



**GLOBAL ENVIRONMENT FACILITY**  
INVESTING IN OUR PLANET

**Naoko Ishii**  
CEO and Chairperson

March 15, 2018

Ms. Kelly West  
GEF Executive Coordinator  
United Nations Environment Programme  
Nairobi 00100, Kenya

Dear Ms. West:

I am pleased to inform you that I have approved the medium-sized project detailed below:

Decision Sought:	Medium-sized Project (MSP) Approval
GEFSEC ID:	9539
Agency(ies):	UNEP
Focal Area:	Biodiversity
Project Type:	Medium-Sized Project
Country(ies):	Malawi
Name of Project:	Enhancing Sustainability of Protected Area Systems and Stabilizing Agro-production in Adjoining Areas through Improved IAS Management
Indicative GEF Project Grant:	\$1,502,511
Indicative Agency Fee:	\$142,739
Funding Source:	GEF Trust Fund

This approval is subject to the comments made by the GEF Secretariat in the attached document. It is also based on the understanding that the project is in conformity with GEF focal areas strategies and in line with GEF policies and procedures.

Sincerely,

Naoko Ishii  
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document  
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee



# GEF-6 REQUEST FOR PROJECT ENDORSEMENT/APPROVAL

PROJECT TYPE: Medium-sized Project

TYPE OF TRUST FUND: GEF TRUST FUND

For more information about GEF, visit [TheGEF.org](http://TheGEF.org)

## PART I: PROJECT INFORMATION

Project Title: <b>Enhancing sustainability of Protected Area systems in Malawi, and stabilizing agro-production in adjoining areas through improved IAS management</b>			
Country(ies):	Malawi	GEF Project ID: <sup>1</sup>	9539
GEF Agency(ies):	UN Environment	GEF Agency Project ID:	01404
Other Executing Partner(s):	Environmental Affairs Department in the Ministry of Natural Resources, Energy and Mining	Resubmission Date:	February 12, 2018
GEF Focal Area (s):	BD	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP <input type="checkbox"/>	
Name of Parent Program	[if applicable]	Agency Fee (\$)	142,739

### A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES<sup>2</sup>

Focal Area Objectives/Programs	Focal Area Outcomes	Trust Fund	(in \$)	
			GEF Project Financing	Co-financing
BD-1 Program 1	Outcome 1.2: Improved management effectiveness of protected areas.	GEFTF	701,255	1,970,000
BD-2 Program 4	Outcome 4.1 Improved management frameworks to prevent, control, and manage invasive alien species (IAS)	GEFTF	801,256	3,194,147
<b>Total project costs</b>			<b>1,502,511</b>	<b>5,164,147</b>

### B. PROJECT DESCRIPTION SUMMARY

Project Objective: To prevent new invasions and reduce the current impacts of invasive alien species (IAS) in protected areas and adjoining agro-ecosystems in Malawi						
Project Components	Financing Type <sup>3</sup>	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Financing	Co-financing
1. Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems	TA	Outcome 1.1. Strengthened national IAS frameworks and improved national capacity and coordination amongst different government agencies and the private sector to respond to existing and new invasive species problems throughout Malawi, with a focus on protected areas and their adjoining agro-ecosystems	1.1.1. National framework for the cross-sectoral management of IAS operational and supporting long-term development planning:  1.1.2. Evidence base informing policy and supporting IAS prevention and management in and around PAs	GEFTF	342,260	1,008,000
2. Strengthening IAS management in existing protected areas	TA/INV	Outcome 2.1. Reduced IAS impacts in two PAs (Mulanje FR and Nyika NP) resulting in enhanced	2.1.1. Two revised PA Management Plans including strategies and budgets for IAS prevention and control	GEFTF	670,000	2,409,432

<sup>1</sup> Project ID number remains the same as the assigned PIF number.

<sup>2</sup> When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#) and [CBIT programming directions](#).

<sup>3</sup> Financing type can be either investment or technical assistance.

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and adjoining agro-ecosystems		<p>conservation outcomes for endangered or threatened species.</p> <ul style="list-style-type: none"> <li>• GEF TT scores up with 50% on IAS management &amp; 10% up on PA METT</li> <li>• Increased budgets for IAS management in two protected areas, involving a total of 50,000 ha under IAS management</li> <li>• Invaded areas (150 ha total) in two protected areas cleared and restored</li> </ul> <p>Outcome 2.2. Reduced IAS impacts in adjoining agro-ecosystems of Mount Mulanje FR and Nyika NP contributing to improved livelihoods and biodiversity conservation</p> <ul style="list-style-type: none"> <li>• Invaded areas (total 100 ha.) adjoining two protected areas cleared and restored, through expanded partnership between PAs and farmers</li> <li>• 15 % enhanced tree cover in PA buffer zones (baseline to be set at PPG)</li> <li>• Sustainable farming practices adopted by 50 households and incorporating IAS prevention and control</li> </ul>	<p>2.1.2. Tested management plans for four IAS, including IAS control and habitat restoration in two protected areas (see Table 2)</p> <p>2.1.3. Capacity of 80 protected area staff improved and applied in the identification and management of IAS</p> <p>2.1.4. Biocontrol Working Group established and operational leading to the introduction of three host specific and damaging biocontrol agents</p> <p>2.2.1. Invaded rangelands (100 ha. total) in buffer zones/agro-ecosystems of two adjoining PAs cleared and restored (native trees) through enhanced partnerships between PA staff and farming communities, including the training of 100 farmers in IAS identification and management.</p> <p>2.2.2. Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping adopted and promoted by 50 households as a result of training and demonstration trials.</p>			
3. Knowledge management and broader adoption	TA	<p>Outcome 3.1. Replication and increased adoption in the Malawi PA system of IAS prevention and management through national dissemination of best practice and awareness programs.</p>	<p>3.1.1. Communication strategy and outreach campaigns including use of media, workshops and meetings (targeting government officials, PA staff and affected communities)</p> <p>3.1.2. National information sharing procedures including the development of a Guide on the identification and management of invasive plant species in Malawi.</p> <p>3.1.3. Project M&amp;E program, evidence of IAS monitoring capacity built and implemented in PA's and their agro-ecosystems</p>	GEFTF	353,659	1,230,300
Subtotal					1,365,919	4,647,732
Project Management Cost (PMC) <sup>4</sup>				GEFTF	136,592	516,415
<b>Total Project Cost</b>					<b>1,502,511</b>	<b>5,164,147</b>

<sup>4</sup> For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.  
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### C. CONFIRMED SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE

Please include evidence for co-financing for the project with this form.

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Government	Environmental Affairs Department	Grant	187,500
Recipient Government	Environmental Affairs Department	In-kind	365,500
Recipient Government	Department of National Parks and Wildlife	Grant	60,000
Recipient Government	Department of National Parks and Wildlife	In-kind	450,000
Recipient Government	Department of Agricultural Research Services	Grant	100,600
Recipient Government	Department of Agricultural Research Services	In-kind	457,700
Recipient Government	Department of Land Resources Conservation	Grant	92,200
Recipient Government	Department of Land Resources Conservation	In-kind	595,500
Recipient Government	Forest Research Institute of Malawi	In-kind	354,052
Recipient Government	Department of Forestry	Grant	178,800
Recipient Government	Department of Forestry	In-kind	503,800
Recipient Government	National Herbarium and Botanical Gardens	In-kind	235,800
Recipient Government	Museums of Malawi	Grant	191,000
Recipient Government	Museums of Malawi	In-kind	110,000
Recipient Government	Peace Parks Foundation	Grant	355,000
GEF Agency	United Nations Environment	In-kind	100,000
Others	Mount Mulanje Mountain Conservation Trust	In-cash	100,000
Others	Mount Mulanje Mountain Conservation Trust	In-kind	200,000
Others	Nyika Vwaza (UK) Trust (NVT-UK)	In-kind	65,000
Others	Nyika Vwaza (MW) Trust (NVT-MW)	In-kind	75,000
Others	Total Land Care (TLC)	In-kind	60,000
Others	Queensland Biosecurity, Australia	In-kind	76,695
Others	Centre for Agriculture and Biosciences International (CABI)	In-kind	250,000
<b>Total Co-financing</b>			<b>5,164,147</b>

### D. TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) <sup>b)</sup>	Total (c)=a+b
UNEP	GEFTF	Malawi	Biodiversity		1,502,511	142,739	1,645,250
<b>Total GEF Resources</b>					<b>1,502,511</b>	<b>142,739</b>	<b>1,645,250</b>

a) Refer to the Fee Policy for GEF Partner Agencies

### E. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS<sup>5</sup>

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	385,000+ <sup>6</sup> .

### F. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? NO

<sup>5</sup> Update the applicable indicators provided at PIF stage. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the *GEF-6 Programming Directions*, will be aggregated and reported during mid-term and at the conclusion of the replenishment period.

<sup>6</sup> Total size of two PAs (NNP and MMFR) is 385,000 ha. Direct benefits through clearing of IAS in 150 ha in both PAs and 100 ha in adjoining agro-ecosystems. Indirect benefits to both PAs through improved prevention, early detection and rapid response of new infestations, as well as monitoring of IAS. These activities will also benefit other PAs in Malawi and biodiversity conservation throughout the country.  
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(If non-grant instruments are used, provide an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/CBIT Trust Fund) in Annex D.

## **PART II: PROJECT JUSTIFICATION**

### **A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF<sup>7</sup>**

<b>PIF Elements &amp; Text</b>	<b>CEO ER Elements</b>	<b>Explanation of Changes</b>
<b>Component 1:</b> Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems	<b>Component 1:</b> Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems	No changes
<b>Outcome 1.1:</b> National IAS policy and improved national capacity and coordination amongst different government agencies and the private sector to respond to existing and new invasive species problems throughout Malawi, with a focus on protected areas and their adjoining agro-ecosystems	<b>Outcome 1.1:</b> National IAS <b>frameworks</b> and improved national capacity and coordination amongst different government agencies and the private sector to respond to existing and new invasive species problems throughout Malawi, with a focus on protected areas and their adjoining agro-ecosystems	Targeted ‘policy’ changed into ‘national framework’ also better in line with GEF strategic objective on IAS work,
<b>Output 1.1.2:</b> Evidence base <b>established and communicated for</b> IAS prevention and management in and around PAs	<b>Output 1.1.2:</b> Evidence base <b>informing policy and supporting</b> IAS prevention and management in and around PAs	Slight changes in wording to make it clearer as to which changes are envisaged
<b>Component 2:</b> Strengthening IAS management in existing protected areas and adjoining agro-ecosystems	<b>Component 2:</b> Strengthening IAS management in existing protected areas and adjoining agro-ecosystems	No changes
<b>Outcome 2.1:</b> Reduced IAS impacts in <b>five</b> selected protected areas resulting in enhanced conservation outcomes for endangered and threatened species	<b>Outcome 2.1:</b> Reduced IAS impacts in <b>two</b> selected protected areas resulting in enhanced conservation outcomes for endangered and threatened species	We have reduced the number of PAs to two - in which we will actively reduce the distribution and abundance of IAS in order to be more effective and have more of an impact. It was felt during the PPG workshop in Malawi that we would be spreading ourselves too thin by undertaking clearing activities in 5 PAs. As a result the total area for IAS control has been reduced from 75,000 ha to 50,000 hectares in total for the two PAs.  METT score reduced from 20% to 10% for each PA based on field realities assessed during PPG
<b>Output 2.1.1:</b> <b>Five revised PA</b> Management Plans including strategies and budgets for IAS prevention and control	<b>Output 2.1.1:</b> <b>Two revised PA</b> Management Plans including strategies and budgets for IAS prevention and control	See explanation above
<b>Output 2.1.2:</b> Tested management plans for <b>six</b> IAS, including IAS control and habitat restoration in <b>three of the five</b> protected areas	<b>Output 2.1.2:</b> Tested management plans for <b>four</b> IAS, including IAS control and habitat restoration in <b>two</b> protected areas	In order to be more effective and have a greater impact we have reduced the number of targeted invasive plants from six to four. This will allow us to undertake more treatments and have more replicates – it will improve the scientific rigour of our trials. This was recommended during the PPG workshop in

<sup>7</sup> For questions A.1 –A.7 in Part II, if there are no changes since PIF, no need to respond, please enter “NA” after the respective question.

PIF Elements & Text	CEO ER Elements	Explanation of Changes
		Malawi
<b>Output 2.1.3:</b> Capacity of <b>50</b> protected area staff improved and applied in the identification and management of IAS	<b>Output 2.1.3:</b> Capacity of <b>80</b> protected area staff improved and applied in the identification and management of IAS	Based on recommendations during the PPG workshop it was recommended that we increase the number of staff for training due to the fact that most Forestry Department and Department of National Parks and Wildlife staff are not aware of the IAS issue and how best to manage invasive plants
<b>Outcome 2.1:</b> Invaded areas (150 ha total) in <b>three</b> protected areas cleared and restored	<b>Output 2.1.5:</b> Invaded areas (150 ha total) in <b>two</b> protected areas cleared and restored	Should have been an additional output in the PIF. Invasive plants will only be cleared in two PAs (Nyika NP – 100 ha and Mount Mulanje FR – 50 ha)
<b>Outcome 2.2:</b> Reduced IAS impacts in adjoining agro- ecosystems of <b>five</b> selected protected areas contributing to improved livelihoods and biodiversity conservation	<b>Outcome 2.2:</b> Reduced IAS impacts in adjoining agro- ecosystems of <b>two</b> selected protected areas contributing to improved livelihoods and biodiversity conservation	Similar to some of the comments made above. Best to be focussed in our approach and make a significant difference at two sites than spread ourselves to thin and achieve little overall.
<b>Output 2.2.1:</b> Invaded areas ( <b>150 ha. total</b> ) in agro-ecosystems of <b>three</b> adjoining protected areas cleared and restored	<b>Output 2.2.1:</b> Invaded rangelands ( <b>100 ha. total</b> ) in buffer zones/agro-ecosystems of <b>two</b> adjoining protected areas (Nyika NP and Mount Mulanje FR) cleared and restored (native trees) through enhanced partnerships between PA staff and farmer communities, including the training of 100 farmers on IAS identification and management.	Combined outputs 2.2.1; 2.2.2; and 2.2.4 in order to reduce the number of outputs – no changes in the original outputs; they have merely been combined. However, the area to be cleared has been reduced from 150 to 100 ha and only two instead of three areas will be cleared. Reasons are similar to those explained above – to have a more focussed approach which will increase the probability of success.  The % increase in tree cover has now been confirmed and set as 15% increase of LOP
<b>Output 2.2.2:</b> Increased collaboration between PA managers and farmers with regard to IAS management including the promotion of native trees to enhance crop and livestock production		Included in the revised Output 2.2.1.
<b>Output 2.2.3:</b> Sustainable farming practices, including Farmer Managed Natural Regeneration (FMNR) adopted and promoted by 50 households	<b>Output 2.2.2:</b> Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), <b>Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping</b> adopted and promoted by 50 households <b>as a result of training and demonstration trials</b>	Expansion of the original Output 2.2.3 to include CA and other agricultural practices and something on training and demonstration trials to facilitate adoption. Needed to make it clear that we will be promoting other practices and that adoption will be facilitated by training and demonstration trials in line with the revised Output 2.2.1.
<b>Output 2.2.4:</b> One hundred farmers trained in the identification and management of IAS.		Included in the revised Output 2.2.1
<b>Component 3:</b> Knowledge management and broader adoption	<b>Component 3:</b> Knowledge management and broader adoption	No changes
<b>Outcome 3.1:</b> Lessons learnt, documented and disseminated and awareness programs to facilitate replication and broader adoption in the Malawi National PA system <b>established.</b>	<b>Outcome 3.1:</b> Replication and increased adoption in the Malawi PA system of IAS prevention and management through national dissemination of best practice and awareness programs.	Changed in wording based on QAS review of the results Framework; and in order to make it clearer
<b>Output 3.1.1:</b> Communication strategy developed and implemented for PAs	<b>Output 3.1.1:</b> Communication strategy and outreach campaigns including use of	Combined Output 3.1.1. and Output 3.1.2.



PIF Elements & Text	CEO ER Elements	Explanation of Changes
and agro-ecosystems	media, workshops and meetings targeting two levels of national and local government, as well as staff and affected communities of the two protected areas.	
<b>Output 3.1.2:</b> Outreach campaigns including use of media, workshops, and meetings, targeting government officials, protected area staff and affected communities		Combined Output 3.1.1. and Output 3.1.2.
<b>Output 3.1.4:</b> Project M&E program developed, IAS monitoring capacity built and implemented in PAs and their agro-ecosystems.	<b>Output 3.1.4:</b> Project Impact Monitoring System developed, capacity built and results reported.	Change in wording

## A.1. Project Description

### A1.1 The global environmental and/or adaptation problems, root causes and barriers that need to be addressed

#### Threats:

Invasive alien species (IAS) are those plants, animals and microbes which are introduced to new regions, as a result of human activities, where they establish and spread, impacting negatively on biodiversity, agriculture, water resources, and human health (Pimentel et al., 2001). IAS pose one of the most important threats to biodiversity in Malawi. Malawi's Clearing House Mechanism under the CBD identifies four major threats to biodiversity -- habitat loss and fragmentation, invasive alien species, population pressure and poverty – and further states that “the major threats to biodiversity are from invasive plants.” Both protected landscapes and productive landscapes in Malawi are vulnerable to IAS. Productive lands are frequently subject to land degradation from human activities such as unsustainable agriculture and livestock grazing, overharvesting of forests, etc., which makes them more vulnerable to IAS, as healthy ecosystems are generally more resilient to plant invasions. As IAS establish and spread in degraded productive lands, reductions in crop yields and pasture production due to IAS impacts will increase the reliance of local communities on resources within PAs. In addition, established IAS within areas adjoining PAs will also, in time, invade PAs further threatening biodiversity and increasing IAS management costs. Therefore, in order to protect globally significant biodiversity within PAs, it is critical to not only manage invasive plants within PA sites, but also to restore degraded lands to improve productivity and increase resilience to re-invasion of cleared areas. As such PAs cannot be managed in isolation, a landscape approach is required.

Although national estimates on the costs of IAS in Malawi do not exist, reports from other countries indicate that IAS incur significant costs to the country. For example, the water hyacinth (*Eichhornia crassipes*) is widespread in the Shire River where it affects the generation of hydroelectric power and irrigation programs. The Malawi Compact Environment and Natural Resource Management Project estimates that power shutdowns cause by water hyacinth and other waterweeds that clog up the turbines cost US\$27,000 per day and lead to industrial losses worth ten times this amount. Invasive plants in water catchments and riparian zones, especially shrubs and trees, have a negative impact on water quantity and quality, affecting downstream users. Invasive plants can also have a negative impact on pollinators and reduce the abundance of natural enemies of crop pests, such as insect predators and parasitoids. Weeds, most of which have been introduced, also pose one of the most significant threats to food production by reducing crop yields, especially in developing countries (Oerke, 2006; Gianessi, 2009) such as Malawi, while also contributing to the erosion of ecosystem services (Turpie, 2004; van Wilgen et al., 2008; Strayer (2012). Studies undertaken in other parts of Africa have also revealed that invasive alien plants can reduce pasture production by as much as 71% if not controlled (van Wilgen *et al.*, 2008) – natural pasture is already heavily invaded in Malawi. Livestock production (dependent on pasture) contributes about 20% of the total value of agricultural production in Malawi, consisting mainly of subsistence grazing of sheep, cattle, goats, poultry and pigs (WTO, 2002). IAS also produce significant negative social impacts; in Malawi the vast majority of the population depend on natural resources for food, livelihoods, energy security, as well as a healthy living environment, and the degradation of ecosystem services and productivity from IAS is a major concern. Any activities which prevent the introduction and spread of IAS and mitigate the impacts of those that are already present will therefore benefit the most vulnerable members of Malawian society, especially the poor who are the least able to cope with the negative impacts of IAS on their livelihoods.

The following factors and root causes predisposes Malawi to IAS:

The IAS threatening the unique biodiversity of Malawi are being introduced at an increasing rate through trade, travel (tourism) and transport - the infamous “three Ts”, the major drivers of biological invasion. The risk of such introductions, intentional or accidental,

is growing rapidly as a result of globalization. The introduction of plants for agriculture, silviculture, soil improvement and amenity, including gardening, is increasing, as is the intentional importation of fish for aquaculture, including the aquarium and pet trades.

*Trade* routes in the form of road and rail and associated transport are the major pathways and vectors for IAS into Malawi. Most imports are from South Africa, followed by Zimbabwe, United Kingdom, Mozambique and the USA. This poses a significant threat as South Africa has the highest recorded number of invasive alien plants in Africa, closely followed by Zimbabwe. Surveys have already revealed that Malawi shares many invasive plants that are already widespread throughout much of South Africa. Imports of cereals from Mozambique are also increasing, another possible source of IAS. In fact imports into Malawi during the last five years have increased at an annualized rate of 0.8%, from \$2.21 billion in 2010 to \$2.29 billion in 2015.

*Tourism* is an important sector in Malawi with tourist numbers increasing year on year. In 2014 tourism contributed 8% to GDP with a vision to increase it to 13% by 2018. With thousands of tourists visiting Malawi every year and a lack of adequate information services and screening procedures at airports and land borders, the risk of both accidental and intentional introductions is significant.

The impacts of *climate change* in Malawi are being manifested in various ways including intense rainfall, changing rainfall patterns, floods, and prolonged dry spells. An increase in temperatures and intense rain in Malawi over the past 40 years has led to both drought and flooding, resulting in shorter growing seasons, poor crop yields, food shortages, hunger and the spread of disease in a country where 29% of people already now live in extreme poverty. An increase in extreme weather events as a result of climate change will facilitate plant and animal invasions.

Some invasive plant species will also benefit from higher carbon dioxide levels and temperatures (Kriticos and Filmer, 2007). For example, the invasive shrub *Acacia nilotica*, in Australia, is likely to benefit from increases in water-use efficiency as a result of increased CO<sub>2</sub> concentrations, allowing it to invade drier sites, while increased temperatures will allow it to complete its reproductive life cycle in areas which are currently too cool to sustain populations (Kriticos et al., 2003).

Malawi is also *extremely vulnerable* country because it is land-locked, surrounded by Mozambique, Zambia, and Tanzania. An invasive animal or plant species introduced into a neighbouring country within the region is likely to spread into Malawi. For example countries neighbouring Malawi, such as Tanzania, could easily be a source as well as a pathway for new IAS infestations into Malawi through their connected ecosystems, cross border trade and human migration, since hundreds of IAS are already recorded in neighbouring countries.

*Rapid population growth coupled with high levels of poverty* has contributed to the rapid depletion of natural resources, making Malawi very vulnerable to environmental perturbations which increase susceptibility to biological invasions. A very strong factor contributing to the spread of IAS in Malawi and the region as a whole is the massive conversion of natural habitats to other uses. Increased disturbance and land degradation are major drivers of plant invasions. Productive lands are frequently subject to land degradation from human activities such as unsustainable agriculture and livestock grazing, overharvesting of forests, etc., which makes them more vulnerable to IAS, as healthy ecosystems are generally more resilient to plant invasions. As IAS establish and spread in degraded productive lands, reductions in crop yields and pasture production due to IAS impacts will increase the reliance of local communities on resources within PAs.

#### *Barrier Analysis:*

#### ***Barrier 1: Inadequate policy, institutional framework and capacity for managing IAS – specifically in protected area landscapes and surrounding agro-ecosystems***

One critical issue has been that Malawi does not have a single institution that is primarily responsible for dealing with IAS issues. The lack of clear institutional ownership or an overarching policy on IAS has led to ineffective coordination amongst various agencies, especially those in agriculture, forestry and the environment, and often leads to conflicting recommendations made by different agencies and institutions that constrain the government's ability to generate a unified response to IAS control. This may be partially resolved by the proposed establishment of an Malawi Environmental Protection Authority (MEPA) under the recently promulgated Environmental Management Act of 2017. MEPA will be mandated to coordinate IAS management activities, but until such time, IAS management will continue to be largely uncoordinated.

Another critical barrier to effective IAS management is the fact that Malawi has very few policies or laws specifically established for the management of invasive species, which is instead addressed primarily through sectoral policies and legislation that deal with biodiversity generally, or the prevention and control of agricultural pests. In addition, sectoral policies often promote or encourage the introduction of exotic species without evaluating their potential risk, especially to biodiversity. For example, government departments and NGOs often promote the introduction of exotic agroforestry species without adequate evaluation of the potential costs and benefits.



Only a few laws and regulations in Malawi make specific reference to and promote the management of invasive alien species in the country, two of which fall under the mandate of the Ministry of Agriculture, Irrigation and Water Development. One of these is the Plant Protection Act (Cap 64:01), which provides for the “eradication of pests and diseases destructive to plants to prevent the introduction and spread of pests and diseases destructive to plants, and for matters connected therewith and incidental thereto.” The other is the Noxious Weeds Act (Cap 64:02), which governs the management of declared noxious weeds. However, the existing Acts and their subsidiary regulations are seriously outdated and enforcement weak. That said, the recently promulgated EMA makes many references to IAS, and may provide for a more coordinated and consolidated policy and regulatory approach to IAS.

There is little capacity to develop and implement effective management strategies for IAS already present and impacting on communities, the PA system and various economic sectors; nor have these been incorporated into PA management plans..

There is currently very little or no information available on which IAS are present, their distribution and impacts. The Department of National Parks and Wildlife and the Forestry Department do not have the necessary experience or capacity to conduct proper risk analysis of IAS already in and around PAs. IAS have also not been adequately addressed in PA management plans. The Environmental Affairs Department, Ministry of Natural Resources, Energy and Mines, has no surveillance systems in place nor monitoring data on the main pathways by which these species were initially introduced, how new IAS may be introduced, and how they are currently being moved to new localities. There is also little to no knowledge among practitioners in Malawi on the current policies and regulations in the various Government Departments with responsibility for IAS management. This prevents the agencies from coordinating and collaborating in prevention and management of IAS of national importance.. Without adequate baseline data it is not possible for Malawi to develop or implement effective IAS management strategies at a national, regional, local or even PA level. These capacity issues and knowledge gaps need to be addressed. For example, IAS prevention and management is not incorporated in national agricultural development and poverty alleviation programs, nor adequately addressed in PA management directives or budgets; nor is it clearly targeted in the country’s (agriculture) quarantine and pest management systems.

***Barrier 2: Limited experience, partnership and capacity to implement IAS management (prevention, control and restoration) in protected areas and adjoining landscapes***

Implementation of IAS prevention and control strategies in Malawi is inadequate to support the conservation of biodiversity and the maintenance of ecosystem services and functions. For example, the GoM takes precautions with regard to the intentional introduction of pests under the Plant Protection Act, but it is mainly concerned with those that pose a risk to agriculture and human health rather than those that may threaten biodiversity. In other words pest risk assessments (PRAs) are often only mainly concerned with the pests associated with, for example, an imported plant rather than the plant itself.

Malawi does not have adequate systems in place to monitor or detect new invasions, or to take effective steps to eradicate them, except in the case of some agricultural pests. Control programs for well-established and widespread IAS are also often inadequate, mainly owing to lack of information, capacity and resources relating to the methodologies for management (mechanical/manual, chemical, biological and restoration). Shortages of institutional, human and physical resources all limit Malawi’s ability to address IAS effectively.

There is little awareness and capacity to develop and implement a national biocontrol programme despite the proven cost-effectiveness of this pest management strategy This is despite the fact that there are a large number of known host-specific and damaging agents for many of the invasive plants present in Malawi, which have been used with great success elsewhere. In addition, no policies in Malawi explicitly advocate Integrated Pest Management (IPM). The main barriers to the adoption of IPM are “insufficient training and technical support to farmers” followed by “lack of favorable government policies and support”.

The benefits of Conservation agriculture (CA) include a reduction in soil erosion, increases in soil organic matter, improvement in soil biological processes and soil fertility, and conservation of soil moisture, all of which have contribute to increased yields However, adoption remains a challenge. Some of the commonly cited barriers include a lack of awareness of the appropriate practices and their benefits, as well as low levels of investment in knowledge dissemination. Agriculture projects run by governments, NGOs, and others often fail to engage with farmers or effectively spread the word about how to accomplish rainwater harvesting, agroforestry, and other practices.

At a PA level the National Parks and Wildlife Act makes no reference to the management of IAS. That said it is stated clearly that the introduction of exotic species into PAs is prohibited. However, based on our preliminary surveys this is not being effectively implemented probably as a result of a lack of knowledge of what is native and exotic.

There is virtually no experience on the management (manual, chemical and cultural control) of environmental weeds other than those which have been targeted for management in Nyika NP and Mount Mulanje FR. These experiences have not been widely shared with staff from other PAs or with communities living adjacent to PAs.

Partnerships are critical in order to be effective in the control of shared IAS, especially for those invasive species which affect multiple sectors all of which are managed or controlled by different entities. IAS are biological pollutants and as such require holistic and coordinated interventions. In other words IAS cannot be managed in isolation. An absence of partnerships also leads to a situation where invasive or potentially invasive agroforestry or other species, such as exotic fish, are introduced by one Ministry without consulting or informing another.

***Barrier 3: Insufficient information and understanding of IAS threats and impacts is preventing informed and strategic decision-making for IAS management***

There is a serious lack of knowledge and understanding of the issues around IAS in Malawi, at all levels from senior policy makers to local communities. Water hyacinth is an exception, since it has had a serious negative impact on hydro-electric generation in Malawi. Almost everyone in Malawi, especially those living along the shores of Lake Malawi and the Shire River, are familiar with water hyacinth and its impacts. There is also some information on the impacts and management of invasive plants targeted for control in Mount Mulanje FR and NyikaNP. However, based on our preliminary surveys there are a large number of invasive plants in Malawi, the presence of which officials are unaware of, while communities may know the plants but have little knowledge with regard to best management practices. The situation is slightly different for introduced crop pests which are generally better known by officials and communities, although there is still insufficient information available on how best to control them.

Without clear information on IAS, it is not possible to prioritize species for action or to develop and implement national management strategies, especially with regard to early detection and rapid response. Another result of this lack of knowledge is unwillingness among policy makers and resource managers to interfere in the commerce and trade of exotic species. A further constraint is that the weak policy and institutional environment for IAS management in Malawi means that critical information needed for informed decision-making is not widely shared among national stakeholders and therefore does not inform decision-making. Few of the senior managers responsible for PA system planning and management have extensive knowledge of IAS, and as a result, protected areas in general have demonstrated little willingness to act in dealing with IAS threats and impacts.

**A1.2 The baseline scenario or any associated baseline projects.**

N.A. Please see section 2.6 of the Prodoc

**A1.3 The proposed alternative scenario, GEF focal area<sup>8</sup> strategies, with a brief description of expected outcomes and components of the project.**

Invasive Alien Species (IAS) are one of the biggest threats to biodiversity and livelihoods. In Malawi IAS are adversely affecting locally and globally significant biodiversity, and are invading and threatening a range of habitats, as well as, indirectly, the livelihoods of millions of people depending on natural ecosystems for food, commodities and energy security. Malawi has recognized the need to implement Article 8 (h) of the CBD to mitigate the threats of IAS. They have also agreed to meet Aichi Target 9 which states that “by 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment”. The project will also address Aichi Target 12 by contributing to the conservation status of threatened species and Target 7 by enhancing the sustainable management of areas under agriculture. The project also addresses many of the SDG’s, including one of the targets under Goal 15 which encourages countries to “introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.” The project will contribute to Malawi reaching many of these targets.

The project will contribute to the GEF meeting its targets with regard to improving the sustainability of protected area systems by improving the financial sustainability and effective management of the national ecological infrastructure (BD 1: Program 1) and by reducing threats to globally significant biodiversity through prevention, control, and management of invasive alien species (BD 2: Program 4). Much of this will be achieved by focussing on improving the management of IAS through capacity development and enhancing financial sustainability of IAS management interventions. Management interventions will include “comprehensive prevention, early detection, control and management frameworks that emphasize a risk management approach.”

Malawi already has some IAS management measures in place, but these are largely biased towards the agricultural sector. While building on the existing human capacity in a cost-effective manner, the MSP will expand the scope of these interventions focussing on

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<sup>8</sup> For biodiversity projects, in addition to explaining the project’s consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving..

PAs of global significance (Nyika NP and Mount Mulanje FR) and adjoining agro-ecosystems. This is reflected by investing most of the allocated GEF funds into Component 2 to manage selected invasive plants from these two PAs of great conservation value. This will be institutionalized with the help of some international players, such as CABI and UNEP; National Government Institutions such as the Ministry of Natural Resources, Energy and Mining, Ministry of Agriculture, Irrigation and Water Development; local institutions such as the Forestry Department and Department of National Parks and Wildlife; and NGO's such as the Lilongwe Wildlife Trust, Mulanje Mountain Conservation Trust, Nyika-Vwaza Trust and Total Land Care.

National and local sharing, among all stakeholders, especially at PA level, of early warning about potential invaders, their rapid detection and identification, as well as the sharing of information, risk assessments, and monitoring and control techniques, are critical to prevent the establishment and subsequent spread of invasive species. This information exchange and integration will be systematically fostered throughout Malawi. IAS information exchange, especially between conservation and agricultural institutions, and local communities will be enhanced during the MSP.

The recognition of IAS issues as a major threat to biodiversity and livelihoods, especially in PAs and adjoining agro-ecosystems, and efforts made in addressing those threats, will form the basis for contributing additional information to globally accessible databases on the IAS present and their impacts.

## **Project components and expected results**

### **COMPONENT 1: Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems**

**Outcome 1.1: Strengthened national IAS framework and improved national capacity and coordination amongst different government agencies and the private sector to respond to existing and new invasive species problems throughout Malawi, with a focus on protected areas and their adjoining agro-ecosystems.**

*Output 1.1.1: National framework for the cross-sectoral management of IAS operational and supporting long-term development planning.*

Key deliverables: (i) National Invasive Species Strategy and Action Plan developed addressing IAS threats, especially those to protected areas; (ii) High risk pathways and most damaging species in Malawi, especially those threatening protected area systems, identified; (iii) IAS Risk Analysis procedures established, including ones for protected areas; and (iv) National vigilance and surveillance systems, including rapid response to alerts

Any IAS management strategy requires a national framework which deals with all aspects related to IAS management such as policy, coordination, prevention, Early Detection and Rapid Response, best management practices, awareness creation, capacity development and even resource mobilization. Most of these are specifically addressed in considerable detail in this project under the various Components and will be included in the National Invasive Species Strategy and Action Plan (NISSAP). The NISSAP provides an over-arching strategy to address IAS at a national and local level, especially at a PA level where biodiversity is threatened by IAS and communities living adjacent to them.

*NISSAP and improved coordination.* A NISSAP is a sub-output which provides for an over-arching strategy to address IAS issues at both national and local level. The NISSAP is both a national consultative process with all stakeholders causing, impacted by or (potentially) managing invasive species, as well as the strategy document itself, incorporating agreed actions and suggested implementation arrangements on e.g. awareness creation, capacity development, prevention, early detection and rapid response (EDRR) and control, as well as options for cost recovery.

One of the key aspects addressed in a NISSAP is the formation of cross-sectoral management for shared IAS. Many IAS have cross-sectoral impacts and as such need to be managed by all affected sectors across the whole of Malawi. As such it is critical that a NISSAP be developed that addresses IAS issues at a national level, focusing on the protection of biodiversity and livelihoods, especially in PAs areas and adjoining agro-ecosystems. It is anticipated that the Malawi Environmental Protection Agency will be ultimately responsible, for the development and implementation of the NISSAP, given its mandate under the EMA of 2017.

The private sector is also an important stakeholder and coordination with this sector will be important. Private industry is often involved in the introduction of IAS, either through the pet trade, aquaculture or the horticultural industry. At the same time commercial farmers, such as the tea estates around Mount Mulanje, may be affected by a host of IAS. In order to get facilitate implementation of the NISSAP the private sector will be involved in some of the stakeholder meetings where issues pertaining to the importation, breeding and sale of exotic plants and animals will be discussed.

*Prevention.* Prevention is the most cost-effective IAS management strategy and will be a critical sub-output of the national framework and will be included in the NISSAP framework. Identifying pathways (see below) is critical in preventing IAS incursions. The Malawi Environmental Protection Agency (MEPA), once established, will also be mandated to take measures for

the “control, eradication or management of alien and invasive species,” including prevention. In fact the Environmental Management Act states that MEPA will be mandated to “ensure that environmental and risk assessments are undertaken” one of the key areas which needs strengthening in Malawi and will be tackled by the project. For intentional introductions at national level, the project will support the adoption of Pest Risk Assessments (PRAs) prior to importation, or at the port of entry, to identify species that pose a threat to biodiversity or economic development, PRA systems will be developed for use in PAs to ensure that no invasive or potentially invasive species that are already present in Malawi spread into PAs. By the end of the project it is envisaged that PRA’s will be conducted for at least 50% of legally imported plant species and five agro-forestry species already present in Malawi with an inclusive PRA system developed and adopted at PA level and at least 10 exotic species present in agro-ecosystems evaluated for risk to targeted PAs

*Pathway risk analysis.* As mentioned above the identification of pathways is critical in improving prevention mechanisms and as such also needs to be included in the NISSAP. In other words to strengthen prevention interventions it is also critical to understand the pathways through which exotic species are being introduced. The project will identify high risk pathways, pathways through which IAS are introduced into Malawi, and at a local level into PAs and adjoining agro-ecosystems, and propose ways in which they can be managed. By the 5<sup>th</sup> year of the project pathways for high risk species will be known and included in PA Management Plans – supported by specific resources, especially for targeted PAs.

Much of the pathway risk analysis work will be undertaken by the Department of National Parks and Wildlife in Nyika NP and Mount Mulanje Conservation Trust and the Forestry Department in Mount Mulanje Forest Reserve, coordinated by the Environmental Affairs Department. Unless there is a good understanding of the pathways, prevention protocols will largely be ineffective. By focussing on the identified high risk pathways prevention interventions will be considerably more cost-effective.

*Early Detection and Rapid Response (EDRR).* Managing IAS pathways more effectively and preventing IAS entry or incursions is the first step in an effective IAS management strategy or NISSAP. However, prevention is not fool proof and as such some exotic species may find their way into Malawi, establish and then spread. To deal with this issue it is important to establish a surveillance system (EDRR system) to detect and eradicate invasive species before they become widespread and abundant – specifically in the targeted national system of PAs. The identification and management of these species will be facilitated through the Identification Guide (Component 3). By the end of the project surveillance and rapid response systems will be part of the new PA Management Plans, and trialled in and around (buffer zones) Nyika NP and Mount Mulanje Forest Reserve for invasive and/or potentially invasive species.

*Output 1.1.2: Evidence base established and communicated for IAS prevention and management in and around PAs.*

Key deliverables: (i) Costs and benefits of three IAS, including ‘conflict’ species present in agro-ecosystems adjoining protected areas; (ii) National inventory on presence and distribution of priority invasive plants in five National Parks and Wildlife Reserves; and (iii) Information generated under Component 1 made available to policy and decision makers through communications

*Cost-benefit analyses (CBA’s).* CBA’s should form part of any Pest Risk Assessment (see project output 1.1.1), especially for agro-forestry species since they can contribute to the objectivity of the decision-making process. In developing countries many agro-forestry species are introduced for fuelwood, nitrogen-fixation or other purposes. Some of these species, despite their beneficial attributes, go on to become invasive. Studies have demonstrated that the costs of some of these species, to for example, ecosystem goods and services, are higher than the benefits which accrue from their use. Without any information or analyses of their negative impacts these species continue to be promoted/disseminated to the detriment of biodiversity and livelihoods, and in some cases also economic development. It is therefore important to gain better support for the development and implementation of IAS policies, regulations, and actions in the field through various project-sponsored activities including CBA’s of a few selected national priority IAS, national communications (Output 3.1.1) as well as capacity building. Staff and/or students from various learning institutions will undertake CBA’s of three ‘conflict’ species, the results of which will be published in peer-reviewed publications and communicated to more than three key national agencies, incorporated in the NISSAP, and included in two PA management plans. As part of project activities to carry out the analyses, the project will initially provide training by an international consultant to PPS staff that undertake PRA’s and university/college students/staff so that similar studies can be undertaken on other species in the future. The CBA process/research by local individuals/institutions will be supported by the consultant post-training.

*National inventory on presence and distribution of priority invasive plants.* There can be no effective management of IAS in PAs in Malawi without an IAS inventory. To that end detailed surveys of naturalized and invasive alien plants in five NPs, four Wildlife Reserves, and MMFR will be undertaken. This information will be invaluable when prioritizing species for management interventions and important for the implementation of an EDRR programme. These surveys will also contribute information which will be included in the Field Guide under Component 3. The Malawi Environment Protection Authority (MEPA), under the Environmental Management Act, is also required to publish a “list of alien and invasive species in respect of which a permit issued under this subsection may not be issued.” Without data on which naturalized and invasive plants are present in Malawi MEPA will not be able to fulfill its mandate. Multiple agencies will contribute to developing this inventory which will be made available on multiple websites [CABI’s ISC, GISD, GBIF, NVT (UK), and other relevant sites]. The IAS inventory will also be included in the NISSAP and relevant PA Management Plans.

*Results targeting policy and decision makers through communications.* Information generated by activities under this component will be important, especially to the Malawi Environment Management Authority (MEPA), who is mandated under the Environmental Management Act to “coordinate the promotion of public awareness and education on the protection and management of the environment.” Based on previous outcomes it has been determined that the best way to make policy and decision-makers aware of environmental and related issues is through the use of TV, radio, posters, sms, billboards, social media and workshops. However, in our case we envisage doing much of this through on-on-one meetings or small workshops. Much of this will be determined and outlined in detail under the Communication Strategy developed under Component 3.

## **COMPONENT 2. Strengthening IAS management in existing protected areas and adjoining agro-ecosystems**

### **Outcome 2.1. Reduced IAS impacts in two selected protected areas resulting in enhanced conservation outcomes for endangered and threatened species**

**Key results and deliverables:** (i) Two revised PA Management Plans (NNP and MMFR); (ii) Biocontrol Working Group established; and (ii) three biocontrol agents released; (iii) GEF TT scores up with 50% on IAS management and ~10% up on PA METT in MMFR and NNP; (iv) Increased budgets for IAS management in MMFR and NNP, involving a total of 50,000 ha under improved IAS management; and (v) Control of selected IAS in invaded areas, 100 ha in NNP and 50 ha in MMFR, and restored to semi-natural habitat.

#### *Output 2.1.1. Two revised PA Management Plans including strategies and budgets for IAS prevention and control*

Based on the revised PA Management Plans we expect to see a ~10% improvement on the METT scores for Nyika NP (NNP) and Mount Mulanje Forest Reserve (MMFR). In other words we expect to see an increase in current METT for NNP and MMFR of 63 and 61 to 69 and 67 by the end of the project, respectively, especially in terms of enhanced budget and improved IAS management, capacity and awareness. The current NNP Master Plan (2004) makes many references to IAS and the need to manage them. In fact it proposed management plans for a number of introduced and invasive species but few have been implemented. The Master Plan is currently being revised, providing an ideal opportunity to make substantive inputs through the GEF project. Likewise, the MMFR Management Plan is currently being developed and the inclusion of IAS management interventions will be proposed during project implementation. As such IAS management and control will be institutionalized into PA management plans in both MMFR and NNP. In addition, a mechanism will be developed for securing sufficient funding for development and implementation of the management plans. This will be addressed by undertaking a review and identification of gaps in the current policy, regulatory and institutional frameworks affecting the PA financing systems and current financial planning, accounting and business planning at the national and PA level. Diversification of revenue sources also needs to be considered and is key to reduce dependency on limited government budgets and may be addressed by seeking other sources such as tourism entrance fees, debt swaps, tourism concession arrangements, payments for water and carbon services and in some cases, carefully controlled levels of resource extraction. The Mount Mulanje Conservation Trust and the Nyika-Vwaza Trust may also be additional source of funds for IAS management activities.

#### *Output 2.1.2. Tested management plans for four IAS, including IAS control and habitat restoration in two protected areas*

The most widespread and damaging IAS in Nyika NP (NNP) are *Pinus patula*, *Acacia mearnsii*, *Rubus niveus*, *R. ellipticus* and *Pteridium aquilinum*. *Pteridium aquilinum* or bracken fern is a native plant that has become extremely abundant in NNP, displacing valuable forage species. It is also extremely problematic in Mulanje Mountain Forest Reserve (MMFR) together with *P. patula*, *A. mearnsii*, and *R. ellipticus*. Additionally, a host of other species have been introduced to staff villages and tourist accommodation facilities in both PAs which need urgent attention. IAS such as *Lantana camara*, *Tithonia diversifolia*, *Mimosa diplotricha*, and others, are abundant in agro-ecosystems immediately adjacent to these PAs and may spread into the PAs if not controlled soon. *Dolichandra unguis-cati* is, together with other invasive vines and herbs, a serious problem in tea plantations adjacent to MMFR.

Based on preliminary review of feasibility, costs and likelihood of sustained positive outcomes for both biodiversity conservation in the two PAs as well as crop production in adjacent production land, management trials will target the following four species: *Rubus* spp., *A. mearnsii*, *P. aquilinum*, and *D. unguis cati* and include manual, chemical and cultural control or a combination of these, in the form of demonstration trials, so that PA managers and their staff and communities living adjacent to the PAs can familiarize themselves with control methodologies, their efficacy and benefits (see Appendix 16 in ProDoc for additional information on physical and chemical control). It is envisaged, based on the implementation of best management practices, that *Rubus* spp. and *A. mearnsii*, will be eradicated from NNP and MMFR. Best management practices for *P. aquilinum* will be developed and adopted by PA staff and surrounding communities ensuring the long term control of this species. *Pinus patula* invasions will not be eradicated, but interventions made to clear significant areas, contributing to biodiversity conservation. Other species listed for interventions under the GEF TT are rare and localized and as such there will be no need to develop best management practices – they will merely be hand-pulled or uprooted and destroyed.

Best management practices for the selected species will then be implemented across a wider area – and as an integral part of the agreed PA Management Plan (2.1.1) focusing on the habitats of the most threatened species and/or impacted areas in PAs,

provisionally 100 ha. in NNP and 50 ha. in MMFR. This will also include clearing of all invasive and potentially invasive species from tourism facilities and staff quarters, provided populations are still localized and eradication is feasible; but may also include any buffer zones or multiple-use zones – if being formally part of the PA management area. Parts of the sites where IAS management has taken place will be restored. Information on best management practices will be widely disseminated among other PA staff (see Component 3). We expect to see a 50% improvement on the GEF TT scores on IAS management.

Key will be to involve senior management of MMFR, NNP, Department of Forestry, DNPW, MEPA (once established) and Africa Parks to replicate and sustain best management practices to other affected PAs in Malawi. The project will organize a minimum of two study tours for Government staff to enable this, as well as conduct high level seminars with national stakeholders to strengthen support and dissemination.

*Output 2.1.3. Capacity of 80 PA staff improved and applied in the identification and management of IAS*

PA staff will be capacitated with regard to the identification and management of IAS and in so doing the project will contribute to improved biodiversity conservation. The Field Guide, developed under Component 3, will be an important tool in facilitating invasive plant identification and enhancing management. Capacity will be further enhanced by taking staff into the field where they will receive practical training on invasive alien plant identification. By the end of the project there will be a measured increase in knowledge of 80 PA staff on IAS identification (with at least 25% women)

Some staff will also be involved in field trials– under Output 2.1.2, to test invasive alien plant management methodologies while others, not directly involved, will visit these “demonstration” trials to familiarize themselves with the various treatments. By the 5<sup>th</sup> year of the project at least four staff of each targeted PA (incl. at least one woman each) would have applied their new skills on IAS prevention and management in project PAs (measured through involvement in management work within and outside the project).

