is testable by experiment or investigation
Incident	(of problem elephants) a separate occurrence involving damage
Intervention	(in HEC) any counter-measure or method used to mitigate the problem
Matrix	table comparing options in order to facilitate decision-making
Method	action which is assigned to a counter-measure category
Opportunity cost	a cost incurred as a result of time spent pursuing another activity (cost is often indirect or poorly-quantifiable in nature)
PAC	Problem Animal Control
Rank	place in order of importance or priority
Reporter	as enumerator (see above)
Researcher	person trained to design and implement a study
Sampling	selecting only some units (for measurement)
Standardized	in the same fashion
Synergy	additive effect of several actions employed together
Training package	a set of instructions for enumerators
Treatment	experimental conditions imposed
Trend	a quantitative change (increase, stability, decrease)
Variable	a condition which is measured in order to study an effect
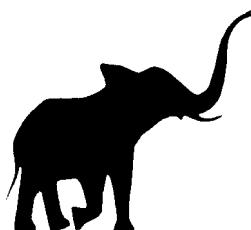
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These references are abstracted in the African Elephant Library on the AfESG internet website (see Appendix B). Hard copies are kept at the AfESG secretariat in Nairobi (Appendix B) but a reprint service is not currently on offer. Publications in journals (underlined) may be obtained from libraries that have the relevant journal while an unpublished report may be obtained from the organisation listed as producing it.

SCHEMATIC OF THE OPERATION OF A MANAGEMENT PLAN
(such as might be applied to a HEC site)
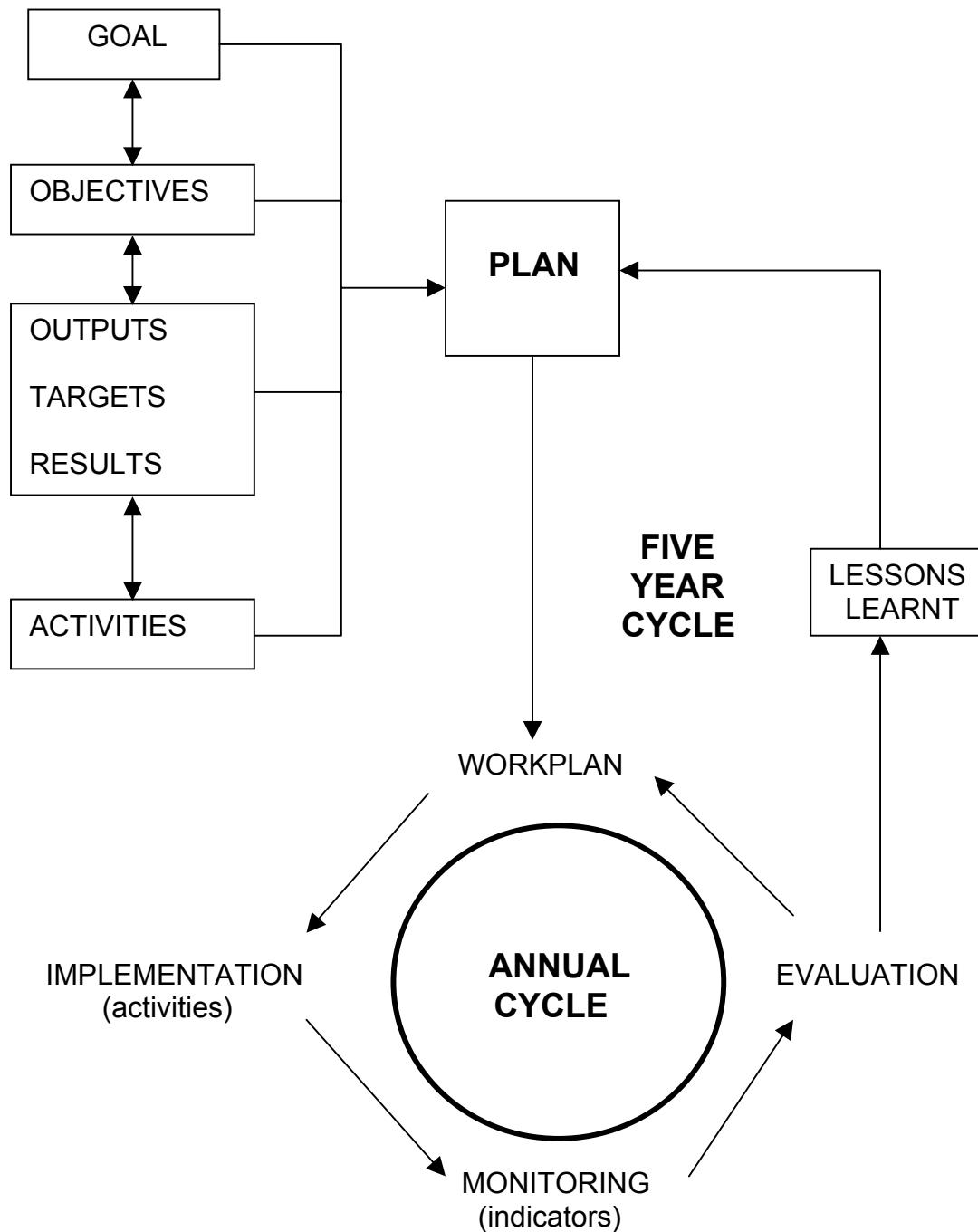
APPENDIX B