*Output 2.1.4. Biocontrol Working Group established and operational leading to the introduction of three host specific and damaging biocontrol agents*

Biological control as a safe and effective management strategy will be prioritized. Biological control, which is a cost effective approach to IAS control, should form an important component of any IAS management strategy in developing countries, such as Malawi, that do not have significant resources for chemical and mechanical control. Furthermore, biocontrol agents are optimal for use in PAs and adjoining agro-ecosystems as they reduce the excessive and unnecessary use of pesticides that have negative impacts on biodiversity and on human health. The project will promote the use of biocontrol measures in croplands adjoining PAs, and specifically the use of biocontrol agents that are known to be host-specific and damaging and that have been released elsewhere in Africa (see Appendix 17 in ProDoc for more information on biocontrol and the targeted species). The Project will facilitate their possible introduction by undertaking Risk Assessments, followed by the compilation of all relevant reports, which will be submitted to the Regulatory Authorities for their approval before the implementation of any biocontrol activities. By the end of the project there will be at least a 50% increase in awareness of biocontrol above baseline among PA staff and those in Ministry of Natural Resources, Energy and Mines and Ministry of Agriculture, Irrigation and Water Development. In order to facilitate the introduction of these and future biocontrol agents a single national Biocontrol Working Group will be established in PY2, to support the use of biological control methods.

*Outcome 2.2. Reduced IAS impacts in adjoining agro- ecosystems of two selected protected areas contributing to improved livelihoods and biodiversity conservation*

**Targeted results:** (i) Invaded areas in agro-ecosystems adjoining two protected areas (50 ha in NNP and 50 ha in MMFR) cleared and restored (non-cropland), through partnership between local government, PA management, commercial plantations/estates, and farmers; (ii) 15% enhanced tree cover in PA buffer zones as a result of tree planting and/or adoption of FMNR systems; and (iii) Sustainable farming practices such as CA, crop rotation, crop integration, use of cover crops, and/or FMNR in croplands adopted by 50 small-holder households to reduce impacts of invasive plants

*Output 2.2.1. Invaded rangelands (100 ha total) in buffer zones/agro-ecosystems of two adjoining PAs cleared and restored (native trees) through enhanced partnerships between PA staff and farmer communities, including the training of 100 farmers on IAS identification and management*

Selected community members, working in partnership with PA staff, will jointly develop best management practices in PAs (see 2.1.2). These community members are expected to become ‘champions’ and inform others on best management practices. Wider dissemination will take place through Farmer Field Schools based in adjoining agro-ecosystems. Best management practices developed under 2.1.2 on IAS control will also be implemented in agro-ecosystems adjoining Nyika NP (NNP) and Mulanje Mountain Forest Reserve (MMFR), resulting in the clearing and restoration of 100 ha (50 in NNP and 50 in MMFR buffer zones) of invaded natural pasture. Clearing will be undertaken by community members under the guidance of trained PA staff and those community members that were involved in activities under 2.1.2. Clearing will be followed by restoration. Communities living adjacent to PAs will be further capacitated with regard to the identification and management of IAS through training and in so doing



the project will contribute to improved pasture/rangeland production, as well as improved biodiversity conservation. Tools such as the Field Guide (Component 3) will contribute to building that capacity.

In order to enhance the management of shared species or species which may invade from an adjoining ecosystem it is critical to enhance collaboration between all stakeholders. In Nyika NP and Mount Mulanje Forest Reserve the project will build on existing relationships developed between communities and PA staff. By the end of the project PA staff and community members will be meeting at least three times annually to discuss IAS issues. This collaboration will ameliorate pressures on PAs and improve collaboration between farmers and PA staff, based on the consultations and strategies developed jointly under Output 2.1.1 towards the incorporation of IAS objectives, targets and budgets in the PA Management Plans.

*Output 2.2.2. Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping adopted and promoted by 50 households as a result of training and demonstration trials*

Direct interventions and biological control can mitigate against the impacts of IAS. Other interventions such as crop integration, crop rotation and the growing of cover crops in croplands can also enhance weed control. These interventions will not only increase yields but also reduce pesticide use. These interventions will all be developed and implemented among communities living adjacent to PAs. By the end of PY 5 control practices would have been tested and efficacy determined for each of the three target species in community rangelands and invaded areas (100 ha total) around PAs cleared and restored with a 15% increase in tree cover. By that time sustainable farming practices would have been adopted by 50 households, incorporating IAS prevention and control. It is also envisaged that by then 100 farmers would have been trained in IAS identification and sustainable land-use practices such as Conservation Agriculture and FMNR. Fair gender distribution on all capacity building activities will be applied in terms of the selection of trainees, co-management groups at pilots, as well as decision making fora, which in most cases will be near 50:50. At pilot sites, at least 50% of field workers will be women.

### **COMPONENT 3. Knowledge management and broader adoption**

#### **Outcome 3.1. Lessons learnt, documented and disseminated and awareness programs established to facilitate replication and broader adoption in the Malawi National PA system.**

*Output 3.1.1. Communication strategy and outreach campaign including use of media, workshops, and meetings targeting government officials, PA staff and affected communities*

One targeted national and two site specific awareness/communication strategies will be developed for the two targeted PAs in consultation with relevant sectors, including government officials, conservation agencies and representatives of rural communities. It will target those individuals and agencies which can contribute to the long-term sustainability of project interventions. Efforts will also be made to target potential IAS “champions”, especially at a local level, who will be able to drive the IAS agenda into perpetuity. Tried and tested methods will be used to increase IAS awareness, especially at local levels resulting in an increased average awareness of 50% over baseline by PY 5 with PA staff and communities showing an increased knowledge and skills of prioritized IAS and IAS management mechanisms, including biocontrol.

There are insufficient resources for an effective countrywide awareness programme hence the need for a focused campaign, targeting particular key national individuals or institutions with focused messaging. Based on previous experiences the most convincing arguments, at least for government policy-makers and politicians, are largely based on the costs and benefits of actual IAS control. To that end information on the costs and benefits of management interventions in the pilot sites/demonstration trials in Nyika NP and Mount Mulanje Forest Reserve (MMFR), and surrounding agro-ecosystems, will be made available to the Permanent Secretaries and other high-ranking Government officials during a high-level workshop hosted by the PMU, where additional information in the form of a booklet on the costs and benefits of management will be made available. Results of the CBA’s of “conflict” species will also be made available. Efforts will also be made to enhance capacity and awareness amongst women – gender sensitive awareness material will be developed and separate workshops will be held for women and men based on their availability, but more importantly to allow women in male dominated communities to comment and participate more freely in issues pertaining to IAS.

*Output 3.1.2. National information sharing procedures including the development of a Guide on the identification and management of invasive plant species in Malawi*

Much of the information sharing agenda has been discussed under 3.1.1. An additional information source will be the Identification Guide that will include descriptions of invasive plants, their distribution and management. The Guide will be made available to extension officers, PA managers and associated staff, quarantine officers, researchers, staff from the Forestry Department, private individuals in the plant nursery and associated trades, community members and others.

*Output 3.1.3. Project M&E program developed, IAS monitoring capacity built and implemented in PAs and their agro-ecosystems*

Monitoring and evaluation will be critical in measuring the success of project interventions and an M&E will continue throughout project implementation, especially with regard to changes in awareness levels. It is envisaged that by the end of the project there would have been an increase in awareness of 50% above baseline. Changes in capacity will be measured by undertaking pre- and

post-knowledge surveys awareness surveys prior to and after training workshops. Changes in biodiversity levels at sites where IAS are controlled will be measured prior to control interventions and then again at mid-term and end of project. All monitoring and evaluation activities will collect gender-disaggregated data, and where appropriate, women-only focus group discussions will be held regarding the impact of project activities on women's time (e.g. less or more time spent weeding). M&E will be led by a Malawi-based institution or M&E specialist to be confirmed at project initiation. This information will be an integral part of the reporting by the NEA to UN Environment.

#### **A1.4 incremental/additional cost reasoning and expected contributions from the baseline, the GEFTE, and co-financing**

Most of the past efforts of national institutions and international agencies to address IAS issues in Malawi have dealt with IAS in a peripheral way or as secondary/tertiary objective. As a result, impacts and problems related to IAS persist in the country, with negative impacts on effective conservation and management of PAs, the maintenance of critical ecosystem services and landscape productivity, and the protection of community interests. Nevertheless, the proposed project will seek to coordinate with and benefit from lessons learned under other programs and projects on IAS management, including those of donor and project co-financing partners.

**In the Baseline**, the Government of Malawi (GoM) is supporting efforts to strengthen (agriculture) quarantine requirements and to create awareness among relevant staff and other stakeholders about the threats posed by IAS, however no specific IAS prevention and control programs related to PA management – specifically biodiversity protection, are being funded through government right now. However, several other related government programs constitute a good baseline investment to build up and improve focus as well as additional activities towards IAS aspect. Under the Government's National Development Program, support is being provided to protected areas, mainly in the form of staff training and under the anti-poaching activities (see below). It is envisaged that training in the identification and management of key invasive alien plants will be included within this government training program through support by the GEF project. Over the next five years from 2015/2016 to 2018/2019 the GoM through its Ministry of Natural Resources, Energy and Mining is supporting several environment related programs including "Environment and Climate Change Management" (US\$ 8,941,513) and "Wildlife Conservation and Management" (US\$ 3,224,300), the latter much focused on species protection, anti-poaching, tourism development, and some activities related to management of their habitat. A very meagre US\$ 21,326 of this will be available for biodiversity conservation and management, which is the government program coming closest to IAS issues. Notwithstanding the low level of available government funding set aside specifically for BD conservation, the various ongoing and planned program activities under this latter baseline program offers much scope for collaboration and incremental activities focused on IAS prevention, management and control, including training, awareness building, inventory of IAS in (wildlife) reserves, (economic) impact analysis of emerging IAS to game tourism, as well as development of the national IAS strategy through partnership, also because the same Ministry is at the helm of both this as well as the GEF project. Because of the lack of GoM resources to meet the management costs of all PAs, they are entering into agreements with the private industry, bilateral donor and e.g. GEF support. Other current or past projects of this ministry relevant to the GEF IAS and agro-ecosystems work include the "Sustainable management of Nyika Transfrontier Conservation" (US\$ 366,398), "Combating deforestation and forest degradation for sustainable rural development" (US\$ 70,461), as well as "Improved forestry management for sustainable livelihoods" (US\$ 70,461), all relevant to the GEF IAS project.

The Ministry of Agriculture, Irrigation and Water Development in its 2016-2017 Program Budget Statement includes two Strategic Objectives: (i) To ensure sustained food security; and (ii) To ensure increased agro-based incomes, which are closely related to both the prevention as well as control of invasive pest species. Its Agricultural Productivity and Risk Management program budget is large at US\$ 177,598,400 over the next three years. The Ministry of Local Government and Rural Development will invest a minimum of US\$ 8,158,789 in rural development of which a small part may benefit the project through the planned livelihood improvement initiatives potentially benefitting communities involved in the agro-ecozones around the protected areas. The GoM also plans to achieve improved IAS management in order to meet its CBD obligations (Target 9 of the Aichi Biodiversity Target) by undertaking a range of activities requiring estimated funding in the range of US\$6,500,000, which will be requested from a number of agencies including UNEP, UNDP, NORAD, FAO, DFID, USAID, IrishAid, GIZ and the private sector (NBSAP, 2015-2025). To assist the GoM in achieving its mandate many private-public partnerships around the management of protected areas have already been developed. For example, 3 NP's in Malawi are now contractual parks, managed by the African Parks Foundation. This provides the proposed project with the opportunity to not only raise awareness among private and public stakeholders about the threat of IAS, but also to accrue resources from both sectors for the management of IAS. The Electricity Supply Commission of Malawi continues to support programs to reduce the impact of introduced waterweeds in the Shire River using Environmental Management Funds. Both the Blantyre and Lilongwe city assemblies are also involved in manual removal of *Salvinia molesta* that is threatening their water reservoirs.

Among non-governmental organizations, the Malawi Environmental Endowment Trust (MEET) and the Mulanje Mountain Conservation Trust (MMCT) provide sustainable sources of financing for the management of protected areas (MMCT continues to

support implementation of the management plan for the Mulanje Mountain Forest Reserve). MMCT has supported IAS management interventions in the past. In addition, the Nyika-Vwaza (UK) Trust Fund also is funding conservation and community projects in the Nyika NP and Vwaza Marsh Wildlife Reserve, including some management of IAS. WWF and IUCN have been involved in a number of Projects concerned with biodiversity conservation in Malawi, although none have focused primarily on invasive species management. The Wildlife and Environment Society of Malawi (WESM), a Birdlife International partner, supports the management of protected areas in Malawi in areas such as lobbying the government to establish protected areas; promotion of environmental education; infrastructure development; re-introduction and game management; promotion of effort-based law-enforcement; snare bounty scheme; research activities; and ecotourism. More recently they were involved in a NORAD-funded, which was active, amongst others in the Ntchisi Forest Reserve, with the specific objectives of improved governance structures in and around IBAs; improved community-based natural resources management; monitoring bird species and habitats and increased incomes from NRM-based enterprise development. The Wildlife Action Group (WAG) works on nature conservation and management in the Central Region of Malawi. Its main objectives are to protect Malawi's wildlife and environment, and to assist and support the Malawi Government in the protection of National Parks, Game and Forest Reserves. Total Friends supports Liwonde National Park with fencing, firebreaks and road network maintenance within the rhino sanctuary. 'Endangered species of Malawi Circle' attached to J&B's 'Care for the Rare' Programme is also involved in a number of conservation efforts. Finally, Lead-Southern and Eastern Africa, the Forestry Department and World Fish Centre are implementing the Lake Chilwa Basin (LCB) Climate Change Adaptation Program in collaboration with Machinga, Phalombe and Zomba district councils. The program is designed to secure the livelihoods of 1.5 million people in the Lake Chilwa Basin and enhance resilience of the natural resource base through the development and implementation of a basin-wide climate change adaptation program that will enhance the capacity of communities to adopt sustainable livelihood and natural resource management practices. The program includes the management of invasive species.

In agro-ecosystems CABI is working together with the Department of Agriculture in the Plantwise Program, whereby extension officers are trained to assist farmers in the identification of pests, including IAS, and how best to manage them. Advice focusses on the reduction of pesticide use through integrated pest management, of which biocontrol is an important component. The Plant Clinics, which have been established as part of the Program, play an important role with regard to early detection and rapid response and will be an integral component of the proposed Project. The Project will also work closely with Total Land Care, an NGO established in 1999, with a mandate "to improve the livelihoods of smallholder farmers in the region with a focus on community based approaches to increase agricultural production, food security and incomes within a context that ensures sound management of their natural resources." The Project will also benefit from previous interventions, including the Manda Wilderness Agricultural Project, which was initiated, with funding from CEPF, to introduce 360 subsistence farmers and their families to the concepts of conservation and sustainable agricultural practices in an attempt to protect the Manda Wilderness Area, an area of approximately 250,000 hectares.

In summary, Malawi does not have any **baseline** data on the presence and distribution of invasive alien species prevalent in the country; no national invasive alien species management plan; limited actions with regard to prevention and early detection and rapid response, including monitoring of current invasions; little awareness on the impacts of IAS; and insufficient capacity to identify and manage IAS. As a result existing sector policies continue to promote or encourage the introduction of exotic species without evaluating their potential risk, especially to biodiversity. Efforts to implement IAS management remain uncoordinated, with little collaboration/communication between various stakeholders, especially those in agriculture, forestry and the environment, resulting in duplication and a continued waste of resources. With no national IAS inventory contributing to the development of IAS management interventions IAS continue to be intentionally and unintentionally introduced into protected areas and adjoining agro-ecosystems, while IAS already present within these areas continue to spread and multiply to the detriment of threatened and endangered species and crop and pasture production. IAS within protected areas continue to invade adjoining agro-ecosystems and increase tensions between communities and protected area managers, and protected area managers remain powerless to prevent invasions from agro-ecosystems. A reduction in crop yields or pasture production due to IAS impacts continue to place increasing pressure on protected areas from people living adjacent to them. The few ad hoc and uncoordinated IAS control activities that are undertaken rely primarily on costly chemical and/or manual control methodologies, and as a result cannot be sustained. Resource managers and other stakeholders are still unaware of many IAS impacts and are unable to identify important IAS or pathways for their introduction and spread, and as a result IAS continue to be introduced and existing infestations continue to proliferate. The lack of information and coordination mechanisms and strategies limit the ability of the GoM to convey knowledge and information generated on IAS threats and management strategies to communities and protected area staff.

The GoM is very aware of these gaps and needs and is attempting to address them more effectively through the promulgation of the Environment Management Act (2017), which has many clauses pertaining to the management of IAS. The Malawi Environment Protection Authority (MEPA) which is to be established under the Act "shall, in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species". The Authority "shall ensure the coordination and implementation of programmes for the prevention, control or eradication of listed alien species and invasive plants". The

promulgation of the Act is extremely timely since many of the activities/outputs of this proposed project will provide MEPA with the tools/information which it requires to fulfil its mandate. It is also timely since the threats of IAS are likely to increase due to factors such as climate change, land degradation, and an escalation in trade, travel and tourism, and thus the longer that Malawi waits to address critical IAS management priorities, the greater the likelihood of severe negative impacts from IAS on biodiversity, ecosystem services, and livelihoods and the greater the costs will become to address those impacts.

**The project alternative and its interventions** will result in changes in policies, enhanced capacities, and increased awareness which will significantly enhance IAS management. The project will support the development of a National Invasive Species Strategy and Action Plan (NISSAP), cost-benefit analyses of selected IAS, and the development of a national invasive plant inventory, all of which will increase the knowledge base on IAS in the country and the ability of stakeholders to address IAS in a strategic manner. Risk Analyses and Early Detection and Rapid Response systems will be put into place that will enable early and effective detection and identification of priority potential invaders, the rapid sharing of information among all stakeholders, and monitoring and control techniques that will prevent the spread and establishment of potential invasive species. At the site level, the development and implementation of IAS management plans that include control and restoration activities will reduce the negative impacts of IAS on key biodiversity habitat and important agro-ecosystems, while also reducing existing and potential conflicts over the intentional introductions / uses of non-native species that may become invasive. Communication and awareness activities will greatly increase understanding and awareness among resource managers and local communities on IAS and their impacts, thereby producing increased support for IAS management and increased participation and allocation of resources to reducing IAS introduction and spread. In summary, the project will result in a scenario where the status of biodiversity, ecosystem services and agro-ecosystem production levels and livelihoods support are all more effectively protected from existing and potential future IAS impacts at the national level and at the level of targeted demonstration areas with adjoining protected and productive landscapes. GEF support will ensure that the majority of IAS targets as set out in the revised NBSAP (2015-2025) are reached.

**The Increment:** This will be achieved through incremental GEF support of US\$342,260 further strengthened with a total of US\$1,008,000 in co-funding to the establishment of a national framework and capacity to enhance IAS management in protected areas and adjoining agro-ecosystems through the development of a NISSAP, Pest Risk Analysis procedures, and Early Detection and Rapid Response systems under Component 1. These outputs will be strengthened by undertaking cost-benefit analysis and developing a national IAS inventory. In order to strengthen IAS management in protected areas and adjoining agro-ecosystems the project will, under Component 2, through US\$670,000 incremental GEF support towards development of best management practices for selected IAS, the clearing and restoration of 100 ha in Nyika NP, 50 ha in Mulanje Mountain Forest Reserve, and 50 ha of rangeland in each of the PAs adjoining agro-ecosystems; implementation of sustainable farming practices resulting in reduced land degradation and enhanced yields and the training of 80 PA staff and 100 community members in the identification and management of IAS. This is made possible through a total of US\$2,409,432 in co-funding to Component 2. The project will allocate US\$353,659 in incremental GEF support under Component 3 for knowledge management and broader adoption, including US\$1,230,300 in co-funding resources..

Co-financing: Contributions totalling US\$5,164,147 will be provided to the project by a variety of partners, including several Ministries, a number of NGOs and institutes, and UNEP.

#### **A1.5 [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF).**

##### Global Environmental Benefits

The expected global benefits of this project include contributions firstly to reduce the loss of biodiversity and maintain the quality of protected habitats in the Protected Area system of Malawi, and secondly, as an indirect benefit, reducing the negative impacts of IAS on local livelihoods around the targeted Protected Areas specifically, and the economy of Malawi in general. Nyika NP (NNP), one of the pilot sites, has high levels of biodiversity and endemism. The Nyika plateau is part of the Eastern Afromontane Biodiversity Hotspot, which encompasses several widely scattered but biogeographically similar mountain ranges in eastern Africa. Endemism levels in the hotspot are high, with 31% of plants, 21% of mammals, 30% of reptiles, 30% of amphibians, and 69% of fish occurring nowhere else in the world. The Nyika Plateau supports more than 215 orchid species, of which four species and two subspecies are thought to be endemic. A total of 1,927 plant species and subspecies have been identified in the NNP, of which 33 are endemics only found in the park and a further 13 are considered near-endemics. The NP also harbours globally significant mammals. Nyika's butterfly fauna is the richest in Malawi, with some 120 of the 200 species present in the country. Over 420 species of birds have been recorded in the park.

Another pilot site, Mount Mulanje is the highest massif in the country, located in the southeast near the border with Mozambique. The Mount Mulanje FR (MMFR) occupies 60,000 hectares, including montane grassland and shrubland, small patches of Widdringtonia cedar forest, and lowland, mid-altitude and montane rainforest. The Reserve provides important habitat for numerous bird species, and it is the most important centre of plant endemism in Malawi. In all there are over 1,100 species of plants in Mulanje/Michesi of which 57 are strict endemics including one subspecies and four varieties. Seven of the bird species recorded are

endemic or near endemic. There are 14 endemic reptile species and 4 near endemics. There are 60 species of snails (8 endemics), 10 of slugs, 22 of dragonflies, 233 of butterflies (11 endemics or near endemics), and 145 of beetles (7 endemics or near endemics). Mulanje is the only known locality in Malawi for the rodent *Aethomys namaquensis*. Due to its species richness and high levels of endemism, Mt. Mulanje was identified by the World Wildlife Fund as one of 200 global ecoregions in the world for the conservation of biodiversity, and designated as an Afrotropical Regional Centre of Endemism, and as a UNESCO World Heritage Site.

Both NNP and MMFR are directly threatened by a host of invasive species such as *Rubus ellipticus*, *Pinus patula*, *Acacia mearnsii*, and *Pteridium aquilinum*, especially at higher elevations while species such as *Tithonia diversifolia*, *Mimosa diplotricha* and *Lantana camara* are abundant in the foothills. By managing invasive plants that are already present in NNP and MMFR and surrounding agro-ecosystems will contribute significantly to biodiversity conservation. Communities will also benefit from the project's IAS management interventions, as IAS have a significant impact on the goods and services provided by ecosystems (Turpie, 2004; Strayer, 2012; van Wilgen et al., 2013). Management of IAS can therefore contribute significantly to sustaining ecosystem functions and services (van Wilgen et al., 2013). For example, both Mount Mulanje and Nyika Plateau are critical water towers. Invasions by woody invasive plants such as pines and Australian acacias are known to reduce water run-off by up to 80%. Management of woody weeds will contribute to water quantity and quality for downstream water-users.

In order to address the issue of invasive alien species and it so doing contribute to biodiversity conservation and ecosystem services within and adjacent to these two PAs and enhance livelihoods in the adjoining agro-ecosystems the project will develop a NISSAP, improving coordination and cross-sectoral management at a national and local level (especially between PA staff/management and adjoining communities as IAS cannot be managed in isolation); identify and manage IAS pathways (IAS being introduced into PAs and adjoining agro-ecosystems); improve prevention and EDRR mechanisms (include the use of Pest Risk Assessments); manage invasive plants within two PAs and surrounding agro-ecosystems (include the development of best management practices for selected IAS); and build capacity and create awareness about the threats and management of IAS. The project will clear 100 ha. of invasive *Pinus* and *Rubus* spp., and *A. mearnsii* in Nyika NP and 50 ha. of invasive *Rubus* spp. and other invasive plants in Mount Mulanje FR. Invaded areas in lands adjoining these PAs will also be cleared of invasive plants (50 ha around MMFR and 50 ha around NNP) and sustainable farming practices developed and implemented. Implementation of sustainable farming practices such as Conservation Agriculture, Farmer Managed Natural Regeneration, crop rotation, crop integration and cover cropping will not only help to suppress the weed burden but also increase yields, contributing to improved livelihoods. As a result of project interventions it is envisaged that the METT scores for both MMFR and NNP will be improved by approximately 10% and that forest/tree cover in adjoining areas will increase by about 15% as a result of project interventions. Project interventions will also result in a 50% increase in the GEF TT scores on IAS management.

It is important to recognise that by addressing IAS management among communities living in areas adjacent to PAs, the project also will reduce negative IAS impacts on the protected areas themselves, both by removing IAS populations that might spread into PAs, and by protecting agricultural production from negative IAS impacts and thereby reducing the reliance of rural communities on resources within PAs. Project interventions described above will also reduce pesticide use, one of the biggest contributors to biodiversity loss in agro-ecosystems. Reduce pesticide use will improve water quality and risks associated with their use to human and livestock health.

It should also be recognized that Malawi and many of its PAs are representative of many other ecosystems and habitats in the region and elsewhere in Africa. Activities in Malawi will act as a model for the wider dissemination of the project findings throughout Africa especially with regard to the management of bracken fern, one of the worst weeds in the world.

## **A1.6 Innovativeness, sustainability and potential for scaling up.**

### Innovation

This project is innovative in that it not only addresses IAS within PAs to protect biodiversity but also in crop fields and communal grazing lands – this is critical since IAS know no boundaries, as well as in this case concerns joint responsibility for management between the conservation authorities as well as the agriculture sector. Additionally, the project approach of activities contributing to reduction in IAS in lands adjoining PAs, a source of current and future invasions, but also enhancing crop yields to the benefit of communities, will strengthen the likelihood of conservation partnerships between farmers and the Protected Area management. Improved livelihoods and recognition of stewardship will also reduce other pressures on PAs such as poaching, deforestation and encroachment. There are significant opportunities for replication which will benefit biodiversity conservation and livelihoods throughout Malawi. The project design in itself is innovative in that it builds the case towards enhanced national policy under Component 1 through first of all establishing and communicating the evidence base of the spread, analysis of costs (and benefits), as well as mapping existing pathways of intentional and non-intentional introductions of IAS in and around PAs, which will contribute to sustainability; targeted management action, and increase in budget allocations for IAS management under Component 2; and the targeted outreach for national and local decision makers under Component 3 to enable upscaling and replication of best management practise and the implementation of the NISSAP.

### Sustainability

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Sustainability is largely built by developing capacity which will generate information on IAS presence, distribution, impacts and management. This information is then used to create awareness to change behaviour among decision makers and affected parties which in turn will drive the process in terms of developing and strengthening policy and its implementation. Capacity will be developed through training but also through demonstration trials within PAs and surrounding agro-ecosystems. Information on best practices and their benefits will then be made available to all interested parties, including policy-makers. Sustainability will be enhanced by being able to demonstrate that management costs are significantly lower than the benefits that accrue from IAS control.

The project has been designed to ensure that activities and outputs are key elements contributing to and enhancing sustainability of project outcomes beyond the project. Examples include strengthening of the legal and policy framework for IAS prevention, EDRR and control; and improving coordination of activities relating to IAS management at the national level through the process of drafting, endorsement as well as implementation of the NISSAP (see Component 1). The recently promulgated Environment Management Act (EMA) will contribute significantly to our efforts in terms of sustainability. Under the EMA, the Malawi Environmental Protection Agency (MEPA) will be mandated, once established, to not only coordinate IAS management activities but also take measures to control, eradicate or manage alien and invasive species. Based on EMA the costs of management activities will be borne by landowners.

Increased awareness among the general public, government officials and other stakeholders is an essential prerequisite for sustainable results in IAS control and management, and this will be another major focus of the project (see Component 3). Capacity building, which is fully or partly addressed in each of the three components, and awareness creation, will contribute to the sustainability of institutional and policy support for IAS management, while tools such as the IAS Identification Guide, which will also include information on best management practices, will facilitate more cost efficient and effective IAS management interventions. The development of best management practices under Component 2, and their wider dissemination will also contribute to more effective IAS control. The successful introduction of damaging and host-specific biocontrol agents will provide a mechanism whereby target species can potentially be controlled in perpetuity without additional activities or costs required.

It is expected that working together with the private sector and NGO's (Lilongwe Wildlife Trust, MMCT, NVT); Wildlife and Environmental Society of Malawi, Total Land Care) will contribute to the sustainability of IAS management activities in a manner similar to what has been achieved in Malawi with regard to PA management, where the private sector has been involved in lobbying the government on PA establishment, environmental education, infrastructure development, re-introduction and game management, promoting effort-based law-enforcement, a snare bounty scheme, research activities, and ecotourism (Mauambeta, 2003). The existence of PA financing mechanisms will contribute to the financial sustainability of IAS management interventions, especially in NNP and MMFR. By training PA staff from a number of other PAs and raising awareness among DNPW senior management as to the impacts of IAS it is envisaged that there will be increased investments in PA management. The Lilongwe Wildlife Trust is well established in Malawi and involved in a range of activities, including environmental education. As a project partner the Trust will contribute to awareness raising during the project and continue to do so post-project. This will be facilitated through the production of modules which the Trust can use to raise awareness even once the project has closed. This material will also be made available to the Wildlife and Environment Society of Malawi which is also involved in creating awareness among the public on environmental issues. The Malawi Environment Endowment Trust (MEET) also finances a range of environmental programs in Malawi and may be expected to allocate more funding to IAS issues as their profile in the country increases through the activities of the proposed project.

### Scaling Up

Many of the project outputs are focused on two PAs, namely NNP and MMFR. This includes the identification of high risk pathways, IAS Risk Analysis procedures and improved surveillance and eradication mechanisms. IAS pathways will be similar for all PAs in Malawi and RA procedures and EDRR systems to enhance IAS management will be generic and as such there will be opportunities to also implement them elsewhere. Many of the invasive plant species targeted in these two PAs are also problematic elsewhere and as such the development of best management practices will also benefit other stakeholders, especially PA managers. IAS management strategies which will be developed and integrated into NNP and MMFR PA management plans will also be useful for other PAs since most of the issues that will be addressed are generic. As such majority of activities undertaken in MMFR and NNP will benefit all of the PAs in Malawi to some or other degree – great opportunities for replication. This replication will be enhanced by working closely with the DNPW and by providing training to PA staff on invasive plant identification and management, including prevention and EDRR.

Approaches for improved IAS management and sustainable farming practices in surrounding agro-ecosystems will also be of benefit to other communities in Malawi, especially those that share many of the same IAS. The partnership between PA staff, Local Government and communities in the control of IAS and the experience in habitat restoration through Farmer Managed Natural Regeneration and other activities, could easily be replicated elsewhere. This collaboration will enable the DNPW, Forestry



Department and communities to establish surveillance and monitoring systems for new and existing IAS in other PAs in Malawi, as well as target particular species for containment and control through their routine PA programs and budgets. Since many PAs in Africa are facing similar problems the information generated and management systems implemented and trialled will also be useful for other PAs throughout Africa, including TFCA's.

At a broader level the project will also lay the foundations to ensure that there will be potential for scaling up in the future. The development and implementation of IAS policies, capacity building and awareness creation will all contribute to scaling up of IAS management activities in Malawi, and elsewhere, in the future. This model has worked well in other African countries such as Ethiopia and Uganda, supported which were supported through the GEF Project "Removing Barriers to Invasive Plant Management in Africa" (GEF 2140). For example, the coffee-table book produced through this Project is not only widely used as a reference/information source for IAS management in the project countries but also elsewhere on the continent. As such we expect that many of the project outputs of the Malawi Project will have relevance for other countries in Africa.

The development of baseline data on the distribution of IAS and their impacts, together with some cost-benefit analyses, will provide policy makers and government officials with the necessary information to develop and implement additional policies to manage IAS in Malawi more effectively. For example, training on cost-benefits analyses will allow the Malawi authorities to replicate these studies on other 'conflict' species. In addition, the results of the cost-benefit analyses will also be useful for other countries in the region, and on the continent as a whole, since the same or similar invasive agro-forestry species have been promoted elsewhere.

The Communication campaign will be key in making information generated during project activities available to others. Without information dissemination there will be insufficient adoption and replication. Much of the information will be disseminated through workshops and Farmer Field Schools and other media, but adoption by DNPW and the Forestry Department will be key in ensuring that IAS issues are addressed and budgeted for across all PAs.

The development of identification tools will also make more information available on how to identify and best manage IAS, information largely lacking to date in Malawi. This information will be very useful to other PA managers in Malawi and elsewhere on the continent, allowing for the improved management of invasive plants. Since the impacts and management of particular IAS are generic this allows for replication.

**A.2. Child Project?** If this is a child project under a program, describe how the components contribute to the overall program impact.

N/A

**A.3. Stakeholders.** Identify key stakeholders and elaborate on how the key stakeholder's engagement is incorporated in the preparation and implementation of the project. Do they include civil society organizations (yes x ☐ /no ☐)? and indigenous peoples (yes x ☐ /no ☐)? <sup>9</sup>

The key stakeholders were consulted in a national workshop that was held in March 2017 followed by a subsequent meeting in October 2017. The October workshop reviewed the project goals, objectives and budget. For full details on how these stakeholders both contribute through e.g. co-funding, as well as benefit as being targeted stakeholders under the GEF incremental support, please see paragraph 62 of the procod. The table below provides a short summary.

Country/Stakeholder	Sector/Actor	Current role or function
Ministry of Natural Resources, Energy and Mining: Environmental Affairs Department (EAD)	Public sector: Environment – natural resource management	EAD is solely responsible for dealing with environmental issues, including IAS. They also undertake EIA's. They will be the National Executing Agency and house the National Project Coordinator
Ministry of Natural Resources, Energy	Public sector: Environment - forest	Custodian of all Forest Reserves in Malawi including IAS management. Manage Mount

<sup>9</sup> As per the GEF-6 Corporate Results Framework in the GEF Programming Directions and GEF-6 Gender Core Indicators in the Gender Equality Action Plan, provide information on these specific indicators on stakeholders (including civil society organization and indigenous peoples) and gender.

and Mining: Department of Forestry	management	Mulanje FR, one of the pilot sites
Ministry of Natural Resources, Energy and Mining: Department of National Parks and Wildlife	Public sector: Environment - National Parks and Wildlife Reserves management	Responsible for management of all NP's and Wildlife Reserves in Malawi, including IAS management. Manage Nyika NP, one of the pilot sites
Ministry of Natural Resources, Energy and Mining: Forestry Research Institute of Malawi	Public sector: Environment – forest research	Research and development in forestry sector including control of pests of plantation species
Ministry of Natural Resources, Energy and Mining: Environmental Management Authority (EMA)	Public sector: Environment – environmental protection	Principal agency for the protection and management of the environment and sustainable management of natural resources. Will be, once established, the principle agency responsible for IAS management
Ministry of Agriculture, Irrigation and Water Development: Department of Agricultural Research Services	Public sector: Agriculture – research on crop production	Undertake research to improve crop production, including pest management and Conservation Agriculture.
Ministry of Agriculture, Irrigation and Water Development: Plant Protection Services	Public sector: Agriculture – plant quarantine	Mainly involved in plant quarantine issues, including undertaking Pest Risk Assessments. Also mandated to screen potential biocontrol agents
Ministry of Agriculture, Irrigation and Water Development: Department of Land Conservation Resources	Public sector: Agriculture – sustainable agricultural practices	Promotion of sustainable agricultural practices such as Conservation Agriculture, Farmer Managed Natural Regeneration, crop integration, etc.
National Museums of Malawi	Public sector – curation of museums including research	
National Herbarium and Botanical Gardens of Malawi	Public sector -	Collection and curation of plant specimens, plant surveys, research and management of Botanical Gardens
University of Malawi	NGO: Learning institution	Research in environmental issues, including IAS impacts and management
Mzuzu University	NGO: Learning institution	Research in environmental issues, including IAS impacts and management
Lilongwe University of Agriculture and Natural Resources (LUANAR)	NGO: Learning institution	Research in environmental issues, including IAS impacts and management
United Nations Environment Programme (UN Environment)	UN Agency: Environment	Implementing Agency and will also provide technical advice where possible and provide monitoring and supervision services for the project.

African Parks Foundation (APF)	NGO: Environment - PA management	Currently manage three NP's in Malawi in a public-private partnership
Peace Parks Foundation (PPF)	NGO: Environment – TFCA's	Establishment and development of Transfrontier Conservation Areas in Africa
Mulanje Mountain Conservation Trust (MMCT)	NGO: Environment - MMFR management	Co-manage MMFR together with the Forestry Department, including IAS management, awareness creation, anti-poaching, etc.
Nyika-Vwaza Trust (NVT)	NGO: Environment - NNP management	Contribute towards the management of NNP, including co-financing
Lilongwe Wildlife Trust (LWT)	NGO: Environment	Involved in environmental awareness creation in Malawi
Total Land Care (TLC)	NGO: Agriculture – sustainable agriculture	Promotion of sustainable agriculture in Malawi including Conservation Agriculture and FMNR
Centre for Agriculture and Biosciences International (CABI)	IGO: Environment and Agriculture – pest management	Development and implementation of IAS policies, awareness creation, capacity development and best management practices
Queensland Biosecurity, Australia	Public sector: Environment and Agriculture – weed and pest management	Biological control of environmental weeds

**A.4. Gender Equality and Women's Empowerment.** Elaborate on how gender equality and women's empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. Did the project conduct a gender analysis during project preparation (yes ☐ /no ☒)? **This analysis will be done during the inception phase of the project.** Did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes X /no ☐)? what is the share of women and men direct beneficiaries (women X%, men X%)? <sup>10</sup>

According to a GISP report on mainstreaming *gender* issues women generally rate risks due to invasive species higher than men. This can be attributed to a range of factors including the fact that weeds cause significant human health problems. For example, of the 25 plant species in Australia which cause seasonal allergies, 20 are introduced. As such, gender issues are considered under each of the components described above. For example, the cost-benefit analysis of three 'conflict' species under Component 1 will assess gender-specific impacts, costs and the role of women in their management and control through agricultural practices. Under Component 2, strengthening of IAS management will include supporting community participation, and a communication and outreach to those living in and around protected areas will target not only community leaders but also women and women's groups. This approach will be extended to the national communications and outreach programs under Component 3, ensuring that the whole community learns which plants are invasive, how to manage them, and how to reduce the negative impacts and prevent the spread of IAS. Targeting women is key to the control of IAS weeds in agricultural landscapes, as women are typically responsible for weeding and their constant presence in the fields makes them likely to identify IAS more quickly than others in the community. At the same time, IAS control plans developed by the project will take account of the potential burden that could be placed on women if they become responsible for IAS control activities. Women-only focus group discussions will be held at the community level to ensure that women have the information necessary and a forum to discuss their roles in IAS management. The project manager will be responsible for the monitoring and review of gender sensitivity in the training workshops and the application of gender-disaggregated indicators. To ensure that the progress of gender mainstreaming can be monitored throughout the project, gender disaggregated targets will be developed and used to monitor indicators.

The involvement of women in the project is key because women generally perceive IAS as more of a threat than men. The project will build on this and apply guidelines to target fair gender distribution on its capacity building activities – e.g. selection of trainees,

<sup>10</sup> Same as footnote 8 above.

co-management groups at pilots, as well as decision making fora, which in most cases will be near 50:50 throughout all strata of the project stakeholder groups. At pilot sites, where communities will be directly involved in IAS management activities, at least 50% of field workers will be women. Additional efforts will also be made to enhance capacity and awareness amongst women – gender sensitive awareness material will be developed and separate workshops will be held for women and men based on their availability, but more importantly to allow women in male dominated communities to comment and participate more freely in issues pertaining to IAS.

**A.5 Risk.** Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation. (Table format acceptable):

Risk analysis and risk management measures are summarized in the table below:

Description	Probability & Impact 1(low) to 5 (high)	Mitigation Measures	Responsible oversight agency
<b>Rapid changes in climate conditions could outstrip the ability of Malawi to successfully manage IAS</b>  <b>Type: Environmental</b>	P = 2; I = 1	Managing IAS in PAs and adjoining agro-ecosystems will strengthen the health of these ecosystems and their resilience to the impacts of CC. In addition, project interventions will mitigate against some of the impacts of CC such as an increase in the frequency and intensity of droughts. Woody and aquatic weeds are known to increase evapo-transpiration. By removing these from water catchments, such as Mulanje and Nyika, the project will secure the provision of water to downstream water-users. This is related to the concept of ecosystem-based adaptation which is a cost-effective means of protecting human and ecological communities against the impacts of climate change. Ecosystem based-adaptation is described as “building nature’s resilience to the impacts of climate change, while also helping to meet people’s basic needs.” These ecosystem-based approaches are therefore not just about protecting ecosystems, but also about using ecosystems to help sustain people and the resources on which they depend. Such an approach can also provide an integrative framework to address impacts from both climate change and invasive species.” <sup>11</sup>	Lead NEA, CABI
<b>Lack of interest and support from key national stakeholder groups and organizations in IAS management</b>  <b>Type: Socio-political</b>	P = 2; I = 4	Training and awareness-raising activities will improve communication and coordination as well as increasing stakeholder engagement, including the communities involved through support towards sustainable agriculture practices and pest management (communities will be eager to collaborate if the project is benefitting their day-to-day interests). The implementation of a communication strategy will also facilitate a better understanding of IAS issues amongst all stakeholders and as such contribute to improved decision making. In addition, the promulgation of the Malawi Environment Management Bill which includes the establishment of the Malawi Environment Protection Agency (MEPA) indicates that the GoM is serious in addressing the IAS issue. The Bill clearly states that the MEPA will coordinate IAS activities among all stakeholders and take measures for the control, eradication or management of alien and invasive species. The National Parks and Wildlife Act has clauses that are explicit about the illegality of introducing exotic species into PAs. The MMCT and the NVT have existing programs to manage IAS. The Peace Parks Foundation is also investing in IAS management in Nyika.	Lead NEA, CABI
<b>Insufficient funding and Government support to continue implementation of</b>	P = 2; I = 4	Several factors will increase the likelihood that increased funding and support will be available for IAS management post-project. First, the GoM has promulgated the Malawi Environment Management Bill which deals extensively with the need to manage IAS. The Bill also has clauses	Lead NEA, CABI, UN Environment

<sup>11</sup> |Burgiel, S.W. and Muir, A.A. (2010) Invasive Species, Climate Change and Ecosystem-Based Adaptation: Addressing Multiple Drivers of Global Change. Global Invasive Species Programme, Washington, DC, and Nairobi, Kenya  
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<b>IAS activities after the project ends</b>  <b>Type:</b> Political		<p>placing the onus for IAS management on landowners. For example, “if an alien species establishes itself as an invasive species due to actions of a specific person, the person shall be liable for all costs incurred in the control and eradication of that species.” The MMCT and the NVT continue to fund IAS management activities. The Peace Parks Foundation also continues to fund IAS management activities in the Malawi-Zambia TFCA - Nyika NP is part of that TFCA.</p> <p>The project will also increase awareness and understanding of decision makers on the full range of benefits provided by IAS management, not only in terms of agricultural production and livelihoods but also in terms of hydrological services and other ecosystem functions and services. This will be demonstrated by undertaking cost-benefit analyses which will clearly demonstrate that the benefits of IAS management outweigh the costs. In addition, IAS management in agricultural practices will demonstrate to local communities the tangible economic and social (e.g. health) benefits of effective IAS prevention and control practices, while the introduction of host-specific and damaging biocontrol agents will result in cost-effective and sustainable control of invasive plants, which together will incentivize local communities to continue these practices even in the absence of external support.</p>	
<b>Conflicts of interest where certain invasive alien plants provide benefits to individuals or groups (e.g. for fuelwood)</b>  <b>Type:</b> Socio-political	P = 4; I = 4	<p>The project will develop and disseminate information regarding the pros and cons of various IAS. Cost-benefit analyses (CBA) will be undertaken - specifically on those species characterized as ‘conflict’ IAS, to inform all stakeholders of the true costs of these species, including impacts on livelihoods, ecosystem services, and biodiversity, and a comparison of the benefits they provide. In addition, participatory and consultative approaches will be used to get a consensus among stakeholders on policies towards conflict IAS, and to raise awareness of alternative natural resources to conflict IAS. Results of the CBA will be communicated as part of Component 3 activities to policy and decision makers at national level related to PA, agriculture, and forestry management. It should also be noted that the Malawi Environment Management Bill makes reference to the use of so-called ‘conflict’ species by stating that “a person authorized by a permit under subsection (2) to carry out an activity involving a specimen of an alien species or invasive species shall take all required steps to prevent or minimize harm to biodiversity.”</p>	Lead NEA, CABI
<b>Farmers and others living adjacent to PAs may expect to receive remuneration for their involvement in IAS management</b>  <b>Type:</b> Socio-political		<p>The project will mitigate this risk by providing farmers with information regarding the long-term benefits they will accrue by participating in IAS management actions, and by providing farmers with non-monetary incentives in the form of fruit trees and other valuable native plant species, including valuable medicinal plants (in the PA buffer zones), to support sustainable agricultural production activities. By using demonstration trials farmers will see the benefits of practicing crop rotation, crop integration, cover crops and FMNR – these will mitigate against the need for any compensation.</p>	Lead NEA
<b>Environmental damage from IAS management</b>  <b>Type:</b> Environmental	P = 1; I = 4	<p>Even though the project will make a positive contribution to biodiversity conservation, it should be recognized that IAS management activities, such as the use of agrochemicals and large-scale clearance in control /eradication activities, can sometimes result in negative environmental impacts. The project will undertake risk analyses with regard to the introduction of any potential biocontrol agents, and environmental &amp; social impact assessments (ESIA) to examine the possible negative consequences of any proposed interventions, and propose measures to reduce/mitigate these. The ESIA's will be publicly disclosed in draft form prior to undertaking appraisal.</p>	Lead NEA, CABI
<b>Inability to demonstrate impact of project</b>	P = 2; I = 3	<p>The nature of the project is to demonstrate and to establish the necessary systems, make appropriate tools available, and raise awareness rather than actually targeting large scale impacts (at the pilot sites). The size of the</p>	Lead NEA

<b>interventions due to complex natural interactions and a long time span until impacts are noticed</b>  <b>Type:</b> Environmental	available GEF budget does not allow even the minimum requirements needed to start clearing large tracts of land of IAS, but will allow the project to demonstrate that this is needed and feasible. Additionally, stakeholders will be informed and capacitated, to continue and replicate the work started under the GEF project; as well as conduct participatory monitoring about immediate and long-term developments and the impacts of IAS, thus additionally motivating them to continue the work tested in the pilot sites.
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**A.6. Institutional Arrangement and Coordination.** Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

On institutional arrangements for project implementation, please refer to Section 4 of the Project Document.

On planned coordination with other relevant GEF-financed projects and other initiatives, please refer to Section 2.7 of the Project Document.