AfESG HETF products available to research collaborators, 2001

The IUCN African Elephant Specialist Group (AfESG) is at the forefront of HEC research and management in Africa via its role as an organisation providing advice and technical assistance. The AfESG has a Human-Elephant Conflict Taskforce (HETF) working on this key issue and this has produced a number of HEC management products. These are available at no cost but we encourage people who use them to offer comment and feedback. This DSS is one of those products

We have an increasing number of collaborators using these products and we welcome new people to join this network, especially those who have their own resources to undertake field projects. The whole idea is to establish a standardized approach (and a feedback loop) to HEC research and management so that information is comparable between vastly differing HEC sites.

AVAILABLE PRODUCTS

1. HEC bibliographic list for Africa whose entries are abstracted in the African Elephant Bibliography.
2. A recommended standardized data collection and analysis protocol for HEC situations
3. A training package for enumerators of elephant damage
4. A *'technical brief'* on the use of monetary compensation schemes for elephant damage.
5. A synthesis of recent research into aspects of human-elephant conflict in Africa. This is a synthesis of eight studies done by consultants in 1998-99 published in *Pachyderm* 28 : 73-77 (Jan – June 2000).

1, 2, 3 and 4 above are currently available (easily downloadable) on the AfESG Internet Website:

http://iucn.org/themes/ssc/sgs/afesg/

Other constituents of the website are the regular publication *Pachyderm* , and latest editions of African Elephant Database and African Elephant Bibliography.

If funding allows, by late 2001 we hope to make available a free package on CD ROM containing:
- This DSS
- The standardized data protocol (no.2, above)
- The enumerator training manual (no.3, above)

Appendix B (cont)

PRODUCTS UNDER DEVELOPMENT

1. Standardized hard copy maps of HEC sites generated from satellite imagery

2. GIS analysis of HEC

The more sites that can supply similar data of good quality the easier it will be to analyse them and compare the results, thereby increasing our understanding of HEC (17). The next phase of research is concerned with analyzing these standardized data. We are willing to establish formal Memoranda of Understanding with data providers, should their data be made available to the AfESG. There are fundamental questions related to HEC that the AfESG will try to answer by collaborating with many different researchers across the continent (17). Among these are:

- What actually constitutes a conflict zone? (20; 44)
- What are the causal factors of HEC in different areas and which ones are measureable? (1; 2; 18; 19)
- How can we measure the seriousness of HEC and compare it between zones (19; 20; 33; 53)?
- What could be used to predict where, when or how bad HEC will be? (20; 37)

Queries on any of the above can be directed to:

- Senior Programme Officer, AfESG, P. O Box 68200, City Square 00200 Nairobi, Kenya. E mail: leo.niskanen@iucn.org
- Dr. R. E. Hoare, P. O. Box 707, Arusha, Tanzania. E mail: richard@messerlifoundation.org (the author of this document)
- Programme Officer, AfESG West Africa, UICN BRAO, 01 BP 1618 Ouagadougou 01, Burkina Faso. Email: lamine.sebogo@iucn.org

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A Decision Support System for Managing Human-Elephant Conflict in Africa