Additional Information not well elaborated at PIF Stage:

**A.7 Benefits.** Describe the socioeconomic benefits to be delivered by the project at the national and local levels. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

IAS have a negative impact on biodiversity, crop and pasture production, human and animal health, water resources, tourism and economic development in general, including hydro-electricity generation. As such the expected global benefits of this project include contributions to reducing the loss of biodiversity and reducing the negative impacts of IAS on the national economy of Malawi in general, and local livelihoods of communities living around the two targeted Protected Areas specifically. Management of IAS in Nyika NP and Mount Mulanje FR will contribute to the conservation of many endemic and threatened species, many of which are a major drawcard for national and international tourists, a sector which employs thousands of people in Malawi. Communities will also benefit from the project's IAS management interventions, as several crop pests affecting their agro-production systems are IAS, and additionally have a significant impact on the goods and services provided by ecosystems (Turpie, 2004; Strayer, 2012; van Wilgen et al., 2013), and management of IAS can contribute significantly to sustaining ecosystem functions and services (van Wilgen et al., 2013). By addressing IAS management among communities living in areas adjacent to PAs, the project also will reduce negative IAS impacts on the PAs themselves, both by removing IAS populations that might spread into PAs, and by protecting agricultural production from negative IAS impacts and thereby reducing the reliance of rural communities on resources within PAs.

Under unweeded conditions crop yields can be reduced significantly (see table below from Gianessi, 2009). For example, the introduced weed *Parthenium hysterophorus* reduced sorghum yields by 82-95% in unweeded sorghum field trials in Ethiopia (Tamado and Milberg, 2004). The majority of farmers in Ghana identified weeding as the main constraint in their farming system, with a major effect on yields (Amanor, 1994). Weeding is also time-consuming. According to Harsch (2004), out of the total labour input of African women in rice production, 40-60% is spent on weeding. Reducing weed populations in agro-ecosystems, through improved management, will therefore contribute to increased yields and in so doing enhance livelihoods and reduce pressure on PAs. Farming practices such as crop rotation, crop integration and cover cropping not only improve yields per hectare but also reduce the weed burden. For example, cover crops integrated or grown together with maize can reduce weed growth by 80-100%. Improved IAS management can also enhance livestock production in adjoin agro-ecosystems. It is estimated that 71% of natural pasture will be lost in South Africa if invasive plants are not managed (van Wilgen et al., 2008). We suspect the same for many other regions in Africa, including Malawi. Loss of pasture to invasive plants in adjoin agro-ecosystems will result in increasing overgrazing and associated land degradation in communal land leading to increased pressure on PAs for access to grazingland.

Crop	Yield reductions due to weeds in croplands
Maize	55-90
Common bean	50
Sorghum	40-80
Cowpea	40-60
Rice	50-100

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Cotton	80
Wheat	50-80
Groundnut	80
Cassava	90

**A.8 Knowledge Management.** Elaborate on the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives (e.g. participate in trainings, conferences, stakeholder exchanges, virtual networks, project twinning) and plans for the project to assess and document in a user-friendly form (e.g. lessons learned briefs, engaging websites, guidebooks based on experience) and share these experiences and expertise (e.g. participate in community of practices, organize seminars, trainings and conferences) with relevant stakeholders.

Communication and information are crucial in building understanding, support and action on national and multisectoral IAS issues. The design of the MSP recognizes this by dedicating a whole component of the project (Component 3) to knowledge management and communications. Without awareness it is not possible to change behaviour and bring about the long term sustainable management of IAS. However, to be effective communication needs to be integrated into all project activities. For example, the establishment of demonstration sites under Component 2 to show the efficacy of various management interventions is one way of creating awareness, especially among rural communities. Workshops and meetings to enhance capacity should also be used to create awareness as to the threats of IAS and benefits of management. Ways of enhancing awareness of individual project outputs need to be addressed during the development of the Strategy and then implemented.

Information and awareness building needs will be identified by the development and implementation of a Communications Campaign. The campaign will focus on the most relevant target audiences using tailored forms of communication in order to raise awareness of IAS, especially identification, impacts and costs, and as a result bring about behaviour change with those decision makers involved in e.g. managing the national system of Protected Areas, quarantine services etc.. The project will mainly target PA staff, local government, forestry, tourism and agri-businesses and communities living adjacent to MMFR and NNP. The efficacy or impact of the Strategy will be assessed at pre- and end of project, and if there is no change in awareness among target audience's appropriate changes will be made to the Strategy itself. It is hoped that the information channelled through the communications campaign will provide the impetus for all stakeholders, especially government officials and policy-makers to provide significant resources to manage IAS and promote and endorse IAS policies.

MMCT has undertaken a survey to determine the efficacy of its education and communications strategies. Five categories of communication, the print media, electronic media, shirt messaging; sports infotainment and social infotainment were used and their efficacy ascertained (<http://www.africaforest.org/country-profiles/country-profiles-malawi.html>). The use of print media makes the assumption that all target audiences are literate. Leaflets and fliers were largely found to be ineffective and were reportedly being used for packaging with one parent from Phalombe area saying that: "Fliers and leaflets are meant for school boys and girls and not elders." Information made available through TV and radio was well received with radio being more effective due to the fact that TV's are more costly and need to be connected to the national power grid. TV also require viewers to be seated or unmoving while people can undertake activities while still listening to the radio. That said power sources for radios can also be costly for some families. Radio broadcasts were found to be more impactful if they were "backstopped with authoritative, village based interpersonal sources". Radio jingles were not that successful. That said combining radio messages with print media like posters and pamphlets were regarded as good reminders or reinforcers of broadcasts, and interpersonal sources. Shirt messaging was found to be ineffective and expensive. Attracting people to sponsored sports tournaments did allow for environmental messaging to be shared and discussed although impact was hard to measure. Hosting of global events such as the World Environment Day, World Biodiversity Day and many others (social infotainment), were considered to be effective in getting conservation messages across to local communities, allowing for the use of multiple messaging at one venue to a targeted audience. Targeting learners at school-based environmental clubs has also been successful.

Information on the impacts of IAS and benefits of control will be collated/developed at the initiation of the project, based on available information, and then disseminated to relevant audiences using appropriate forms of communication as determined by experts such as Lilongwe Wildlife Trust, who will be developing the Communications Campaign/Strategy and have been involved in awareness creation on a range of biodiversity issues in Malawi over many years. For example, available information on the impact of invasive woody plants on water resources will be made available to individuals in the MoAIWD to get buy-in for the project right at the onset. This will be linked to issues such as climate change and the fact that Mount Mulanje, an important water tower, is invaded by woody weeds, which impacts on Lake Chilwa, a Ramsar site which has dried up every year for the last 6 years. Similar information will be made available to the MoNREM to highlight the fact that woody weeds in all water catchments are reducing water flows into Lake Malawi, the level of which was down to 473.15 m a.s.l. in October 2016 reducing hydro-electricity generation to 150 MW. This resulted in 321 hours of load shedding (an average of 10 hrs/day) in October alone with significant negative impacts on the economy. The project findings, information and data generated, as well as best practice on IAS management GEF6 CEO Endorsement /Approval Template-August2016

will be disseminated through various means, largely determined by the Communication Strategy as additional information becomes available.

Based on a review of MMCT's communication activities the project will focus on the use of radio in combination with brochures or pamphlets. Meetings and workshops will also be widely used. The Field Guide on the identification and management of naturalized and invasive plants of Malawi will be made available to all interested and affected parties in the form of hard copies and an e-book – the e-book will be available on relevant websites such as those of the CBD, CABI, FISNA, NVT, Lilongwe Wildlife Trust (LWT), and national websites. Other awareness material and relevant project outputs will be made available on a dedicated project website and that of the LWT (<https://www.lilongwewildlife.org/>) and NVT (<http://www.nyika-vwaza-trust.org/>). The development and dissemination of awareness material be largely be supported by co-funding from Peace Parks Foundation, NVT, MMCT and LWT.

All international, regional, national and local partners will be regularly apprised of progress via reports and/or meetings. This will also provide an opportunity to capture their feedback for discussion and consideration.

The project will systematically collate existing information (inventories, databases, etc.) and will link to global initiatives such as CABI's Invasive Species Compendium and the Global Biodiversity Information Facility (GBIF).

B. Description of the consistency of the project with:

**B.1 Consistency with National Priorities.** Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions such as NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

Malawi makes many references to IAS in its NBSAP and reports to the CBD. In Malawi's 3rd National Report to the CBD it identifies the need for programs and activities to address: mechanisms for national and cross-sectoral coordination; review of policy, legislation and institutions (since there is no single policy framework that specifically addresses the control, prevention and management of invasive species); and development of policies and tools to promote activities to reduce the threats of IAS. These goals are also reflected in other documents such as the Forest Ecosystems Biodiversity Conservation Action Plan and the NBSAP. In the revised NBSAP (2015-2025), Target 9 is "By 2025, invasive alien species and their pathways are identified and prioritized for control and prevention from movement and spreading in and out of the country", and identifies the following targets/actions related to IAS that need to be achieved by 2025: 1) compile documentation and maps on IAS in Malawi including an inventory of invasive alien species prevalent in the country 2) develop a national invasive species management plan for management of IAS; iii) conduct awareness campaigns and build capacity of different stakeholders on how to identify, track and prevent IAS in their localities and on the threats of invasive alien species to biodiversity (cross-border inspection, quarantine and certification); iv) procure and upgrade inspection infrastructure for tracking and identifying IAS in Malawi; v) conduct capacity building initiatives on invasive alien species monitoring; vi) monitor the entry and spread of invasive alien species; and vii) regulate and control movement and spreading of IAS.

The Noxious Weeds Act, although outdated, clearly states that "It shall be the duty of every person responsible under this Act to clear or cause to be cleared any noxious weeds growing or occurring on the land in respect of which he is responsible. It shall further be the duty of any person to report forthwith to the nearest known weed inspector the occurrences of any noxious weeds on any land in respect of which such person is responsible". Water hyacinth and lantana are both listed as noxious weeds.

Malawi's National Parks and Wildlife Act of 1992 states that it is illegal to introduce any exotic plants or animals into PAs in Malawi. The clause reads as follows, "any person who conveys or introduces any plant, whether of a wild or cultivated species, into a national park or wildlife reserve shall be guilty of an offence" and the "The Chief Parks and Wildlife Officer may order the destruction or removal of any plant, and any seedling or off-shoot thereof, brought into a national park or wildlife reserve in contravention of subsection (1)."

Malawi's Environment Management Act of 2017 has many clauses pertaining to the management of IAS. The Malawi Environment Protection Agency which is to be established under the Act "shall, in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species". The Authority "shall ensure the coordination and implementation of programmes for the prevention, control or eradication of listed alien species and invasive plants".

Although the the GoM, through the MoNREM, is not investing directly in IAS management they are supporting other conservation-related activities. From 2015/2016 to 2018/2019 support will be provided to "Environment and Climate Change Management" (US\$ 8,941,513) and "Wildlife Conservation and Management" (US\$ 3,224,300), the latter much focused on species protection, anti-poaching, tourism development, and some activities related to management of their habitat. A very meagre US\$ 21,326 of this will be available for biodiversity conservation and management, which is the government program coming closest to IAS issues.

Malawi's recently revised National Agricultural Policy (NAP) of 2016 is focused on sustainable agricultural production and productivity; sustainable irrigation development; mechanization of agriculture; agricultural market development, agro-processing and value addition. With NAP, the GoM hopes for improved management of agricultural resources, increased agricultural exports and incomes, and improved food and nutrition security. The agricultural sector also recognizes the threat posed by weeds and IAS. For example, maximum maize yields are achieved if croplands are kept weed-free for the first 56 weeks after weeding. A one week delay in first weeding can reduce yields by one-third. In Malawi, one-third of the area planted to maize by smallholders is either left un-weeded or weeded after the critical first six weeks (Orr et al., 2002). Shortages of labor early in the season results in delayed weeding and subsequent maize yield losses of 15 to 90% due to weed competition (Kibata et al., 2002). Other NAP priority areas are empowerment of youth, women and vulnerable groups in agriculture; and institutional development, coordination and capacity strengthening; which is supported through the project by e.g. the partnership on weed management and IAS control through Conservation Agriculture in the bufferzones surrounding the two Protected Areas.. The NAP has identified eight policy priority areas one of which is "Agricultural Risk Management" which makes reference to pests and diseases which it is said "can have devastating effects on food security and agricultural growth" and should be addressed through the promotion of integrated pest management. This should include the empowerment of "communities, through capacity strengthening initiatives, to manage infrastructure for pest and disease control" and strengthening of "surveillance systems for monitoring outbreaks of pests and diseases".

With regard to International Conventions, Malawi is a signatory to the Convention on Biological Diversity (CBD). The proposed MSP clearly supports Article 8(h) of the CBD, which calls on signatories to: "Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats and species". The MSP will also help Malawi to meet the Aichi Biodiversity Targets, in particular Target 9: "By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment".

The project also supports Malawi to achieve targets outlined in the Global Strategy for Plant Conservation 2011-2020, including "Effective plans in place to prevent new biological invasions and to manage important areas that are invaded for plant diversity" and to address priorities identified in the International Plant Protection Convention (IPPC). The IPPC "aims to secure coordinated, effective action to prevent and to control the introduction and spread of pests of plants and plant products." The National Plant Protection Organization in Malawi is Plant Protection Services in the Ministry of Agriculture, Irrigation and Water Development.

Malawi is a member of the WTO, which has produced numerous relevant International Standards for Phytosanitary Measures (ISPMs); ISPMs are defined as legislation, regulation or official procedure aimed at preventing the introduction or spread of plant pests (which include invasive plants and other pests). Plant Protection Services are required to implement the various Standards.

Malawi is a signatory to the Convention on Wetlands of International Importance (the Ramsar Convention), which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources; the convention calls upon all Contracting Parties to, wherever possible, address the environmental, economic and social impact of invasive species on wetlands within their jurisdictions. Mulanje Mountain is also an important water catchment for Lake Chilwa, a Ramsar site.

### **C. DESCRIBE THE BUDGETED M & E PLAN:**

The MSP will follow UN Environment standard monitoring, reporting and evaluation processes and procedures. Monitoring and evaluation activities fall under Component 3 of the project.

Progress and financial project reporting requirements are summarized in Appendix 8 in the prodoc. Reporting requirements and templates are an integral part of the UN Environment legal instrument to be signed by the NEA and UN Environment.

The project M&E plan is consistent with the GEF M&E policy. The Project Results Framework presented in Appendix 4 of the prodoc includes SMART indicators for each expected outcome as well as mid-term and end-of-project targets. These indicators, along with the key deliverables and benchmarks are listed in Appendix 6 of the prodoc, will be the main tools for assessing project implementation progress and whether project results are being achieved. The means of verification and the costs associated with obtaining the information to track the indicators are summarized in the table below (Costed M&E Plan). Other M&E related costs are also presented in the costed M&E Plan and are integrated in the overall project budget.

The main outputs of the M&E plan will be:

- Establish and implement a Project M&E Plan
- Develop and implement pilot site monitoring plans to show improvement in biodiversity levels from baseline

- Develop and implement monitoring plans to evaluate improved invasive alien plant management and increased yields in agro-ecosystems
- Changes in (national) awareness levels monitored to show increase in IAS awareness across targeted sectors
- External audits
- Midterm review (UNEP independent study)
- Terminal evaluation (UNEP independent study)

Monitoring protocols will be developed at the initiation of the project in order to provide baseline data. The monitoring will continue throughout the project as the control programmes are implemented at the pilot sites, providing indicators of progress with respect to both the invasive plant and the biodiversity at the site.

Monitoring changes in awareness levels is critical to determine the efficacy of the awareness strategy. This will be determined by undertaking regular surveys of various stakeholder groups which have been targeted in the awareness campaign.

The M&E plan will be reviewed and revised as necessary to ensure that project stakeholders understand their roles and responsibilities vis-à-vis project M&E. Indicators and their means of verification will be fine-tuned at the inception workshop. Day-to-day project monitoring is the responsibility of the National Project Coordinator and his/her team in the PMU but other project partners will have responsibilities to collect specific information to track the indicators. A project M&E specialist will be contracted – to assist the NEA to design, run and report on the impact and performance monitoring aspects. It will be the responsibility of the NPC to inform UN Environment of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely fashion.

The NSC will receive annual reports on progress and will make recommendations to UN Environment concerning the need to revise any aspects of the Results Framework or the M&E plan. Project oversight to ensure that the project conforms to UN Environment and GEF policies and procedures will be the responsibility of the UN Environment-GEF Task Manager, who will also review the quality of draft project outputs and provide feedback to the project partners.

Project supervision will take an adaptive management approach. The Task Manager will develop a project supervision plan at the start of the project which will be communicated to the project partners during the inception workshop. The emphasis of the Task Manager supervision will be on outcome monitoring but without neglecting project financial management and implementation monitoring. Risk assessment and rating is an integral part of the Project Implementation Review (PIR). The quality of project M&E will also be reviewed and rated as part of the PIR. Key financial parameters will be monitored quarterly to ensure cost effective use of financial resources.

The principal means of assessment of project performance will be the mid-term and terminal evaluations. These will provide an opportunity to apply the GEF IAS SP7 Tracking Tool Draft, and to verify the information it provides. The tracking tool will be updated at mid-term and at the end of the project and will be made available to the GEF Secretariat along with the project PIR report.

In-line with UN Environment Evaluation Policy and the GEF's Monitoring and Evaluation Policy the project will also be subject to a Terminal Evaluation (TE). Additionally, a Mid-Term Review (MTR) will be commissioned and launched by the Project Manager before the project reaches its mid-point. The MTR will be carried out using a participatory approach whereby parties that may benefit or be affected by the project will be consulted. The NSC will participate in the MTR and review and approve a management response – as to be developed by the NEA/PMU, to the recommendations along with an implementation plan. It is the responsibility of the UN Environment Task Manager to monitor whether the agreed recommendations are being implemented. However, if project is rated as being at risk, a Mid-Term Evaluation will be conducted by the Evaluation Office instead of a MTR.

The Evaluation Office will be responsible for the TE and will liaise with the Task Manager and Executing Agency(ies) throughout the process. The TE will provide an independent assessment of project performance (in terms of relevance, effectiveness and efficiency), and determine the likelihood of impact and sustainability. It will have two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UN Environment, the GEF, executing partners and other stakeholders. The direct costs of the evaluation will be charged against the project evaluation budget. The Terminal Evaluation will be initiated no earlier than six months prior to the operational completion of project activities and, if a follow-on phase of the project is envisaged, should be completed prior to completion of the project and the submission of the follow-on proposal. Terminal Evaluations must be initiated no later than six months after operational completion.

The draft Terminal Evaluation report will be sent by the Evaluation Office to project stakeholders for comments. Formal comments

on the report will be shared by the Evaluation Office in an open and transparent manner. The project performance will be assessed against standard evaluation criteria using a six point rating scheme. The final determination of project ratings will be made by the Evaluation Office when the report is finalised and further reviewed by the GEF Independent Evaluation Office upon submission. The evaluation report will be publicly disclosed and may be followed by a recommendation compliance process. An independent terminal evaluation (TE) will take place at the end of project implementation. This will again make use of the GEF Tracking Tool. The Evaluation and Oversight Unit (EOU) of UN Environment will manage the terminal evaluation process. A review of the quality of the evaluation report will be done by EOU and submitted along with the report to the GEF Evaluation Office not later than 6 months after the completion of the evaluation.

The table below summarizes main M&E costs showing the total budget (consolidated GEF and co-finance) for the 4 years of project implementation.

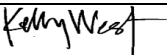
Type of M&E activity	Responsible Parties	GEF Budget US\$	Co-financed Budget - US\$	Time Frame
Inception Workshop	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> <li>PMU</li> <li>UN Environment</li> </ul>	8,000 – 100% of costs under PMC	5,000	Within 2 months of project start-up
Inception Report	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> </ul>	No additional M&E costs	None	1 month after project inception meeting
Development and implementation of the Project Impact Monitoring System: IAS control pilots, capacity building and awareness & Logframe and GEF TTs	<ul style="list-style-type: none"> <li>Lead: National Project M&amp;E Consultant/Institution (9 pm: 3 months in PY1; 1,5 months/year in PY2-5)</li> <li>Co-lead: National Project Coordinator</li> <li>local implementing partners at two Pas</li> </ul>	36,000 (US\$4,000/month (includes travel, accommodation and reporting costs – 24K under Comp 3 and 12K under PMC)	None	<ul style="list-style-type: none"> <li>Design of Project Impact Monitoring System: 6 months after start project.</li> <li>M&amp;E Manual</li> <li>Impact M&amp;E reports: Midterm and end of project</li> <li>Reporting on logframe indicators: Semi-annually</li> <li>GEF Tracking Tools: Start, mid and end of project</li> <li>Progress/performance review: annually at NSC meeting</li> <li>Gender, as part of M&amp;E reports, PIR and SA progress reports</li> </ul>
Communications on M&E activities	<ul style="list-style-type: none"> <li>Lead NEA/National Project Coordinator</li> <li>Administrator</li> </ul>	1,394 – 46% of total costs under PMC		Regularly during project period
Semi-annual Progress Reports to UN Environment	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> </ul>	No additional M&E costs	No additional M&E costs	Every 6 months
Quarterly Expense reports	<ul style="list-style-type: none"> <li>PMU finance &amp; NEA</li> </ul>	No additional M&E costs	No additional M&E costs	Every 3 months
PIR	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> <li>UN Environment</li> </ul>	No additional M&E costs	No additional M&E costs	Annually, part of reporting routine
Project Steering Committee meetings	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> </ul>	20,592 – 100% of costs under PMC	20,000	Once a year minimum

Type of M&E activity	Responsible Parties	GEF Budget US\$	Co-financed Budget - US\$	Time Frame
	<ul style="list-style-type: none"> <li>Secretariat to NSC – by PMU</li> <li>NPSC</li> </ul>			
Mid-Term Evaluation – supported by Comp 3 M&E data	<ul style="list-style-type: none"> <li>National Project Coordinator</li> <li>Lead: National Project M&amp;E Consultant</li> <li>UN Environment</li> <li>NSC</li> <li>MTR consultant(s)</li> </ul>	25,000 – 100% of costs under Comp 3	-	At mid-point of project implementation; PY2.5
Terminal Evaluation	<ul style="list-style-type: none"> <li>UN Environment</li> <li>External TE consultant</li> </ul>	35,000 – 100% of costs under PMC	-	During last 2 months of project implementation
5 annual Financial Audits	<ul style="list-style-type: none"> <li>NEA/PMU finance staff</li> <li>UN Environment</li> </ul>	12,000 – 100% of costs under PMC	-	Annually
Project Terminal Report	<ul style="list-style-type: none"> <li>NEA/National Project Coordinator</li> </ul>	No additional M&E costs	No additional M&E costs	During last 2 months of project implementation
Capturing lessons and best practice	<ul style="list-style-type: none"> <li>National Project Coordinator</li> </ul>	No additional M&E costs	No additional M&E costs	Part of Semi-annual reports, PIR & Project Final Report
Monitoring visits to field sites	<ul style="list-style-type: none"> <li>M&amp;E Specialist</li> <li>NEA/National Project Coordinator</li> <li>Project Technical Advisor</li> </ul>	10,000 – 100% of costs under component 2 (local travel)	10,000	
<b>Indicative budget for M&amp;E Plan</b>	<ul style="list-style-type: none"> <li><b>Master Total</b></li> </ul>	<b>US\$147,986</b> (of which US\$88,986 under PMC and US\$59,000 from other component budgets)		

### **PART III: CERTIFICATION BY GEF PARTNER AGENCY(IES)**

#### **A. GEF Agency(ies) certification**

**This request has been prepared in accordance with GEF policies<sup>12</sup> and procedures and meets the GEF criteria for CEO endorsement under GEF-6.**

Agency Coordinator, Agency Name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Kelly West, Senior Programme Manager & Global Environment Facility Coordinator Corporate Services Division UN Environment		February 12, 2018	Max Zieren Task Manager	+662 2882101	zieren@un.org

<sup>12</sup> GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT  
GEF6 CEO Endorsement /Approval Template-August2016



**ANNEX A: PROJECT RESULTS FRAMEWORK** (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

**Please refer to appendix 4 of the project document.**

**ANNEX B: RESPONSES TO PROJECT REVIEWS** (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF

N.A. as there are no GEFSEC comments for follow up; no STAP review conducted on this MSP, as well as no Council Comments received.

**ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS<sup>13</sup>**

A. Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: <b>50,000</b>			
<i>Project Preparation Activities Implemented</i>	<i>GETF/LDCF/SCCF/CBIT Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Project Personnel	35,200	35,200	
Travel on official business	3,400	4,749	
Sub contract to supporting organizations	8,000	6,000	
Meetings and Conferences	3,400	2,233	
Sundry	0	1818	
<b>Total</b>	<b><u>50,000</u></b>	<b><u>50,000</u></b>	

<sup>13</sup> If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities. Agencies should also report closing of PPG to Trustee in its Quarterly Report.

**ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)**

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or revolving fund that will be set up)

NA



## PROJECT DOCUMENT

### SECTION 1: PROJECT IDENTIFICATION

- 1.1 Project title:** Enhancing sustainability of Protected Area systems in Malawi, and stabilizing agro-production in adjoining areas through improved IAS management
- 1.2 Project number:** 9539
- 1.3 Project type:** Medium-sized Project (MSP)
- 1.4 Trust Fund:** GEF
- 1.5 Strategic objectives:**
- GEF strategic long-term objective: BD 1& BD 4
- Strategic programs for GEF VI: Program 1& Program 4
- 1.6 UN Environment priority:** Ecosystem management
- 1.7 Geographical scope:** National
- 1.8 Mode of execution:** External
- 1.9 Project executing organization (s):** Environmental Affairs Department in the Ministry of Natural Resources, Energy and Mining, Malawi
- 1.10 Duration of project:** 60 months
- Commencing: 1 February 2018
- Technical completion: 31 January 2023
- Validity of legal instrument:** 72 months

<b>1.11 Cost of project</b>	<b>US\$</b>	<b>%</b>
Cost to the GEF Trust Fund	1,502,511	22.54
Co-financing	5,164,147	77.46
<b>Grants:</b>		
Environmental Affairs Department	187,500	3.6
Department of National Parks and Wildlife	60,000	1.2
Department of Agricultural Research Services	100,600	1.9
Department of Land Resources Conservation	92,200	1.8
Department of Forestry	178,800	3.5
Museums of Malawi	191,000	3.7
Peace Parks Foundation	355,000	6.9
Mulanje Mountain Conservation Trust	100,000	1.9
<b>In-kind:</b>		
UN Environment	100,000	1.9
Environmental Affairs Department	365,500	7.1
Forestry Research Institute of Malawi	354,052	6.9

Department of Forestry	503,800	9.8
Department of Agricultural Research Services	457,700	8.9
Department of National Parks and Wildlife	450,000	8.7
Department of Land Resources Conservation	595,500	11.5
National Herbarium and Botanical Gardens	235,800	4.6
Museums of Malawi	110,000	2.1
Mulanje Mountain Conservation Trust	200,000	3.9
Nyika Vwaza Trust (UK)	65,000	1.3
Nyika Vwaza Trust (MW)	75,000	1.5
Total Land Care	60,000	1.2
CAB International (CABI)	250,000	4.8
Biosecurity Queensland	76,695	1.5

### 1.12 Project summary

Invasive Alien Species (IAS) are one of the biggest threats to biodiversity and livelihoods. In Malawi IAS are adversely affecting locally and globally significant biodiversity, and are invading and threatening a range of habitats, as well as, indirectly, the livelihoods of millions of people depending on natural ecosystems for food, commodities and energy security. Malawi has recognized the need to implement Article 8 (h) of the CBD to mitigate the threats of IAS. They have also agreed to meet Aichi Target 9 which states that “by 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment”. The project will also address Aichi Target 12 by contributing to the conservation status of threatened species and Target 7 by enhancing the sustainable management of areas under agriculture. The project also addresses many of the SDG’s, including one of the targets under Goal 15 which encourages countries to “introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.”

This GEF project aims to enhance the capacity of Malawi to manage IAS, especially in protected areas and surrounding agro-ecosystems, by strengthening existing national and protected area specific frameworks for the prevention and management of IAS. A multi-sector approach will be used, targeting the identification and management of high risk pathways to prevent the introduction and further spread of IAS and biocontrol of some of the worst IAS, using proven safe and effective biocontrol agents. The objective of this project is to: To prevent new invasions and reduce the current impacts of IAS in protected areas and adjoining agro-ecosystems in Malawi. IAS management activities in the latter are critical in order to enhance protection of the PA’s from future invasions. The project will seek to (1) establish national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems (2) strengthen on-the-ground IAS management in existing protected areas through invasive species control and habitat restoration, as well as in adjoining agro-ecosystems through sustainable farming for improved welfare, and to (3) improve knowledge management and broader adoption of developed strategies in Malawi protected areas. International cooperation will bring in expertise to develop best practices for the management of selected invasive species. The project will also invest in raising awareness of IAS nationally which will be one of the

most important means to increase the willingness and levels of core government funding to IAS management, all of which are rather low in the two target sites.

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## ACRONYMS AND ABBREVIATIONS

APF	African Parks Foundation
CABI	CAB International - HQ, Wallingford, UK
CABI-ARC	CAB International – Africa Regional Centre, Nairobi, Kenya
CBD	Convention on Biological Diversity
CI	Conservation International
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COP	Conference of Parties
CSIRO	Commonwealth Scientific and Industrial Research Organization
DAFF	Department of Agriculture, Fisheries and Forestry
DGEF	Division of Global Environment Facility
DNPW	Department of National Parks and Wildlife
EA	Executing Agency
ED&RR	Early Detection and Rapid Response
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
FAO	Food and Agricultural Organization
FR	Forest Reserve
FRIM	Forestry Research Institute of Malawi
GDP	Gross Domestic Product
GEF	Global Environment Facility
GISP	Global Invasive Species Program
GoM	Government of Malawi
GPS	Global Positioning System
IA	Implementing Agency
IAS	Invasive Alien Species
IBA	Important Bird Area
IEA	International Executing Agency
ILO	International Labour Organization
IMO	International Maritime Organization
IP	Indigenous People
IPPC	International Plant Protection Convention
ISC	Invasive Species Compendium
ISPM	International Sanitary and Phytosanitary Measures
ISSG	Invasive Species Specialist Group
IUCN	International Union for the Conservation of Nature

LR/cd	Low Risk/conservation dependent
LWL	Lilongwe Wildlife Trust
M&E	Monitoring and Evaluation
MEAs	Multilateral Environmental Agreements
MEPA	Malawi Environmental Protection Authority
MoNREM	Ministry of Natural Resources, Energy and Mining
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MoEST	Ministry of Education, Science and Technology
MoITC	Ministry of Information, Tourism and Culture
MoLGRD	Ministry of Local Government and Rural Development
MMCT	Mount Mulanje Conservation Trust
MMFR	Mulanje Mountain Forest Reserve
MSP	Medium Size Project
NBSAP	National Biodiversity Strategy and Action Plan
NEA	National Executing Agency
NEPAD	New Partnership for African Development
NGO	Non-Governmental Organization
NHGBM	National Herbarium and Botanical Gardens of Malawi
NISSAP	National Invasive Species Strategy and Action Plan
NNP	Nyika National Park
NP	National Park
NPC	National Project Coordinator
NPD	National Project Director
NPPO	National Plant Protection Organization
NRM	Natural Resources Management Programme
NSC	National Steering Committee
NVT	Nyika-Vwaza Trust
NVT – MW	Nyika-Vwaza Trust Malawi
NVT – UK	Nyika-Vwaza Trust United Kingdom
PA	Protected Area
PPF	Peace Parks Foundation
PCU	Project Coordination Unit
PRA	Pest Risk Assessments
PIF	Project Implementation Framework
PIR	Project Implementation Review
PMU	Project Management Unit
PPG	Project Preparatory Grant
PRA	Pest Risk Assessment
QA	Quarantine Agency
RA	Risk Analysis
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
APO	UN Environment – Asia Pacific Office
RPPOs	Regional Plant Protection Organizations
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SCOPE	Scientific Committee on Problems of the Environment
SPS	Sanitary and Phytosanitary

TFCA	Trans Frontier Conservation Area
TLC	Total Land Care
TNC	The Nature Conservancy
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCCD	United Nations Convention to Combat Desertification
UNCLOS	United Nations Convention of the Law of the Sea
UNDAF	United Nations Development Assistance Framework
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
UN Environment	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-REDD	United Nations - Reducing Emissions from Deforested and Degraded Forests
USA	United State of America
WB	World Bank
WCMC	World Conservation Monitoring Centre
WCS	Wildlife Conservation Society
WESM	Wildlife and Environment Society of Malawi
WHO	World Health Organization
WTO	World Trade Organization
WWF	World Wide Fund for Nature

## **SECTION 2: BACKGROUND AND SITUATION ANALYSIS (BASELINE COURSE OF ACTION)**

### **2.1. Background and context**

- 1 The 7<sup>th</sup> Conference of the Parties (COP7) to the Convention on Biological Diversity (CBD) issued the Kuala Lumpur Declaration in February 2004, expressing alarm that biological diversity is being lost at an unprecedented rate. Invasive Alien Species (IAS) pose the biggest threat to biodiversity after habitat destruction and in some ecosystems, particularly islands, they are the most important cause of biodiversity loss. COP7 (Decision VII/20) thus invited the GEF and other funding institutions and development agencies to provide support to developing countries to assist with improved prevention, rapid response and management measures to address the threats of IAS. Target no. 9 of the CBD COP 10 in Nagoya, calls for “increased attention, programming and funding for the identification, control and eradication, as well as management of pathways to prevent further new introductions and establishment of invasive species in member countries”. GEF, as the main funding mechanism for CBD implementation, has worked on IAS prevention and control since GEF 3, and has specific strategic programs on this under GEF 6 Strategic Objective 2, Outcome 4.1: Improved Management Frameworks to Prevent, Control and Manage Invasive Species.
- 2 The main GEF 6 biodiversity strategy goal is to maintain globally significant biodiversity and ecosystem goods and services they provide to society. The first objective focuses on the sustainability of protected area systems, which the GEF defines as one that (1) effectively protects ecologically viable representative samples of the country’s ecosystems (2) has sufficient and predictable financing to support management costs, and one that retains adequate individual and institutional capacity to manage protected areas such that they achieve their conservation objectives. The GEF 6 Biodiversity Strategy also purports support for the “implementation of comprehensive prevention, early detection, control and management frameworks that emphasize a risk management approach by focusing on the highest risk invasion pathways.” Proposals submitted by continental countries that address IAS management through a comprehensive pathways approach will also be supported especially if interventions contribute to the protection of endangered or rare species.
- 3 Under the CBD, invasive alien species are “alien species whose introduction and/or spread threaten biological diversity” (CBD, 2002). Other definitions also address impacts to economic and human health sectors (National Invasive Species Council, 2001). An alien species “refers to a species, subspecies or lower taxon, introduced outside its natural past or present distribution, including any part, gametes, seeds, or propagules of such species that might survive and subsequently reproduce”

- (CBD, 2002). These organisms are sometimes called “exotic,” “non-native,” or “non-indigenous” species.
- 4 Invasive Alien Species (IAS) are a major threat to the vulnerable freshwater and terrestrial biodiversity of Malawi and to people depending on this biodiversity for their livelihoods. Malawi’s Clearing House Mechanism under the CBD identified four major threats to biodiversity - habitat loss and fragmentation, **IAS**, population pressure and poverty – and further states that **“the major threats to biodiversity are from invasive plants.”** Both protected landscapes and productive landscapes in Malawi are vulnerable to IAS.
  - 5 Malawi recognizes the threat of IAS to biodiversity. Malawi’s 3rd National Report to the CBD identifies the need for programs and activities to address IAS: mechanisms for national and cross-sectoral coordination; review of policy, legislation and institutions (since there is no single policy framework that specifically addresses the control, prevention and management of invasive species); and development of policies and tools to promote activities to reduce the threats of IAS. These goals are also reflected in other documents such as the Forest Ecosystems Biodiversity Conservation Action Plan and the NBSAP. In the revised NBSAP (2015-2025), Target 9 is “By 2025, invasive alien species and their pathways are identified and prioritized for control and prevention from movement and spreading in and out of the country”, and identifies the following targets/actions related to IAS that need to be achieved by 2025: 1) compile documentation and maps on IAS in Malawi including an inventory of invasive alien species prevalent in the country 2) develop a national invasive species plan for management of IAS; iii) conduct awareness campaigns and build capacity of different stakeholders on how to identify, track and prevent IAS in their localities and on the threats of invasive alien species to biodiversity (cross-border inspection, quarantine and certification); iv) procure and upgrade inspection infrastructure for tracking and identifying IAS in Malawi; v) conduct capacity building initiatives on invasive alien species monitoring; vi) monitor the entry and spread of invasive alien species; and vii) regulate and control movement and spreading of IAS. The recently promulgated Environment Management Act (EMA) of 2017 calls for the establishment of the Malawi Environment Protection Authority (MEPA) who, in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species.
  - 6 Responding to the need for additional action against invasive species, CABI, in collaboration with national partners in Malawi, has developed a proposal entitled, “Enhancing sustainability of Protected Area systems in Malawi and stabilizing agro-production in adjoining areas through improved IAS management” for funding by the Global Environment Facility (GEF) through United Nations Environment (UN Environment). On December 1, 2016, financial support was granted by GEF to conduct the detailed design of the project through a Project Preparation Grant (PPG). An Inception Meeting was held in Lilongwe, Malawi, on 28-29 March 2017, attended by representatives from all interested and affected parties. During the PPG phase CABI undertook a survey in Malawi to develop a list of known invasive plants which negatively impact on biodiversity, particularly in PAs and adjoining agro-ecosystems. The identification of target species and sites for their control, where best management practices would be developed, was a key activity during the PPG phase. Subsequent meetings were also held in Lilongwe to gain support for the proposal. The present proposal for the MSP is the main output of the PPG.



## 2.2. Global significance

- 7 Because of its varied topography and range of habitats, this relatively small country has high levels of biodiversity and endemism. Lake Malawi, a UNESCO World Heritage Site, is home to more than 1,000 fish species, nearly 90% of which are endemic, including an amazing diversity of cichlids. Of the 172 species of molluscs found in Malawi, 47 species are endemic, and the country has 12 species of reptiles and 7 species of amphibians found nowhere else in the world. Of the approximately 6,000 plant species present in Malawi, 14 species are considered to be endangered, 89 vulnerable, and 25 critically endangered. Malawi also harbors 648 species of birds; 456 of these are resident and a further 94 are intra-African migrants of regular occurrence. The greatest diversity of bird species are in Malawi's protected areas and the country also has identified 22 Important Bird Areas (IBAs).
- 8 Malawi's system of PA's includes five NPs, four Wildlife Reserves, and 88 Forest Reserves (FRs), which together occupy an area of 2,018,198 ha (CBD, 2010) about 21% of Malawi's land area. The protected area system is a key element in Malawi's efforts to conserve biodiversity, but increased development and a proliferation of invasive species in adjoining areas are resulting in increased encroachment into PAs by people and associated invasive plants and animals. The large rural population, which is growing at 3.3% per annum, is putting increased pressure on the natural resource base, including the PAs, which has already resulted in significant deforestation and land degradation, disturbances which drive plant invasions. Loss of biodiversity and unsustainable land-use practices have also led to increased pesticide use, contributing to increased chemical pollution from agricultural run-off. PAs with high levels of biodiversity such as Nyika NP (NNP) and Mount Mulanje Forest Reserve (MMFR) have already been invaded by a large number of invasive plants such as *Pteridium aquilinum*, *Rubus* spp., *Lantana camara*, *Acacia mearnsii*, *A. melanoxylon*, and *Pinus* spp. Although *P. aquilinum* is considered to be native it has proliferated, probably as a result of climate change and changes in fire frequencies and intensities, to the detriment of biodiversity. In fact it is well known that the presence of invasive plant species increases the frequency and intensity of fires. The proposed MSP will establish pilot sites in two PAs: NNP and MMFR.
- 9 Nyika NP (Figure 1; 10°40'S; 33°50'E), one of the pilot sites, has high levels of biodiversity and endemism. The Nyika plateau is part of the Eastern Afromontane Biodiversity Hotspot, which encompasses several widely scattered but biogeographically similar mountain ranges in eastern Africa. Endemism levels in the hotspot are high, with 31% of plants, 21% of mammals, 30% of reptiles, 30% of amphibians, and 69% of fish occurring nowhere else in the world. The Nyika Plateau supports more than 215 orchid species, of which four species and two subspecies are thought to be endemic. A total of 1,927 plant species and subspecies have been identified in NNP, of which 33 are endemics only found in the park and a further 13 are considered near-endemics. The NP harbours globally significant mammals such as Leopard (*Panthera pardus*), Common Eland (*Tragelaphus oryx*) (LR/cd), Roan Antelope (*Hippotragus equinus*) (LR/cd), and Southern Reedbuck (*Redunca arundinum*) (LR/cd). Nyika's butterfly fauna is the richest in Malawi, with some 120 of the 200 species present in the country. Over 420 species of birds have been recorded in the park. Nyika has increasing problems with a number of IAS including various *Rubus* spp., *Pinus patula*, *Acacia mearnsii*, *A. melanoxylon*, and *Pteridium aquilinum* in the highland while species such as *Mimosa diplotricha*, *Hyptis suaveolens* and *Lantana camara* are abundant in the foothills as discussed in

further detail in Appendix 15. There has been some clearing of *P. patula* and limited trials to determine best management practices for *P. aquilinum* in the past.

- 10 Another pilot site, Mount Mulanje Forest Reserve (Figure 1; 15°55'S; 35°38'E) is the highest massif in the country, located in the southeast near the border with Mozambique. The MMFR occupies 60,000 hectares, including montane grassland and shrubland, small patches of *Widdringtonia* cedar forest, and lowland, mid-altitude and montane rainforest. The Reserve provides important habitat for numerous bird species, and it is the most important centre of plant endemism in Malawi. The high altitude zone includes the endemic plant species *Aloeachele oreogena*, *Aloe arborescense*, *Aloe mawii*, *Helichrysum whyteanum* (Whyte's everlasting sunflower) and *Xerophytica splendens* (Stag horn lily) while the plateau grassland zone contains many temperate species, including *Erica johnstonia* and *Morea schimperi* (Mulanje Iris) both of which are endemic. In all there are over 1,100 species in Mulanje/Michesi of which 57 are strict endemics including one subspecies and four varieties. These include four endemic forest trees: *Widdringtonia whytei* (Mulanje cedar), *Rawsonia burtt-davyi*, *Pyrostria chapmanii* and *Vepris elegantissima*. Seven of the bird species recorded are endemic or near endemic. There are 14 endemic reptile species and 4 near endemics. The number of invertebrate species is estimated between 25,000 and 30,000. There are 60 species of snails (8 endemics), 10 of slugs, 22 of dragonflies, 233 of butterflies (11 endemics or near endemics), and 145 of beetles (7 endemics or near endemics). Mount Mulanje is the only known locality in Malawi for the rodent *Aethomys namaquensis*. Due to its species richness and high levels of endemism, Mt. Mulanje was identified by the World Wildlife Fund as one of 200 global ecoregions in the world for the conservation of biodiversity, and designated as an Afromontane Regional Centre of Endemism, and recommended for UNESCO World Heritage Site status. Harmful invasive species such as *Rubus ellipticus*, *Pinus patula*, and *Pteridium aquilinum* are impacting on biodiversity at higher elevations while species such as *Tithonia diversifolia*, *Mimosa diplotricha*, *Dolichandra unguis-cati*, *Argemone* species, *Lantana camara* and others are abundant in the foothills. Some clearing of *P. patula* has been undertaken in the past with some trials for the control of *P. aquilinum*, as discussed in more detail in Appendix 15.

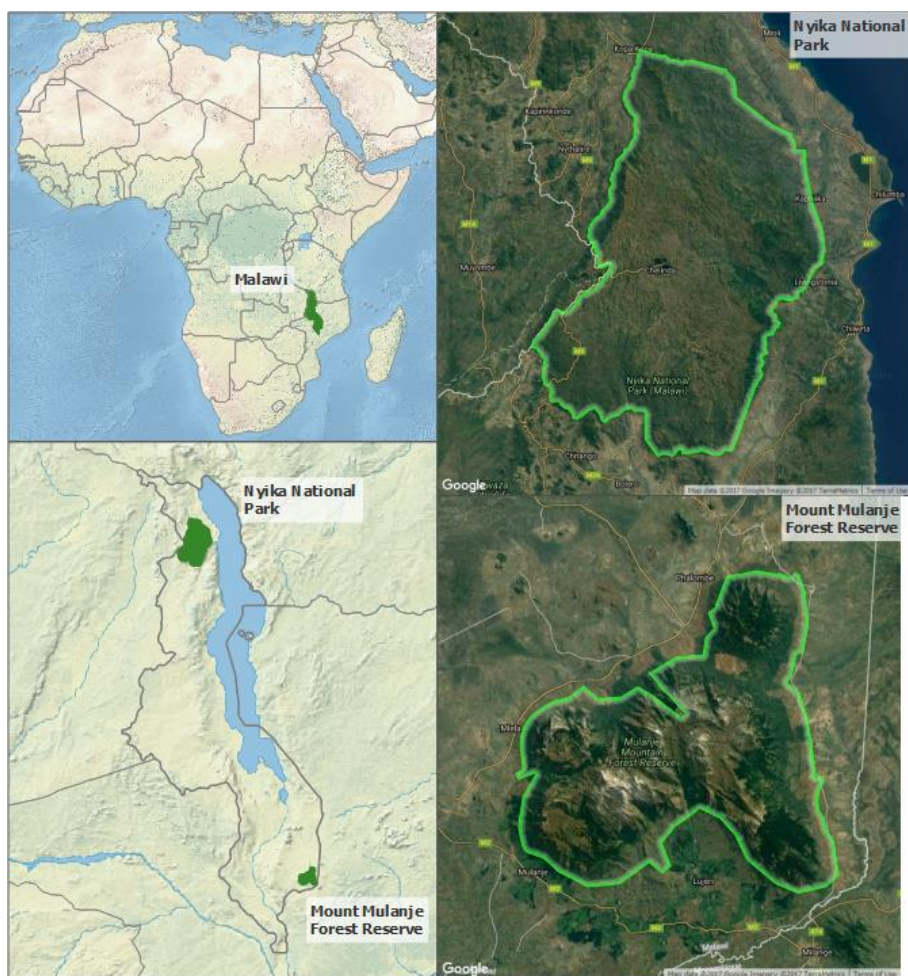


Figure 1. Map showing the location of Malawi within Africa and the locality of Nyika NP and Mount Mulanje FR within the country, including detailed maps of the two protected areas

## 2.3. Threats, root causes and barrier analysis

### 2.3.1 Threats due to invasive alien species and their root causes

#### Impact on water resources

- 11 Protected areas provide a myriad of goods and services to adjoining communities, the country and the region as a whole. Both of the pilot sites are important water towers, which have increasing relevance for agricultural resilience due to the effects of climate change over the past years which has contributed to the increasing frequency and intensity of droughts. In fact the name, Nyika, means "where the water comes from". The Nyika Plateau is a major water catchment and sponge area for both Lake Malawi and the Luangwa River. The Chire/Luwumba, a major tributary of the Luangwa rises on the Zambian Nyika, and four rivers that are responsible for providing water to a large part of the Northern region of Malawi also rise on the Nyika. At 3000 m altitude, Mount Mulanje is high enough to disturb upper level air flow and induce rain clouds to form around it, making it an important source of rain water at the head of almost every river that runs through the south of Malawi: nine large rivers and hundreds of streams supply water to communities below and beyond the reserve. Although nine perennial rivers serve

the Mulanje and Phalombe districts, local communities have observed that some of these rivers no longer flow consistently throughout the year (Nangoma and Nangoma, undated). In the Phalombe district, the Phalombe and Sombani rivers drain into Lake Chilwa Wetland, an important Ramsar site. Several tributaries of the Sombani river, flowing from the northern slopes of the massif, carry water for the greater part of the year. Other major rivers include the Thuchila, Likhubula, Muloza, Ruu, Lichenya, Lujeri and Nanchidwa. All communities depend on this water supply, which they mainly use for crop irrigation and household use.

- 12 However, the provision of water is threatened by plant invasions within these catchments. Several invasive species found in the watersheds of Malawi, including NNP and MMFR, such as *Acacia mearnsii*, *A. melanoxylon*, *Pinus patula*, and *Eucalyptus* spp. are known to have an adverse impact on similar watersheds elsewhere in southern Africa. For example, in South Africa's Mpumalanga Province, the replacement of grassland catchment areas with pines and *Eucalyptus* spp. led, within 6–12 years, to the drying up of streams (van Lill et al., 1980). There, removal of dense stands of pines and wattles (*Acacia mearnsii*) from river banks has resulted in a 120% increase in stream-flows (Dye and Poulter, 1995). Losses in water runoff in South Africa, attributed to infestations of *A. mearnsii*, amount to an estimated 577 million m<sup>3</sup> of water annually (Versfeld et al., 1998). *A. mearnsii* is also considered to be the “most aggressive invader” of stream banks, forest margins and miombo woodlands above 1,600 metres above sea level in the mist belts of the eastern highlands of Zimbabwe. Other studies in South Africa have found that pine plantations on the Drakensberg in KwaZulu-Natal, South Africa, have reduced stream flows by 82% (Bosch, 1979), while in the Western Cape stream-flows from invaded fynbos water catchments have declined by 55%.

#### **Loss of tourism revenue**

- 13 The 2,500 meter high Nyika Plateau contains leopard, roan, eland and elephant as well as Africa's richest orchid communities and a number of endemic plant and bird species. MMFR also has high levels of biodiversity. Additionally, these areas constitute some of the last remaining areas of natural habitat and unrivalled beauty within Malawi. These nature-based attractions draw tourists from around the world. However, much of this biodiversity and natural beauty is affected as a result of plant invasions, potentially reducing tourism numbers with an associated negative impact on surrounding communities that benefit from tourists.

#### **Loss of species at higher trophic levels (iconic species)**

- 14 According to Vilá et al. (2011), invasive plants decrease species diversity and abundance by ca. 51% and ca. 44%, respectively, also reducing fitness and growth of native plant species by ca. 42 and 22%, respectively. By reducing native species diversity, abundance, fitness and distribution and by altering community structure alien invasive plant species have a significant impact on ecosystem services (Hulme, 2006; Gabbard and Fowler, 2007; Hickman et al., 2010). The loss of plant species or changes in vegetation structure, as a result of plant invasions, may have cascading trophic effects (Sakai et al., 2001), especially on other species at higher trophic levels. For example, alien plant species have been reported to decrease animal fitness and abundance both by ca. 17% (Vilá et al., 2011). By altering community structure invasive plant species may also act as ecosystem engineers or transformers (Jones et al., 1997), affecting a multitude of other organisms (Maerz et al., 2005; Brown et al., 2006; Canhoto and Laranjeira, 2007).

- 15 Perre *et al.* (2011) found that exotic species supported a small subset of the herbivore assemblage found on native plants. In a study in forests in the Azores, species richness of plants and insects declined in invaded areas with a dramatic decrease in insect biomass (Heleno *et al.*, 2008). A meta-analysis of 56 studies found that invaded habitats had 29% fewer arthropods and 17% lower diversity as compared to uninvaded habitats (van Hengstum *et al.*, 2014). Riparian sites in the United Kingdom, invaded by Japanese knotweed, supported fewer plant species and had lower abundance, morphospecific richness and biomass of invertebrates, as compared to native grassland or shrub-dominated plots (Gerber *et al.*, 2008). Also in the United Kingdom, the foliage community of plots invaded by Himalayan balsam had 64 and 58% less beetle (Coleoptera) and true bug (Heteroptera) species than uninvaded plots, respectively (Tanner *et al.*, 2013). Many of these impacts on invertebrates are not necessarily as a result of invasive plants being unsuitable as a food source for a host of native organisms, but also because they bring about changes in the composition and structure of the vegetation.
- 16 A reduction in insect quality and quantity can have significant consequences for those taxa at higher trophic levels such as predatory invertebrates, amphibians, reptiles, birds and mammals (Scheiman *et al.*, 2003; Flanders, 2006; Capinera, 2010). Maerz *et al.* (2005) found that green frogs (*Lithobates clamitans* Latreille; Ranidae) gained less mass along transects from areas of native vegetation into areas invaded by Japanese knotweed given a decrease in insect abundance as a result of the plant invasion. The black legless lizard (*Anniella pulchra nigra* Gray; Anniellidae) is now threatened, partly due to a decrease in its natural prey base, mainly insects, as a result of the invasion by the invasive succulent pig face [*Carpobrotus edulis* (L.) N.E. Br; Aizoaceae] on sand dunes in the USA (Rutherford and Rorabaugh, 1995). Amphibian species richness and evenness were lower in forest plots with high densities of the invasive shrub Amur honeysuckle [*Lonicera maackii* (Rupr.) Maxim; Caprifoliaceae]. This was probably as a result of the fact that mean daily maximum and mean temperatures were lower in invaded plots, demonstrating how changes in vegetation structure can influence microclimate, resulting in knock-on impacts on other species. Field observations of reptiles in a habitat invaded by rubber vine (*Cryptostegia grandiflora* Roxb. Ex R.Br; Asclepiadaceae) in Australia recorded only a single lizard as compared with 131 lizards in nearby native vegetation (Valentine *et al.*, 2006). Fewer reptiles were also recorded in areas invaded by giant sensitive plant (Braithwaite *et al.*, 1989) while fewer insects, reptiles and birds were found in areas dominated by Athel pine [*Tamarix aphylla* (L.) Karst.; Tamaricaceae] in Australia (Griffin *et al.* 1989).
- 17 In Africa, various bird guilds were also negatively impacted by the invasive shrub/tree honey mesquite (*Prosopis glandulosa* Torr.; Fabaceae). Dense *Prosopis* species woodlands had less herbaceous understorey cover than the uninvaded *Acacia* woodlands, while the latter was also botanically more diverse (Dean *et al.*, 2002). Bird communities in native woodlands were also consistently more species-rich and more diverse with fewer frugivores and insectivores recorded in areas dominated by *Prosopis* species (Dean *et al.*, 2002). Shanungu (2009) only recorded 24 bird species in areas dominated by the giant sensitive plant in Lochinvar National Park, Zambia, compared to 46 species in uninvaded areas. Negative impacts on birds may be as a result of changes in vegetation structure or decreases in the amount of insects associated with the introduced species.

- 18 Plant invasions are also known to have significant impacts on iconic mammal species. For example, *Mikania micrantha* Kunth (Asteraceae) invasions in Chitwan National Park are considered to be one of the main factors threatening the continued survival of the Greater one-horned rhino (*Rhinoceros unicornis* L., Rhinocertidae). In Lochinvar National Park, Zambia, *Mimosa pigra* invasions have contributed to a significant decline of the endemic and endangered Kafue lechwe, *Kobus leche* ssp. *kafuensis* (Bovidae). An isolated population of the endangered Grevy's zebra (*Equus grevyi* Oustalet, Equidae) in Ethiopia is threatened by *Prosopis* spp. invasions which have reduced the understorey basal grass cover from 68 to 2% and lowered the number of grass species from 7 to 2. The Western lowland gorilla (*Gorilla gorilla gorilla* Savage, Hominidae), which feeds predominantly on species in the ginger family (Zingiberaceae) is threatened by invasions of *Chromolaena odorata* (L.) R.M. King & H. Rob (Asteraceae). In Camp-Ma'an NP in Cameroon, chromolaena has reduced the cover of this important food source for gorillas by over 95% (van der Hoeven and Prins, 2007). In the Hluhluwe-Imfolozi Park in South Africa chromolaena invasions significantly affected habitat selection by buffalo, wildebeest, giraffe, zebra, and warthog (Rozen-Rechels *et al.*, 2017).

### **Reduction in pollinators**

- 19 Farming communities living adjacent to PAs are dependent on bees and other pollinators. Crops such as coffee, potatoes, pigeon peas, tomatoes and sunflower are all pollinated by bees and grown in areas adjacent to MMFR and NNP. It is well recognized that native bee communities are strongly dependent on the proportion of natural habitat within any given area. In addition, access to a rich diversity of flowering plants is very important for the development of honey bee colonies. Displacement of a variety of native species by invasive plants ultimately leads to the development of large monospecific stands of a single invasive plant, to the detriment of pollinator populations. The displacement of food plants for moths by invasive plants may also lead to declines in crop pollination.

### **Decrease in natural pest control capacity**

- 20 In agricultural systems, pest control problems may be exacerbated by biodiversity loss. Habitat conversion results in the reduction or loss of the natural enemies of pests. This loss of natural enemies can be significant in farming communities that may not have access to other more costly pest control interventions. Plant invasions reduce the diversity and abundance of native plant species which results in a reduction in the diversity and abundance of natural enemies of pests (see above for more information of invasive plants on insect abundant and diversity). Managing IAS and in so doing retaining biodiversity can therefore contribute to the natural control of some crop pests.

### **Contributing to land degradation and poverty**

- 21 The Rumphi District in which much of NNP falls is one of the poorest areas in Malawi. Only about 40% of the land around the NNP is suitable for agriculture. Land shortage and food insecurity are underlying causal factors of deforestation (NNP Master Plan, 2004). Bad agricultural practices such as the "cultivation of steep slopes without implementation of any conservation measures, poor ridge

alignment, stream bank cultivation, short return periods of shifting cultivation, mono-cropping and continuous growing of the same crops are all leading to accelerated soil loss and declining soil fertility” (NNP Master Plan, 2004). Food and livestock production is further curtailed by the presence of a number of invasive plants (*Lantana camara*, *Pteridium aquilinum*, *Mimosa diplotricha*, *Striga asiatica*) and introduced crop pests (*Tuta absoluta*, *Spodoptera frugiperda*, *Chilo partellus*) leading many smallholder farmers, who struggle to make a living off the land, to turn to the NP to make ends meet. These activities may include poaching and deforestation. The Mulanje and neighbouring Phalombe Districts have a high population density of, on average, 185 people per square kilometer with high rates of poverty and illiteracy (Nangoma and Nangoma, undated). Many locals practice subsistence farming on less than 0.1 hectares of land. Poverty is further exacerbated by the presence of IAS, many of which are shared with communities around MMFR. People living near the FR boundaries supplement their meagre income by harvesting and selling forest products including honey, fruit, wild vegetables, medicinal plants, mushrooms and some wildlife (Nangoma and Nangoma, undated). Extraction of wood for fuel and charcoal production is also common.

- 22 Unsustainable utilization of resources in these PA's is contributing to land degradation, driving plant invasions. These invasions will not only result in a reduction in the availability of non-timber forest products but also reduce the abundance of pollinators and natural enemies of crop pests, leading to a further decrease in yields and an associated increase in pesticide use. A reduction in available grazing outside of PAs as a result of invasive plants may also force farmers to seek forage elsewhere, often within PAs. This often drives human-wildlife conflict, especially if there are predators within the PA. This is already occurring in the Masai-Mara National Reserve, Kenya, where pastoralists are taking their livestock into the PA for grazing and poisoning predators. The lack of grazing in adjoining areas, as a result of overgrazing and invasive species is driving this (Witt et al. 2017). Increasing encroachment of PAs will lead to a reduction in the ecosystem goods and services they provide, especially the provision of water, leading to serious negative downstream impacts.
- 23 These threats posed by invasive alien species to biodiversity conservation, agriculture and food security, as well as various other sectors like tourism and water services, are as a result of a number of root causes:

**Root causes: Increased pathway activities**

- 24 The IAS threatening the unique biodiversity of Malawi are being introduced at an increasing rate through trade, travel (tourism) and transport - the infamous “three Ts”, the major drivers of biological invasion. The risk of such introductions, intentional or accidental, is growing rapidly as a result of globalization. The introduction of plants for agriculture, silviculture, soil improvement and amenity, including gardening, is increasing, as is the intentional importation of fish for aquaculture, including the aquarium and pet trades.
- 25 Trade routes in the form of road and rail and associated transport are the major pathways and vectors for IAS into Malawi. South Africa is by far the main source of Malawi's imports representing 39.9% of total imports, followed by Zimbabwe (6.5%), United Kingdom (5.3%), Mozambique (5.3%) and the United States (3.7%). Food items including agricultural products constitute the bulk of imports from South Africa and Zimbabwe. This poses a significant threat as South Africa has the highest recorded number of invasive alien plants in Africa, closely followed



by Zimbabwe. Surveys have already revealed that Malawi shares many invasive plants that are already widespread throughout much of South Africa. Imports of cereals from Mozambique are also increasing, another possible source of IAS. In fact imports into Malawi during the last five years have increased at an annualized rate of 0.8%, from US\$2.21 billion in 2010 to US\$2.29 billion in 2015. Infrastructure development can also contribute to plant invasions. The development of the road between Tanzania and Malawi led to the introduction of the invasive plant *Mimosa diplotricha* into northern Malawi, the seeds a possible contaminant of construction equipment.

- 26 Tourism is an important sector in Malawi with tourist numbers increasing year on year. In 2014 tourism contributed 8% to GDP with a vision to increase it to 13% by 2018. This will largely be driven by eco-tourism, facilitate by the upgrading of NPs such as Nkhotakota, Liwonde and Majete through a public-private partnership agreement with the Africa Parks Foundation. With thousands of tourists visiting Malawi every year and a lack of adequate information services and screening procedures at airports and land borders, the risk of both accidental and intentional introductions is significant.
- 27 Many invasive species will also spread or move naturally from one country to the next facilitated by wind, water and animal vectors. In addition, there are various initiatives to develop transboundary protected areas such as the Nyika-Vwaza TFCA which may contribute to the undetected natural movement of invasive species from one country to the next along disturbed areas (corridors) such as park roads, jeep tracks, and fire breaks as well as natural corridors in terrestrial ecosystems such as streams and rivers. The management of these transboundary protected areas face several constraints. These may include, among others, political conflicts, lack of collaboration, differences in relevant national legislation, and variable levels of authority. The effective management of IAS by all the management authorities is critical.

#### **Root causes: Climate Change**

- 28 The impacts of climate change in Malawi are being manifested in various ways including intense rainfall, changing rainfall patterns, floods, and prolonged dry spells. An increase in temperatures and intense rain in Malawi over the past 40 years has led to both drought and flooding, resulting in shorter growing seasons, poor crop yields, food shortages, hunger and the spread of disease in a country where 29% of people already now live in extreme poverty.
- 29 Although not based on direct field evidence from Malawi, examples from elsewhere show that an increase in extreme weather events as a result of climate change will facilitate invasions. For example, extensive fires in West Africa in the 1980s during extremely dry years contributed to the proliferation of invasive species such as paper mulberry (*Broussonetia papyrifera*) which took advantage of an increase in the size of forest gaps and reduced competition from native species. Some invasive plants such as *Chromolaena odorata*, which is common in west, central and southern Africa, have high levels of oil in the dry pithy stems and leaves and as a result rapidly spread fires. The ability of chromolaena to invade forest edges and gaps results in fires being carried well into relatively undisturbed forests and woodlands, further depleting native biodiversity. Climate change may also be benefitting the proliferation of *Pteridium aquilinum* in both NNP and MMFR and in the process driving fires, to the detriment of floral diversity.

- 30 Increases in severe weather events such as cyclones, hurricanes, floods, and droughts will create conditions suitable for the establishment and subsequent spread of invasive species. Increased disturbance will reduce resistance in recipient communities and create enemy-free sites for the establishment of invasive plants. The spectacular success of *Miconia calvescens* in Tahiti is often attributed to the six hurricanes that hit the Society Islands between December 1982 and April 1983. Reports suggested that the cyclones explained the ‘demographic explosion of miconia’, and that ‘the speed of the invasion then became astonishing’. Similarly, invasive species in rainforests in Queensland, Australia capitalized to a greater extent than native species on the disturbance created by Cyclone Larry; and after the major tsunami in SE Asia in 2004, Sri Lanka witnessed a significant expansion of cactus (*Opuntia stricta*), mesquite (*Prosopis juliflora*), lantana (*Lantana camara*) and chromolaena in degraded coastal areas, as well as of water hyacinth (*Eichhornia crassipes*) and cattails (*Typha angustifolia*) in lagoons and estuaries.
- 31 Some invasive plant species will also benefit from higher carbon dioxide levels and temperatures (Kriticos and Filmer, 2007). For example, the invasive shrub *Acacia nilotica*, in Australia, is likely to benefit from increases in water-use efficiency as a result of increased CO<sub>2</sub> concentrations, allowing it to invade drier sites, while increased temperatures will allow it to complete its reproductive life cycle in areas which are currently too cool to sustain populations (Kriticos et al., 2003). Invasive species in Africa, such as *Prosopis juliflora*, will also benefit from increased carbon dioxide levels, allowing them to invade more arid areas.

#### **Root causes: Extreme vulnerability of Malawi**

- 32 Malawi is a land-locked country, surrounded by Mozambique, Zambia, and Tanzania. An invasive animal or plant species introduced into a neighbouring country within the region is likely to spread into Malawi. For example countries neighbouring Malawi, such as Tanzania, could easily be a source as well as a pathway for new IAS invasions into Malawi through their connected ecosystems, cross border trade and human migration, since hundreds of IAS are already recorded in neighbouring countries.
- 33 Rapid population growth coupled with high levels of poverty has contributed to the rapid depletion of natural resources, making Malawi very vulnerable to environmental perturbations which increase susceptibility to biological invasions. Most of the population is dependent on natural resources for their survival, putting considerable pressure on the environment and ecosystems, which are also particularly susceptible to climate change. A very strong factor contributing to the spread of IAS in Malawi and the region as a whole is the massive conversion of natural habitats to other uses. Increased disturbance and land degradation are major drivers of plant invasions. For example, between 1990 and 2000, Tanzania lost an average of 412,300 hectares of forest per year. This amounts to an average annual deforestation rate of 0.99%. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the period 1990-2005, Zambia lost 14.3% of its forest and woodland habitat. Over the same period, Malawi itself lost 12.7% of its forest cover, or around 494,000 hectares. Much of this land has now been invaded and has become a source for further invasions throughout the region.
- 34 Ninety percent of Malawi’s estimated population of 11 million people live in rural areas; most are small-scale farmers growing maize, millet and cassava as well as groundnuts, tobacco, cotton, tea and coffee. The population density varies from less than 25 people/km<sup>2</sup> in some northern areas, to more than 500 people/km<sup>2</sup> in parts of

the central and southern areas. This large rural population, which is growing at 3.3% per annum, is putting increased pressure on the natural resource base, including PAs, which cover about 21% of Malawi's land area. This land pressure has already resulted in significant deforestation and land degradation, disturbances which continue to drive invasions of among others, *Lantana camara*, *Tithonia* spp., *Mimosa diplotricha* and *Hyptis suaveolens*.

Productive lands are frequently subject to land degradation from human activities such as unsustainable agriculture and livestock grazing, overharvesting of forests, etc., which makes them more vulnerable to IAS, as healthy ecosystems are generally more resilient to plant invasions. As IAS establish and spread in degraded productive lands, reductions in crop yields and pasture production due to IAS impacts will increase the reliance of local communities on resources within PAs. It is important to note that IAS have a significant impact on ecosystem services, on which millions of Malawians depend. For example, the estimated value of ecosystem services in South Africa was estimated to be in the region of ZAR 152 billion annually of which an estimated ZAR 6.5 billion was lost to invading alien plants (de Lange *et al.*, 2010). However, without any control this would have amounted to an estimated ZAR 41.7 billion.

### 2.3.2 Barriers

#### Insufficient baseline data

- 35 Information resources on biodiversity in general and IAS in particular are very limited in Malawi. Malawi has comprehensive lists of mammals and birds, but there is no comprehensive database or list of IAS, especially invasive alien plants, present in Malawi, and virtually no information on their distribution and impacts. For the most part, knowledge of IAS is based on anecdotal evidence or unpublished reports, and the understanding of IAS impacts is limited by a lack of technical information, as well as a failure to understand the potential damage to ecosystem services and functioning caused by IAS, and the consequent economic losses and possible hazards to human health.
- 36 Introduced species can benefit communities but at the same time they frequently threaten ecosystem services and functions as well as the economic activities of other communities/ stakeholders. Malawi has undertaken almost no analyses of the costs associated with the negative impacts of IAS, especially 'conflict' species, and the benefits that accrue from their use. To date it has always been assumed that their benefits outweigh their costs, with no scientific assessment ever being undertaken. This applies specifically to species that have been intentionally introduced for nitrogen fixation, animal fodder and fuelwood in agricultural systems. Furthermore, without clear information on the economic and human costs of IAS, it is not possible to prioritize species for action or to develop and implement national management strategies, especially with regard to early detection and rapid response. Other results of this lack of knowledge include unwillingness among policy makers to interfere in the commerce and trade of exotic species, especially if they are reaping financial benefits from this trade; and the failure of PA managers to prevent and control IAS in the areas they manage.
- 37 The weak policy and institutional environment for IAS management in Malawi means that critical information needed for informed decision-making is not widely shared among national stakeholders and therefore does not inform decision-making. Few of the senior managers responsible for PA system planning and management have extensive knowledge of IAS, and as a result, PAs in general have demonstrated little willingness to act in dealing effectively with IAS threats

and impacts. Although many people in Malawi, including the inhabitants of agricultural areas adjoining PAs, have been impacted by a number of IAS and recognize the threat they pose, they don't have the knowledge or means to manage them effectively and sustainably. In many cases this leads to the over-use of chemicals to the detriment of biodiversity and human health.

### **Insufficient stakeholder involvement and coordination**

- 38 The multisectoral nature of IAS issues demands the involvement of governmental and non-governmental agencies, as well as a broad range of stakeholders from the private sector and general public. This requires superior communication and coordination. This is supported by the NBSAP (2015-2025) which states explicitly that all stakeholders need to be involved in order to effectively address IAS in Malawi including the Ministry of Natural Resources, Energy and Mining (MoNREM); Ministry of Agriculture, Irrigation and Water Development (MoAIWD); National Herbarium and Botanical Gardens of Malawi (HBGM); Ministry of Information, Tourism and Culture; Forestry Research Institute of Malawi (FRIM); NGOs, CSOs, Academia; and Local Communities.
- 39 IAS effect biodiversity, tourism, crop and pasture production, human and animal health, hydro-electricity generation; water resources, trade, and a host of other sectors. This would imply that key line agencies such as the MoNREM (biodiversity and hydro-electricity generation); Ministry of Industry, Trade and Tourism (tourism and trade); MoAIWD (agriculture including livestock health and water); Ministry of Health (human health); Ministry of Local Government and Rural Development; Ministry of Foreign Affairs and International Cooperation (management of transboundary pests); NGOs; and other agencies such as the MMCT, NVT, Peace Parks Foundation (PPF) and Africa Parks Foundation (APF) coordinate their work on containing the spread and reducing the impacts of invasive species. However, this rarely happens, even at local level. This is exacerbated by the fact that the so-called 'conflict' species, that is species which have costs in terms of negative impacts and benefits associated with their use, may be promoted by one agency whilst impacting negatively on one or more sectors, which often complicates coordination and swift action. The private companies involved in growing and promoting agro-forestry species, and those importing exotic species such as the pet-shop and horticultural industries, also need to be involved.
- 40 Malawi is a signatory to the IPPC which is mandated to address issues pertaining to food security, trade facilitation, environment protection and capacity development. Plant Protection Services falls under the Ministry of Agriculture, Irrigation and Water Development and they are obliged, as a signatory to the IPPC, to undertake certain activities which include "the conservation or protection of natural ecosystems; and the protection of food security, improved livelihoods and sustainable plant production through the protection of the environment and biodiversity in both natural and agricultural production systems." They are also required to submit regular reports to the IPPC including lists of regulated pests and pest status. According to the IPPC website there are no reports from Malawi on regulated pests, and there are only pest reports for the Fall armyworm (*Spodoptera frugiperda*) and the Tomato leafminer (*Tuta absoluta*). There are no formal reports on any other IAS in Malawi, including environmental weeds or exotic plants affecting crop production; informal and personal records indicate that several other IAS, including crop pests, are present in Malawi. Although the Ministry is involved in pest management it is biased towards crop pests. In fact the Plant Protection Act is mainly concerned with the introduction of pests that may impact crop

production, with little emphasis on preventing the introduction of invasive or potentially invasive plants.

- 41 The Ministry of Natural Resources, Energy and Mining is responsible for the management of IAS in the natural environment. The Department of National Parks and Wildlife (DNPW) has been working with NGOs and other agencies to manage IAS in some PAs. For example, the DNPW worked closely with the Nyika-Vwaza Trust (NVT) in NNP on IAS management, while the Forestry Department and the Museum of Malawi collaborated with the MMCT on the control of IAS. The Electricity Supply Corporation of Malawi Limited (ESCOM) has been involved in a number of projects on the control of water hyacinth, especially on the Shire River.
- 42 The Government of Malawi is cognizant of its shortcomings with regard to IAS management, and has identified a number of gaps, overlaps and inconsistencies in existing policies, regulations, strategies, and institutional arrangements related to IAS in the country. One critical issue is that Malawi does not have a single institution that is primarily responsible for dealing with IAS issues. Other countries have addressed this by establishing a Biosecurity Agency.
- 43 The lack of clear institutional ownership or an overarching policy on IAS has led to ineffective coordination amongst various agencies, especially those in agriculture, forestry and the environment, and often leads to conflicting recommendations made by different agencies and institutions that constrain the government's ability to generate a unified response to IAS control. For example, the Forestry Department may advocate and promote the introduction of agro-forestry species that are, or have the potential to become, invasive. In South Africa the Australian wattle, *Acacia mearnsii*, was actively promoted for agro-forestry but it is now considered to be one of the most costly invasive species. A cost-benefit analysis has indicated that the costs of this invasive tree outweigh the benefits that accrue from its use. The same species has been intentionally introduced to Malawi. Similarly, *Prosopis juliflora* has been actively promoted by various fishers on the edge of Lake Malawi where it is used to smoke and cook fish. However, *prosopis* is known to be extremely invasive reducing biodiversity, depleting water resources and impacting on human and animal health. In an attempt to promote protein production, various Fisheries Departments around Africa and elsewhere, have promoted the introduction of exotic fish. In most cases these fish have become invasive to the detriment of biodiversity. There is increasing pressure on the Fisheries Department in Malawi to introduce exotic fish species which will threaten many of the endemic cichlids in Lake Malawi if they were to establish there. These issues can be dealt with if there is an overarching policy with effective coordination. Even Malawi's more general efforts at biodiversity conservation are carried out without a comprehensive structural and legal framework, apart the guidance provided by the NBSAP.
- 44 In order to address this issue the GoM will establish the MEPA under the EMA of 2017. MEPA will be the "principal agency for the protection and management of the environment and sustainable utilization of natural resources". More importantly it will be mandated to "coordinate, monitor, supervise, and consult with all relevant stakeholders on all activities relating to the utilization and management of the environment and natural resources." It is also required to "facilitate co-operation between the Government, local authorities, private sector and the public" and should "promote international and regional co-operation in the protection and management of the environment." It is hoped that MEPA will provide the

coordination required to manage IAS in Malawi: see Section 2.4, ‘National Policies’.

### **Low IAS management capacity**

- 45 IAS management requires effective institutional, human and physical resources that are often unavailable in developing countries, including Malawi.
- 46 Another ubiquitous problem in Malawi is that many of the most competent professionals are required to take on multiple responsibilities, with substantial commitments to two or more jobs. As IAS are not yet a high priority for politicians and other national decision makers, they are rarely a budgeting or operational priority for assigning technical staff, particularly related to those invasive species still absent from the national territory. Thus preventative measures, the most cost-effective IAS management approach, are de-prioritised and not actively promoted in Malawi.
- 47 Another cost-effective management option, biological control, is also under-utilised, due mainly to a lack of knowledge and understanding of plant-insect/mite/pathogen interactions, as well as a perceived notion, especially among those active in the environment sector, that biological control is unsafe despite ample scientific evidence to the contrary (see Appendix 17). Biocontrol has been widely used in many developed countries as an important component of an integrated pest management strategy: it has been demonstrated that host-specific and damaging agents provide the most cost-effective, safe, and sustainable solution to IAS management. Biocontrol is especially suited to countries that do not have significant resources for chemical and mechanical control; decision-makers in these countries need more exposure to successful examples of biocontrol, and evidence of its cost-effectiveness.
- 48 Implementation of IAS prevention and control strategies in Malawi, specifically in PA landscapes, is inadequate to support the conservation of biodiversity and the maintenance of ecosystem services and functions. For example, the NNP Master Plan (2004) states that staff “require onsite training in control techniques”. Additionally, PA management plans do not incorporate specifics related to IAS prevention and control. For example, the GoM takes precautions with regard to the intentional and unintentional introduction of pests under the Plant Protection Act, but it is mainly concerned with those that pose a risk to agriculture and human health rather than those that may threaten biodiversity. Malawi does not have adequate systems in place to monitor or detect new invasions, or to take effective steps to manage them, except in the case of some agricultural pests. Control programs for well-established and widespread IAS are also often inadequate, mainly owing to lack of information, capacity and resources relating to the methodologies for management (mechanical/manual, chemical, biological and restoration). Shortages of institutional, human and physical resources all limit Malawi’s ability to address IAS effectively.
- 49 There have been some efforts to manage invasive plants in MMFR and NNP which has resulted in the development of some capacity but management of target species has not been sustained.

## **2.4. Institutional, sectoral and policy context**

### **Multilateral Environmental Agreements**

- 50 Since IAS introductions are international in character, the development of an international legislative framework through global, regional and/or bilateral

agreements is necessary to prevent or minimise unwanted introductions and provide mechanisms for eradication or control. Nearly fifty internationally agreed legal instruments or guidelines deal with some aspect of the introduction, control, and eradication of IAS; yet unilateral action by a few countries can never be enough to prevent unwanted introductions. Cooperation is therefore essential at all jurisdictional levels. This is one of the goals of Multilateral Environmental Agreements (MEAs).

- 51 Generally, participation in relevant MEAs in Malawi is good. Internationally agreed instruments may be binding or non-binding. The CBD, with 191 states becoming parties, including Malawi, since the text was adopted in 1992, is the only globally applicable, legally binding instrument to address IAS prevention, control and eradication across all biological taxa and ecosystems. Malawi is also a signatory to the IPPC, which provides a framework for international cooperation to prevent the introduction of pests of plants, which include invasive plants, and plant products and to promote appropriate measures for their control. In 1997 the IPPC was revised to provide for the development of International Phytosanitary Standards (ISPMs) which are recognised within the multilateral trading system. ISPMs are not binding per se on World Trade Organization (WTO) members, but Members who do not comply with available standards must base national measures on risk assessment.
- 52 Malawi is party to other major conventions (ACCN, UNCCD, UNCLOS, UNFCCC, UNESCO, CMS, CITES, Cartagena, Ramsar) and is a member of key organisations (FAO, WHO, WTO).
- 53 Malawi is also signatory to SADC on shared watercourses, wildlife management and law enforcement, energy, mining, forestry and fisheries. In fact the SADC Regional Biodiversity Strategy is to establish and/or enhance capacity and institutional mechanisms that enable SADC Member States to collaborate in regional biodiversity conservation; to prevent or control the spread of Invasive Alien Species (IAS); and to apply Access and Benefit Sharing (ABS) principles.
- 54 It is critical to recognize that IAS management will contribute to Malawi attaining many of its SDGs including Goal 1 (no poverty); Goal 2 (zero hunger); Goal 3 (good health and well-being); Goal 4 (quality education); Goal 6 (clean water and sanitation); Goal 8 (decent work and economic growth) and Goal 15 (life on land).

### **National Policies**

- 55 Section 13 (d) of the Constitution of Malawi (1995) provides the principles of national policy and states the environment principles as follows; "To manage the environment responsibly in order to: i) prevent the degradation of the environment; ii) provide a healthy living and working environment for the people of Malawi; iii) accord full recognition to the rights of future generations by means of environmental protection; iv) conserve and enhance the biological diversity of Malawi." Implementing these environmental principles remains a challenge largely due to the fact that the policy environment is largely fragmented and sometimes weak. Under its Constitution, applicable acts and operational policies which make reference to environmental and agricultural issues are listed below:
  - National Parks and Wildlife Act (1992)
  - Environment Management Act (1996)
  - National Wildlife Policy (2000)
  - National Environmental Policy (2004)



- National Biodiversity Strategy and Action Plan (NBSAP) (2015)
- Environment Management Act (2017)
- Plant Protection Act (1969)
- Noxious Weeds Act (1936)
- National Forest Policy (1996)
- Forestry Act (1997)
- National Forest Policy (2016)
- National Fisheries and Aquaculture Policy (2001)
- Water Resources Act (1969)
- Irrigation Act (2001)
- Water Resources Management Policy (1994)
- Pesticides Act (2002)
- National Land Resources Management Policy and Strategy (2000),
- National Herbarium and Botanical Gardens Act (1987)
- Biosafety Act (2002).
- Biosafety Protocol (2000).
- Science and Technology Act (2003)

56 Malawi has completed its National Biodiversity Strategy and Action Plan (NBSAP, 2015-2025) where references are made to IAS. Malawi does not have a functional National Invasive Species Strategy and Action Plan (NISSAP), and although many national technical agencies are aware of the targets set in their NBSAPs (mostly under the Ministry of Natural Resources, Energy and Mining) it is given very low priority and as a result insufficient funding.

57 National legislation and policy is fragmented across multiple ministries and other agencies. IAS have only been addressed in an ad hoc manner. Responsibilities are often not clearly defined, or the technical expertise that should inform the authorities falls under different departments. This hinders a coordinated approach, often delays appropriate action, and even prevents enforcement. The National Environmental Policy sought to address some of these issues by: (a) promoting the efficient utilization and management of natural resources; (b) facilitating the rehabilitation and management of essential ecosystems and ecological processes; (c) enhancing public awareness of the importance of sound environmental management; and (d) **promoting cooperation between Government, local communities, and women groups, non-governmental organizations and the private sector in the management and sustainable utilization of the natural resources and the environment.** However, since the National Environmental Policy was adopted in 1992, a lot more needs to be done. Many sectoral environment and natural resources policies and legislation have been adopted and enacted since then yet there are policy gaps, conflicts and duplications which adversely affect effective implementation of the policies.

58 The National Parks and Wildlife Act (1992) does not make any reference to IAS, although it does state that it is illegal to “drive, convey, or introduce” any wild or domestic animal into a NP or Wildlife Reserve (WR). It also states that “any person

who conveys or introduces any plant, whether of a wild or cultivated species, into a NP or WR shall be guilty of an offence” and that the “Chief Parks and Wildlife Officer may order the destruction or removal of any plant, and any seedling or off-shoot thereof, brought into a NP or WR.” That said, surveys have found a host of introduced plants in Malawi’s PAs, in and around staff villages and tourist accommodation, an indication that the Act is not being adequately implemented or individuals or unaware of its contents.

- 59 The establishment of the MEPA under the EMA may go some way towards addressing some of the issues raised above. MEPA will be mandated to coordinate, monitor, supervise and consult on all environmental issues and will advise the Minister on the formulation and implementation of policies and initiate legislative proposals, standards and guidelines. Specifically, with regard to IAS MEPA will “in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species.” More importantly MEPA “shall ensure the coordination and implementation of programmes for the prevention, control or eradication of listed alien and invasive species.” The project will provide the MEPA, once established, with the information they require in order to implement their mandate. The EMA will provide the project with an entry point, whereby it can contribute to improved IAS management across all sectors.
- 60 Other entry points for the project are the Plant Protection Act, which deals with issues related to the trade in plants and plant products. This Act needs to be strengthened in order to also deal with issues related to the importation of plants which may have a negative impact on the natural environment. The Noxious Weeds Act also needs to be strengthened and implemented to enhance effective control of declared weeds, although much of what is contained therein also appears in the Malawi EMA. The project will seek to address any issues around its implementation.
- 61 Excessive pesticide use has a negative impact on biodiversity and water quality, and also poses a direct and indirect threat to human health. In order to address this issue the project will work with those institutions implementing the Pesticides Act, such as the Pesticides Control Board. Those implementing the National Land Resources Management Policy and Strategy (2000) will also be consulted in order to improve land-use management practices in areas adjoining PAs.

## **2.5. Stakeholder mapping and analysis**

- 62 A comprehensive analysis has been conducted on related, targeted and active stakeholder groups in Malawi through the PPG inception workshop, baseline assessments, and further analysis. The concerned groups and institutions are, among others, Government Ministries, national institutions, universities, international and national non-governmental organizations, civil society, community groups including farmers, and in some cases even businesses. All of these agencies/organizations will not only contribute to project activities but also benefit from their involvement. Beneficiaries will include policymakers, staff from various Government Departments such as quarantine and PA, farmers, pastoralists, and local community members in general. Since IAS are a cross-cutting issue the majority of people in Malawi will benefit directly or indirectly from project interventions.

### **Regional and international stakeholders**

- 63 The **Forest Invasive Species Network for Africa (FISNA)** was established in 2004 to coordinate the collation and dissemination of information relating to forest

invasive species in sub-Saharan Africa for sustainable forest management and conservation of biodiversity. The Network is open to all countries in sub-Saharan Africa that wish to participate. Objectives of the network are: to facilitate exchange of information and provide a link for communication about forest invasive species; to alert and provide policy advice on transboundary movement, phytosanitary measures and other relevant information; to raise regional awareness on forest invasive species issues; to encourage the publication and sharing of research results, management and monitoring strategies; to facilitate taxonomic support; to act as a link between and among experts, institutions, networks and other stakeholders concerned with forest invasive species; to facilitate the mobilization of resources for critical activities in management of invasive species and; to provide technical guides on research and control of invasives for sustainable forest protection and health issues in Africa. The project will make information on IAS available to FISNA which they can then place on their website.

64 The **Inter-African Phytosanitary Council (IAPSC)** “recognises the need to secure a common and effective action to prevent the spread and introduction of pests of plants and plant products as well as the need to promote appropriate measures for their control”. The mission of the IAPSC is:

- To prevent the introduction and spread of pests which attack and damage crops and forests in Africa.
- To develop a common strategy against the introduction and spread of pests, particularly through the harmonisation of phytosanitary legislation
- To ensure co-operation and a harmonised approach in all areas of plant protection where governments take official measures (registration of pesticides, certification of plant materials, accreditation of people who apply pesticides etc)
- To provide a documentation service for provision and exchange of information in all areas of its activities. Activities as outlined in the Maputo Declaration:
  - Plant protection information management
  - Development of strategies against the introduction and spread of plant pests
  - Promotion of safe and sustainable plant protection techniques
  - Enlighten member states on the implications of the WTO-SPS Agreement on international agricultural trade
  - Capacity building among Member states in phytosanitary and plant protection activities. Core Functions:
    - Development and management of information to serve Africa and International Plant protection Organisations (IPPOs)
    - Harmonization of Phytosanitary regulations in Africa
    - Development of regional strategies against the introduction and spread of plant pests (insects, plant pathogens, weeds etc)
    - Training of various cadres of NPPOs in Pest Risk Analysis (PRA), Phytosanitary inspections and treatment, field inspection and certification, laboratory diagnoses, pest surveillance and monitoring, etc.

65 Working with the IAPSC the Project will help the NPPO in Malawi to better meet its reporting requirements to the IPPC, especially with regard to pest reports. The

IAPSC website <https://gd.eppo.int/rppo/IAPSC> makes reference to a number of crop pests but no crop or environmental weeds. The project will enhance the site by contributing additional information.

- 66 The **South African Development Community (SADC)** is made up of many countries in the region including Malawi. The main objectives of SADC are to achieve development, peace and security, and economic growth, to alleviate poverty, enhance the standard and quality of life of the peoples of Southern Africa, and support the socially disadvantaged through regional integration, built on democratic principles and equitable and sustainable development. One of the key objectives is to “achieve sustainable utilization of natural resources and effective protection of the environment”. The SADC Regional Biodiversity Strategy makes numerous references to IAS and the need to manage them effectively. There is considerable concern regarding aquatic plants which are moved throughout the region on shared water bodies. The project envisages introducing additional host-specific and damaging agent for the control of water hyacinth. It should also be noted that CABI has recently signed an MOU with the SADC Secretariat to enhance IAS management in the region.
- 67 The **Food and Agriculture Organization of the United Nations (FAO)** is active throughout Africa, including Malawi, and has three main goals: “the eradication of hunger, food insecurity and malnutrition; the elimination of poverty and the driving forward of economic and social progress for all; and the sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources for the benefit of present and future generations.” The FAO's assistance in Malawi “reflects national development priorities focusing on five areas affecting food security, nutrition and sustainable agricultural development: (i) The Agriculture Sector-Wide Approach; (ii) Strengthening availability and access to data, information and statistics for evidence-based decision-making; (iii) Support to policy and programmatic action on sustainable resource management and climate change; (iv) Promoting secure land rights and land-use planning; (v) Support to disaster risk reduction and resilience.” The FAO Forestry Department is very active in the management of IAS, especially those impacting on agro-forestry species, many of which are themselves invasive. To this end the project envisages developing protocols, together with the local FAO branch, to avoid the introduction of invasive agro-forestry species or to introduce activities which will mitigate against introduced species becoming invasive.
- 68 **CABI** is an international, intergovernmental, not-for-profit organization established by a UN treaty level agreement between its member countries. CABI's mission is “to improve people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment”. CABI specializes in scientific publishing, research and communication. Since its establishment in 1910, CABI has worked on the taxonomy, prevention and management of IAS on five continents and in nearly 70 countries. Invasive Species is one of CABI's four global themes. CABI advises on national IAS strategies, and is also actively involved in the management of IAS using integrated pest management (IPM) approaches, specialising in the biological control of invasive plants, arthropods and micro-organisms. More recently, CABI has also been implementing projects on the prevention of IAS, specifically through the provision of technical support to the IPPC and the SPS Agreement under the WTO.
- 69 CABI has supported the CBD and its Secretariat from its inception in 1992, and in 2003 signed a Memorandum of Cooperation. CABI contributes IAS expertise through provision of technical support, information and knowledge tools, thereby

contributing towards the implementation of Article 8(h) of the CBD. CABI has provided support to developing countries to assist with their implementation of the CBD in relation to IAS, and continues to provide advice to the Subsidiary Body for Scientific, Technical and Technological Advice (SBSTTA) and COP delegations under the CBD. CABI and IUCN were instrumental in ensuring that IAS were a significant inclusion in the Environment Action Plan of the New Partnership for African Development (NEPAD) and its five sub-regional environment action plans. The proposed MSP will draw upon this expertise.

- 70 CABI is a world leader in providing scientific and unbiased information on agriculture and the environment, especially with regard to pest management. Good examples of the products constantly updated or currently being produced, often in collaboration with other public and private sector partners such as IUCN, The Nature Conservancy (TNC) and the Invasive Species Specialist Group (ISSG), include the Crop Protection Compendium, Biocontrol Abstracts, the IAS glossary Invasive Alien Species Concepts, Terms and Context, available on CABI's website, and the Invasive Species Compendium (ISC), which aims to draw together scientific information and databases on IAS for policy makers, scientists, extension workers, students and practitioners. The ISC, which is constantly being updated and improved, is a comprehensive global interactive encyclopaedia on all aspects of IAS including their taxonomy, biology, ecology and habitats, distribution and spread, host range and symptoms, risks, impacts, and management, all supported by published literature. Ultimately, CABI's ISC will cover all geographic regions, all natural and managed ecosystems, and all IAS taxa while focusing on organisms that have the highest impact on livelihoods and the environment. Data collected during the project will be incorporated in the ISC and in CABI's Knowledge Bank. Information on best management practices, including prevention, EDRR and control obtained from other CABI projects around the world, will be adapted and implemented by this project.
- 71 The project will also work closely with another CABI programme called Plantwise: <https://www.plantwise.org/>. Plantwise is a global programme led by CABI which works to help farmers lose less of what they grow to plant health problems. Working closely with national agricultural advisory services CABI establishes and supports sustainable networks of plant clinics, run by trained plant doctors, where farmers can find practical plant health advice. Plant clinics work similarly to clinics for human health: farmers visit with samples of their crops, and plant doctors diagnose the problem and make science-based recommendations on ways to manage it.
- 72 **UN Environment** was an active participant and supporter of the Global Invasive Species Programme (GISP) since its inception in 1996 until it was disbanded, and served as the GEF IA on a number of GEF funded invasive species projects, mainly in collaboration with CABI.

### **National stakeholders**

- 73 The structure for public governance in Malawi is divided into Central Government and Local Government through a decentralization policy. The latter include City Assemblies, Town Assemblies and District Assemblies. They are Local Government Authorities empowered under Malawi constitutional law to form by-laws in various departments through the assistance of the three arms of Government at City Assembly, Town Assembly and District Assembly levels.

## Government

- 74 There are two key Ministries with responsibilities for the conservation, protection and management of biodiversity and natural resources - the Ministry of Natural Resources, Energy and Mining (MoNREM) and the Ministry of Agriculture, Irrigation and Water Development (MoAIWD). The mandate of MoNREM is to supervise and manage the environment throughout Malawi. Its core business is to “provide policy guidance and direction on all matters concerning Malawi’s natural resources, energy, and environmental management” with the mission “to coordinate, facilitate and promote participation of all stakeholders in the sustainable development, utilization and management of natural resources, energy and environment for socio-economic growth and development.” MoNREM comprises various Departments including Energy Affairs; Environmental Affairs; Forestry; Geological Survey; Mines; and Climate Change and Meteorological Survey. Important partners include the FAO, International Food Policy Research Institute (IPRI), WHO and ICRAF-Malawi.
- 75 The Environmental Affairs Department (EAD) core functions are to provide strategic leadership, administration, executive support and corporate services in environment and natural resources management; protect and improve the quality and safety of the environment to ensure the right of all Malawians to a clean and healthy environment; promote the conservation and sustainable use of natural resources to contribute to economic growth, development and poverty reduction; provide environmental and technical information to the public.
- 76 Most importantly in the context of the proposed MSP, MoNREM is responsible for the implementation of the EMA (2017) and the establishment of the MEPA under the Act. MEPA will be responsible for ensuring improved coordination between all Government ministries and other agencies/organizations and will, in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species. MEPA, once established, will be a key national project stakeholder, and be the body responsible for dealing with IAS issues in Malawi.
- 77 The other Ministry which is key to this project, MoAIWD, “seeks to promote agricultural productivity and sustainable management of land resources to achieve food security, increased incomes and ensure sustainable socio-economic growth.” MoAIWD consists of various Departments including Research Services; Health and Livestock Development; Crop Production; Agricultural Extension Services; Land Resources; and Fisheries.
- 78 Plant Protection Services (PPS) falls under MoAIWD and is considered to be an important partner, especially with regard to the implementation of prevention protocols. Quarantine staff need to be trained to prevent the introduction of invasive or potentially invasive species. They also need to ensure that Pest Risk Assessments (PRAs) be undertaken on all intentional introductions, including plants, and not just the pests associated with them.
- 79 CABI also works closely with the Department of Crop Production in the MoAIWD on Plantwise activities. Since the inception of the Plantwise project in Malawi, CABI has trained 398 staff on pest diagnosis and management and established 116 Plant Clinics. The Project will be working closely with these trained individuals and extension staff, especially around MMFR.
- 80 Another important Government partner will be the Department of National Parks and Wildlife (DNPW). They are responsible for the implementation of the National Parks and Wildlife Act (1992) which states that it is illegal to introduce species into

PAs. Staff based in NNP are aware of some of the threats posed by IAS having being involved in previous IAS management projects, supported by the NVT. Although staff and resources are limited they bring a wealth of experience with regard to invasive plant management, especially bracken fern. They will be an important partner in IAS management activities in NNP.

- 81 The MMCT has been involved in past IAS management projects. The Trust works closely with staff from the Department of Forestry (MoNREM). In the past staff from the Department of Forestry coordinated the control of invasive pine species on MMFR, a task which was undertaken by local community members. There are currently 640 Department of Forestry staff working in MMFR with the majority involved in providing security.
- 82 The Ministry of Education, Science and Technology is responsible for education in Malawi, including the provision of learning materials. The EAD also has an Education and Outreach Division which is involved in education, outreach and information dissemination. Working with the Ministry, EAD and the Lilongwe Wildlife Trust the project aims to build capacity and create awareness among learners about IAS.
- 83 The Ministry of Information, Tourism and Culture is responsible for promoting Malawi as a prime tourist destination. Tourists are often regarded as one of the main pathways for IAS while tourist accommodation within PAs and elsewhere is often a source of IAS, especially if exotic plants have been introduced for landscaping. As such the Ministry will be made aware of the threats and asked that tourism facilities comply with the various Acts which prohibit the introduction of exotics.

Sub-national and local/or site level:

- 84 IAS affect all sectors of society and effective management requires the cooperation of all stakeholders, including both national and local government. There is considerable devolution in Malawi which should facilitate the implementation of IAS management activities. The local government system has 35 single-tier local authorities called councils. There are currently 6, 9, and 13 District Councils in the north, centre and south of Malawi, respectively. Within these District Councils there are 4, 2, and 1 City, Municipal and Town Councils, respectively. District councils are responsible for the overall development of their areas and are required to engage local communities and other interest groups such as the private sector and NGOs in the preparation of their three-year rolling district development plans. To support this process the councils may establish area-wide, ward or village committees. The special interests represented on the council also serve to broaden democratic participation. All council meetings, together with committee, sub-committee and joint committee meetings, are open to the public, subject to advance application to attend. The councils have a duty to publish information relating to local government and the services available within their areas. The Malawi Local Government Association (MALGA) is recognised by the government as the voice of local authorities and is the body for coordinating local government training.
- 85 District Councils can pass their own by-laws to manage IAS. For example, based on the Noxious Weeds Act, “any responsible person or persons in any District or portion of a District of Malawi may petition the Minister to declare any plant to be a noxious weed for the purpose of this Act in such District or portion of a District.” In addition, every Municipal Council and Town Council shall have the power to make by-laws or regulations compelling occupiers of land within the Municipality or Township to keep their land free from a noxious weed. The Act can therefore

possibly be used to enforce IAS management. That said, many are of the opinion that the Act can no longer be implemented and needs to be revised.

- 86 The recently promulgated EMA also states that each local Authority shall, on the advice of the District Environment Sub-Committee, establish Local Environment and Natural Resource Committees who shall be responsible for undertaking environment and natural resources management activities. These local committees will be important players in not only creating awareness but also implementing some management activities.

#### Government-based Research Institutes

- 87 One of the biggest barriers to effective IAS management is the lack of knowledge with regard to IAS distribution, impacts and management. The role of research institutions in developing best management practices is critical. Funding for these institutions comes directly from government revenue and development budgets. A parastatal, the National Herbarium and Botanic Gardens, has in the past been actively involved in raising awareness among communities as to the value of medicinal and other plants growing in MMFR in order to instill a conservation ethic. They also have a significant interest in increasing the number of specimens of invasive and potentially invasive plants in their collection which will contribute to increased awareness and research capacity. The National Museum of Malawi has also been involved in the management of invasive plants, especially bracken fern, in MMFR in the past. The project will be collaborating with these research institutes, and will also seek to engage with other relevant national research bodies such as the Department of Agricultural Research Services (DARS); the Central Water Laboratory; and the Wildlife Research Unit in the Department of Parks.

#### Universities

- 88 The University of Malawi through its five constituent colleges; Mzuzu University; and other numerous private universities provide a strong national research entity in different fields, most of them related to environmental health. Examples include the Center for Water, Sanitation, Health, and Appropriate Technology Development at Polytechnic; the Center for Natural Resource and Environment, Molecular Biology and Ecology Research Unit at Chancellor College. Some students from Lilongwe University of Agriculture and Natural Resources (LUANAR) have undertaken studies on IAS in the past.
- 89 Students from state and private universities will be encouraged to engage in research on the management of IAS, especially in MMFR and NNP. They will assist the project in identification of IAS, awareness raising to the public and monitoring sites with communities and the project team. The project will provide resources to prospective post-graduate students to undertake research on the impacts of selected IAS and the benefits of management interventions. A university may also possibly be contracted to develop and implement the project M&E Plan, including activities at pilot sites.

#### Non-Government Organizations (NGOs)

- 90 Selected international and local NGOs that are interested and have a similar work programme, particularly on aspects of biodiversity conservation and management and related subjects, will be included as project partners. BirdLife International, IUCN, Peace Parks Foundation, NVT-UK Trust, MMCT, Total Land Care, African Parks, and Lilongwe Wildlife Trust, among others, have collaborated with the



government in conservation and management of natural resources in Malawi. NGOs may provide technical assistance and participate in the development of identified policies, guidelines and other tools to manage established invasive species in their own sites; encourage government to take action; or develop public education and outreach initiatives for various audiences and prevent further IAS introductions. Resource mobilization is also an important work programme for supporting IAS project implementation. NGOs will be encouraged to engage in the consultative process of developing the Malawi invasive strategic action plan and other policies and frameworks.

- 91 The MMCT will be one of the main partners in developing and implementing IAS management interventions. They have six working professionals including Programme Officers for Biodiversity Conservation, Research and Monitoring, Forest Co-management and Sustainable Livelihoods, and Environmental Education and Communication. They also have a Monitoring and Evaluation Officer and a Finance, Procurement and Administration Officer together with an Executive Director. MMCT also has an active Research Committee with members from the Museum of Malawi, National Herbarium and Botanic Gardens, amongst others. They are providing co-funding support in terms of staff, office space, equipment and other support.
- 92 The NVT – UK and NVT - MW have been involved in IAS management activities in NNP in the past. They have also supported students to undertake research on IAS impact and control. They have an office in NNP together with equipment, workshop facilities and even a tractor to support IAS management interventions. However they only have a very small staff component.
- 93 The Peace Parks Foundation (PPF) facilitates the establishment of trans-frontier conservation areas (TFCAs) and develops human resources, thereby promoting sustainable economic development, the conservation of biodiversity, and regional peace and stability. The Malawi-Zambia TFCA includes the Nyika-North Luangwa component, which is centered on a high undulating montane grassland plateau rising over 2000 m above the bushveld and wetlands of Vwaza Marsh. The Foundation has staff, office space, vehicles and equipment in the TFCA and has provided significant co-funding to manage IAS in NNP.
- 94 Africa Parks Foundation (APF), a non-profit conservation organization which takes on direct responsibility for the rehabilitation and long-term management of PAs in partnership with governments and local communities, now manages three PAs in Malawi. Their staff are actively involved, together with DNPW staff, in managing IAS in these PAs. Although none of these PAs are being targeted in this project the staff employed by Africa Parks have considerable experience in IAS management. The project may therefore consider working with Africa Parks and DNPW staff in awareness creation and capacity development.
- 95 The Lilongwe Wildlife Trust is involved in environmental advocacy and enforcement, wildlife rescue and research and conservation education. They will be an important partner in raising awareness about IAS.

#### Private sector

- 96 The project will work closely with the pet and aquarium trade, the horticultural industry, and other private companies who work in the environment and agriculture sector and/or are involved in the importation of exotic species. These sectors will

be represented on the project's National Project Steering Committee (NPSC) and will be consulted during the formulation of policies and strategies to manage IAS.

- 97 Owners of tourism facilities will also be involved. For example, Wilderness Safaris manages lodges in NNP, and in addition to offering support in the form of accommodation during project activities, also want to get involved in creating awareness and removing IAS from areas immediately around their facilities. There are also a number of lodges in and around Mulanje Mountain. The Mountain Club of Mulanje has also been active in the clearing of invasives in inaccessible areas. The privately owned tea plantations in the foothills of the Mount Mulanje are also seriously affected by invasive plants such as lantana, *Dolichandra unguis-cati* and *Mimosa diplotricha*. They would benefit from any management interventions and as such are likely to contribute to various associated activities.

#### Indigenous People and Communities

- 98 Indigenous people and communities occasionally use some IAS, and are directly affected by them. They play a crucial role, especially in the management of IAS, because they are directly affected by invasive species and are able to detect the presence of new species. Local people can contribute to the detection of IAS and be involved in their management. Indigenous people and communities will be targeted to engage in pilot site management and sustain the activities of the project, building on the project outputs. By building capacity and creating awareness amongst communities, the project will be contributing directly to biodiversity protection. The project will be working very closely with communities living adjacent to PA's.
- 99 Population densities around Mulanje are extremely high, with many locals practising subsistence farming on less than 0.1 hectares of land. The most commonly grown crop is maize together with bananas, pigeon peas, tomatoes and cassava. Inhabitants in three areas around Mount Mulanje are having a particular high negative impact on the FR which is contributing to the further spread of invasive plants. The Kambenje, Muloza and Nkhulambe communities live adjacent to the MMFR, and extensively utilize resources from the Mount Mulanje. The villages of Chole, Kambenje, and Manolo lie on the leeward (dry) side of the Mountain within the Kambenje area, and are involved in illegal logging (timber, firewood, charcoal production), encroachment and farming close to the Thuchila River, which is contributing to streambank erosion and water pollution. The Muloza Area lies within the windward (wet) side of the Mountain and includes several villages including Chipoka, Makaula, Mikundi, Ngwezu and others. Villagers are also involved in illegal activities including deforestation. Nkhulambe Area is in Phalombe District and contains several villages such as Msikita, Malunda, Makuluni and others. Activities that threaten resources in the FR are similar to those seen in other villages. CABI Plantwise activities have revealed that crop yields in areas around MMFR are being significantly reduced by crop pests, mainly insects and viruses. Reduced yields are driving communities to extract resources from the Reserve.
- 100 NNP lies within three districts, namely Rhumpi, Chitipa and Karonga. The Traditional Authorities bordering the park are TA Katumbi, TA Chikulumayembere, STA Kachulu, STA Mwalweni and STA Mwahenga in Rumphi District; TA Kyungu and TA Wasombo in Karonga District; and TA Nthalire in Chitipa. Maize, cassava, sweet potatoes, bananas, pigeon peas, cow peas, soya beans, ground beans, wheat, chillies, paprika, fruits, macadamia, cashew nuts, groundnuts, tobacco, rice, millet, Irish potatoes and coffee are the crops

grown in the area. The Karonga District also holds one of the largest cattle populations in the northern region of Malawi. Only 40% of the land around NNP is suitable for agriculture, leading many communities to illegally utilize resources in the NP. Deforestation, soil erosion and declining soil fertility are some of the most serious issues facing farmers. Pests and environmental weeds are reducing crop yields and pasture carrying capacities. For example, bracken fern has invaded large tracts of communal grazing land in areas adjoining the PA, displacing valuable forage species.

## 2.6. Baseline analysis and gaps

101 The baseline report for Malawi is based on the analysis of available literature from national and international documents, and on national stakeholder consultations. Analysis by the project team shows that there are major gaps at national level in the following areas with regard to the management of IAS:

- *Existing legislation, regulations, sector programmes and other relevant tools make little reference to the management of IAS and those that do are not fully implemented.* For example, water hyacinth and lantana are listed under the Noxious Weeds Act which does not appear to be enforced/implemented based on our preliminary surveys, although there have been some efforts to control water hyacinth on the Shire River. That said, a revision of the Act and its implementation may contribute to improved IAS management in Malawi. The number of species listed also needs to be expanded – only four plant species are currently listed as noxious weeds in Malawi. The National Parks and Wildlife Act (1992) states that it is illegal to introduce exotic species into any PA yet there is no reference to the management of exotic species once they are widely established within NPs. That said the NNP Master Plan (2004) does make reference to IAS and the need to manage them. However, in our preliminary surveys we found many exotic species growing around and in lodges and staff villages, species not captured in the NNP Master Plan – the project will address this by listing these species and advocating for control/eradication. The situation with regard to IAS management in Malawi may possibly be resolved, in part, by the recently promulgated EMA of 2017 which requires that a MEPA be established which will take measures for the control of IAS. It is too early to say what the impact of this new Act will be.
- *There is no specific national policy on IAS across sectors.* IAS cannot be managed in isolation. IAS introduced to agro-ecosystems or elsewhere will threaten and invade PAs, impacting negatively on biodiversity. MEPA, under the EMA, will be mandated to address this issue, at least in part. The project plans to develop a NISSAP working closely with various Ministries;
- *Lack of coordination/cooperation across government agencies and institutions* whose mandate and responsibilities include the management, conservation and utilization of biodiversity, including IAS issues. Some Ministries and NGOs are promoting the introduction of agro-forestry and other exotic species into crop production areas adjoining PAs. Some of these have invaded PAs; improved cooperation between various institutions may resolve this. MEPA, once established, has been mandated to coordinate, monitor, supervise, and consult with all relevant stakeholders relating to the management of the environment. This will include close cooperation with the DNPW;
- *Conflict of interest between conservationists who are concerned about the loss of native species and economists who focus on food security and economic*

*development*. Some non-native species play key roles in local livelihoods and contribute to economic development even if they have a long-term negative impact on the economy, human health and the environment. For example, the invasives *Pinus patula*, *P. elliotii*, *Acacia mearnsii* and *Eucalyptus* spp. were intentionally introduced to the NNP for timber and fuelwood. Pines were also intentionally introduced to MMFR. Many of these species have subsequently escaped cultivation and now pose a very serious threat to biodiversity and water resources. The Forestry Department, under the Forest Act of 1997, encourages communities and NGOs to plant trees, stating that any forestry pests and diseases need to be controlled but makes no references to IAS management or the prohibition on the planting of invasive or potentially invasive species. Many NGOs therefore continue to promote agro-forestry species which are known to be invasive such as *Albizia lebbbeck*, *Melia azedarach*, *Senna simea*, *S. spectabilis*, *Leucaena leucocephala*, *Gmelina arborea*, and other species. The recently promulgated EMA may partly resolve this issue in that it clearly stipulates that “a person shall not carry out an activity involving a specimen of an alien species or an invasive species without a permit issued by the Authority.” Revision/strengthening of the Noxious Weeds Act may also partly resolve this issue. However, in the final analysis it will be critical to undertake cost-benefit analyses in order to provide an objective assessment of the benefits and costs of any introductions;

- Most government agencies responsible for the protection, conservation and use of biodiversity and related natural resources have *insufficient budget to implement even basic control and management of IAS*. From 2015/2016 to 2018/2019 the GoM through its Ministry of Natural Resources, Energy and Mining is supporting several environment related programs including “Environment and Climate Change Management” (US\$ 8,941,513) and “Wildlife Conservation and Management” (US\$ 3,224,300), the latter much focused on species protection, anti-poaching, tourism development, and some activities related to management of their habitat. A very meagre US\$ 21,326 of this will be available for biodiversity conservation and management, which is the government program coming closest to IAS issues. Because of the lack of GoM resources to meet the management costs of all PAs, they are entering into agreements with the private industry and seeking support from bilateral donors and others such as GEF. For example, three NPs in Malawi are now contractual parks, managed by the African Parks Foundation. This provides the proposed project with the opportunity to not only raise awareness among private and public stakeholders about the threat of IAS, but also to accrue resources from both sectors for the management of IAS. Other projects of the MoNREM relevant to the GEF IAS and agro-ecosystems work include the “Sustainable management of Nyika Transfrontier Conservation” (US\$ 366,398), “Combating deforestation and forest degradation for sustainable rural development” (US\$70,461), as well as “Improved forestry management for sustainable livelihoods” (US\$70,461). The NVT and the MMCT both support IAS management but they have insufficient resources to do so effectively. The GoM also plans to achieve improved IAS management in order to meet its CBD obligations (Target 9 of the Aichi Biodiversity Target) by undertaking a range of activities requiring funding in the estimated range of US\$6,500,000, which will be requested from a number of agencies including UN Environment, UNDP, NORAD, FAO, DFID, USAID, IrishAid, GIZ and the private sector (NBSAP, 2015-2025). This project will contribute to the GoM efforts to achieve some of the targets;

- The MoAIWD in its 2016-2017 Program Budget Statement includes two Strategic Objectives: (i) To ensure sustained food security; and (ii) To ensure increased agro-based incomes. These are closely related to both prevention and control of invasive pest species. Its Agricultural Productivity and Risk Management Program budget is large at US\$177,598,400 over the next three years. The Ministry of Local Government and Rural Development will invest a minimum of US\$ 8,158,789 in rural development, of which a small part may benefit the project through the planned livelihood improvement initiatives potentially benefitting communities involved in the agro-ecozones around the protected areas;
- *Woody invasive plants and poor land-use practices can have a dramatic negative impact on water resources.* LEAD-Southern and Eastern Africa, the Forestry Department and World Fish Centre are implementing the Lake Chilwa Basin (LCB) Climate Change Adaptation Program in collaboration with Machinga, Phalombe and Zomba District Councils. The Mulanje Mountain is an important water catchment for Lake Chilwa. The program is designed to secure the livelihoods of 1.5 million people in the Lake Chilwa Basin and enhance resilience of the natural resource base through the development and implementation of a basin-wide climate change adaptation program that will enhance the capacity of communities to adopt sustainable livelihood and natural resource management practices. The program includes the management of invasive species;
- In agro-ecosystems CABI is working together with the Department of Agriculture, Irrigation and Water Development in the Plantwise Program, whereby extension officers are trained to assist farmers in the identification of pests, including IAS, and how best to manage them. Advice focusses on the reduction of pesticide use through integrated pest management, of which biocontrol is an important component. The plant clinics, which have been established as part of the program, play an important role with regard to early detection and rapid response and will be an integral component of the proposed MSP. The project will also work closely with Total Land Care, an NGO established in 1999, with a mandate “to improve the livelihoods of smallholder farmers in the region with a focus on community based approaches to increase agricultural production, food security and incomes within a context that ensures sound management of their natural resources.” The project will also benefit from previous interventions, including the Manda Wilderness Agricultural Project, which was initiated, with funding from CEPF, to introduce 360 subsistence farmers and their families to the concepts of conservation and sustainable agricultural practices in an attempt to protect the Manda Wilderness Area, an area of approximately 250,000 hectares;
- *Most government agencies and the public do not realise the level of IAS impacts, and perceive any such as a low priority* for their work programmes compared to better known environmental problems such as climate change, flooding, drought, land degradation, poaching, land invasions and others caused by human activities. That said, the MMCT and the NVT have created significant awareness about the impacts of IAS in MMFR and NNP. Indeed, the NNP Master Plan (2004) makes numerous references to invasive plants and the need to manage them but control largely appears to have been ad hoc. There has also been considerable awareness as to the impacts of water hyacinth on hydro-electricity generation. Many communities are also aware of the impacts of many IAS but don’t know how best to manage them;

- *There is a lack of government awareness of the potential negative impact of IAS, resulting in very limited budget allocation for management and control. There is no national IAS database and little information on impacts and management. One of the project partners, the Lilongwe Wildlife Trust, has been involved in environmental education focussing on issues related to conservation and poaching. Working with them the project will also include IAS in their educational material.*
- *Baseline analysis of the project Pilot Sites indicate that some staff at both NNP and MMFR have previous experience in IAS management. MMCT have six working professionals including Programme Officers for Biodiversity Conservation, Research and Monitoring, Forest Co-management and Sustainable Livelihoods, and Environmental Education and Communication. MMCT also has an active Research Committee with members from some universities, the Museum of Malawi, National Herbarium and Botanic Gardens, among others. In fact, staff from the Museum of Malawi were involved in trials to determine the efficacy of *P. aquilinum* chemical control. About 640 Forestry Department staff work in MMFR, mainly as guards or patrolmen. Staff from this department previously coordinated some clearing of pines by community members. MMCT and the Forestry Department are supportive of initiatives to manage IAS on Mount Mulanje. The PA Management Plan is currently under development, providing an ideal opportunity to include an IAS management strategy. The NNP, managed by the DNPW have considerably fewer staff compared to MMFR with a total of 140 established positions of which only 55 are filled according to the NNP Master Plan of 2004. Some of the staff have been involved in some IAS management activities in the past. The most recent NNP Master Plan (2004) makes a number of references to IAS management. It is currently being revised, again providing an ideal opportunity for the project to make comprehensive inputs into the IAS management component. The NVT (UK), NVT (MW), Peace Parks Foundation and the DNPW is supportive of IAS management initiatives and as such has also provided co-funding. There have been no IAS management initiatives in areas adjoining these PA's other than some work undertaken by CABI's Plantwise Programme, which is mainly focused on crop pests. However, there have been some initiatives in promoting conservation agriculture and the use of crop rotation and crop integration to improve crop yields in areas adjoining the PA's, often undertaken in close cooperation with Total Land Care, one of the project partners.*

### **Pilot Site no. 1 – Nyika National Park**

- 102      The NNP covers 310,000 hectares, encompassing the largest mountain complex in Malawi and consisting primarily of gently rolling grasslands, along with small patches of montane forest, rainforest, and drier woodlands (total forest cover in the park is approximately 6,000 ha.). Nyika is an important catchment area and contains the source of four large rivers which drain into Lake Malawi. A total of 1,927 plant species and subspecies have been identified in the park, of which 33 are endemics only found in the park and a further 13 are considered near-endemics. The park also harbours globally significant mammals. Nyika's butterfly fauna is the richest in Malawi, with some 120 of the 200 species present in the country. Over 420 species of birds have been recorded in the park.
- 103      Biodiversity within NNP is threatened by the invasive plant species *Rubus ellipticus*, *R. niveus*, *Pinus patula*, *P. elliotii*, *Acacia mearnsii*, *A. melanoxylon*,

*Lantana camara*, and others. Bracken fern, *Pteridium aquilinum*, is also abundant in and around the PA and spreading to the detriment of native flora and fauna. Rivers and streams in the park have been colonised by *Pistia stratiotes* and *Azolla nilotica*. A number of exotic species, which are known to be invasive elsewhere, such as *Desmodium uncinatum*, *Bryophyllum* spp., *Tecoma stans*, *Cestrum nocturnum*, have also been introduced to the staff village and to the tourist lodge.

104 NNP is managed by the DNPW. Due to budgetary constraints they have limited staff capacity to undertake IAS management activities although staff were previously involved in some limited IAS control, supported by the Nyika-Vwaza Trust. Much of the staff is involved in anti-poaching activities. The NNP Master Plan (2004) suggested a number of priorities for invasive plant eradication:

- in the long-term to reduce the pine plantation to approx. 90 hectares as per recommendation;
- to control regrowth of *Acacia mearnsii* on the already cleared patch;
- to prevent the second wattle patch from expanding;
- to eliminate wattle, pine and eucalyptus along streams, dams and wattle around chalet 4;
- to eliminate the pine stand between the airstrip and Chilinda plantation;
- to investigate the present situation of *Rubus ellipticus* and possible methods of control and make recommendations for implementation;
- to prevent any other exotic species from invading and spreading into NNP.

105 Most of these proposed targets have not been reached despite support from NVT which financed some trials to develop best management practices for bracken fern. Private contractors were provided with the opportunity to bid for the removal and utilization of the invasive pines but this practice was halted due to various concerns, the main one being damage to roads. There have been no attempts to manage the invasive *Rubus* spp. with some control of *A. mearnsii*.

106 There is widespread poverty among communities living in areas adjacent to the NP. In order to alleviate poverty and improve relations between NP management and the community, the DNPW has established co-management agreements with communities on the periphery/edge of the park, which allow for the collection of forest products including honey, fruits, thatch grass, mushrooms, medicinal plants, termites, caterpillars, and dead wood for fuel, within 5 km of the park boundaries. However, many small-scale farmers struggle to produce sufficient food to maintain their families, leading to increased encroachment on the NP, deforestation, and poaching. Low crop yields can be attributed to low nutrient soils, and crop pests, many of them introduced.

### **Pilot Site no. 2 – Mount Mulanje Forest Reserve**

107 Mount Mulanje is the highest massif in Malawi, located in the southeast near the border with Mozambique. The MMFR occupies 60,000 hectares, including montane grassland and shrubland, small patches of *Widdringtonia* cedar forest, and lowland, mid-altitude and montane rainforest. The Reserve provides important habitat for numerous bird species, and it is the most important centre of plant endemism in Malawi, with about 30 endemic plant species. Mulanje Mountain is the only known locality in Malawi for the rodent (*Aethomys namaquensis*) and has the second-most important forest butterfly fauna in Malawi, with some 111 species.

108 Invasive species in the MMFR include *Pinus patula*, *Rubus ellipticus*, *Digitalis purpurea*, and *Lantana camara*. *Eucalyptus* species have been planted in and around the reserve, but their current level of invasiveness is unknown. Bracken fern, *Pteridium aquilinum*, has benefitted from increased disturbance and now occupies much of the Forest Reserve to the detriment of native flora and fauna. A large number of other invasive plants are abundant on the edge of the FR such as lantana, Mexican sunflower, creeping sensitive plant (*Mimosa diplotricha*), and others. These are encroaching onto the FR. Creeping sensitive plant poses a significant threat to small-holder farmers and commercial tea plantations. In Nigeria, *M. diplotricha* densities have reached 630,000 plants per ha, reducing cassava-root yields, 12 months after planting, by 80% (Alabi *et al.*, 2001). Invaded cattle ranches in the Markham Valley, Papua New Guinea, are spending up to US\$130,000 annually on chemical control of this invasive species (Kuniata, 1994). It is apparently also toxic to livestock. In northern Malawi some farmers have abandoned their land as a result of invasions.

109 The MMCT has been responsible for much of the management of invasive plants in the FR itself. The two pine plantations on the massif, Chambe and Sombani, were a major source of invasions. The Chambe plantation and all outliers were eradicated, an exercise coordinated by the Department of Forestry and undertaken by community members. This was followed by the “eradication” of pines in the Sombani Basin. However, many of the cleared and surrounding areas in Sombani have been invaded by introduced *Rubus* species. Species introduced as ornamentals, such as *Digitalis purpurea*, have also escaped cultivation and have to be considered as being invasive on Mount Mulanje now.

110 Unlike the situation around NNP, population densities in the Mulanje and neighbouring Phalombe districts are significantly higher, with 185 people per square kilometer. An estimated 63% of the total land area in the Mulanje District is used for agriculture; 70% for subsistence farming and 30% commercially, mainly for tea plantations. Most locals practice subsistence farming on less than 0.1 hectares of land growing cereal crops, mainly maize, legumes, pulses and tuber or root crops. There is concern that communities are increasingly adopting fast-maturing crop varieties which may provide a short-term solution to hunger instead of traditional crops and their wild relatives which are more adapted to local conditions. IAS, including weeds are largely responsible for reduced yields.

111 Mitigating the gaps and threats of inadequate national institutional capacity and the lack a unified IAS strategy, weak local level systems for IAS prevention and control by PA management boards and local farming communities, are challenged by the following three Barriers, constituting the basis of the project framework:

***Barrier 1. Inadequate policy, institutional framework and capacity for managing IAS – specifically in protected area landscapes and surrounding agro-ecosystems***

112 One critical issue has been that Malawi does not have a single institution that is primarily responsible for dealing with IAS issues. The lack of clear institutional ownership or an overarching policy on IAS has led to ineffective coordination amongst various agencies, especially those in agriculture, forestry and the environment, and often leads to conflicting recommendations made by different agencies and institutions that constrain the government’s ability to generate a unified response to IAS control. These issues can only be dealt with if there is an overarching policy with effective coordination. Even Malawi’s more



general efforts at biodiversity conservation are carried out without a comprehensive structural and legal framework, apart from the guidance provided by the NBSAP. This may be addressed by the formation of the MEPA which has been mandated to coordinate a host of activities related to biodiversity conservation, including IAS management. This may go some way in improving coordination between PA management, staff from the MoAIWD and communities living in areas adjoining PAs but needs to be institutionalized within a NISSAP or similar. The proposed NISSAP development and implementation may provide MEPA with a stronger mandate.

113 Another critical barrier to effective IAS management is the fact that Malawi has very few policies or laws specifically established for the management of invasive species, which is instead addressed primarily through sectoral policies and legislation that deal with biodiversity in general, or the prevention and control of agricultural pests. In addition, sectoral policies often promote or encourage the introduction of exotic species without evaluating their potential risk, especially to biodiversity. For example, Government Departments and NGOs often promote the introduction of exotic agroforestry species without adequate evaluation of the potential costs and benefits. It is therefore critical that a national policy be developed so that IAS can ultimately be managed across the country, and across all sectors, rather than in isolation. For example, Environmental Impact Assessments (EIAs) undertaken by relevant agencies generally do not consider the impacts of IAS, including EIAs for restoration activities, which often involve the use of IAS. This situation may change with the promulgation of the EMA. For example, “a person shall not carry out an activity involving a specimen of an alien or an invasive species without a permit issued by the Authority in accordance with the Act.” Of interest, the Act also states that if an IAS establishes as a result of the actions of an individual, that individual will be responsible for management costs. Without a good understanding of what is considered to be introduced and invasive, and how best these species can be managed, implementation of the Act may be problematic.

114 Only a few laws and regulations in Malawi make specific reference to and promote the management of invasive alien species in the country, two of which fall under the mandate of the MoAIWD. One of these is the Plant Protection Act (Cap 64:01), which provides for the “eradication of pests and diseases destructive to plants to prevent the introduction and spread of pests and diseases destructive to plants, and for matters connected therewith and incidental thereto.” The other is the Noxious Weeds Act (Cap 64:02), which governs the management of declared noxious weeds. However, the existing Acts and their subsidiary regulations are seriously outdated; for example, the list of declared weeds has not been updated since the 1960s. In addition, enforcement of the Acts is weak and as a result many invasive species are imported and distributed in Malawi “often without the knowledge of the Plant Protection Services”. The National Parks and Wildlife Act prohibits the introduction of exotic species into PAs, yet many were found to have been introduced, indicating a lack of enforcement or knowledge of the Act or possibly no awareness as to which species are native or introduced. The recently promulgated EMA contains many of the clauses present in the Noxious Weeds Act which requires landowners to control listed IAS. The EMA of 2017 requires the MEPA to publish a “list of alien and invasive species”, an exercise that the project can contribute to based on countrywide surveys. The planned development of a NISSAP for Malawi will facilitate implementation of EMA.

- 115 A number of other laws and policies pertaining to biodiversity conservation exist in Malawi, including the Forestry Act (1997), the National Fisheries and Aquaculture Policy (2001), the Fisheries Conservation and Management Act (1997), the National Wildlife Policy (2000), the National Parks and Wildlife Act (1992), the Water Resources Management Policy (1994), the Water Resources Act (1969), the National Land Resources Management Policy and Strategy (2000), and the National Herbarium and Botanic Gardens Act (1987), but none of these instruments makes specific reference to IAS management.
- 116 According to Malawi's CHM, private sector participation in prevention, control and eradication of invasive species is minimal, a shortcoming which will be mitigated by the project by involving the agro-forestry, horticultural and pet trade industries in discussions and workshops, and further creating awareness in these sectors by providing them with the Identification Guide which will be an important output of the project. More than 50% of invasive plant species have been introduced as ornamentals by the horticultural industry; many agro-forestry species have been introduced by private forestry, plantations and other companies; and international trade and cargo agencies play an important role in the accidental introduction of invasive plants and animals by not following correct or appropriate procedures.
- 117 There is little capacity to develop and implement effective management strategies for IAS already present and impacting on communities, the PA system and various economic sectors; nor have these been incorporated into PA management plans. Although the proposed MEPA may partly resolve this issue, Malawi currently has so little capacity or experience with regard to IAS management, especially plants, that it is unlikely that the GoM will have sufficient resources to develop and implement best management practices.
- 118 There is currently very little or no information available on which IAS are present, their distribution and impacts. The DNPW and the Forestry Department do not have the necessary experience or capacity to conduct proper risk analysis of IAS already in and around PAs; neither have they integrated the management of IAS into their PA/FR management plans and annual budgets. The EAD, MoNREM, has no surveillance systems in place nor monitoring data on the main pathways by which these species were initially introduced, how new IAS may be introduced, and how they are currently being moved to new localities. There is also little to no knowledge among practitioners in Malawi on the current policies and regulations in the various Government Departments with responsibility for IAS management. This prevents the agencies from coordinating and collaborating in prevention and management of IAS of national importance. Without adequate baseline data it is not possible for Malawi to develop or implement effective IAS management strategies at a national, regional, local or even PA level. These capacity issues and knowledge gaps need to be addressed. For example, IAS prevention and management is not incorporated in national agricultural development and poverty alleviation programs, nor in PA management directives or budgets; nor is it clearly targeted in the country's (agriculture) quarantine and pest management systems.

***Barrier 2. Limited experience, partnership and capacity to implement IAS management (prevention, control and restoration) in protected areas and adjoining landscapes***

- 119 Implementation of IAS prevention and control strategies in Malawi is inadequate to support the conservation of biodiversity and the maintenance of ecosystem services and functions. For example, the GoM takes precautions with

regard to the intentional introduction of pests under the Plant Protection Act, but it is mainly concerned with those that pose a risk to agriculture and human health rather than those that may threaten biodiversity. In other words PRAs are mainly concerned with the pests associated with, for example, an imported plant rather than the plant itself.

- 120 Malawi does not have adequate systems in place to monitor or detect new invasions, or to take effective steps to eradicate them, except in the case of some agricultural pests. Control programs for well-established and widespread IAS are also often inadequate, mainly owing to lack of information, capacity and resources relating to the methodologies for management (mechanical/manual, chemical, biological and restoration). Shortages of institutional, human and physical resources all limit Malawi's ability to address IAS effectively.
- 121 Malawi has some experience based on the successful control of the cassava mealy bug, the cassava green mite and water hyacinth. In fact Malawi has introduced the biocontrol agents *Eccritotarus catarinensis*, *Neochetina bruchi*, *N. eichhorniae*, and *Niphograpta albiguttalis*, for the control of water hyacinth. However, despite the fact that there are a large number of host specific and damaging agents already present in Africa, that have been used with great success outside of Malawi, very few have been released in Malawi.
- 122 No policies in Malawi explicitly advocate Integrated Pest Management (IPM). However, the Pesticide Control Board, established under the Pesticides Act of 2000, recommends the use of safer alternatives to existing pesticides. The Pesticide Regulations of 2002 and other Acts advocate the safe use of pesticides. However, at a landscape level IPM is not widely practiced. A study by Parsa et al. (2014) found a number of barriers to the adoption of IPM in the developing world. The obstacle most frequently cited was "insufficient training and technical support to farmers" followed by "lack of favorable government policies and support".
- 123 Conservation agriculture (CA) in its simplest form includes minimum or no soil disturbance, permanent soil cover, and crop rotation. The benefits of CA include a reduction in soil erosion, increases in soil organic matter, improvement in soil biological processes and soil fertility, and conservation of soil moisture, all of which have contributed to increased yields (Derpsch and Friedrich, n.d.). Although weed control can be difficult in no-till cropping systems it can be significantly enhanced through crop rotation and retaining surface residue and further by adjusting crop density and arrangement (spacing) (Nichols et al., 2015). Barriers to adoption include a lack of awareness of the appropriate practices and their benefits, as well as low levels of investment in knowledge dissemination. Agriculture projects run by governments, NGOs, and others often fail to engage with farmers or effectively spread the word about how to accomplish rainwater harvesting, agroforestry, and other practices.
- 124 At a PA level the National Parks and Wildlife Act makes no reference to the management of IAS despite the Act stating clearly that the introduction of exotic species into PAs is prohibited. The National Forest Policy mentions that forests are threatened by the introduction of invasive plants, yet many of the species being promoted for plantation forests and woodlots are themselves known to be invasive.
- 125 There is virtually no experience on the management (manual, chemical and cultural control) of environmental weeds other than those which have been targeted for management in NNP and MMFR. These experiences have not been widely shared with staff from other PAs or with communities living adjacent to PAs.

- 126 Partnerships are critical in order to be effective in the control of shared IAS, especially for those invasive species which affect multiple sectors all of which are managed or controlled by different entities. IAS are biological pollutants and as such require management by all sectors – they cannot be managed in isolation. An absence of partnerships leads to a situation where invasive or potentially invasive agro-forestry or other species, such as exotic fish, are introduced by one Ministry without consulting or informing another.

***Barrier 3. Insufficient information and understanding of IAS threats and impacts is preventing informed and strategic decision-making for IAS management***

- 127 As explained in Section 2.3.2, there is a serious lack of knowledge and understanding of the issues around IAS in Malawi, at all levels from senior policy makers to local communities. Water hyacinth is an exception, since it has had a serious negative impact on hydro-electric generation in Malawi. Almost everyone in Malawi, especially those living along the shores of Lake Malawi and the Shire River, are familiar with water hyacinth and its impacts. There is also some information on the impacts and management of invasive plants targeted for control in MMFR and NNP. However, based on our preliminary surveys there are a large number of invasive plants in Malawi, the presence of which officials are unaware of, while communities may know the plants but have little knowledge with regard to best management practices. The situation is slightly different for introduced crop pests which are generally better known by officials and communities, although there is still insufficient information available on how best to control them.
- 128 Without clear information on IAS, it is not possible to prioritize species for action or to develop and implement national management strategies, especially with regard to early detection and rapid response. Another result of this lack of knowledge is unwillingness among policy makers and resource managers to interfere in the commerce and trade of exotic species. A further constraint is that the weak policy and institutional environment for IAS management in Malawi means that critical information needed for informed decision-making is not widely shared among national stakeholders and therefore does not inform decision-making. Few of the senior managers responsible for PA system planning and management have extensive knowledge of IAS, and as a result, protected areas in general have demonstrated little willingness to act in dealing with IAS threats and impacts.
- 129 The two pilot sites, both PAs, are NNP and MMFR. They were selected as pilot sites because they contain significant amounts of biodiversity, including many endemic species which are threatened by invasive plants. Both are also important water catchments, making the management of invasive plants even more critical. They are “islands” in a massively transformed landscape in which invasive plants and crop pests are widespread and abundant – species which will in time also invade these PAs. The presence of IAS in adjoining agro-systems is reducing crop yields and grazing potential, leading to increased pressure on NNP and MMFR. Weeds in croplands can reduce yields by 30-40%. In fact parthenium, a widespread IAS in Africa, can reduce sorghum yields by more than 90% in unweeded croplands. On average 50-70% of the labour in crop production is spent on weeding, a task mainly undertaken by women and children. In Africa, 69% of farmers’ children aged 5-14 are employed in the agricultural sector, especially at peak periods of weeding. It is also widely acknowledged that many farmers have abandoned their land due to an inability to effectively manage them.

## 2.7. Linkages with other GEF and non-GEF interventions GEF interventions

- 130 This project will complement and enhance existing invasive species activities and build on past projects by assisting the process of drawing them into a comprehensive national framework, linking production and conservation-based initiatives, and providing regionally-facilitated efficient and effective support-raising, information-sharing, research and management mechanisms, while building national capacity. Sustainability will be built through increased awareness as to the threats posed by IAS and by providing park managers as well as communities with the best tools to control IAS. Biological control is the most cost-effective and sustainable IAS management option; but IAS cannot be managed in isolation and a national approach is required to ensure their effective management in key biodiversity hotspots. The lessons and support to be drawn from existing and past GEF IAS projects will be invaluable. The project will support coordination between existing projects by hosting annual meetings/workshops and establishing joint Working Groups, which will facilitate the sharing of information, foster cooperation and avoid duplication.
- 131 Coordination and exchanges of best practices will be sought with several regional/global GEF projects underway elsewhere, in various stages of development and implementation. The regional UN Environment-GEF Project “Removing Barriers to Invasive Plant Management in Africa, although it ended four years ago, can still provide experiences and lessons learnt relevant to the proposed project, particularly since both projects synergies include a focus on strengthening policy, building capacity, and creating awareness. Several other projects, all of which involved the participation of CABI and/or its partners, have focused on awareness creation, capacity building, strengthening of IAS policy and the development of best management practices for selected target species, and can provide valuable lessons and potential coordination and information sharing with the proposed project. These other GEF projects including the regional project “Mitigating the Threats of Invasive Alien Species in the Insular Caribbean” (which ended in early 2014); the project in Cameroon “Development and Implementation of a National Monitoring and Control System (framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)” under the GEF Biosafety Program; the project “Prevention, Control, and Management of Invasive Alien Species in the Pacific Islands”; and the project “Removing Barriers to Invasive Species Management in Production and Protection Forests in SE Asia”.
- 132 At the national level, the proposed project aims to build on the successes of several previous GEF-funded projects that contributed to the management of IAS in various ways. The Lake Malawi/Nyasa Biodiversity Conservation Project (GEF ID 51) resulted in the introduction of three agents for the biological control of water hyacinth (*Eichhornia crassipes*). The WB and GEF-funded Malawi Compact Environment and Natural Resource Management Project and Shire River Basin Management Project provided inputs into the control of water hyacinth in the Shire River, Lake Malawi and Lake Malombe. These programs developed strategies to acquire and raise bio-control organisms, to train members of local communities in the release of these agents in infested areas, to manually remove the alien plant where it was abundant, and to conduct awareness campaigns through the production of posters. These projects have provided models, processes and lessons to facilitate the introduction of additional agents for other target species and systems, and processes have been developed and implemented to allow for this. For example, our proposed project intends to introduce host specific and damaging agents for the control of another aquatic weed, *Pistia stratiotes*, and the terrestrial

weeds *Lantana camara*, *Mimosa diplotricha* and possibly *Acacia mearnsii*, funds permitting (see Appendix 17 for more information on the safety and efficacy of weed biocontrol agents). The previous projects provide an ideal opportunity to demonstrate that biocontrol agents are host specific and damaging. The processes used to acquire permission to introduce and mass rear the agents will also be invaluable. In this respect the project will be working closely with Plant Protection Services in the Ministry of Agriculture, Irrigation and Water Development since they are responsible agency regarding biological control.

133 The Mulanje Mountain Conservation Project (GEF ID 640), implemented by the MMCT, enhanced the capacity of communities around the Mulanje massif to identify and manage invasive alien plants. One of the major pine invasions (Sombani Basin – 175 ha) was effectively controlled with project financing, an activity coordinated by the Department of Forestry and undertaken by community members. That said a number of new areas have been invaded by *Pinus patula*, and areas previous cleared of pines (Chambe Basin – 650 ha) have seen a dramatic increase in the regeneration of pines from the seed bank and have also been invaded by *Rubus ellipticus* and other IAS. Lessons on what did and did not work will be invaluable for developing new control strategies under the proposed project, supported by improved policy and legal frameworks and capacities that did not exist under the previous project. Sustainability of project interventions on Mount Mulanje will be ensured by working with the MMCT. MMCT, an endowment trust funded by the World Bank through the GEF, provides long-term reliable support for biodiversity research, conservation of biological diversity and sustainable utilization of natural resources, including the eradication and management of invasive species on Mount Mulanje. The proposed project can build on existing knowledge and contribute to the enhanced management of woody invasives through the introduction of host specific seed-feeding agents – this intervention will not impact on the useful attributes of some woody invasive species – a win-win solution in the sense that communities will still have access to fuelwood but the exotic trees will no longer be invasive.

134 The project will also build-on the Shire Natural Ecosystems Management (GEF ID 4625) project, which is focused on i) improved management effectiveness of existing and new PAs, ii) improved agricultural management, iii) enhanced cross-sector enabling environment for integrated landscape management and, iv) good management practices applied in existing forests. Increased erosion in water catchments is leading to increased sedimentation in Lake Malawi and the Shire River. In order to address these issues the project is targeting sub-catchments and PAs in order to reduce erosion and improve livelihoods. This will include rehabilitation of water catchments and support to communities to develop alternative livelihoods that don't degrade water catchments. Although IAS are not addressed in the project, failure to manage them can increase water-use and contribute to erosion. The Ministry of Agriculture, Irrigation and Water Development is the national partner on this project and will benefit from inputs regarding the impacts of woody weeds on water resources.

135 The Sustainable Management of the Nyika Transfrontier Conservation Area (GEF ID 3618) initiated some mechanical control of bracken fern and *Pinus patula* across the Nyika plateau, integrating research and management in dealing with bracken fern by frequent slashing of the undesired plant on the plateau in sampled areas, and will provide lessons learned to benefit the proposed project. Much of this work was undertaken by the NVT in collaboration with the DNPW, both of whom are partners in this project. Similar studies on bracken fern, but using herbicides,

have been undertaken by the Museum of Malawi on Mount Mulanje. Findings will be consolidated and additional research undertaken, building on what is already known.

- 136 Finally, the project will coordinate activities with the recently endorsed GEF Project Enhancing the Resilience of Agro-ecological Systems Project (ERASP) which will be implemented by IFAD and executed at a national level by the Ministry of Agriculture, Irrigation and Water Development. This project will focus on integrated catchment management; scaling up catchment level, sustainable land management practices; and monitoring and assessment of ecosystem services, resilience and food security. The project does not make direct reference to any activities focussing on invasive species management, even woody invasives, which pose the biggest threat to water resources, especially if they are present in water catchments or riparian zones. The promotion of fast growing species in woodlots is also recommended with no reference being made to the risks associated with the planting of some of these non-native species. The issue of improved food production, through the effective management of pests, by implementing integrated pest management programs is also not directly addressed. Through increased collaboration between the IFAD project and what this project is proposing, outcomes will be significantly enhanced, resulting in improved benefits to rural communities and enhanced biodiversity conservation. As such, the project will look into program synergies and shared interest in supporting sustainable farming practices in shared agro-ecosystems, specifically those in vicinity of the targeted PAs.

#### **Non-GEF interventions (past and present)**

- 137 Most of the past efforts of national institutions and international agencies to address IAS issues in Malawi have dealt with IAS in a peripheral way or as secondary/tertiary objective. As a result, impacts and problems related to IAS persist in the country, with negative impacts on effective conservation and management of PAs, the maintenance of critical ecosystem services and landscape productivity, and the protection of community interests. Nevertheless, the proposed project will seek to coordinate with and benefit from lessons learned under other programs and projects on IAS management, including those of project co-financing partners.
- 138 The Government of Malawi (GoM) is supporting efforts to strengthen (agriculture) quarantine requirements through the Plant Protection Services, and to create awareness among relevant staff and other stakeholders about the threats posed by IAS. However, no specific IAS prevention and control programs related to PA management, specifically biodiversity protection, are currently being funded by the government, although the Department of National Parks and Wildlife and the Forestry Department have been involved in IAS management in the past. There are also ongoing efforts to try to manage water hyacinth on the Shire River. However, several other related government programs constitute a good baseline investment to build on and improve focus as well as additional activities towards IAS management. Under the Government's National Development Program, support is being provided to protected areas, mainly in the form of staff training and under the anti-poaching activities (see below). It is envisaged that training in the identification and management of key invasive alien plants will be included within this government training program through support by the GEF project.

- 139As discussed in Section 2.9, the GoM is currently supporting several major environment programs within MoNREM; and notwithstanding the low level of funding set aside specifically for biodiversity conservation within these (US\$21,326 out of a total of over US\$12 million), the various ongoing and planned program activities offer much scope for collaboration and incremental activities focused on IAS prevention, management and control, including training, awareness building, inventory of IAS in (wildlife) reserves, (economic) impact analysis of emerging IAS to game tourism, as well as development of the national IAS strategy through partnership, also because the same Ministry (MoNREM) is at the helm of both this and the GEF project.
- 140The Ministry of Agriculture, Irrigation and Water Development (MoAIWD) in its 2016-2017 Program Budget Statement includes two Strategic Objectives: (i) To ensure sustained food security; and (ii) To ensure increased agro-based incomes, which are closely related to both the prevention as well as control of invasive pest species. The availability of water is critical for agricultural development. Woody invasive species pose a significant threat to water run-off from important water towers such as Mount Mulanje and Nyika. Invasive plants can also contribute to increased erosion leading to the siltation of irrigation canals, dams and Lake Malawi itself. Overgrazing due to a loss of available pasture as a result of plant invasions and poor crop management practices can also lead to the loss of soils while pesticide over-and misuse can reduce water quality. For these reasons the project will be working closely with MoAIWD. Its Agricultural Productivity and Risk Management program budget is large: US\$177,598,400 over the next three years.
- 141The Ministry of Local Government and Rural Development (MoLGRD) will invest a minimum of US\$8,158,789 in rural development, of which a small part may benefit the project through the planned livelihood improvement initiatives potentially benefitting communities involved in the agro-ecozones around the protected areas. It is important to note that each local authority will be required, under the new EMA, to establish Local Environment and Natural Resource Committees. These Committees will undertake, among others, environmental education and outreach programs and mobilize local communities to manage and conserve the environment. These Committees will be important partners in areas adjoining Mount Mulanje and Nyika.
- 142The GoM also plans to achieve improved IAS management in order to meet some of its CBD obligations by undertaking a range of activities requiring estimated funding in the range of US\$6,500,000, which will be requested from UN Environment, UNDP, NORAD, FAO, DFID, USAID, IrishAid, GIZ and the private sector (NBSAP, 2015-2025). To assist the GoM in achieving its mandate many private-public partnerships around the management of protected areas have already been developed. For example, three NPs in Malawi are now contractual parks, managed by the African Parks Foundation. This provides the proposed project with the opportunity to not only raise awareness among private and public stakeholders about the threat of IAS, but also to accrue resources from both sectors for the management of IAS.
- 143 The World Bank will also be supporting the GoM in the implementation of the Agricultural Commercialization (AGCOM) Project with the objective of increasing commercialization of selected farm and agribusiness products for domestic and export markets. The activities proposed under AGCOM trigger the World Bank safeguard policy on Pest Management (OP.4.09) and as such a standalone Pest Management Plan (PMP) has been prepared to meet the



requirement. The objectives of the PMP include the use of “biological treatment, mechanical and manual methods for pesticide control, which are recommended for use, with the ultimate objective of progressive reduction in the application of chemical pesticides, by replacing them with the more environmentally friendly options”. The PMP discusses these opportunities and makes recommendations for implementation. For AGCOM a strong capacity building program will be required to manage and monitor the use of pesticides that may be used by farmers to scale up their production. This is an activity that CABI, in its Plantwise Programme, is already promoting widely in parts of Malawi through the establishment of mobile plant clinics. The project will also be promoting sustainable farming practices, including IPM and biological control, and in so doing complement many of the activities under the AGCOM Project.

144 The Electricity Supply Commission of Malawi continues to support programs to reduce the impact of introduced waterweeds in the Shire River using Environmental Management Funds. Both the Blantyre and Lilongwe City Assemblies are also involved in manual removal of *Salvinia molesta* that is threatening their water reservoirs. The project will work together with the Commission and other partners to improve the management of waterweeds by introducing additional biological control agents.

145 The project will also build on the Community Partnerships for Sustainable Resource Management Project (COMPASS II) which was funded by USAID. The project creates an enabling environment for communities to manage sustainable harvesting of natural resources, thereby increasing rural incomes, reducing environmental degradation and maintaining biological diversity. In NNP, the focus of COMPASS II was to increase honey production capacity. The project will be working with the community groups established during the project. The DNPW have also undertaken a number of initiatives to establish community based organisations (CBOs) to integrate conservation of Nyika with economic development outside its borders.

146 Among non-governmental organizations, the Malawi Environmental Endowment Trust (MEET) and the MMCT provide sustainable sources of financing for the management of protected areas, including IAS (MMCT continues to support implementation of the management plan for the MMFR). In addition, the NVT (UK) and (Malawi) funds also fund conservation and community projects in the NNP and Vwaza Marsh Wildlife Reserve, including the management of IAS. MMCT, NVT (UK) and NVT (Malawi) are project partners, having supported IAS management in the past, and will be providing in-kind support in the form of office space, equipment, communications, housing, storage, workshop facilities, and even a tractor/trailer during IAS management activities.

147 The Wildlife and Environment Society of Malawi (WESM), a BirdLife International partner, supports the management of protected areas in Malawi in areas such as lobbying the government to establish protected areas; promotion of environmental education; infrastructure development; re-introduction and game management; promotion of effort-based law-enforcement; snare bounty scheme; research activities; and ecotourism. More recently they were involved in a NORAD-funded project, which was active, amongst others in the Ntchisi FR, with the specific objectives of improved governance structures in and around IBAs; improved community-based natural resources management; monitoring bird

species and habitats and increased incomes from NRM-based enterprise development. WESM will contribute to awareness creation.

- 148 LEAD-Southern and Eastern Africa, the Forestry Department and World Fish Centre are implementing the Lake Chilwa Basin (LCB) Climate Change Adaptation Program in collaboration with Machinga, Phalombe and Zomba district councils. The program is designed to secure the livelihoods of 1.5 million people in the Lake Chilwa Basin and enhance resilience of the natural resource base through the development and implementation of a basin-wide climate change adaptation program that will enhance the capacity of communities to adopt sustainable livelihood and natural resource management practices. Mount Mulanje is an important water catchment for Lake Chilwa and as such activities of this project will benefit those of the Climate Change Adaptation Program.
- 149 In agro-ecosystems CABI is working together with the Department of Agriculture, Irrigation and Water Development in the Plantwise Program, whereby extension officers are trained to assist farmers in the identification of pests, including IAS, and how best to manage them. Advice focusses on the reduction of pesticide use through integrated pest management, of which biocontrol is an important component. The Plant Clinics, which have been established as part of the Program, play an important role with regard to early detection and rapid response and will be an integral component of the proposed Project.
- 150 The Project will also work closely with Total LandCare, an NGO established in 1999, with a mandate “to improve the livelihoods of smallholder farmers in the region with a focus on community based approaches to increase agricultural production, food security and incomes within a context that ensures sound management of their natural resources.” The project will be working closely with Total LandCare with regard to the introducing cropping practices such as crop integration and crop rotation. The introduction of trees into the agricultural landscape will also be done in partnership with Total LandCare.
- 151 The Lilongwe Wildlife Trust, established in 2008 is involved in advocacy and enforcement initiatives that influence decision makers and help to bring wildlife criminals to justice; wildlife rescue and research; and conservation education. To date they have helped create awareness among 35,871 school kids and trained 249 teachers, community scouts and local leaders. The project will work closely with the Trust in creating awareness on IAS.

## SECTION 3: INTERVENTION STRATEGY (ALTERNATIVE)

### 3.1. Project rationale, policy conformity and expected global environmental benefits

- 152 *Rationale:* Although Malawi is a relatively small country it has high levels of biodiversity and endemism. For example, the Nyika Plateau is part of the Eastern Afromontane Hotspot, which has high levels of endemism with 31% of plants, 21% of mammals, 30% of reptiles, 30% of amphibians, and 69% of fish occurring nowhere else in the world. The Nyika Plateau itself supports more than 215 orchid species, of which four species and two subspecies are thought to be endemic. MMFR contains over 1,100 species of plants of which 57 are strict endemics including one subspecies and four varieties. Of the 172 species of molluscs found in all of Malawi, 47 species are endemic, and the country has 12 species of reptiles and 7 species of amphibians found nowhere else in the world. Malawi also

harbours 648 species of birds; 456 of these are resident and a further 94 are intra-African migrants of regular occurrence. One of the main threats to this biodiversity are IAS.

153 At the same time Malawi is one of the least developed and most impoverished countries on earth. Nearly 53% of its 15 million inhabitants live below the poverty line with 85% of the population living in rural areas. The majority of these are small-scale farmers, dependent on natural resources for their survival. Low yields and diminishing livestock carrying capacities have forced many people to encroach on PAs. Pests, many of them introduced, have contributed to a dramatic reduction in crop yields, while invasive plants have displaced valuable forage species and also invaded croplands.

154 A large number of IAS are already present in Malawi including, among others, the Tomato leafminer (*Tuta absoluta*), Fall armyworm (*Spodoptera frugiperda*), Asian fruitfly (*Bactrocera dorsalis*), Papaya mealybug (*Paracoccus marginatus*), Mexican pine (*Pinus patula*), Mesquite (*Prosopis juliflora*), Tickberry (*Lantana camara*), Giant sensitive plant (*Mimosa pigra*), and Creeping sensitive plant (*Mimosa diplotricha*). Fall armyworm has already destroyed over 300,000 hectares of maize in Africa with potential estimated losses of US\$3 billion in the coming year (Cock et al., 2017). According to 40% of those interviewed in Uganda, lantana reduced the amount of forage available to livestock by more than 50%, while one-third of those interviewed reported a 26–50% reduction in crop yields (Shackleton et al., 2017). Lantana invasions cost individual households substantial amounts of money (US\$400–500 per annum). It is highly likely that Pas and adjoining agro-ecosystems in Malawi will increasingly be affected by IAS, with a corresponding increase in economic, human health and social impacts, in addition to the impacts to biodiversity, unless Malawi is made aware of the dangers of invasive species and the need for concerted action. Malawi must also be assisted in accessing and using the available technical options and tools, and in building national partnerships to prevent and control the spread of invasive species throughout Malawi, but especially in PAs and adjoining landscapes.

155 There is generally a low level of understanding of the impacts of invasive species in Malawi, and little support for their control. In fact there is no database on the presence, distribution and impacts of IAS, except for a few serious crop pests. A major focus of the MSP will therefore be to build awareness among policy and decision makers, which in the medium to long term should lead to increased levels of programming and government investments as well as a willingness to make significant changes in how Malawi deals with the problem of invasive species, specifically those related to protected areas and adjoining agro-ecosystems.

156 Malawi already has some measures in place to prevent, control and/or eradicate IAS, but those measures focus mainly on agricultural pests and crop weeds. The environment sector, including protected areas, is particularly under-represented in national IAS research, control and management programmes. The proposed MSP will widen this narrow approach to dealing with IAS by establishing an extensive framework addressing IAS that threaten biodiversity, particularly in protected areas, including mitigation strategies embedded in national policy frameworks. It will build on existing national measures in the plant and animal health sectors and feed biodiversity capacity into the project by linking with diverse national stakeholders, primarily those working in protected areas management.

157The project will build the case with the Government of Malawi for addressing IAS by demonstrating the impacts of invasive species in protected areas, but importantly also from the perspective that many people in the region depend upon natural resources in adjoining agro-ecosystems for their subsistence, regular livelihoods and coping strategies in times of adversity. The proposed MSP will provide Malawi with the necessary tools and capacity to address existing and future biological invasions. The development of a national inventory and identification guides, strengthened national regulatory and legal frameworks, increased capacity in the management of IAS, and other outputs will contribute immensely to IAS management.

158Management interventions, especially for introduced pests, generally involve the use of pesticides which are expensive for smallholder farmers but also place a heavy chemical burden on the environment and human health, and are the biggest drivers of biodiversity loss in agro-ecosystems. Pesticide drift can also impact on biodiversity within protected areas. To reduce pesticide use, especially targeting crop pests in areas adjacent to protected areas, the project will promote and implement integrated pest management. This will include the promotion of herbicide free weed management, crop integration and crop rotation to enhance soil health and nutrient fertility, food production and provide communities with residue free crops.

159Malawi also lacks an over-arching IAS strategy and there is little coordination between various stakeholders. In fact some sector-based policies promote the introduction and dissemination of IAS. Lack of coordination also results in duplication and a waste of precious resources. More importantly the lack of a NISSAP and coordination means that some IAS are never managed because it is assumed that it is the responsibility of other agencies, with ultimately nobody taking responsibility.

160*Policy conformity:* The goal of the GEF 6 biodiversity focal area strategy is to maintain globally significant biodiversity and the ecosystem goods and services that it provides to society. To achieve this goal, the strategy encompasses four objectives: (a) improve sustainability of protected area systems; (b) reduce threats to biodiversity; (c) sustainably use biodiversity; and (d) mainstream conservation and sustainable use of biodiversity into production landscapes/seascapes and sectors. The project is in line with Program 1 “Improving Financial Sustainability and Effective Management of the National Ecological Infrastructure”, specifically its Outcome 1.2 ‘Improved management effectiveness of protected areas’; and Program 4 “Prevention, Control, and Management of Invasive Alien Species”, specifically its Outcome 4.1 “Improved management frameworks to prevent, control and manage invasive alien species (IAS)”. With regard to the latter this project addresses IAS management through a comprehensive pathways approach. Only once pathways for the introduction of IAS into a country, region or protected area are identified can action be taken to manage them; for example, by addressing the introduction of IAS by the agro-forestry industry.

161By addressing the following priorities and establishing an integrated work plan at site and national levels, the project will meet several GEF policy objectives:

- Establishing national policy and institutional frameworks;
- National capacity building and institutional support;
- Developing expertise on the prevention, control and management of priority IAS in protected areas;

- Implementing national information, monitoring and awareness programmes.

162 The MSP will help Malawi to meet its obligations under the Convention on Biological Diversity (CBD), including Article 8(h), which commits member countries to ‘prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.’ The project contributes to the goals of the CBD in implementing activities identified in Malawi’s National Biodiversity Strategy and Action Plans, and it will directly assist Malawi with achievement of the Aichi Targets 1, 7, 9, 11, 12, 14 and 19, in particular Target no. 9: “By 2020, invasive species and pathways are identified and prioritized, priority species are controlled and eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.” This is very similar to what has been included in Malawi’s revised NBSAP (2015-2025): Target 9 is “By 2025, invasive alien species and their pathways are identified and prioritized for control and prevention from movement and spreading in and out of the country”. The NBSAP identifies the following targets/actions related to IAS that need to be achieved by 2025: 1) compile documentation and maps on IAS in Malawi including an inventory of invasive alien species prevalent in the country 2) develop a national invasive species management plan for management of IAS; iii) conduct awareness campaigns and build capacity of different stakeholders on how to identify, track and prevent IAS in their localities, and on the threats of invasive alien species to biodiversity (cross-border inspection, quarantine and certification); iv) procure and upgrade inspection infrastructure for tracking and identifying IAS in Malawi; v) conduct capacity building initiatives on invasive alien species monitoring; vi) monitor the entry and spread of invasive alien species; and vii) regulate and control movement and spreading of IAS. This is also in line with the findings of the Millennium Ecosystem Assessment, identifying the spread of invasive species as one of the five major direct drivers of change in biodiversity and ecosystems. The project will assist in all these actions aimed at meeting Target 9 of the NBSAP. It will also assist Malawi in contributing to some of the Sustainable Development Goals (SDG), including Goal 15: “By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.” By managing IAS in agro-ecosystems the project will also contribute to SDG 2 (zero hunger) by reducing the negative impacts of IAS on crop and pasture production. It also contributes to other SDGs by protecting water catchments from plant invasions which are known to reduce water quality and quantity and by providing communities with nutritious food, with no pesticide residues.

*Global Environmental Benefits:*

163 Global benefits of this project include contributions firstly to reduce the loss of biodiversity and maintain the quality of protected habitats in the PA system of Malawi by initially focusing on two PA’s, Nyika NP and Mount Mulanje FR, and secondly, as an indirect benefit by reducing the negative impacts of IAS on local livelihoods and the economy of Malawi. IAS management activities in areas adjoining these PA’s will also reduce potential future threats of IAS present there that may invade these PAs, threatening biodiversity and increasing future PA management costs.

164 A total of 1,927 plant species and subspecies have been identified in the Nyika NP (NNP), of which 33 are endemics only found in the park and a further 13 are considered near-endemics. The Nyika Plateau itself supports more than 215

orchid species, of which four species and two subspecies are thought to be endemic. A large number of insect species have also been collected in NNP, including some 120 of the 200 species butterfly species present in Malawi, of which at least 13 species are endemic. At least 15 species of frogs and toads have been recorded including two endemics. Lake Kaulime and the three man-made dams, together with the four major rivers that rise on the plateau and supply the northern region before flowing to Lake Malawi, as well as numerous streams, provide habitats for 27 indigenous species of fish. There are a large number of reptiles in NNP with 47 species already recorded, three of which are endemic to the Nyika. NNP is also an Important Bird Area (IBA) with 430 species of birds having been recorded of which around 60 are vagrants or very rare. The NNP also harbours 100 mammal species.

- 165 The other pilot site, Mount Mulanje Forest Reserve (MMFR) also harbours significant biodiversity. In all there are over 1,100 species in Mulanje/Michesi of which 57 are strict endemics including one subspecies and four varieties. Seven of the bird species recorded are endemic or near endemic. There are 14 endemic reptile species and 4 near endemics. The number of invertebrate species is estimated between 25,000 and 30,000. There are 60 species of snails (8 endemics), 10 of slugs, 22 of dragonflies, 233 of butterflies (11 endemics or near endemics), and 145 of beetles (7 endemics or near endemics). Due to its species richness and high levels of endemism, Mt. Mulanje was identified by the World Wildlife Fund as one of 200 global ecoregions in the world for the conservation of biodiversity, and designated as an Afrotropical Regional Centre of Endemism, and identified as a potential UNESCO World Heritage Site.
- 166 Based on numerous studies from around the world it is obvious that invasive plants have a dramatic impact on biodiversity. By managing invasive plants that are already present in NNP and MMFR and surrounding agro-ecosystems the project will contribute significantly to biodiversity conservation. Communities will also benefit from the project's IAS management interventions, as IAS have a significant impact on the goods and services provided by ecosystems (Turpie, 2004; Strayer, 2012; van Wilgen et al., 2013). Management of IAS can therefore contribute significantly to sustaining ecosystem functions and services (van Wilgen et al., 2013). For example, both Mount Mulanje and Nyika Plateau are critical water towers. Invasions by woody invasive plants such as pines and Australian acacias are known to reduce water run-off by up to 80%. Management of woody weeds will contribute to water quantity and quality for downstream water-users.
- 167 By addressing IAS management among communities living in areas adjacent to PA's, the project also will reduce negative IAS impacts on the protected areas themselves, both by removing IAS populations that might spread into PAs, and by protecting agricultural production from negative IAS impacts and thereby reducing the reliance of rural communities on resources within PAs. Project interventions will also reduce pesticide use, one of the biggest contributors to biodiversity loss in agro-ecosystems. Reduce pesticide use will improve water quality and risks associated with their use to human and livestock health.
- 168 It should also be recognized that Malawi and many of its PAs are representative of many other ecosystems and habitats in the region and elsewhere in Africa. Activities in Malawi will act as a model for the wider dissemination of the project findings throughout Africa especially with regard to the management of bracken fern, one of the worst weeds in the world.

169 In order to address these issues and contribute to biodiversity within and adjacent to these PAs and reduce pressures on them from adjoining agro-ecosystems, the project will develop a NISSAP, improving coordination and cross-sectoral management at a national and local level (especially between PA staff/management and adjoining communities as IAS cannot be managed in isolation); identify and manage IAS pathways (IAS being introduced into PAs and adjoining agro-ecosystems); improve prevention and EDRR mechanisms (include the use of Pest Risk Assessments); manage invasive plants within two PAs and surrounding agro-ecosystems (include the development of best management practices for selected IAS); and build capacity and create awareness about the threats and management of IAS. The project will clear a minimum of 100 ha. of invasive *Pinus* and *Rubus* spp., and *A. mearnsii* in Nyika NP and a minimum of 50 ha. of invasive *Pinus* and *Rubus* spp., and other IAS in Mount Mulanje FR. Invaded areas in lands adjoining these PAs will also be cleared of invasive plants (50 ha around MMFR and 50 ha around NNP) and sustainable farming practices developed and implemented. It is envisaged that the GEF TT scores for IAS management will increase by 50%, METT scores for both MMFR and NNP will be improved by approximately 10%, and that forest/tree cover in adjoining areas will increase by about 10% as a result of project interventions.

### 3.2. Project goal and objective

170The **overall goal** is to conserve globally important biodiversity in Malawi.

171The **project objective** is to prevent new invasions and reduce the current impacts of invasive alien species (IAS) in protected areas and adjoining agro-ecosystems in Malawi.

172According to Genovesi and Monaco (2013) there are eight components to improving IAS management in PAs all of which will be addressed in this project. They are:

- Raise awareness on biological invasions at all levels;
- Integrate invasive species and protected area management
- Implementing site-based prevention actions as a priority;
- Develop staff capacity for all aspects of invasive species management;
- Set-up rapid detection and prompt response framework;
- Manage invasive species beyond the protected areas boundaries;
- Implement surveillance, monitoring and information exchange networks;
- Lobby with institutions and decision-makers to support stringent policies

173Previous invasive species programs and projects in Malawi have primarily focused on individual sectors, e.g. water or agriculture or forestry or protected landscapes, and not on national frameworks for IAS prevention and control. This is critical since most IAS have cross-cutting impacts. Recognizing that IAS cannot be managed in isolation and that IAS populations and impacts move between protected and productive areas, the proposed project adopts a landscape approach to IAS prevention and control by including sectors and stakeholders concerned with protected area management and the management of agro-ecosystems in areas adjacent to protected areas. As such communities living adjacent to MMFR and NNP will be working together with PA staff to develop a coherent and holistic management strategy for shared IAS. This will also require the involvement of

different Government Ministries, such as the Ministry of Natural Resources, Energy and Mining and the Ministry of Agriculture, Irrigation and Water Development, NGO's and other stakeholders.

174 Specifically, the project aims to assist Malawi in the development of effective national IAS policies, especially those pertaining to protected areas and surrounding agro-ecosystems, capacity building, awareness raising, IAS control and management field testing, and sharing knowledge and experiences through collaboration. This will be achieved by engaging with stakeholders at all levels, and within all socio-economic groups from resource-poor farmers to lodge owners, thereby providing these groups with the necessary skills to control and manage IAS in their areas. A greater understanding of the problems caused by IAS, and participation in the management and control of the species by all socio-economic groups, will lead to greater benefits in terms of preserving local biodiversity and protecting new areas from invasion. The Project will also provide the opportunity for improved cross-sectoral management, and access to additional resources, by working with multiple Government sectors, especially Agriculture and the Environment, and communities living adjacent to protected areas. In addition, increased coordination between existing projects will be achieved by hosting annual meetings/workshops and establishing joint Working Groups, and by sharing of information in order to foster cooperation and avoid duplication.

### 3.3. Project components and expected results

175 The project consists of three components to address the current barriers to IAS management in Malawi. In order to address policy issues the project will strengthen/develop national IAS policy, improve IAS coordination between various sectors, and build capacity in order to deal more effectively with IAS, especially in PAs and adjoining agro-ecosystems. The second component focuses on MMFR and NNP and communities living adjacent to them. Activities here will be mainly concerned with capacity development, improved coordination/partnerships, and active IAS control, including the development and implementation of improved farming practices to reduce IAS impacts and improve yields. The last component deals with awareness: we need to create awareness about the distribution and impacts of IAS and how best to manage them.

#### **COMPONENT 1: Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems**

**Outcome 1.1: Strengthened national IAS frameworks and improved national capacity and coordination amongst different government agencies and the private sector to respond to existing and new invasive species problems throughout Malawi, with a focus on protected areas and their adjoining agro-ecosystems.**

*Output 1.1.1: National framework for the cross-sectoral management of IAS operational and supporting long-term development planning.*

Key deliverables: (i) National Invasive Species Strategy and Action Plan developed addressing IAS threats, especially those to protected areas; (ii) High risk pathways and most damaging species in Malawi, especially those threatening protected area systems, identified; (iii) IAS Risk Analysis procedures established, including ones for



protected areas; and (iv) National vigilance and surveillance systems, including rapid response to alerts

176 Any IAS management strategy requires a national framework which deals with all aspects related to IAS management such as policy, coordination, prevention, Early Detection and Rapid Response, best management practices, awareness creation, capacity development and even resource mobilization. Most of these are specifically addressed in considerable detail in this project under the various Components and will be included in the National Invasive Species Strategy and Action Plan (NISSAP). The NISSAP provides an over-arching strategy to address IAS at a national and local level, especially at a PA level where biodiversity is threatened by IAS and communities living adjacent to them. Information on high risk pathways, which is critical in developing prevention mechanisms, IAS Risk Analysis procedures or Pest Risk Assessments (PRAs), and improved surveillance (EDRR) are all included in a national framework, albeit in less detail. At a local level these will also be more detailed and included in, for example, the PA Management Plans. An over-arching strategy (NISSAP) which includes improved coordination, prevention (including identification and management of high risk pathways), and EDRR are the cornerstones of any effective national IAS management framework.

177 *NISSAP and improved coordination.* A NISSAP is a sub-output which provides for an over-arching strategy to address IAS issues at both national and local level. The NISSAP is both a national consultative process with all stakeholders causing, impacted by or (potentially) managing invasive species, as well as the strategy document itself, incorporating agreed actions and suggested implementation arrangements on e.g. awareness creation, capacity development, prevention, early detection and rapid response (EDRR) and control, as well as options for cost recovery. It is suggested to give the NISSAP a particular focus on preventing and containing the spread of IAS in the national protected area system and its adjoining agro-ecosystems. Several of these are addressed in more detail under the other components which focus on the development and implementation of best management practices and awareness creation. By the end of the project a NISSAP will be finalized and some of its strategies started, funded or integrated in sector policy, management plans or field programs – specifically in support of the national PA system

178 One of the key aspects addressed in a NISSAP is the formation of cross-sectoral management for shared IAS. Many IAS have cross-sectoral impacts and as such need to be managed by all affected sectors across the whole of Malawi. IAS cannot be managed in isolation by PA managers or communities living adjacent to PA's. For example, IAS introduced outside of PAs by the agro-forestry industry will, in time, impact on PAs. As such it is critical that a NISSAP be developed that addresses IAS issues at a national level, focusing on the protection of biodiversity and livelihoods, especially in PA and adjoining agro-ecosystems. In the last year of the project a NISSAP will be enabled and monitored through a National Designated Agency or Cross-sectoral coordination mechanism – especially on co-management of IAS in and around PAs.

179 The Environmental Affairs Department (EAD) will take the lead in developing a NISSAP, working closely with other stakeholders, especially the MEPA, once established, and Departments within the MoAIWD; Ministry of Industry, Trade and Tourism; Finance, Economic Planning and Development; and others.

Coordination between these Ministries/Departments/Agencies will be established through a NISSAP Multi-Stakeholder Forum to be created during the inception of the project. It is anticipated that MEPA will be ultimately responsible, for the development and implementation of the NISSAP, given its mandate under the EMA of 2017. MEPA, once established, will be responsible to improve coordination between various agencies, including Government departments. MEPA is also expected to establish a Local Environment and Natural Resource Committee which “will be responsible for undertaking environment and natural resources management activities in their jurisdiction”, in turn benefitting implementation of the NISSAP once developed and agreed nationally.

180The private sector is also an important stakeholder and coordination with this sector will be important. Private industry is often involved in the introduction of IAS, either through the pet trade, aquaculture or the horticultural industry. At the same time commercial farmers, such as the tea estates around Mount Mulanje, may be affected by a host of IAS. Other than introduced crop pests, there are a large number of introduced plants affecting yields such as *Dolichandra unguis-cati*, *Argemone* spp. and others. In order to facilitate implementation of the NISSAP, the private sector, especially the aquaculture, horticultural and pet industry, will be involved in some of the stakeholder meetings where issues pertaining to the importation, breeding and sale of exotic plants and animals will be discussed.

181**Prevention.** Prevention is the most cost-effective IAS management strategy and will be a critical sub-output of the national framework and will be included in the NISSAP. Identifying pathways (see below) is critical in preventing IAS incursions. MEPA, once established, will also be mandated to take measures for the “control, eradication or management of alien and invasive species,” including prevention. In fact the EMA states that MEPA will be mandated to “ensure that environmental and risk assessments are undertaken” one of the key areas which needs strengthening in Malawi and will be tackled by the project. IAS risk analysis criteria such as “black”, “grey” and “green” lists will be established so that IAS which pose a threat to biodiversity, ecosystems or livelihoods can be intercepted and rejected prior to introduction into Malawi. At a local level, IAS risk analysis criteria will be developed specifically for PAs by the DNPW, where IAS are often introduced for beautification or restoration. In fact, the private sector, often lodge owners/managers, are often responsible for the introduction of exotic species into PAs for beautification and as such they also need to be sensitized. They can play an important role in creating awareness among tourists about the need to prevent the introduction of invasive or potentially invasive species. For intentional introductions at national level, the project will support the adoption of Pest Risk Assessments (PRAs) prior to importation, or at the port of entry, to identify species that pose a threat to biodiversity or economic development, PRA systems will be developed for use in PAs to ensure that no invasive or potentially invasive species that are already present in Malawi spread into PAs. By the end of the project it is envisaged that PRAs will be conducted for at least 50% of legally imported plant species and five agro-forestry species already present in Malawi with an inclusive PRA system developed and adopted at PA level and at least 10 exotic species present in agro-ecosystems evaluated for risk to targeted PAs.

182Relevant staff at the national and local (PA) levels will receive training in the use of a Pest Risk Assessment. The project will work closely with Plant Protection Services (PPS) in the MoAIWD, who will take the lead in strengthening current prevention practices to ensure that Risk Analysis are undertaken on all legally introduced species, including agro-forestry species, some of which are promoted by

the Forestry Department and NGOs. At a local level PPS will work with staff in the DNPW in NNP and MMCT in MMFR to develop PRA procedures. Failure to adequately address gaps in the implementation of prevention systems will mean that IAS will continue to be introduced to Malawi and its PAs to the detriment of biodiversity, water resources and livelihoods.

- 183 *Pathway risk analysis.* As mentioned above the identification of pathways is critical in improving prevention mechanisms and as such also needs to be included in the NISSAP. In other words to strengthen prevention interventions it is also critical to understand the pathways through which exotic species are being introduced. If the pathways are not known, or understood, then the introduction of invasive or potentially invasive species will continue. To this end the project will identify high risk pathways, pathways through which IAS are introduced into Malawi, and at a local level into PAs and adjoining agro-ecosystems, and propose ways in which they can be managed. By the 5<sup>th</sup> year of the project pathways for high risk species will be known and included in PA Management Plans – supported by specific resources, especially for targeted PAs.
- 184 One way to identify pathways is to determine how IAS, already present in Malawi, were initially introduced, especially into PAs and adjoining agro-ecosystems. To address this knowledge gap, surveys will be undertaken to identify the most problematic IAS and determine why and how they were initially introduced. This will be geographically focused on PAs and associated agro-ecosystems. Although surveys will target particularly those IAS that are known to threaten biodiversity, other IAS found will also be recorded, to maximize the optimum use of survey funds. This information will be made available in an Identification Guide (see Component 3).
- 185 Much of the pathway risk analysis work will be undertaken by the DNPW in NNP and MMCT and the Forestry Department in MMFR, coordinated by EAD. Unless there is a good understanding of the pathways, prevention protocols will largely be ineffective. By focussing on the identified high risk pathways prevention interventions will be considerably more cost-effective. Information on high risk pathways, once identified, will be made available to PA managers and staff through the hosting of workshops/meetings. This information will also be included in the PA Management Plans for NNP and MMFR. Information will also be made available to the Ministry of Industry, Trade and Tourism as tourist facilities are often a major source of IAS. They will also be requested to inform the industry about the risks associated with growing IAS.
- 186 *Early Detection and Rapid Response (EDRR).* Managing IAS pathways more effectively and preventing IAS entry or incursions is the first step in an effective IAS management strategy or NISSAP. However, prevention is not fool proof and as such some exotic species may find their way into Malawi, establish and then spread. To deal with this issue it is important to establish a surveillance system (EDRR system) to detect and eradicate invasive species before they become widespread and abundant – specifically in the targeted national system of PAs. That said, some of these IAS may already be present in Malawi outside of PAs. It is therefore also critical to undertake surveillance activities within PAs to detect new incursions early and ensure that they are contained or eradicated. For example, preliminary surveys in NNP have revealed the presence of a host of exotic species in and around staff villages. One of these, *Desmodium uncinatum*, is already widely established but can be eradicated together with other exotic species that have the potential to invade. In Liwonde NP *Cascabela thevetia*, grown as a hedge/barrier plant, is escaping cultivation and should be eradicated. The identification and

management of these species will be facilitated through the Identification Guide (Component 3). By the end of the project surveillance and rapid response systems will be part of the new PA Management Plans, and trialled in and around (buffer zones) NNP and MMFR for invasive and/or potentially invasive species.

- 187 Much of the work with regard to surveillance will be undertaken by the DNPW in NNP and Department of Forestry rangers who are involved in patrols in and around MMFR with new detections communicated to the Mount Mulanje Management Authority (Forestry Department) in MMFR. Information on new pest incursions will also be available to the PPS for inclusion in the IPPC pest reports, if they have not been recorded elsewhere in Malawi before. The development of an EDRR system will be coordinated and collated by EAD.

*Output 1.1.2: Evidence base established and communicated for IAS prevention and management in and around PA's.*

Key deliverables: (i) Costs and benefits of three IAS, including 'conflict' species present in agro-ecosystems adjoining protected areas; (ii) National inventory on presence and distribution of priority invasive plants in five National Parks and four Wildlife Reserves; and (iii) Information generated under Component 1 made available to policy and decision makers through communications

- 188 *Cost-benefit analyses (CBAs).* CBAs should form part of any Pest Risk Assessment (see project output 1.1.1), especially for agro-forestry species since they can contribute to the objectivity of the decision-making process. In developing countries many agro-forestry species are introduced for fuelwood, nitrogen-fixation or other purposes. Some of these species, despite their beneficial attributes, go on to become invasive. Studies have demonstrated that the costs of some of these species, to for example, ecosystem goods and services, are higher than the benefits which accrue from their use. Without any information or analyses of their negative impacts these species continue to be promoted/disseminated to the detriment of biodiversity and livelihoods, and in some cases also economic development. It is therefore important to gain better support for the development and implementation of IAS policies, regulations, and actions in the field through various project-sponsored activities including CBAs of a few selected national priority IAS, national communications (Output 3.1.1) as well as capacity building. As an example, all Government officials, NGOs and communities potentially involved in introducing, or supporting the introduction, trade and use of IAS, need to understand and support the need to undertake a PRA which should include the use of CBA. Support for the outcome of a PRA can be enhanced by undertaking such a CBA to confirm if the risks of introducing a species actually outweigh any real or perceived benefits.

- 189 It is imperative that CBAs be undertaken on exotic species already present in Malawi and those that the authorities plan to introduce. To that end the staff and/or students from the Lilongwe University of Agriculture and Natural Resources (LUANAR) and/or other learning institutions will undertake CBAs of three 'conflict' species namely *Pinus patula*, *Acacia mearnsii*, and *Prosopis juliflora*, the results of which will be published in peer-reviewed publications and communicated to more than three key national agencies, incorporated in the NISSAP, and included in two PA management plans. As part of project activities to carry out the analyses, the project will initially provide training by an international

consultant to PPS staff that undertake PRAs and university/college students/staff so that similar studies can be undertaken on other species in the future. The CBA process/research by local individuals/institutions will be supported by the consultant post-training.

190      *National inventory on presence and distribution of priority invasive plants.*

Intensive surveys will be undertaken in Malawi's five NPs, four Wildlife Reserves and MMFR to determine the presence and distribution of invasive alien plants. This data is critical as there can be no effective management of IAS in PAs without an IAS inventory. IAS management plans cannot be developed and implemented unless the distribution of all naturalized and invasive plants is known, including information on impacts and the costs of control. This information is invaluable when prioritizing species for management interventions and important for the implementation of an EDRR programme. With knowledge as to which species are present it is also possible to undertake a pathway risk analysis which will contribute to future efforts with regard to prevention. Data collected from these PAs will also contribute to the development of the Field Guide under Component 3. These data will also be included in the NISSAP, especially with regard to the compilation of "green", "grey" and "black" lists. Indeed MEPA, under the EMA, is also required to publish a "list of alien and invasive species in respect of which a permit issued under this subsection may not be issued." Without data on which naturalized and invasive plants are present in Malawi, MEPA will not be able to fulfill its mandate. This data from Malawi also contributes to a better understanding of plant invasions at a global level, but more importantly provides Malawi with additional useful information when undertaking a PRA – given information on plant invasions in other countries may highlight the risk of introducing the very same species elsewhere. As such national IAS inventories may contribute to preventing invasions elsewhere. CABI, working closely with the EAD, DNPW, Forestry Department, MMCT, NVT and the National Herbarium and Botanical Gardens will be responsible for developing the IAS inventory which will be made available on multiple websites [CABI's ISC, GISD, GBIF, NVT (UK), and other relevant sites]. Involvement of the National Herbarium and Botanical Gardens will also result in the collection/compilation of additional invasive plant specimens for inclusion in the herbarium plant collection. The IAS inventory will also be included in the NISSAP and relevant PA Management Plans.

191      *Results targeting policy and decision makers through communications.*

Information generated by activities under this component will be important, especially to MEPA, who is mandated under the EMA to "coordinate the promotion of public awareness and education on the protection and management of the environment." Much of the information generated through the project will therefore be made available to the chairperson of MEPA and other members, all appointed by the President. MEPA will in turn make this information available to Local Environment and Natural Resources Committees. Others who will be provided with information will include the Permanent Secretaries of the MoNREM and MoAIWD, Directors of DNPW and Forestry, Executive Directors of MMCT and NWT, and others. Based on previous outcomes it has been determined that the best way to target policy and decision-makers is through the use of TV, radio, posters, sms, billboards, social media and workshops. However, the project envisages doing much of this through one-on-one meetings or small workshops.

Much of this will be determined and outlined in detail under the Communication Strategy developed under Component 3.

## **COMPONENT 2. Strengthening IAS management in existing protected areas and adjoining agro-ecosystems**

### **Outcome 2.1. Reduced IAS impacts in two selected protected areas resulting in enhanced conservation outcomes for endangered and threatened species**

**Key results and deliverables:** (i) Two revised PA Management Plans (NNP and MMFR); (ii) Biocontrol Working Group established; and (ii) three biocontrol agents released; (iii) GEF TT scores up by 50% on IAS management and ~10% up on PA METT in MMFR and NNP; (iv) Increased budgets for IAS management in MMFR and NNP, involving a total of 50,000 ha under improved IAS management; and (v) Control of selected IAS in invaded areas, 100 ha in NNP and 50 ha in MMFR, and restored to semi-natural habitat.

#### *Output 2.1.1. Two revised PA Management Plans including strategies and budgets for IAS prevention and control*

192 Based on the revised PA Management Plans we expect to see a ~10% improvement on the METT scores for NNP and MMCT. In other words we expect to see an increase in current METT for NNP and MMFR of 63 and 61 to 69 and 67 by the end of the project, respectively, especially in terms of enhanced budget and improved IAS management, capacity and awareness. The current NNP Master Plan (2004) makes many references to IAS and the need to manage them. In fact it proposed management plans for a number of introduced and invasive species but few have been implemented. The Master Plan is currently being revised, providing an ideal opportunity to make substantive inputs through the GEF project. Likewise, the MMFR Management Plan is currently being developed and the inclusion of IAS management interventions will be proposed during project implementation. As such IAS management and control will be institutionalized into PA management plans in both MMFR and NNP. The revised PA Management Plans will also include strategies for the prevention, partnership building, and management of IAS in immediate surrounding landscapes/buffer zones. The PA Management Plans will include: i) an outreach and partnership building program for PA staff to engage with affected parties and other stakeholders of strategic interest to contain the impacts of IAS to protected areas as well as its adjoining agro-ecosystems; ii) strategies and policies to effectively prevent the introduction of IAS to the PA and adjoining agro-ecosystems – benefitting IAS invested areas inside the two PA of at least 50,000 ha in total; iii) effective control plans for the existing priority IAS developed including chemical, mechanical and biological control; iv) a system of monitoring and evaluating the implementation of the plan and its effectiveness developed; and vi) a mechanism developed for securing sufficient funding for development and implementation of the program.

193 The last point is critical and will be addressed by undertaking a review and identification of gaps in the current policy, regulatory and institutional frameworks affecting the PA financing systems and current financial planning, accounting and business planning at the national and PA level. Diversification of revenue sources

also needs to be considered and is key to reduce dependency on limited government budgets and may be addressed by seeking other sources such as tourism entrance fees, debt swaps, tourism concession arrangements, payments for water and carbon services and in some cases, carefully controlled levels of resource extraction. The MMCT and the NVT may also be additional source of funds for IAS management activities.

- 194A consultant will lead the process of integrating IAS management objectives and targets into existing PA management plans, working closely with EAD; DNPW and NVT in NNP; and MMCT and the Forestry Department in MMFR. Success of implementation (e.g. on habitat restoration) will be measured in two ways, first through use of the GEF Tracking Tools (TT) with regard to IAS management – prevention, EDRR and implementation of best management practices, as well as secondly by developing an impact monitoring system during the first year of the project (this will be led by a specialised agency or consultant based in Malawi – see also Component 3). The Management Effectiveness Tracking Tool (METT) which has been developed to provide a quick overview of progress in improving the effectiveness of PA management also makes reference to IAS management. We not only expect to see improvements in IAS management but we also expect to see advancements in PA staff capacity, improved financing, and reduced impacts on biodiversity in buffer zones. In fact we expect to see an improvement in the METT for each of NNP and MMFR by ~10%.

*Output 2.1.2. Tested management plans for four IAS, including IAS control and habitat restoration in two protected areas*

- 195The most widespread and damaging IAS in NNP are *Pinus patula*, *Acacia mearnsii*, *A. melanoxylon*, *Rubus niveus*, *R. ellipticus* and *Pteridium aquilinum*. *Pteridium aquilinum* or bracken fern is a native plant that has become extremely abundant (locally invasive) in NNP, displacing valuable forage and other species. It is also extremely problematic in MMFR together with *P. patula*, *A. mearnsii*, and *R. ellipticus*. Additionally, a host of other species have been introduced to staff villages and tourist accommodation facilities in both PAs which need urgent attention. IAS such as *Lantana camara*, *Tithonia diversifolia*, *Mimosa diplotricha*, *Hyptis suaveolens*, and others, are abundant in agro-ecosystems immediately adjacent to these PAs and may spread into the PAs if not controlled soon. For example, lantana is widely grown as a hedge by communities living immediately adjacent to the Pas. *Dolichandra unguis-cati* is also, together with other invasive vines and herbs, a serious problem in tea plantations adjacent to MMFR.
- 196Based on preliminary review of feasibility, costs and likelihood of sustained positive outcomes for both biodiversity conservation in the two PAs as well as crop production in adjacent production land, management trials will target the following four species: *Rubus* spp., *A. mearnsii*, *P. aquilinum*, and *D. unguis cati* and include manual, chemical and cultural control or a combination of these, in the form of demonstration trials, so that PA managers and their staff and communities living adjacent to the PAs can familiarize themselves with control methodologies, their efficacy and benefits. Depending on the target species, trials will compare the efficacy of manual removal of the rootstock or hand pulling versus cut-stump (herbicide application to the cut-stump) or basal-bark or scrape and paint treatments (see Appendix 15 & 18 for more information on methodologies). Species with small populations in the PAs such as *Rubus* spp. and *A. mearnsii* will be eradicated using the determined best management practices – any germinating seeds will be uprooted until the seed bank is depleted. In the case of bracken fern,

trials will compare hand-pulling to that of foliar herbicide applications. Hand removed plants will be dried and then burnt, with the ash being used for K-enrichment of soils in adjoining croplands. Once PA staff will continue implementing the best management practices as determined in trials in order to reduce the spread and densification of bracken fern. It should be noted that other species such as *Cestrum* spp., *Bryophyllum* spp., *Tecoma stans*, etc. which are also listed in the GEF TT (Appendix 18) will also be removed from PAs. However, since they are rare and haven't spread yet, they will be fully eradicated through hand pulling and other manual means – there will be no need to test any management interventions as needed and applicable to the other 4 IAS for control.

197 Best management practices will then be implemented across a wider area – and as an integral part of the agreed PA Management Plan (2.1.1.) focusing on the habitats of the most threatened species and/or impacted areas in PAs, provisionally a minimum of 100 ha in NNP and a minimum of 50 ha in MMFR. This will also include clearing of all invasive and potentially invasive species from tourism facilities and staff quarters, provided populations are still localized and eradication is feasible; but may also include any buffer zones or multiple-use zones – if being formally part of the PA management area. Parts of the sites where IAS management has taken place will be restored through enrichment planting if deemed necessary, assisted natural regeneration or other techniques using local species, resulting in improved semi-natural habitats which will be more resilient in preventing re-invasion of the same or other IAS, as well as increased habitats for threatened and endangered species. Information on best management practices will be widely disseminated among other PA staff (see Component 3). We expect to see a 50% improvement on the GEF TT scores on IAS management.

198 Key will be to involve senior management of MMFR, NNP, Department of Forestry, DNPW, MEPA (once established) and Africa Parks to replicate and sustain best management practices to other affected PAs in Malawi. The project will organize a minimum of two study tours for Government staff to enable this, as well as conduct high level seminars with national stakeholders to strengthen support and dissemination.

199 A host of agencies will be involved in the development and implementation of these interventions, with CABI taking the lead in their development in both MMFR and MMCT, working closely with EAD, MMCT, NVT, Department of Forestry, DNPW and the Museums of Malawi (have undertaken some trials using a chemical to control bracken fern in MMFR) with implementation being undertaken by PA staff and communities from adjoining agro-ecosystems.

*Output 2.1.3. Capacity of 80 PA staff improved and applied in the identification and management of IAS*

200 PA staff will be capacitated with regard to the identification and management of IAS and in so doing the project will contribute to improved biodiversity conservation. The Field Guide, developed under Component 3, will be an important tool in facilitating invasive plant identification. It will also include information on best management practices. Capacity will be further enhanced by taking staff into the field where they will receive practical training on invasive alien plant identification – this will largely depend on the training venue but could be undertaken during training breaks in urban open space, within PAs or agro-ecosystems. By the end of the project there will be a measured increase in knowledge of 80 PA staff on IAS identification (with at least 25% being women).



- 201 Some staff will also be involved in field trials– under Output 2.1.2, to test invasive alien plant management methodologies while others, not directly involved, will visit these “demonstration” trials to familiarize themselves with the various treatments. By the 5<sup>th</sup> year of the project at least four staff of each targeted PA (incl. at least one woman each) would have applied their new skills on IAS prevention and management in project PAs (measured through involvement in management work within and outside the project).
- 202 Much of the training will be led by CABI staff with support from NVT, MMCT, DNPW, and the Forestry Department. Co-funding support will be provided by the Peace Parks Foundation, NVT and MMCT. We envisage training 80 PA staff in the identification and management of IAS.

*Output 2.1.4. Biocontrol Working Group established and operational leading to the introduction of three host specific and damaging biocontrol agents*

- 203 Biological control as a safe and effective management strategy will be prioritized. Biological control, which is a safe cost effective approach to IAS control (see Appendix 17 for more information on biocontrol), should form an important component of any IAS management strategy in developing countries, such as Malawi, that do not have significant resources for chemical and mechanical control. Furthermore, biocontrol agents are optimal for use in PAs and adjoining agro-ecosystems as they reduce the excessive and unnecessary use of pesticides that have negative impacts on biodiversity and on human health. The project will promote the use of biocontrol measures in croplands adjoining PAs, and specifically the use of biocontrol agents that are known to be host-specific and damaging and that have been released elsewhere in Africa; these will include agents for the control of *Pistia stratiotes* (CBC agent: *Neohydronomus affinis*) *Lantana camara* (CBC agent: *Aceria lantanae*) and *Mimosa diplotricha* (CBC agent: *Heteropsylla spinulosa*) (see Appendix 17). The Project will facilitate their possible introduction by undertaking Risk Assessments, followed by the compilation of all relevant reports, which will be submitted to the Regulatory Authorities for their approval before the implementation of any biocontrol activities. Approved agents will be introduced, mass reared and released in the most widespread and dense infestations in order to facilitate initial establishment. By the end of the project there will be at least a 50% increase in awareness of biocontrol above baseline among PA staff and those in MoNREM and MoAIWD.
- 204 In order to facilitate the introduction of these and future biocontrol agents a single national Biocontrol Working Group will be established right from Project Year 2, with involvement of the government national Regulatory Authorities, to support the use of biological control methods, which will reduce the costs associated with conventional control methodologies and more importantly reduce the use of herbicides that can have a negative impact on fauna and flora. Plant Protection Services will take the lead on this activity working closely with CABI with support from Environmental Affairs Department (EAD).

*Outcome 2.2. Reduced IAS impacts in adjoining agro- ecosystems of two selected protected areas contributing to improved livelihoods and biodiversity conservation*

**Targeted results:** (i) Invaded areas in agro-ecosystems adjoining two protected areas (minimum of 50 ha in NNP and 50 ha in MMFR) cleared and restored (non-cropland), through partnership between local

government, PA management, commercial plantations/estates, and farmers; (ii) 15% enhanced tree cover in PA buffer zones as a result of tree planting and/or adoption of FMNR systems; and (iii) Sustainable farming practices such as CA, crop rotation, crop integration, use of cover crops, and/or FMNR in croplands adopted by 50 small-holder households to reduce impacts of invasive plants

*Output 2.2.1. Invaded rangelands (minimum of 50 ha NNP and 50 ha in MMFR – 100 ha total) in buffer zones/agro-ecosystems of two adjoining PAs cleared and restored (native trees) through enhanced partnerships between PA staff and farmer communities, including the training of 100 farmers on IAS identification and management*

- 205 Selected community members, working in partnership with PA staff, will jointly develop best management practices in PAs (see 2.1.2). These community members are expected to become ‘champions’ and inform others on best management practices. Wider dissemination will take place through Farmer Field Schools based in adjoining agro-ecosystems. Best management practices developed under 2.1.2 on IAS control will also be implemented in agro-ecosystems adjoining NNP and MMFR, resulting in the clearing and restoration of 100 ha (50 in NNP and 50 in MMFR buffer zones) on invaded natural pasture. Clearing will be undertaken by community members under the guidance of trained PA staff and those community members that were involved in activities under 2.1.2. CABI will take the lead in this activity working closely with DNPW, the Forestry Department, MMCT and CBO’s with funding support from NVT, MMCT, the Forestry Department and PPF (NNP).
- 206 Invasive alien plants know no boundaries and as such can move rapidly from where they have established into PAs. In some cases invasive plants present in PAs can invade adjoining agro-ecosystems or be present in both PAs and adjoining farmlands. In order to enhance the management of these shared species or species which may invade from an adjoining ecosystem it is critical to enhance collaboration between all stakeholders. In NNP the project will build on existing relationships developed between communities and PA staff as part of the COMPASS II/USAID Project. The MMCT has already established relationships with surrounding communities which will be strengthened. Agencies/organizations such as MMCT and the Forestry Department will take the lead in this activity in MMFR while NVT and DNPW will do so in areas surrounding NNP. By the end of the project PA staff and community members will be meeting at least three times annually to discuss IAS issues.
- 207 It should also be recognized that healthy ecosystems are more resilient to invasions that those which have been degraded through deforestation or overgrazing. Most invasive plants are not shade tolerant. As such the potential of invasion can be inhibited by enhancing tree cover or shade in natural pasture/rangelands. These activities will be undertaken by CABI in collaboration with EAD, Forestry Department, DNPW, MMCT, and NVT.
- 208 The project will ameliorate pressures on PAs and improve collaboration between farmers and PA staff, based on the consultations and strategies developed jointly under Output 2.1.1 towards the incorporation of IAS objectives, targets and budgets in the PA Management Plans.

209Communities living adjacent to PAs will be capacitated with regard to the identification and management of IAS and in so doing the project will contribute to improved pasture/rangeland production, as well as improved biodiversity conservation. Tools such as the Field Guide (Component 3) will contribute to building that capacity. Much of the training will be undertaken in Farmer Field Schools. Additional learning material will be provided by CABI with assistance from EAD and Lilongwe Wildlife Trust.

*Output 2.2.2. Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping adopted and promoted by 50 households as a result of training and demonstration trials*

210 Direct interventions and biological control can mitigate against the impacts of IAS. Other interventions such as crop integration, crop rotation and the growing of cover crops in croplands can also enhance weed control. These interventions will not only increase yields but also reduce pesticide use. For example, by rotating crops with different planting dates and growth periods, contrasting competitive characteristics and dissimilar management practices, the regeneration niche of different weed species can be disrupted and increases in particular weed species prevented. Cover crops can suppress weeds by competing for the use of growth resources, changing environmental factors that affect weed germination and establishment and releasing phytotoxins. Other interventions such as Conservation Agriculture include a reduction in soil erosion, increases in soil organic matter, improvement in soil biological processes and soil fertility, and conservation of soil moisture, all of which contribute to increased yields. Farmer Managed Natural Regeneration (FMNR), which is a form of agro-forestry where crop production is integrated with habitat restoration by enabling the systematic regrowth and management of trees and shrubs from felled tree stumps, sprouting root systems or seeds. The regrown trees and shrubs – integrated into crops and grazing pastures – helps restore soil structure and fertility, inhibit erosion and soil moisture evaporation, rehabilitate springs and the water table, and increase biodiversity. Some tree species, such as *Faidherbia albida*, also impart nutrients such as nitrogen into the soil. These interventions will all be developed and implemented among communities living adjacent to PA's. By the end of PY 5 control practices would have been tested and efficacy determined for each of the three target species in community rangelands and invaded areas (100 ha total) around PAs cleared and restored with a 15% increase in tree cover. By that time sustainable farming practices would have been adopted by 50 households, incorporating IAS prevention and control. It is also envisaged that by then 100 farmers would have been trained in IAS identification and sustainable land-use practices such as Conservation Agriculture and FMNR.

211 Fair gender distribution on all capacity building activities will be applied in terms of the selection of trainees, co-management groups at pilots, as well as decision making fora, which in most cases will be near 50:50. At pilot sites, at least 50% of field workers will be women.

212Total Land Care (TLC) will take the lead in implementing sustainable farming practices, working closely with the Land Resources Conservation Department (LRCD), Department of Agricultural Extension Services (DAES) and the Department of Agricultural Research Services (DARS), all in the MoAIWD. Staff

from CABI's Plantwise Programme will also provide inputs, promoting IPM. All of these agencies will work together with the Ministry of Local Government and Rural Development to facilitate adoption and ensure that interventions are sustained. Sites will be selected in the villages of Chole, Kambenje and Manolo (Kambenje Area); Chipoka, Makaula, Mikundi and Ngwezu (Muloza Area); and Msikita, Malunda and Makuluni (Nkhulambe Area) around MMFR. Around NNP the project will be working with villagers in Lupoka, Jino, Zondola, Mwabuwira, Mjuma, Mwachirwa, Chikazinga, Kaiwale and Mzondola, all in the Rumphi District.

### **COMPONENT 3. Knowledge management and broader adoption**

#### **Outcome 3.1. Replication and increased adoption in the Malawi PA system of IAS prevention and management through national dissemination of best practice and awareness programs.**

*Output 3.1.1. Communication strategy and outreach campaign including use of media, workshops, and meetings targeting government officials, PA staff and affected communities*

- 213 One targeted national and two site specific awareness/communication strategies will be developed for the two targeted PAs in consultation with relevant sectors, including government officials, conservation agencies and representatives of rural communities. It will target those individuals and agencies which can contribute to the long-term sustainability of project interventions. Efforts will also be made to target potential IAS "champions", especially at a local level, who will be able to drive the IAS agenda into perpetuity. There has been some evaluation of the efficacy of various categories of communication such as the print media, electronic media, shirt messaging; sports infotainment and social infotainment by MMCT and their efficacy ascertained. Radio broadcasts were found to be most impactful, especially if they were "backstopped with authoritative, village based interpersonal sources". Attracting people to sponsored sports tournaments was also deemed to be an effective way of getting a message across. It is these tried and tested methods which will be used to increase IAS awareness, especially at local levels resulting in an increased average awareness of 50% over baseline by PY 5 with PA staff and communities showing an increased knowledge and skills of prioritized IAS and IAS management mechanisms, including biocontrol.
- 214 There are insufficient resources for an effective countrywide awareness programme hence the need for a focused campaign, targeting particular key national individuals or institutions with focused messaging. Based on previous experiences the most convincing arguments, at least for government policy-makers and politicians, are largely based on the costs and benefits of actual IAS control. For example, what are the costs of clearing an invaded hectare and what are the benefits of doing so in terms of improved productivity. This also applies to the adoption of sustainable farming practices such as FMNR and Conservation Agriculture – what are the benefits, especially in terms of reduced input costs and increased crop yields. To that end information on the costs and benefits of management interventions in the pilot sites/demonstration trials in NNP and MMFR, and surrounding agro-ecosystems, will be made available to the Permanent Secretaries and other high-ranking Government officials during a high-level workshop hosted by the PMU, where additional information in the form of a booklet on the costs and benefits of management will be made available. Results of the CBAs of "conflict" species will also be made available. Similar workshops,

attended by senior PA staff, especially field ecologists, focusing on the biodiversity impacts of IAS, and the benefits of management, will also be hosted by the PMU. Communities living adjacent to PAs will be made aware through FFS. The Lilongwe Wildlife Trust (LWT) already delivers environmental education to over 30,000 people in Malawi each year – IAS issues will be integrated into their current awareness raising programmes.

- 215 Efforts will be made to enhance capacity and awareness amongst women – gender sensitive awareness material will be developed and separate workshops will be held for women and men based on their availability, but more importantly to allow women in male dominated communities to comment and participate more freely in issues pertaining to IAS.
- 216 Information generated as a result of project activities will be made available through these selected and targeted communication channels developed during the project. The LWT will take the lead in developing and implementing the Strategy working closely with EAD. LWT will also establish baseline awareness and capacity levels during the 1<sup>st</sup> year of the project which will be measured again at mid-term and the end of the project. This will form an integral part of the M&E system which will be designed under output 3.1.3.

*Output 3.1.2. National information sharing procedures including the development of a Guide on the identification and management of invasive plant species in Malawi*

- 217 Much of the information sharing agenda has been discussed under 3.1.1. An additional information source will be the Field Guide which will be made available in hard print (500 copies) and an e-book. The Guide will include descriptions of invasive plants, their distribution and management. The Guide will be made available to extension officers, PA managers and associated staff, quarantine officers, researchers, staff from the Forestry Department, private individuals in the plant nursery and associated trades, community members and others. The Guide itself will be used as an identification and management tool for a host of other activities such as prevention, EDRR and for information on control to be implemented in PAs and surrounding agro-ecosystems. It will also be a useful tool which can be used by staff in Plant Protection Services when undertaking PRAs. Some of the information contained in the Guide will also be incorporated in the NISSAP. It is also hoped that information on IAS identification contained in the Guide will provide for an opportunity for users to contribute to new locality data which will greatly improve information on IAS distribution in Malawi. CABI will take the lead in developing the Guide working together with EAD.

*Output 3.1.3. Project M&E program developed, IAS monitoring capacity built and implemented in PAs and their agro-ecosystems*

- 218 Monitoring and evaluation will be critical in measuring the success of project interventions and M&E will continue throughout project implementation, especially with regard to changes in awareness levels. It is envisaged that by the end of the project there would have been an increase in awareness of 50% above baseline. This will be confirmed by undertaking surveys among targeted audiences at the start of the project and then again at mid-term and the end of the project. Changes in capacity will be measured by undertaking pre- and post-knowledge surveys awareness surveys prior to and after training workshops. Changes in biodiversity levels at sites where IAS are controlled will be measured prior to control interventions and then again at mid-term and end of project. Taxa recorded

will include plants and insects. In croplands the benefits of sustainable farming practices such as CA and FMNR will be measured at baseline, mid-term and end of project by recording changes in weed diversity and abundance and changes in crop yields. All monitoring and evaluation activities will collect gender-disaggregated data, and where appropriate, women-only focus group discussions will be held regarding the impact of project activities on women's time (e.g. less or more time spent weeding). M&E will be led by a Malawi-based institution or M&E specialist to be confirmed at project initiation. This information will be an integral part of the reporting by the NEA to UN Environment.

### 3.4. Intervention logic and key assumptions

219 The overall objective of the project is: *To prevent new invasions and reduce the current impacts of invasive alien species (IAS) in protected areas and adjoining agro-ecosystems in Malawi*

220 The intervention logic is largely founded on experience from previous IAS projects and information from existing national IAS programmes which clearly indicate that by investing in the management of IAS by strengthening policy, creating awareness and building capacity in the control of IAS, sufficient impetus will be created for Malawi to effectively manage IAS into perpetuity and in so doing contribute to the protection of biodiversity. The process through which this transformation or change will occur leading to an impact of a *significant reduction in new invasions and reduction in the current impacts of IAS in primary production sectors, protected areas, and adjoining agro-ecosystems in Malawi, leading to better protection of key biodiversity, maintenance of ecosystem services as well as improved livelihoods* is shown in the Theory of Change (TOC) Model (see Figure 2). The TOC describes the temporal linkages between activities, represented by the outputs on the left, leading to the direct and medium-term outcomes, including the intermediary state, resulting in the desired impact on the right.

221 The project aims to build national IAS management capacity at key intervention points, by strengthening the national framework for the cross-sectoral management of IAS supported by studies on the costs and benefits of selected IAS and the development of an IAS inventory (Component 1) to strengthening IAS management especially in protected areas and adjoining agro-ecosystems by building capacity and developing and implementing best IAS management practices, including sustainable farming practices (Component 2). By increasing awareness, gaining broader adoption of the threats posed by IAS, and benefits of IAS management especially at PA level and surrounding agro-ecosystems (Component 3). The outputs under each Component will lead to a number of outcomes, all of which complement each other, and contribute to making a significant impact (see Section 3.3 for detail on components and TOC Model).

222 The effectiveness of this project largely depends on the willingness of national agencies to cooperate on IAS issues. Although the project focusses on protected areas and adjoining ecosystems, collaboration across all sectors is critical, especially with regard to prevention and EDRR. We are assuming that there will be improved collaboration across all sectors, fostered and facilitated through various project interventions. Progress to date illustrates that regular networking, is essential as this creates mutual awareness, reduces distrust and thereby fosters cooperation between all interested and affected parties.

223 The threats, root causes and barriers highlighted in Section 2.3 are inexorably linked to livelihoods, with the infamous “three Ts” [(trade, travel (tourism) and

transport)) providing both income opportunities and pathways for IAS introduction. Protected areas selected for pilot site activities (see Section 3.1; Appendix 15) were selected and developed in a participatory manner with extensive stakeholder involvement, which will be maintained and further consolidated during the MSP (see Section 2.5) to avoid conflicts of interest and thereby to reduce several risks flagged in Appendix 14. At the same time this participatory approach involves local communities so that the awareness of the threat posed by IAS to livelihoods in the long term becomes a part of the culture and changes behavior in an informed and sustainable manner. Awareness creation, especially lessons learnt, is one of the main activities of the project under Component 3 leading to replication and broader adoption in the Malawi PA system.

- 224A five year project has to be able to adapt to changing conditions in a coordinated manner, taking into account the views and concerns of stakeholders who are affected by the changes, whether positively or negatively. Such changes may result from project activities or may be due to factors entirely beyond the control of the project. The use of adaptive management, annual project implementation review and programming, as well as participatory approaches with wide stakeholder consultation provide the principal management tools for maintaining the public and political support needed for a sustainable and positive impact from the project.
- 225All of the project components and outcomes are closely linked (see TOC Model) to ensure that mechanisms are developed to protect biodiversity within protected areas from IAS. Sustainability of IAS management within protected areas can only be achieved by developing local and national IAS policies involving all sectors affected or potentially affected by IAS. Potential pathways for the introduction and spread of IAS into protected areas and the country will also be targeted. The project will create awareness about the threats posed by IAS, and build capacity with regard to IAS management especially in protected areas and adjoining agro-ecosystems.
- 226National policy development is largely driven by an awareness of the threats posed by IAS, while awareness itself is generated by research outputs on the impacts of IAS which inform government, communities and other stakeholders. The ability to undertake research or capture research findings globally will contribute to awareness which can be made available to all sectors of society based on a well-developed communications campaign. Targeted awareness strategies, focussing on protected area staff and communities living adjacent to them, will influence all stakeholders, including policymakers to develop and strengthen policies to enhance IAS management. These policies will support the most cost-effective management option, prevention, which will lead to the development of risk analysis and early detection and rapid response procedures, at a national and protected area level. Because IAS affect all sectors and are multisectoral, an IAS National Coordination Unit (NCU) will be established to bring all related actors together.
- 227The TOC Model encapsulates and summarizes much of what has been expounded on above. For sustainability (see intermediary state) it is critical that IAS move up the political agenda, as a key threat, not only to biodiversity but also economic development. With increased political support, including funding, an over-arching strategy will be implemented and coordination improved, even at PA and local community level, leading to improved management, resulting in enhanced livelihoods, improved biodiversity conservation and economic growth. Achievement or success is based on overcoming a number of barriers based on a few assumptions (see Appendix 4 – Results Framework).

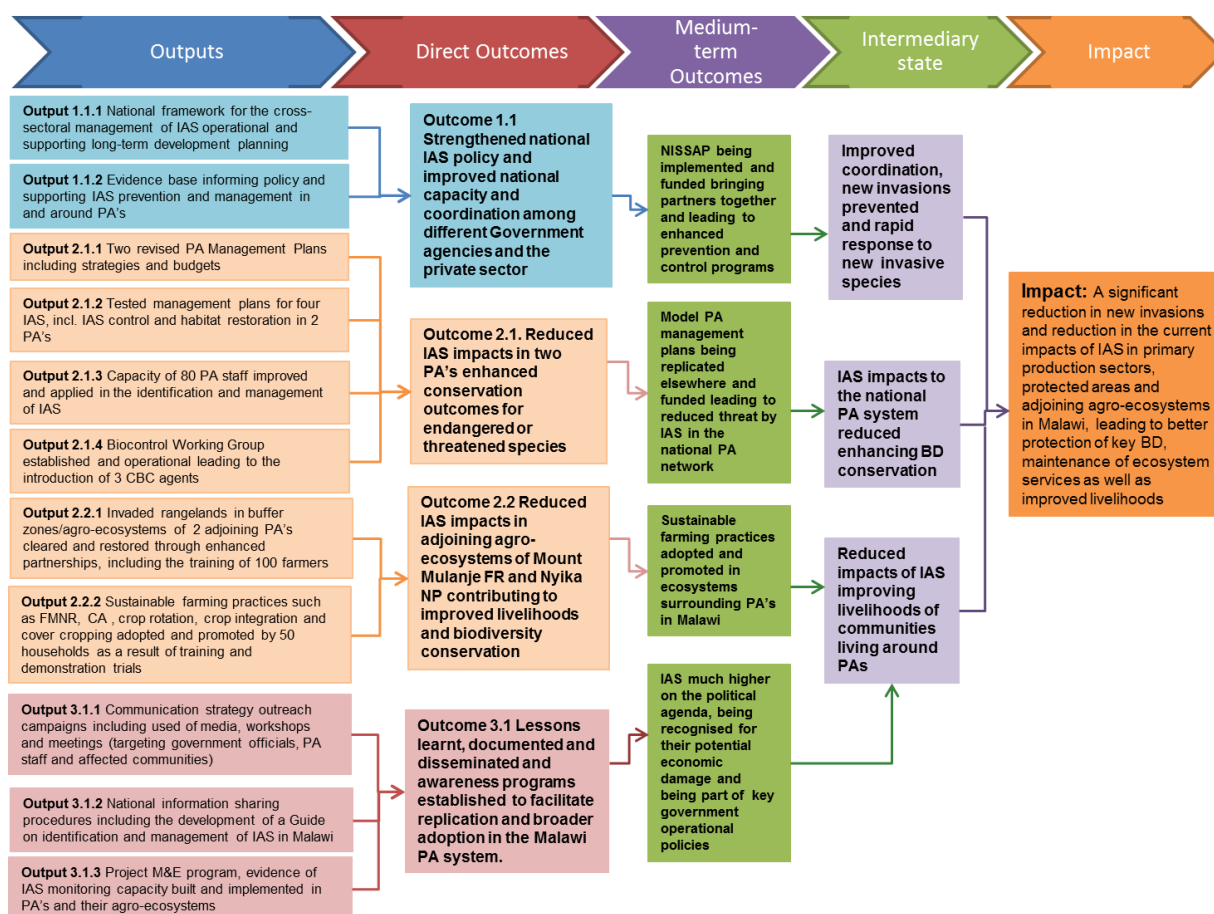


Figure 2: Theory of Change for the proposed Malawi IAS Project

### 3.5. Risk analysis and risk management measures

228The main risks to the project have been identified below (Table 1) together with measures taken to manage these risks.

Table 1: Main Risks and Risk Management Measures

Description	Probability & Impact 1(low) to 5 (high)	Mitigation Measures	Responsible oversight agency
<b>Rapid changes in climate conditions could outstrip the ability of Malawi to successfully manage IAS</b>  <b>Type:</b> Environmental	P = 2; I = 1	Managing IAS in PAs and adjoining agro-ecosystems will strengthen the health of these ecosystems and their resilience to the impacts of CC. In addition, project interventions will mitigate against some of the impacts of CC such as an increase in the frequency and intensity of droughts. Woody and aquatic weeds are known to increase evapo-transpiration. By removing these from water catchments, such as Mulanje and Nyika, the project will secure the provision of water to downstream water-users. This is related to the concept of ecosystem-based adaptation which is a cost-effective means of protecting human and ecological communities against the impacts of climate	Lead NEA, CABI



		change. Ecosystem based-adaptation is described as “building nature’s resilience to the impacts of climate change, while also helping to meet people’s basic needs.” These ecosystem-based approaches are therefore not just about protecting ecosystems, but also about using ecosystems to help sustain people and the resources on which they depend. Such an approach can also provide an integrative framework to address impacts from both climate change and invasive species.” (Burgiel and Muir, 2010)	
<b>Lack of interest and support from key national stakeholder groups and organizations in IAS management</b>  <b>Type: Socio-political</b>	P = 2; P = 4	<p>Training and awareness-raising activities will improve communication and coordination as well as increasing stakeholder engagement, including the communities involved through support towards sustainable agriculture practices and pest management (communities will be eager to collaborate if the project is benefitting their day-to-day interests). The implementation of a communication strategy will also facilitate a better understanding of IAS issues amongst all stakeholders and as such contribute to improved decision making. In addition, the promulgation of the Malawi Environment Management Bill which includes the establishment of the Malawi Environment Protection Agency (MEPA) indicates that the GoM is serious in addressing the IAS issue. The Bill clearly states that the MEPA will coordinate IAS activities among all stakeholders and take measures for the control, eradication or management of alien and invasive species. The National Parks and Wildlife Act has clauses that are explicit about the illegality of introducing exotic species into PAs. The MMCT and the NVT have existing programs to manage IAS. The Peace Parks Foundation is also investing in IAS management in Nyika.</p>	Lead NEA, CABI
<b>Insufficient funding and Government support to continue implementation of IAS activities after the project ends</b>  <b>Type: Political</b>	P = 2; I = 4	<p>Several factors will increase the likelihood that increased funding and support will be available for IAS management post-project. First, the GoM has promulgated the Malawi Environment Management Bill which deals extensively with the need to manage IAS. The Bill also has clauses placing the onus for IAS management on landowners. For example, “if an alien species establishes itself as an invasive species due to actions of a specific person, the person shall be liable for all costs incurred in the control and eradication of that species.” The MMCT and the NVT continue to fund IAS management activities. The Peace Parks Foundation also continues to fund IAS management activities in the Malawi-Zambia TFCA - Nyika NP is part of that TFCA.</p> <p>The project will also increase awareness and understanding of decision makers on the full range of benefits provided by IAS management, not only in terms of agricultural production and livelihoods but also in terms of hydrological services and other ecosystem functions and services. This will be demonstrated by undertaking cost-benefit analyses which will clearly demonstrate that the benefits of IAS management outweigh the costs. In addition, IAS management in agricultural practices will demonstrate to local communities the tangible economic and social (e.g. health) benefits of effective IAS prevention and control practices, while the introduction of host-specific and damaging biocontrol agents will result in cost-effective and sustainable control of invasive plants, which together will incentivize local communities to continue these practices even in the absence of external support.</p>	Lead NEA, CABI, UN Environm ent
<b>Conflicts of interest where certain invasive alien plants</b>	P = 4; I = 4	The project will develop and disseminate information regarding the pros and cons of various IAS. Cost-benefit analyses (CBA) will be undertaken - specifically on those	Lead NEA, CABI

<p><b>provide benefits to individuals or groups (e.g. for fuelwood)</b></p> <p><b>Type:</b> Socio-political</p>		<p>species characterized as ‘conflict’ IAS, to inform all stakeholders of the true costs of these species, including impacts on livelihoods, ecosystem services, and biodiversity, and a comparison of the benefits they provide. In addition, participatory and consultative approaches will be used to get a consensus among stakeholders on policies towards conflict IAS, and to raise awareness of alternative natural resources to conflict IAS. Results of the CBA will be communicated as part of Component 3 activities to policy and decision makers at national level related to PA, agriculture, and forestry management. It should also be noted that the Malawi Environment Management Bill makes reference to the use of so-called ‘conflict’ species by stating that “a person authorized by a permit under subsection (2) to carry out an activity involving a specimen of an alien species or invasive species shall take all required steps to prevent or minimize harm to biodiversity.”</p>	
<p><b>Farmers and others living adjacent to PAs may expect to receive remuneration for their involvement in IAS management</b></p> <p><b>Type:</b> Socio-political</p>		<p>The project will mitigate this risk by providing farmers with information regarding the long-term benefits they will accrue by participating in IAS management actions, and by providing farmers with non-monetary incentives in the form of fruit trees and other valuable native plant species, including valuable medicinal plants (in the PA buffer zones), to support sustainable agricultural production activities. By using demonstration trials farmers will see the benefits of practicing crop rotation, crop integration, cover crops and FMNR – these will mitigate against the need for any compensation.</p>	Lead NEA
<p><b>Environmental damage from IAS management</b></p> <p><b>Type:</b> Environmental</p>	P = 1; I = 4	<p>Even though the project will make a positive contribution to biodiversity conservation, it should be recognized that IAS management activities, such as the use of agrochemicals and large-scale clearance in control /eradication activities, can sometimes result in negative environmental impacts. The project will undertake risk analyses with regard to the introduction of any potential biocontrol agents, and environmental &amp; social impact assessments (ESIA) to examine the possible negative consequences of any proposed interventions, and propose measures to reduce/mitigate these. The ESIA's will be publicly disclosed in draft form prior to undertaking appraisal.</p>	Lead NEA, CABI
<p><b>Inability to demonstrate impact of project interventions due to complex natural interactions and a long time span until impacts are noticed</b></p> <p><b>Type:</b> Environmental</p>	P = 2; I = 3	<p>The nature of the project is to demonstrate and to establish the necessary systems, make appropriate tools available, and raise awareness rather than actually targeting large scale impacts (at the pilot sites). The size of the available GEF budget does not allow even the minimum requirements needed to start clearing large tracts of land of IAS, but will allow the project to demonstrate that this is needed and feasible. Additionally, stakeholders will be informed and capacitated, to continue and replicate the work started under the GEF project; as well as conduct participatory monitoring about immediate and long-term developments and the impacts of IAS, thus additionally motivating them to continue the work tested in the pilot sites.</p>	Lead NEA

### 3.6. Consistency with National Priorities

229Malawi makes many references to IAS in its NBSAP and reports to the CBD. In Malawi's 3rd National Report to the CBD it identifies the need for programs and activities to address: mechanisms for national and cross-sectoral coordination; review of policy, legislation and institutions (since there is no single policy

framework that specifically addresses the control, prevention and management of invasive species); and development of policies and tools to promote activities to reduce the threats of IAS. These goals are also reflected in other documents such as the Forest Ecosystems Biodiversity Conservation Action Plan and the NBSAP. In the revised NBSAP (2015-2025), Target 9 is “By 2025, invasive alien species and their pathways are identified and prioritized for control and prevention from movement and spreading in and out of the country”, and identifies the following targets/actions related to IAS that need to be achieved by 2025: 1) compile documentation and maps on IAS in Malawi including an inventory of invasive alien species prevalent in the country 2) develop a national invasive species management plan for management of IAS; iii) conduct awareness campaigns and build capacity of different stakeholders on how to identify, track and prevent IAS in their localities and on the threats of invasive alien species to biodiversity (cross-border inspection, quarantine and certification); iv) procure and upgrade inspection infrastructure for tracking and identifying IAS in Malawi; v) conduct capacity building initiatives on invasive alien species monitoring; vi) monitor the entry and spread of invasive alien species; and vii) regulate and control movement and spreading of IAS.

- 230 The Noxious Weeds Act, although outdated, clearly states that “It shall be the duty of every person responsible under this Act to clear or cause to be cleared any noxious weeds growing or occurring on the land in respect of which he is responsible. It shall further be the duty of any person to report forthwith to the nearest known weed inspector the occurrences of any noxious weeds on any land in respect of which such person is responsible”. Water hyacinth and lantana are both listed as noxious weeds.
- 231 Malawi’s National Parks and Wildlife Act of 1992 states that it is illegal to introduce any exotic plants or animals into PA’s in Malawi. The clause reads as follows, “any person who conveys or introduces any plant, whether of a wild or cultivated species, into a national park or wildlife reserve shall be guilty of an offence” and the “The Chief Parks and Wildlife Officer may order the destruction or removal of any plant, and any seedling or off-shoot thereof, brought into a national park or wildlife reserve in contravention of subsection (1).”
- 232 Malawi’s Environment Management Act of 2017 has many clauses pertaining to the management of IAS. The Malawi Environment Protection Agency which is to be established under the Act “shall, in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species”. The Authority “shall ensure the coordination and implementation of programmes for the prevention, control or eradication of listed alien species and invasive plants”.
- 233 Although the GoM, through the MoNREM, is not investing directly in IAS management they are supporting other conservation-related activities. From 2015/2016 to 2018/2019 support will be provided to “Environment and Climate Change Management” (US\$ 8,941,513) and “Wildlife Conservation and Management” (US\$ 3,224,300), the latter much focused on species protection, anti-poaching, tourism development, and some activities related to management of their habitat. A very meagre US\$ 21,326 of this will be available for biodiversity conservation and management, which is the government program coming closest to IAS issues.
- 234 Malawi’s recently revised National Agricultural Policy (NAP) of 2016 is focused on sustainable agricultural production and productivity; sustainable irrigation

development; mechanization of agriculture; agricultural market development, agro-processing and value addition. With NAP, the GoM hopes for improved management of agricultural resources, increased agricultural exports and incomes, and improved food and nutrition security. The agricultural sector also recognizes the threat posed by weeds, including IAS. For example, maximum maize yields are achieved if croplands are kept weed-free for the first 56 weeks after weeding. A one week delay in first weeding can reduce yields by one-third. In Malawi, one-third of the area planted to maize by smallholders is either left un-weeded or weeded after the critical first six weeks (Orr et al., 2002). Shortages of labor early in the season results in delayed weeding and subsequent maize yield losses of 15 to 90% due to weed competition (Kibata et al., 2002). Other NAP priority areas are empowerment of youth, women and vulnerable groups in agriculture; and institutional development, coordination and capacity strengthening; which is supported through the project by e.g. the partnership on weed management and IAS control through Conservation Agriculture in the buffer zones surrounding the two Protected Areas.. The NAP has identified eight policy priority areas one of which is “Agricultural Risk Management” which makes reference to pests and diseases which it is said “can have devastating effects on food security and agricultural growth” and should be addressed through the promotion of integrated pest management. This should include the empowerment of “communities, through capacity strengthening initiatives, to manage infrastructure for pest and disease control” and strengthening of “surveillance systems for monitoring outbreaks of pests and diseases”.

- 235 With regard to International Conventions, Malawi is a signatory to the Convention on Biological Diversity (CBD), and as mentioned in Section 3.1, the proposed MSP clearly supports Article 8(h) of the CBD, which calls on signatories to: “Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats and species”. The MSP will also help Malawi to meet the Aichi Biodiversity Targets, in particular Target 9: “By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment”.
- 236 The project also supports Malawi to achieve targets outlined in the Global Strategy for Plant Conservation 2011-2020, including “Effective plans in place to prevent new biological invasions and to manage important areas that are invaded for plant diversity” and to address priorities identified in the International Plant Protection Convention (IPPC). The IPPC “aims to secure coordinated, effective action to prevent and to control the introduction and spread of pests of plants and plant products.” The National Plant Protection Organization in Malawi is Plant Protection Services in the Ministry of Agriculture, Irrigation and Water Development.
- 237 Malawi is a member of the WTO, which has produced numerous relevant International Standards for Phytosanitary Measures (ISPMs); ISPMs are defined as legislation, regulation or official procedure aimed at preventing the introduction or spread of plant pests (which include invasive plants and other pests). Plant Protection Services are required to implement the various Standards.
- 238 Malawi is a signatory to the Convention on Wetlands of International Importance (the Ramsar Convention), which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources; the convention calls upon all Contracting Parties to, wherever possible, address the environmental, economic and social impact of invasive species on

wetlands within their jurisdictions. Mulanje Mountain is also an important water catchment for Lake Chilwa, a Ramsar site.

### 3.7. Incremental cost reasoning

The incremental analysis is summarized and given in Appendix 3.

#### Baseline Scenario (without GEF support)

- 239 The management of IAS in Malawi is not yet effectively addressed in terms of policies and legislation, professional capacity, and active management to control and limit IAS introduction and spread. Although some policies make reference to IAS there has been little enforcement or effective implementation of any management activities. Although the NBSAP and reports to the CBD outline many interventions, most of them have never or only partly been realized. The Plant Protection Act is mainly concerned with preventing “the introduction, and eradication, of pests and diseases destructive to plants,” but it makes no reference to preventing the introduction of invasive or potentially invasive plants. *Lantana camara* and *Eichhornia crassipes* are both listed under the Noxious Weeds Act which makes it an offence not to control these IAS, and stipulates that the occurrence of these weeds should be reported to a weed inspector as a matter of urgency. Although there have been some efforts to manage water hyacinth, little has been done to control lantana, which is still widespread and abundant. The Noxious Weeds Act is probably outdated and can clearly no longer be enforced – a revision of the Act is therefore critical.
- 240 Malawi’s National Parks and Wildlife Act of 1992 states that it is illegal to introduce any exotic plants or animals into PAs, yet we have found a number of species that have been intentionally introduced. The Forestry Act makes no references to the control of IAS other than pests and diseases affecting forestry species, specifically introduced plantation species. Exotic species have probably been introduced into PAs because they have not been identified as such or there has been an inherent failure to implement the Act.
- 241 It was also highlighted during the PPG that many NGOs and other agencies continue to promote invasive and potentially invasive agro-forestry species. These are mainly planted for fuelwood, nitrogen fixation or erosion control. Some species such as *Tithonia diversifolia*, are highly invasive and actively promoted as a “green manure”. Although these species may benefit communities in the short-term, once they become more widespread and abundant, their costs often outweigh their benefits. Although existing sector policies do not necessarily promote or encourage the introduction of exotic species without evaluating their potential risk, especially to biodiversity, there appears to be little effort to address this issue. As a result, in the baseline, efforts to implement IAS management will continue to be uncoordinated, with little collaboration/communication between various stakeholders, especially those in agriculture, fisheries, forestry and the environment, and duplication or inaction by one sector will contribute to a continued waste of resources.
- 242 These and other issues have resulted in the promulgation of the EMA which has many clauses pertaining to the management of IAS. The MEPA which is to be established under the Act “shall, in consultation with relevant lead agencies, take measures for control, eradication or management of alien and invasive species”. The Authority “shall ensure the coordination and implementation of programmes for the prevention, control or eradication of listed alien species and invasive plants”. The Act is timely since the threats are likely to

increase due to factors such as climate change, land degradation, and an escalation in trade, travel and tourism, and thus the longer that Malawi waits to address critical IAS management priorities, the greater the likelihood of severe negative impacts from IAS on biodiversity, ecosystem services, and livelihoods and the greater the costs will become to address those impacts.

243 The EMA addresses many concerns related to IAS management; but without baseline information as to which IAS are present, their distribution, impacts and best control methodologies, it is unlikely to be implemented effectively. In the absence of a national inventory of IAS, it will be impossible to identify and address the most urgent IAS issues in a strategic manner. IAS will continue to be intentionally and unintentionally introduced into protected areas and adjoining agro-ecosystems, while IAS already present within these areas will continue to spread and multiply to the detriment of threatened and endangered species, and crop and pasture production. IAS within PAs may even invade adjoining agro-ecosystems and thereby increase tensions between communities and PA managers, and PA managers in turn will remain powerless to prevent invasions from agro-ecosystems.

244A reduction in crop yields or pasture production due to IAS impacts will also place increasing pressure on PAs from people living adjacent to them. In addition, IAS control activities that continue to rely primarily on costly chemical control methods are not sustainable due to chemical resistance. Increased pesticide use will also contribute to further biodiversity loss.

Alternative Scenario (with GEF support):

245 Project interventions will strengthen implementation of existing policies such as the recently promulgated Malawi Environment Management Bill (EMA) and older Acts such as the National Parks and Wildlife Act, specifically through development of a NISSAP, improved coordination between various sectors especially at the local level, strengthening of prevention and EDRR mechanisms, and active control on the ground. Project implementation will also develop capacities and increase awareness which will significantly facilitate implementation of the EMA and enhance IAS management in general. The project will support the development of a National Invasive Species Strategy and Action Plan (NISSAP) which will, without a doubt, strengthen the ability of the MEPA to implement the EMA. Cost-benefit analyses of selected IAS, and the development of a national invasive plant inventory, will increase the knowledge base on IAS in the country and the ability of stakeholders to identify priorities to address IAS in a strategic manner, particularly with regard to the implementation of the EMA.

246 Effective prevention is not possible without a good understanding of pathways and how best they can and should be managed. By strengthening the capacity of practitioners to undertake detailed pathways risk analyses, the risks of IAS being introduced into Malawi and its PAs and agro-ecosystems will be greatly reduced. The current inability of PA staff to identify pathways and deal with them has already led to the introduction of a number of IAS into PAs.

247 The risk of a known exotic species becoming invasive or not also needs to be assessed, so there is a need to develop and implement PRAs that not only take cognizance of pests but also assess the risk of an introduced plant becoming invasive. Management interventions for particular IAS already present within an ecosystem will also be prioritized through a PRA, resulting in the development and implementation of more cost-effective IAS management strategies. High risk species will be managed first, followed by management of species which pose less of a threat post-project. The outcome of a PRA can also be strengthened by

undertaking cost-benefit analyses, particularly of those introduced species which may have some benefits. Cost-benefit analyses will also provide the authorities with the means to make objective decisions regarding the management of 'conflict'. Training on CBA will be undertaken early in the project so that aspects of it can be included in the NISSAP. It will also facilitate implementation of the EMA. Project interventions will thus enhance the ability of Government officials to prevent the introduction of IAS.

248 Because incursions in PAs cannot always be prevented, other interventions will also be developed and implemented under the MSP, to prevent IAS establishment. To detect new pest incursions it is critical to develop a surveillance system for the national PA system. However, early detection is largely dependent on an individual's ability to be able to identify a pest species, be it an insect or plant. To facilitate species identification the project will be producing a Field Guide to the naturalized and invasive plants of Malawi which will be distributed to all interested and affected individuals. Once small populations are detected and eradication is still possible control techniques need to be implemented as a matter of urgency. The project will also provide information on how best IAS can be eradicated. This information will be made available to all stakeholders. Factsheets of the most serious crop pests and Pest Management Decision Guides, developed by CABI's Plantwise Programme, will also be distributed among farmers living in adjoining agro-ecosystems.

249 At the site level, the development and implementation of IAS management plans that include control and restoration activities will reduce the negative impacts of IAS on key biodiversity habitats and important agro-ecosystems. Information on developed best management practices will also be widely disseminated. The promotion of integrated pest management will reduce pesticide use and in so doing enhance biodiversity conservation and improve livelihoods. In addition, practices promoted by the project such as crop rotation, crop integration and FMNR will not only improve livelihoods but also contribute to improved biodiversity conservation. These interventions will result in an improvement in the GEF TT of at least 50% and of at least 10% in the PA Management Effectiveness Tracking Tools (METT). At least 150 ha of invaded land in the two PA's will be cleared together with 100 ha in adjoining agro-ecosystems. Tree cover in adjoining farmlands will also be improved and sustainable farming practices adopted by 50 households. These direct benefits will not be realized without GEF support.

250 Conventional IAS management strategies such as manual and chemical control are often difficult and expensive to implement, especially for invasive species that are already widespread and abundant. The MSP provides the opportunity to create awareness and build capacity around biological control and to introduce host specific and damaging agents that have been used with good effect elsewhere.

251 Communication and awareness activities will greatly increase understanding and awareness among resource managers and local communities of IAS and their impacts, thereby producing increased support for IAS management and increased participation and allocation of resources to reducing IAS introduction and spread. In summary, the project will result in a scenario where biodiversity, ecosystem services, agro-ecosystem production levels and livelihoods are all more effectively protected from existing and potential future IAS impacts.

### 3.8. Sustainability

252 GEF defines sustainability as "the extent to which benefits continue, within or outside the project domain, from a particular project or programme, after GEF



assistance/external assistance has come to an end”. Sustainability is largely built by developing capacity which will generate information on IAS presence, distribution, impacts and management. This information is then used to create awareness to change behaviour among interested and affected parties which in turn will drive the process in terms of developing and strengthening NISSAP policy and its implementation. Capacity will be developed through training but also through demonstration trials within PAs and surrounding agro-ecosystems. Information on best practices and their benefits will then be made available to all interested parties, including policy-makers. Sustainability will be enhanced by being able to demonstrate that management costs are significantly lower than the benefits that accrue from IAS control.

253 The project has been designed to ensure that activities and outputs are key elements contributing to and enhancing sustainability of project outcomes beyond the project. Examples include strengthening of the legal and policy framework for IAS prevention, EDRR and control; and improving coordination of activities relating to IAS management at the national level (see Component 1). The recently promulgated EMA will contribute significantly to our efforts in terms of sustainability. The MEPA will be mandated to not only coordinate IAS management activities but also take measures to control, eradicate or manage alien and invasive species. Based on EMA the costs of management activities will be borne by landowners.

254 Increased awareness among the general public, government officials and other stakeholders is an essential prerequisite for sustainable results in IAS control and management, and this will be another major focus of the project (see Component 3). Capacity building, which is fully or partly addressed in each of the three components, and awareness creation, will contribute to the sustainability of institutional and policy support for IAS management, while tools such as the IAS Identification Guide, which will also include information on best management practices, will facilitate more cost efficient and effective IAS management interventions. The development of best management practices under Component 2, and their wider dissemination will also contribute to more effective IAS control. The successful introduction of damaging and host-specific biocontrol agents will provide a mechanism whereby target species can potentially be controlled in perpetuity without additional activities or costs required.

255 It is expected that working together with the private sector and NGO's (Lilongwe Wildlife Trust, MMCT, NVT); Wildlife and Environmental Society of Malawi, Total Land Care) will contribute to the sustainability of IAS management activities in a manner similar to what has been achieved in Malawi with regard to PA management, where the private sector has been involved in lobbying the government on PA establishment, environmental education, infrastructure development, re-introduction and game management, promoting effort-based law-enforcement, a snare bounty scheme, research activities, and ecotourism (Mauambeta, 2003). The existence of PA financing mechanisms will contribute to the financial sustainability of IAS management interventions, especially in NNP and MMFR. The NVT and the MMCT have both been involved in IAS management activities in the past and continue to undertake activities in order to maintain areas cleared during past donor-funded operations. IAS management activities will also be initiated and sustained in PA's currently managed by Africa Parks Foundation through a partnership agreement with DNPW. These include Majete NP, Liwonde NP and Nkhosakota Wildlife Reserve where PA management has initiated IAS management activities. By training PA staff from a number of other PA's and raising awareness among DNPW senior management as to the impacts of IAS it is envisaged that there will be increased investments in PA



management. The Lilongwe Wildlife Trust is well established in Malawi and involved in a range of activities, including environmental education. As a project partner the Trust will contribute to awareness raising during the project and continue to do so post-project. This will be facilitated through the production of modules which the Trust can use to raise awareness even once the project has closed. This material will also be made available to the Wildlife and Environment Society of Malawi which is also involved in creating awareness among the public on environmental issues. The Malawi Environment Endowment Trust (MEET) also finances a range of environmental programs in Malawi and may be expected to allocate more funding to IAS issues as their profile in the country increases through the activities of the proposed project.

### 3.9. Replication

256 Many of the project outputs are focused on two PAs, namely NNP and MMFR. This includes the identification of high risk pathways, IAS Risk Analysis procedures and improved surveillance and eradication mechanisms. IAS pathways will be similar for all PA's in Malawi and RA procedures and EDRR systems to enhance IAS management will be generic and as such there will be opportunities to also implement them elsewhere. Many of the invasive plant species targeted in these two PAs are also problematic elsewhere and as such the development of best management practices will also benefit other stakeholders, especially PA managers. IAS management strategies which will be developed and integrated into NNP and MMFR PA management plans will also be useful for other PAs since most of the issues that will be addressed are generic. As such, majority of activities undertaken in MMFR and NNP will benefit all of the PAs in Malawi to some or other degree – great opportunities for replication. This replication will be enhanced by working closely with the DNPW and by providing training to PA staff on invasive plant identification and management, including prevention and EDRR.

257 Approaches for improved IAS management and sustainable farming practices in surrounding agro-ecosystems will also be of benefit to other communities in Malawi, especially those that share many of the same IAS. The partnership between PA staff, Local Government and communities in the control of IAS and the experience in habitat restoration through Farmer Managed Natural Regeneration and other activities, could easily be replicated elsewhere. This collaboration will enable the DNPW, Forestry Department and communities to establish surveillance and monitoring systems for new and existing IAS in other PAs in Malawi, as well as target particular species for containment and control through their routine PA programs and budgets. Since many PAs in Africa are facing similar problems the information generated and management systems implemented and trialled will also be useful for other PAs throughout Africa, including TFCAs.

258 At a broader level the project will also lay the foundations to ensure that there will be potential for scaling up in the future. The development and implementation of IAS policies, capacity building and awareness creation will all contribute to scaling up of IAS management activities in Malawi, and elsewhere, in the future. This model has worked well in other African countries such as Ethiopia and Uganda, which were supported through the GEF Project “Removing Barriers to Invasive Plant Management in Africa” (GEF 2140). For example, the coffee-table book produced through this Project is not only widely used as a reference/information source for IAS management in the project countries but also elsewhere on the continent. As

such we expect that many of the project outputs of the Malawi Project will have relevance for other countries in Africa.

259 The development of baseline data on the distribution of IAS and their impacts, together with some cost-benefit analyses, will provide policy makers and government officials with the necessary information to develop and implement additional policies to manage IAS in Malawi more effectively. For example, training on cost-benefits analyses will allow the Malawi authorities to replicate these studies on other ‘conflict’ species. In addition, the results of the cost-benefit analyses will also be useful for other countries in the region, and on the continent as a whole, since the same or similar invasive agro-forestry species have been promoted elsewhere.

260 The Communication Strategy will be key in making information generated during project activities available to others. Without information dissemination there will be insufficient adoption and replication. Much of the information will be disseminated through workshops and Farmer Field Schools and other media, but adoption by DNPW and the Forestry Department will be key in ensuring that IAS issues are addressed and budgeted for across all PAs.

261 The development of identification tools will also make more information available on how to identify and best manage IAS, information largely lacking to date in Malawi. This information will be very useful to other PA managers in Malawi and elsewhere on the continent, allowing for the improved management of invasive plants. Since the impacts and management of particular IAS are generic this allows for replication.

### **3.10. Public Awareness, Communications and Mainstreaming Strategy**

262 Communication and information are crucial in building understanding, support and action on national and multisectoral IAS issues. The design of the MSP recognizes this by dedicating a whole component of the project (Component 3) to knowledge management and communications. Without awareness it is not possible to change behaviour and bring about the long term sustainable management of IAS. However, to be effective communication needs to be integrated into all project activities. For example, the establishment of demonstration sites under Component 2 to show the efficacy of various management interventions is one way of creating awareness, especially among rural communities. Workshops and meetings to enhance capacity should also be used to create awareness as to the threats of IAS and benefits of management. Ways of enhancing awareness of individual project outputs need to be addressed during the development of the Strategy and then implemented.

263 Information and awareness building needs will be identified by the development of a Communications Strategy. The Strategy will focus on the most relevant target audiences using tailored forms of communication in order to raise awareness of IAS, especially identification, impacts and the costs and benefits of management, and as a result bring about behaviour change. The project will mainly target PA staff, local government, forestry, tourism and agri-businesses and communities living adjacent to MMFR and NNP. The efficacy or impact of the Strategy will be assessed at pre- and end of project, and if there is no change in awareness among target audiences appropriate changes will be made to the Strategy itself. The Communication Strategy is mainly to inform local stakeholders in the two targeted PAs about the impacts and management options available for IAS. It is hoped that this information will provide the impetus for local stakeholders, especially local

government officials and PA managers to provide significant resources to manage IAS and promote and endorse implementation of IAS policies.

264The Field Guide will be an important source of information to individuals at a local and national level, especially with regard to IAS identification and management. At national level a very targeted approach is suggested where senior Government officials will mainly be targeted with information on the costs and benefits of IAS management. Much of this information will be gleaned from the IAS management trials and benefits of sustainable farming practices in PAs and surrounding agro-ecosystems. Information on the costs and benefits of biological control will also be made available to the same target audience during high-level workshops. Information on pathways, prevention, EDRR and best management practices will be made available to PA staff and community representatives during regional workshops. As much of the information presented will also appear in the revised PA management plans for NNP and MMFR it is envisaged that a small booklet will be developed for use and wider dissemination.

265MMCT has undertaken a survey to determine the efficacy of its education and communications strategies. Five categories of communication, the print media, electronic media, shirt messaging; sports infotainment and social infotainment were used and their efficacy ascertained (<http://www.africaforest.org/country-profiles/country-profiles-malawi.html>). The use of print media makes the assumption that all target audiences are literate. Leaflets and fliers were largely found to be ineffective and were reportedly being used for packaging with one parent from Phalombe area saying that: “Fliers and leaflets are meant for school boys and girls and not elders.” Information made available through TV and radio was well received with radio being more effective due to the fact that TV’s are more costly and need to be connected to the national power grid. TV also require viewers to be seated or unmoving while people can undertake activities while still listening to the radio. That said power sources for radios can also be costly for some families. Radio broadcasts were found to be more impactful if they were “backstopped with authoritative, village based interpersonal sources”. Radio jingles were not that successful. That said combining radio messages with print media like posters and pamphlets were regarded as good reminders or reinforcers of broadcasts, and interpersonal sources. Shirt messaging was found to be ineffective and expensive. Attracting people to sponsored sports tournaments did allow for environmental messaging to be shared and discussed although impact was hard to measure. Hosting of global events such as the World Environment Day, World Biodiversity Day and many others (social infotainment), were considered to be effective in getting conservation messages across to local communities, allowing for the use of multiple messaging at one venue to a targeted audience. Targeting learners at school-based environmental clubs has also been successful.

266Information on the impacts of IAS and benefits of control will be collated/developed at the initiation of the project, based on available information, and then disseminated to relevant audiences using appropriate forms of communication as determined by experts such as Lilongwe Wildlife Trust, who will be developing the Outreach and Communications Strategy and have been involved in awareness creation on a range of biodiversity issues in Malawi over many years. For example, available information on the impact of invasive woody plants on water resources will be made available to individuals in the MoAIWD to get buy-in for the project right at the onset. This will be linked to issues such as climate change and the fact that Mount Mulanje, an important water tower, is invaded by woody weeds, which impacts on Lake Chilwa, a Ramsar site which has

dried up every year for the last 6 years. Similar information will be made available to the MoNREM to highlight the fact that woody weeds in all water catchments are reducing water flows into Lake Malawi, the level of which was down to 473.15 m a.s.l. in October 2016 reducing hydro-electricity generation to 150 MW. This resulted in 321 hours of load shedding (an average of 10 hrs/day) in October alone with significant negative impacts on the economy. The project findings, information and data generated, as well as best practice on IAS management will be disseminated through various means, largely determined by the Communication Strategy as additional information becomes available.

267Based on a review of MMCT's communication activities the project will focus on the use of radio in combination with brochures or pamphlets. Meetings and workshops will also be widely used. The Field Guide on the identification and management of naturalized and invasive plants of Malawi will be made available to all interested and affected parties in the form of hard copies and an e-book – the e-book will be available on relevant websites such as those of the CBD, CABI, FISNA, NVT, Lilongwe Wildlife Trust (LWT), and national websites. Other awareness material and relevant project outputs will be made available on a dedicated project website and that of the LWT (<https://www.lilongwewildlife.org/>) and NVT (<http://www.nyika-vwaza-trust.org/>). The development and dissemination of awareness material be largely be supported by co-funding from Peace Parks Foundation, NVT, MMCT and LWT.

268All international, regional, national and local partners will be regularly apprised of progress via reports and/or meetings. This will also provide an opportunity to capture their feedback for discussion and consideration.

269The project will systematically collate existing information (inventories, databases, etc.) and will link to global initiatives such as CABI's Invasive Species Compendium and the Global Biodiversity Information Facility (GBIF).

### 3.11. Environmental and Social Safeguards

270In accordance with the GEF and UN Environment's Policies on Environmental, Economic and Social Safeguards, safeguard measures have been part of project design and will be considered in project implementation. UN Environment's Environmental, Social and Economic Review Note (ESERN) (see **Appendix 9**) has been used to assess the possible impacts of the project on Malawi, its communities, and environment. This tool will continue to be used to monitor project activities, in particular if there are changes from the original plan of actions.

271All project interventions will contribute to enhancing biodiversity conservation with no activities planned that will have a negative impact on *biodiversity, natural habitats and sustainable management of natural resources*. In fact the project is expected to have positive environmental impacts, by improving IAS management in Malawi. Environmental safeguards have been integral to the project during its design and development phases and will be also be adhered to during its implementation, for example the mandatory Risk Analysis to be conducted on introduction of classical biological control agents and the judicious use of registered herbicides to control invasive plants.

272Prior to the importation of any biocontrol agents a Risk Analysis will be undertaken according to the provisions/recommendations outlined in the IPPC International Standards for Phytosanitary Measures (ISPMs) *to ensure that project interventions have no negative impacts on biodiversity and natural habitats*. ISPM 3 provides "guidelines for the export, shipment, impact and release of biological control agents

and other beneficial organisms.” Only those agents that have been released elsewhere based on thorough host range trials and having demonstrated no non-target impacts based on post-release studies will be considered for importation. It was estimated (Winston *et al.*, 2014) that by the end of 2012, there were 1555 separate and intentional releases of 469 species of weed biological control agents against 175 species of non-native target weeds (when related taxa of unidentified plant species, such as some *Opuntia* species, are counted as single target weeds). These so-called ‘classical’ biocontrol projects have been conducted in a total of 90 countries (Winston *et al.*, 2014). At a national level, biocontrol programmes have achieved success rates of 83%, 80%, 61%, 51% and 50%, respectively, in New Zealand (Fowler, 2000), Mauritius (Fowler *et al.*, 2000), South Africa (Zimmermann *et al.*, 2004), Australia (McFadyen, 2000) and Hawaii (Markin *et al.*, 1992).

- 273 The project does envisage using chemicals such as herbicides and in so doing may contribute to hazardous waste production (*Resource efficiency, pollution prevention and management of chemicals and wastes*). However, only FAO/WHO endorsed chemicals will be used according to the specifications on the product label in order to reduce any non-target impacts. In addition, herbicides will only be used in accordance with the provisions outlined in an EIA, if an EIA is required as per Government protocols. Measures will be taken to ensure a safe and healthy working environment for workers employed during the project, especially with regard to the use of herbicides. The project will apply all principles and criteria which require compliance with the International Labour Organization (ILO) guidance on safety and health during forestry operations (*Labour and working conditions*).
- 274 All pilot programs in PAs will be developed in line with environmental and social priorities in Malawi as identified through stakeholder consultations. These pilot projects will be designed to provide environmental and social safeguards against the impact of IAS on biodiversity and livelihoods with the purpose to contribute to environmental sustainability. By reducing the impact of IAS and restoring ecosystems the project will contribute directly to poverty alleviation among *indigenous communities*. Local communities living around the PA are often dependent on the ecosystem goods and services provided by PAs will benefit from these proposed interventions. In some PAs, particularly Forest Reserves, communities are permitted to collect non-timber products and undertake other activities such as bee-keeping. However, with increasing population pressure many of these activities are not sustainable and interventions are required to improve land productivity and reduce land degradation in surrounding agro-ecosystems.
- 275 According to a GISP report on mainstreaming *gender* issues women generally rate risks due to invasive species higher than men. This can be attributed to a range of factors including the fact that weeds cause significant human health problems. For example, of the 25 plant species in Australia which cause seasonal allergies, 20 are introduced. As such, gender issues are considered under each of the components described above. For example, the cost-benefit analysis of three ‘conflict’ species under Component 1 will assess gender-specific impacts, costs and the role of women in their management and control through agricultural practices. Under Component 2, strengthening of IAS management will include supporting community participation, and a communication and outreach to those living in and around protected areas will target not only community leaders but also women and women’s groups. This approach will be extended to the national awareness programs under Component 3, ensuring that the whole community learns which plants are invasive, how to manage them, and how to reduce the negative impacts

and prevent the spread of IAS. Targeting women is key to the control of IAS weeds in agricultural landscapes, as women are typically responsible for weeding and their constant presence in the fields makes them likely to identify IAS more quickly than others in the community. At the same time, IAS control plans developed by the project will take account of the potential burden that could be placed on women if they become responsible for IAS control activities. Women-only focus group discussions will be held at the community level to ensure that women have the information necessary and a forum to discuss their roles in IAS management. The project manager will be responsible for the monitoring and review of gender sensitivity in the training workshops and the application of gender-disaggregated indicators. To ensure that the progress of gender mainstreaming can be monitored throughout the project, gender disaggregated targets will be developed and used to monitor indicators.

276 Stakeholder participation constitutes an important mechanism to provide social safeguards, and national cross-sectoral stakeholder participation from both the governmental and NGO sectors has been a priority during the PPG phase to ensure ownership of the project. Mechanisms to provide all partners and stakeholders with information on project progress and to capture their feedback for consideration will ensure a continuous assessment of the ongoing work of the project against the national social and environmental backdrop. Public awareness campaigns addressing the threats of IAS and their management, particularly in selected PAs and adjoining agro-ecosystems, aim to engage local communities with the project. This will provide buy-in from the general public, raise the sensitivity and understanding of IAS issues and their impact on livelihoods of communities in and ensure lasting support for IAS management beyond the duration of the project. Overall, this participatory approach will provide the mechanism to address concerns and changing points of view within the stakeholder community throughout the course of the project and to make the necessary adjustments to the project activities as appropriate.

277 Interventions will be undertaken with the aim to prevent or mitigate undue harm to the environment and local communities and will be combined with measures for ecosystem restoration as detailed in management plans devised for the respective pilot sites. Monitoring and evaluation programmes will be put in place as a long-term environmental safeguard in order to capture the impact of the intervention on local/regional biodiversity and to detect unanticipated negative side effects and/or potential re-invasion of the targeted IAS, and thus to enable appropriate rapid responses. National capacity building and public awareness raising will provide the skills, understanding and sensitivity to deal with IAS issues and, therefore, constitute an additional environmental safeguard with respect to detecting and reporting re-occurring or new IAS invasions.

## **SECTION 4: INSTITUTIONAL FRAMEWORK AND IMPLEMENTATION ARRANGEMENTS**

278 Based on existing GEF policies, UN Environment is the GEF - Implementing Agency for this project. As Implementing Agency UN Environment will be responsible for overall project supervision to ensure consistency with GEF and UN Environment policies and procedures and will provide guidance on linkages with related UN Environment and GEF-funded activities. UN Environment will establish a contract with the NEA on implementation and management of the project (including running the PMU) and its partners, including budgets, M&E and reporting. The UN Environment project management team will be composed of a

UN Environment Task Manager (TM), located in the Asia and the Pacific Office in Bangkok, a Funds Management Officer (FMO) located in UN Environment HQ in Nairobi responsible for project administrative/financial tasks, supported by technical staff based at the offices in Bangkok as well as in Nairobi. The flowchart of the project institutional structure is given in **Appendix 9**. The Terms of Reference for the key project management units and staff is given in **Appendix 10**.

279 The Environmental Affairs Department (EAD) in the Ministry of Natural Resources, Energy and Mining will be the lead National Executing Agency and will be responsible for the implementation of the project in accordance with the approach, objectives, activities and deliverables as outlined in the UN Environment Project Document until such time as the MEPA is established. The EAD, with support from CABI, will work closely with UN Environment, providing it with free access to all relevant information to allow the organization to fulfil its responsibilities to the GEF. The main responsibilities of EAD as National Executing Agency will include the following:

- Responsibility to UN Environment with regard to project implementation, reporting, and performance;
- Inviting the members for the Project Steering Committee (PSC), and through the PMU run the secretariat for the PSC;
- Planning for and monitoring the technical aspects of the project, and monitoring progress benchmarks and outputs;
- Actively participating in all relevant project activities where appropriate;
- Adopting, during the course of the project, the systems, programs and tools developed by the project to ensure sustainability of the project outcomes;
- Playing an active role in coordinating with national and other stakeholders throughout the project;
- Preparation and submission of periodic progress reports, and regular consultations with beneficiaries and contractors;
- Maintaining a separate project account for the accountability of project funds;
- Ensuring advanced funds are used in accordance with agreed work plans and project budget;
- Preparing, authorizing and adjusting commitments and expenditures; ensuring timely disbursements, financial recording and reporting against budgets and work plans;
- Managing and maintaining budgets, including tracking commitments, expenditures and planned expenditures against budget and work plan;
- Maintaining productive, regular and professional communication with UN Environment and other project stakeholders to ensure the smooth progress of project implementation.

280 Based on previous experiences with implementation of IAS projects in Africa and Asia of similar technical content and scope, it has become apparent that national agencies have struggled with regard to much of the technical reporting required of such projects, including some of the project management aspects. These have included issues related to having consultants/sub-contractors keep to agreed delivery schedules and attainment of minimum levels of scientific and/or technical quality in, for example, experimental design and implementation, etc. It has therefore been agreed by the NEA, that CABI will be contracted by the NEA to provide two types of support to the project, administrative as well as technical assistance. In the case of administrative support CABI will provide the NEA with



advice/inputs especially with regard to the sourcing of consultants/sub-contractors; technical inputs to drafting of ToRs for consultancies and sub-contractors; reviewing of all technical reports on quality and consistence; as well as general technical backstopping (see Appendix 10).

- 281 It has also been agreed that CABI will provide the following technical services and be responsible for the timely delivery of a number of products: Inventory of IAS in selected PAs; an IAS Field Guide for Malawi; training workshops on IAS identification and management, including biocontrol; development and implementation of IAS management trials in PAs and surrounding communities in partnership with other agencies; (see Appendix 10).
- 282 The Project Management Unit (PMU) – supervised by the NEA, will be responsible for the day-to-day planning, management and implementation of the project. EAD will house the PMU in Lilongwe and will assist EAD with project coordination and management, including financial management, procurement and contract management, management of equipment and supplies, monitoring and reporting on the project operations, and the coordination of project work plans.
- 283 EAD, through a dully appointed specialized institution or consultant is also responsible for the design, implementation and reporting on monitoring of project progress as well as project impact against the set Indicators and Targets, as per the draft Monitoring and Evaluation Plan described in Section 6 and detailed in Appendix 7. EAD will appoint or select a full- time national project coordinator (NPC) who will be responsible for the day to day running of the project including leading the PMU. This specifically involves the selection and contracting of consultants and service providers required under the various project Components, among others related to policy, outreach and communications, national IAS information and C/B analysis, prevention and management and capacity building. The NPC will be supported by an accountant and administrator, both part-time positions. The NPC will also appoint two part-time technical assistants to oversee project activities, one in NNP and the other in MMFR, drawn from staff of DNPW in the case of NNP and MMCT and the Forestry Department in Mulanje, respectively.
- 284 A National Project Steering Committee (NPSC) will also be established. This will be chaired by the National Project Director (NPD) (Director of EAD), and include the Project Coordinator (NPC), representatives from various government agencies (DNPW, Forestry Department, etc.), the UN Environment Task Manager, and representatives of key organizations with expertise in IAS that have a strategic, funding or practical interest in the project such as individuals from CABI, MMCT, NVT, LWT and others. The PSC will provide political and strategic guidance to the project, especially in regard to national political and administrative issues and will take decisions on issues related to legislation, regulations and guidelines on IAS management, especially in PA and neighbouring agro-ecosystems. The PSC will meet at least once a year in person and have the following responsibilities: (i) overseeing project implementation and performance based on reports provided by the NEA/PMU; (ii) approving annual project work plans and budgets for submission to UN Environment; (iii) approving any major changes in project implementation arrangements for submission to UN Environment for endorsement; (iv) providing technical input and advice; (v) reviewing the quality of major project deliverables; (vi) ensuring commitment of co-funding resources to support project implementation; (vii) coordinating conflicts within the project and/or negotiating solutions between the project and any parties beyond the scope of the project; (viii)



ensuring coordination amongst member agencies, and (ix) reviewing findings and recommendations.

285 Finally, to ensure long-term stability and sustainability, a robust and representative governance structure for IAS prevention and management in Malawi will be developed during the implementation of the project, and being an integral part of the evolving national partnership, coordination and implementation of the NISSAP.

## **SECTION 5: STAKEHOLDER PARTICIPATION**

286 Stakeholder participation across a range of sectors is critical in ensuring the success of the MSP. In order to garner support for proposed interventions the project will work with local governments, village chiefs and established NGOs, as well as local communities living around MMFR and NNP, who will be major beneficiaries of the MSP. The project will also work through Farmer Field Schools (FFS). Much of the training at FFS will focus on the “training of trainers” and development and implementation of demonstration trials to demonstrate the efficacy of various interventions.

287 National institutions will play a critical role in providing in-kind and financial support for the project, and the support of government ministries and their respective departments and agencies, especially with regard to the implementation of strategies and action plans, is also essential. The NEA will be the Environment Affairs Department (EAD) within the Ministry of Natural Resources, Energy and Mining (MoNREM). Staff from EAD will be involved in coordinating activities within country while CABI will provide guidance and technical backstopping as outlined in the previous section. EAD will be the NEA until the proposed Malawi Environment Management Authority (MEPA) is established. According to the EMA (2017) MEPA will be the lead IAS agency in Malawi.

288 The two key Ministries involved in the Project will be the MoNREM and the Ministry of Agriculture, Irrigation and Water Development (MoAIWD). Two critical Departments within these Ministries will be the Forestry Department and the Department of National Parks and Wildlife (DNPW). The Forestry Department is responsible for management of the MMFR while the DNPW managed NNP.

289 Other relevant Departments within MoAIWD include the Department of Crop Development (DCD) and Plant Protection Services (PPS). The DCD “promotes sustainable pest and disease management practices” while PPS is the agency responsible for undertaking PRA’s and developing other IAS prevention mechanisms.

290 Other important Ministries which are affected by IAS and as such need to be consulted during the development of some project outputs, such as the NISSAP, include the Ministries of Industry, Trade and Tourism (MoITT); Education, Science and Technology (MoEST); Local Government and Rural Development (MoLGRD); and Finance and Economic Planning and Development (MoFEPD). The MoFEPD is critical in ensuring that financial investments be made in IAS management, both at national and local level.

291 The National Herbarium and Botanical Gardens, a parastatal, and the Forest Research Institute within the Forestry Department will contribute to collating/contributing data on IAS presence and distribution

292 A number of international and national organizations active in social and environmental aspects of biodiversity conservation in Malawi will contribute to the

project in various ways: Total Land Care (TLC) will assist the project in undertaking agricultural and natural resource management programs, based on its experience in implementing a host of agriculture related projects including the USAID-funded Malawi Agroforestry Extension Project. The project will work closely with TLC with regard to developing and implementing practices such as Conservation Agriculture, including crop rotation, crop integration, growing of cover crops, FMNR and other interventions. The MMCT, NVT and other Natural Resources Management Trusts will help the project to explore additional options for sustainable financing of IAS management. The project will be working very closely with MMCT and NVT with regard to the management of invasive plants at the pilot sites in MMFR and NNP, respectively.

293 Several academic institutions in Malawi also contribute to research and knowledge generation concerning IAS and will assist in the design and implementation of IAS management activities at pilot sites, especially with regard to monitoring changes in biodiversity. These include Chancellor College (Biology Department, Natural Resources and Environment Centre, Leadership for Environment and Development-Southern and Eastern Africa), Bunda College (Forestry and Horticulture Department, Natural Resources Management Department, Crop Science Department and Aquaculture and Fisheries Science Department), Mzuzu University (Biological Sciences Department and Forestry Department), Natural Resources College, the Malawi College of Forestry and Wildlife and the Lilongwe University of Agriculture and Natural Resources (LUANAR).

294 The involvement of women in the project is key because women generally perceive IAS as more of a threat than men. The project will build on this and apply guidelines to target fair gender distribution on its capacity building activities – e.g. selection of trainees, co-management groups at pilots, as well as decision making fora, which in most cases will be near 50:50 throughout all strata of the project stakeholder groups. At pilot sites, where communities will be directly involved in IAS management activities, at least 50% of field workers will be women. Additional efforts will also be made to enhance capacity and awareness amongst women – gender sensitive awareness material will be developed and separate workshops will be held for women and men based on their availability, but more importantly to allow women in male dominated communities to comment and participate more freely in issues pertaining to IAS.

**Table 2: List of potential partners and roles under each project component**

Ministry or other	Department or other	Output/ Sub-output	Activity
MoNREM	EAD		National Executing Agency – Coordination, reporting, etc.
MoNREM	EAD	1.1.1.1	Lead agency in development of NISSAP with support from MoAIWD, MoITT, MoFEPD, private sector (tea, timber, etc.), and horticulture, aquaculture and pet industry
MoAIWD	PPS	1.1.1.2	Lead agency in development of PRA (prevention) with support from EAD, Forestry Department, DNPW, MMCT, NVT and CABI
MoNREM	EAD	1.1.1.3	Lead agency in development of pathway RA with support from DNPW, Department of Forestry, MMCT, NVT and

			CABI. The Ministry of Industry, Trade and Tourism will play a role here since tourism facilities are often a source of IAS – they will also be involved in creating awareness as to the threats
MoNREM	EAD	1.1.1.4	Lead agency in development of EDRR systems with support from DNPW, Forestry Department, MMCT, NVT and CABI
Universities	LUANAR, Chancellor College, Bunda College, Mzuzu University, Natural Resources College, etc.	1.1.2.1	Students/lecturer will undertake CBA's
CAB International	CABI	1.1.2.2	Lead agency in development of IAS inventory working with EAD, DNPW, Forestry Department, MMCT, NVT, National Herbarium and Botanical Gardens and Museums of Malawi
CAB International	CABI	2.1.1	Lead agency in development of IAS management plans for integration in PA Management plans working with EAD, DNPW, Forestry Department, MMCT and NVT
CAB International	CABI	2.1.2	Lead agency in undertaking trials to develop best management practices and implementing management of four IAS, including restoration, working with EAD, DNPW, Forestry Department, MMCT, Museums of Malawi, NVT, and PPF. Students from colleges/universities will undertake studies in IAS impacts and benefits of control
CAB International	CABI	2.1.3	Lead agency in building capacity among PA staff on IAS identification and management working with EAD, DNPW, Forestry Department, MMCT, and NVT
MoAIWD	Plant Protection Services	2.1.4	Lead agency in establishing a biological control working group working with EAD and CABI
CAB International	CABI	2.1.4	Lead agency in developing Risk Assessments for the introduction of classical biological control agents into Malawi working with PPS.
Queensland Biosecurity, Australia			Supply of biocontrol agents
ARC-Plant Protection Research Institute, South Africa	ARC-PPRI		Supply of biocontrol agents
CAB International	CABI	2.2.1	Lead agency managing IAS in agro-ecosystems, including restoration, working with EAD, DNPW, Forestry Department, MMCT, NVT, and PPF. Students from LUANAR will undertake studies in IAS impacts and benefits of control. Training on IAS identification and management also undertaken by CABI

Total Land Care	TLC	2.2.2	Lead agency in development and implementation of sustainable farming practices in agro-ecosystems working with the Land Resources Conservation Department (LRCD), Department of Agricultural Extension Services (DAES) and the Department of Agricultural Research Services (DARS), all in the MoAIWD. Extension officers in the Department will be involved in creating awareness on sustainable farming practices.
Ministry of Local Government and Rural Development		2.2.2	Will be an important partner in getting support for project initiatives in and around the protected areas.
Lilongwe Wildlife Trust	LWT	3.1.1	Lead agency in developing a Communication Strategy and outreach campaigns working together with EAD, MMCT and DNPW.
CAB International	CABI	3.1.2	Lead agency in development of an invasive alien plant Field Guide working together with EAD, National Herbarium and Botanical Gardens, and Museums of Kenya
National Consultant	TBD	3.1.3	Lead agency developing and undertaking Monitoring and Evaluation

## SECTION 6: MONITORING AND EVALUATION PLAN

295The project will follow UN Environment standard monitoring, reporting and evaluation processes and procedures. Monitoring and evaluation activities fall under Component 3 of the project.

296Progress and financial project reporting requirements are summarized in Appendix 8. Reporting requirements and templates are an integral part of the UN Environment legal instrument to be signed by the NEA and UN Environment.

297The project M&E plan is consistent with the GEF M&E policy. The Project Results Framework presented in Appendix 4 includes SMART indicators for each expected outcome as well as mid-term and end-of-project targets. These indicators, along with the key deliverables and benchmarks listed in Appendix 6, will be the main tools for assessing project implementation progress and whether project results are being achieved. The means of verification and the costs associated with obtaining the information to track the indicators are summarized in Appendix 7 (Costed M&E Plan). Other M&E related costs are also presented in the costed M&E Plan and are integrated in the overall project budget.

298In addition to the ‘standard’ impact monitoring reporting outlined in the previous paragraph and given the specific project investments in capacity building, outreach and IAS control in and around the two targeted Protected Areas, the project will devise a Project Impact Monitoring System measuring and reporting in standardized ways:

- The impact of IAS control measures (Outcome 2.1) and/or Conservation Agriculture, FMNR, crop rotation, crop integration and cover cropping

(Outcome 2.2) on PA conservation objectives, habitat restoration, farmers uptake and welfare, and general environmental quality parameters;

- Improvement in awareness levels about IAS of key national decisions makers (related to PA management and IAS) and local stakeholder groups in and around the two PAs; and
- Success and quality of capacity building;
- Attainment of the targets set in the Project Framework, as well as GEF Tracking Tools.

299A specialized national institution or national consultant will be contracted during the first year of the project to firstly design the Project Impact Monitoring System, as well as subsequently and at a part-time basis guide the data collection and systemic reporting throughout the life of the project. Once agreement has been reached on the indicators, parameters, data collection and reporting protocols to be applied, the results of this consultancy will be captured in a Project M&E Manual, a Midterm M&E results report, as well as the Consolidated report on Project Impacts, for use by the Terminal Evaluation. CABI may provide advisory services to the national entity on the project M&E – specifically related to the IAS control pilots, yet will not design and implement the Project Impact Monitoring System.

300The project M&E plan will be reviewed and revised as necessary during the project inception workshop to ensure that project stakeholders understand their roles and responsibilities vis-à-vis project M&E. Indicators and their means of verification may also be fine-tuned at the inception workshop. Day-to-day project monitoring is the responsibility of the National Project Coordinator and his/her team in the PMU but other project partners will have responsibilities to collect specific information to track the indicators. It will be the responsibility of the NPC to inform UN Environment of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely fashion.

301The NSC will receive annual reports on progress and will review and approve any suggestions revisions of the Results Framework or the M&E plan, submitted by the NEA to UN Environment. Project oversight to ensure that the project conforms to UN Environment and GEF policies and procedures will be the responsibility of the UN Environment-GEF Task Manager, who will also review the quality of draft project outputs and provide feedback to the project partners.

302Project supervision will take an adaptive management approach. The Task Manager will develop a project supervision plan at the start of the project which will be communicated to the project partners during the inception workshop. The emphasis of the Task Manager supervision will be on outcome impact monitoring but without neglecting project financial management and implementation monitoring. Risk assessment and rating is an integral part of the Project Implementation Review (PIR). The quality of project M&E will also be reviewed and rated as part of the PIR, and as such a swift design and start of the Project Impact Monitoring System – described above, would be key. Key financial parameters will be monitored quarterly to ensure cost effective use of financial resources.

303The principal means of assessment of project performance will be the mid-term and terminal evaluations. These will provide an opportunity to apply the GEF IAS Tracking Tool, as well as the Protected Area Management Effectiveness Tracking Tool (attached as Appendix 18 and 19 respectively), and to verify the information it provides. The tracking tools will be updated at mid-term and at the end of the

project and will be made available to the GEF Secretariat along with the project PIR report.

304 In-line with UN Environment Evaluation Policy and the GEF's Monitoring and Evaluation Policy the project will also be subject to a Terminal Evaluation (TE). Additionally, a Mid-Term Review (MTR) will be commissioned and launched by the Project Manager before the project reaches its mid-point. The MTR will be carried out using a participatory approach whereby parties that may benefit or be affected by the project will be consulted. The NSC will participate in the MTR and review and approve a management response – as to be developed by the NEA/PMU, to the recommendations along with an implementation plan. It is the responsibility of the UN Environment Task Manager to monitor whether the agreed recommendations are being implemented. However, if project is rated as being at risk, a Mid-Term Evaluation will be conducted by the Evaluation Office instead of a MTR.

305 The Evaluation Office will be responsible for the TE and will liaise with the Task Manager and Executing Agency(ies) throughout the process. The TE will provide an independent assessment of project performance (in terms of relevance, effectiveness and efficiency), and determine the likelihood of impact and sustainability. It will have two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UN Environment, the GEF, executing partners and other stakeholders. The direct costs of the evaluation will be charged against the project evaluation budget. The Terminal Evaluation will be initiated no earlier than six months prior to the operational completion of project activities and, if a follow-on phase of the project is envisaged, should be completed prior to completion of the project and the submission of the follow-on proposal. Terminal Evaluations must be initiated no later than six months after operational completion.

306 The draft Terminal Evaluation report will be sent by the Evaluation Office to project stakeholders for comments. Formal comments on the report will be shared by the Evaluation Office in an open and transparent manner. The project performance will be assessed against standard evaluation criteria using a six point rating scheme. The final determination of project ratings will be made by the Evaluation Office when the report is finalised and further reviewed by the GEF Independent Evaluation Office upon submission. The evaluation report will be publicly disclosed and may be followed by a recommendation compliance process.

307 An independent terminal evaluation (TE) will take place at the end of project implementation. This will again make use of the GEF Tracking Tool. The Evaluation and Oversight Unit (EOU) of UN Environment will manage the terminal evaluation process. A review of the quality of the evaluation report will be done by EOU and submitted along with the report to the GEF Evaluation Office not later than 6 months after the completion of the evaluation.

## **SECTION 7: PROJECT FINANCING AND BUDGET**

### **3.12. Overall project budget**

308 The overall project budget is presented in detail in Appendix 1 (budget requested from GEF) and Appendix 2 (co-financing). The allocations per Component and on the Project management Costs are as follows:

<i>Components</i>	<i>GEF funding (US\$)</i>
<b>Component 1.</b> Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems	342,260
<b>Component 2.</b> Strengthening IAS management in existing protected areas and adjoining agro-ecosystems	670,000
<b>Component 3.</b> Knowledge management and broader adoption	353,659
<b>Project management</b>	<b>136,592</b>
<b>TOTAL GEF budget</b>	<b>1,502,511</b>

### 3.13. Project co-financing

309The co-finance committed for the project includes commitments from various government ministries and associated departments, NGOs and other partners (Table 3). The breakdown per project component and activity is given in Appendix 2.

Table 3: Co-financing by source and components

	<b>Total</b>	<b>Cash</b>	<b>In-kind</b>
Environmental Affairs Department	553,000	187,500	365,500
Department of National Parks and Wildlife	510,000	60,000	450,000
Department of Land Resources Conservation	687,700	92,200	595,500
Forestry Research Institute of Malawi	354,052	-	354,052
Department of Forestry	682,600	178,800	503,800
Department of Agricultural Research Services	558,300	100,600	457,700
National Herbarium and Botanical Gardens	235,800	-	235,800
Museums of Malawi	301,000	191,000	110,000
Peace Parks Foundation	355,000	355,000	-
Mulanje Mountain Conservation Trust	300,000	100,000	200,000
UN Environment	100,000	-	100,000
Nyika Vwaza Trust (UK)	65,000	-	65,000
Nyika Vwaza Trust (MW)	75,000	-	75,000
Total Land Care	60,000	-	60,000
CAB International (CABI)	250,000	-	250,000
Biosecurity Queensland	76,695	-	76,695
<b>TOTALS</b>			
Component 1	1,008,000	290,000	718,000
Component 2	2,409,432	605,100	1,804,332
Component 3	1,230,300	285,000	945,300
PMC	516,415	85,000	431,415
<b>TOTALS</b>	<b>5,164,147</b>	<b>1,265,100</b>	<b>3,899,047</b>

### 3.14. Project cost-effectiveness

- 310 The cost-effectiveness of the proposed project is a function of the potential damage caused by IAS in Malawi in the absence of any project intervention (the ‘business as usual’ scenario). The scale of the threat posed by biological invasions is alarming in both environmental and economic terms. For example, globally, UN Environment has estimated that invasive species represent a major factor in the potential extinction of 30% of threatened bird species, and 15% of threatened plant species. Overall, approximately two-thirds of species extinctions may involve competition with invasive species. Although no national estimates of the costs of IAS, in terms of impact and management, have been published, based on reports from other countries the estimated cost of inaction in the prevention and control of IAS in Malawi would amount to millions of US\$ annually. For example, it is estimated that approximately US\$27.9 billion worth of crop losses can be attributed to exotic weeds in the USA alone. Approximately 45% of the weeds in USA pasture are alien species, which account for a loss of about US\$1 billion in pasture production per year. It is estimated that introduced weeds in crops and pastures in the USA, United Kingdom, South Africa, India, and Brazil result in economic losses of US\$94.92 billion per annum. For individual invasive species the costs in terms of impacts can be significant. For example, the total annual cost of an invasive plant such as Japanese knotweed (*Fallopia japonica*) to Great Britain has been estimated at US\$222,895,000. In South Africa it was found that the potential economic loss (economic use of water, impact on biodiversity, and preservation of land values based on 2000 values) to the country, if uninvaded land were to become invaded by the invasive plants *Acacia longifolia*, *A. pycnantha*, and *Hakea sericea*, would be US\$504, US\$532, and US\$356 per hectare per year, respectively. By investing resources in IAS management now, a considerable amount of money will therefore be saved in the long term.
- 311 Under a dynamic simulation of an ecological-economic model of alien plant control, in a mountain fynbos ecosystem in South Africa, it was found that the cost of proactive clearing would range from 0.6% to 4.76% of the economic value of ecosystem services, but increases the value of these services between 138% and 149%, depending on the assumptions of the model (Higgins et al., 1997). In another study the value of ecosystem services in South Africa was estimated to be US\$ 20,336,900,000 annually of which an estimated US\$ 869,671,000 is lost every year due to invasive alien plants. However, the loss would have been an estimated additional US\$ 5,579,270,000 had no invasive plant control been carried out. Between 5% and 75% of this protection was due to biological control (De Lange and van Wilgen, 2010).
- 312 Failure to manage plant invasions in PAs and surrounding agro-ecosystems in Malawi would result in significant biodiversity loss, including many endemic species, some of which are already threatened with extinction. Malawi is also developing its eco-tourism industry by restocking a large number of PAs, hoping to compete with other safari destinations in Tanzania, Zambia, South Africa, Namibia, Zimbabwe and Kenya. Invasive plants, if not managed, will displace valuable forage species leading to the demise of large herbivores and as a result predators, which are a significant tourist attraction.
- 313 The Nyika plateau and Mulanje Mountain are also two important water towers. Failure to address plant invasions in these water towers will have serious knock-on impacts, including hydro-electric generation. Low water levels in Lake Malawi in



2016 already resulted in significant power shedding, affecting economic development in the whole country. This situation will be exacerbated by climate change with more frequent and severe droughts, which will not only reduce water availability but contribute to further invasions.

- 314Component 1 addresses policy issues which include the development and implementation of a NISSAP and the creation of an IAS Coordination Unit. An over-arching strategy will contribute to the resolution of sector-based policies which often promote the introduction and dissemination of IAS while improved coordination will not only improve IAS management but reduce duplication, especially at PA level. Both the NISSAP and Coordination Unit will thus contribute to considerable cost savings facilitating IAS management across landscapes which are generally always under the management/control of many entities.
- 315Prevention is the most cost-effective way to manage IAS, compared to post-invasion measures such as control, eradication and restoration. In order to improve Malawi's ability to prevent invasions a pathway risk analysis will be undertaken. It is imperative that high risk pathways be identified and managed, especially for PAs. Prevention is a key element of the CBD Guiding Principles. For this reason the proposed project deals extensively with preventative actions such as risk analysis, early detection and rapid response.
- 316Many beneficial or useful species have been intentionally introduced but have subsequently become invasive. Management interventions have been rejected due to the value of these so-called conflict species without considering that their negative impacts may outweigh their benefits. In order to resolve this issue, cost-benefit analysis (CBA) will be undertaken on 3-5 conflict IAS. CBAs undertaken prior to the introduction of a species will also allow for a more informed decision, preventing the introduction of a species whose costs may outweigh any of its benefits.
- 317Capacity-building and public awareness-raising are important elements of this proposed MSP. These are activities which will form part of the costs of the pilots in MMFR and NNP, but will have benefits lasting far beyond the end of the project. Subsequent replication of the pilot activities at other sites, including other PAs and in adjoining agro-ecosystems, using staff trained under the project and benefiting from public support generated during the project, will thus be cheaper, and therefore more cost-effective, than the pilot activities themselves.
- 318The development of cost-effective and environmentally friendly management strategies for selected invasive plants at the pilot sites will significantly reduce the costs of management of targeted species and enhance biodiversity conservation at a national level. There are significant differences in the costs and impacts of various management strategies such as manual vs chemical control or between various chemicals (herbicides) and different application methods. Biological control also offers good returns on research investments, especially if effective off-the-shelf agents can be utilized, that is using host specific and damaging agents that have already been released and established elsewhere. For example, in South Africa the benefit:cost ratios of biocontrol ranged from 50:1 for invasive sub-tropical shrubs to 3,726:1 for invasive Australian trees. The costs were based on those associated with the development of the biocontrol agent while the benefits were the estimated value of ecosystem services protected by weed biological control.

319Cost effectiveness will be enhanced by working together with a large number of national partners who are currently involved in capacity building and awareness creation activities, especially with regard to environmental issues.

320The cost-effectiveness of this project can be summarized as follows:

- Awareness creation, especially amongst decision-makers and other stakeholders, on the economic costs of IAS impacts and their management, if they are allowed to enter, establish and proliferate. Prevention is the most cost-effective management option, followed by the development of cost-effective control strategies, if IAS have escaped detection and establish;
- By mainstreaming IAS issues in other sectors such as forestry, agriculture, health, etc. we may achieve economies of scale and enable cost-recovery;
- Creating knowledge, understanding and acceptance of biocontrol as a cost-effective and sustainable strategy when compared to mechanical and chemical control alone.

## REFERENCES

- Alabi, B.S., Ayeni, A.O., Agboola A.A., Majek B.A. (2001) Giant sensitive plant interference in cassava. *Weed Science* 49(2): 171-176.
- Biosafety Act (2002). Retrieved from [http://www.nccpmw.org/index.php/documentation/doc\\_download/63-biosafety-act-2002](http://www.nccpmw.org/index.php/documentation/doc_download/63-biosafety-act-2002)
- Biosafety Protocol (2000).
- Bosch, J. M. (1979) Treatment effects of annual and dry period streamflow at Cathedral Peak. *South African Forestry Journal*. 108: 29-38.
- Braithwaite, R.W., Lonsdale, W.M., Estbergs, A.J. (1989) Alien vegetation and native biota in tropical Australia: the impact of *Mimosa pigra*. *Biological conservation* 48: 189-210.
- Brown, C.J., Bernd, B., Maerz, C.J., Joule, S.J. (2006) Invasive plant and experimental venue affect tadpole performance. *Biological Invasions* 8 (2): 327-338.
- Burgiel, S.W., Muir, A.A. (2010) *Invasive Species, Climate Change and Ecosystem-Based Adaptation: Addressing Multiple Drivers of Global Change*. Global Invasives Species Programme, Washington, DC, and Nairobi, Kenya.
- Canhoto, C., Laranjeira, C. (2007) Leachates of *Eucalyptus globulus* in intermittent streams affect water parameters and invertebrates. *International Review of Hydrobiology* 92(2): 173-182.
- Capinera, J. (2010) *Insects and wildlife - Arthropods and their relationships with wild vertebrate animals*. Wiley-Blackwell, Chichester, U.K. 500pp.
- Cock, M.J.W., Beseh, P.K., Buddie, A.G., Cafá, G., Crozier, J. (2017) Molecular methods to detect *Spodoptera frugiperda* in Ghana, and implications for monitoring the spread of invasive species in developing countries. *Scientific Reports* 7(4103).10 pp.
- Council for National Herbarium and Botanic Gardens of Malawi Act (1987). Retrieved from <http://malawilaws.com/revised-laws/alphabetical-list-of-statutes/112-CHAPTER%2030-06COUNCIL%20FOR%20NATIONAL%20HERBARIUM%20AND%20BOTANIC%20GARDENS%20OF%20MALAWI.html>
- De Lange, W.J., van Wilgen, B.W. (2010) An economic assessment of the contribution of weed biological control to the management of invasive alien plants and to the protection of ecosystem services in South Africa. *Biological Invasions* 12:4113-4124.
- Dean, W.R.J., Anderson, M.D., Milton, S.J., Anderson, T.A. (2002) Avian assemblages in native *Acacia* and alien *Prosopis* drainage line woodland in the Kalahari, South Africa. *Journal of Arid Environments* 51: 1-19.
- Department of National Parks and Wildlife (2004) Nyika National Park Master Plan.
- Derpsch, R., Friedrich, T. (n.d.) Development and current status of No-till adoption in the world. Retrieved from <http://www.fao.org/ag/ca/ca-publications/istro%202009.pdf>
- Dye, P.J., Poulter, A.G. (1995) A field demonstration of the effect on streamflow of clearing invasive pine and wattle trees from a riparian zone. *Southern African Forestry Journal* 173:27-30.
- Environment Management Act No. 23 of 1996. Retrieved from <http://archive.resourcegovernance.org/sites/default/files/Environment%20Management%20Act.pdf>

- Environmental Affairs Department Ministry of Natural Resources, Energy and Environment (2010). Malawi Fourth Country Report to the convention on Biological Diversity. 155pp.
- Environmental Affairs Department, Ministry of Natural Resources, Energy and Mining (2015) National Biodiversity Strategy And Action Plan II (2015 –2025). Retrieved from <http://extwprlegs1.fao.org/docs/pdf/mlw149233.pdf>
- Flanders, A.A. et al. (2006). Effects of Invasive Exotic Grasses on South Texas Rangeland Breeding Birds. *The Auk: Ornithological Advances* 123(1):171-182.
- Forestry Act No.11 of 1997. Retrieved from [http://www.chmmw.org/publications/Forestry\\_Act\\_1997.pdf](http://www.chmmw.org/publications/Forestry_Act_1997.pdf)
- Fowler, S.V. (2000) Trivial and political reasons for the failure of classical biological control of weeds: A personal view. In: Spencer, N.R. (Ed.). *Proceedings of the X International Symposium on Biological Control of Weeds*. Advanced Litho Printing, Great Falls, MT, pp. 169–172.
- Gabbard, B.L., Fowler, N.L. (2007) Wide ecological amplitude of a diversity reducing invasive grass. *Biological Invasions*, 9:149–160.
- Genovesi, P., Monaco, A. (2013) Chapter 22: Guidelines for addressing invasive species in protected areas. In: Foxcroft LC, Pyšek P, Richardson DM, Genovesi P (eds) *Plant invasions in protected areas: patterns, problems and challenges*. Springer, Dordrecht, pp 487–506.
- Gerber, E., Krebs, C., Murrell, C., Moretti, M., Rocklin, R., Schaffner, U. (2008) Exotic invasive Knotweeds (*Fallopia* spp.) negatively affect native plant and invertebrate assemblages in European riparian habitats. *Biological Conservation* 141:646–654.
- Gianessi, L. (2009) Solving Africa's weed Problem: Increasing crop production and improving the lives of women. Crop Protection Research Institute. [www.croplifefoundation.org](http://www.croplifefoundation.org).
- Griffin, G.F., Stafford, D.M., Smith, Morton, S.R., Allan G.E., Masters, K.A., Preece, N. (1989) Status and implications of the invasion of Tamarisk (*Tamarix aphylla*) on the Finke River, Northern Territory, Australia. *Journal of Environmental Management*. 29: 297-315.
- Heleno, R.H., Ceia, R.S., Ramos, J.A., Memmott, J. (2009) The effect of alien plants on insect abundance and biomass: a food web approach. *Conservation Biology* 23(2):410-419.
- Hickman, J.E., Wu, S.L., Mickley, L.J., Lerda, M.T. (2010) Kudzu (*Pueraria montana*) invasion doubles emissions of nitric oxide and increases ozone pollution. *Proceedings of the National Academy of Science USA* 107:10115-10119.
- Higgins, S.I., Richardson, D.M., Cowling, R.M., Trinder-Smith, T.H. (1999) Predicting the landscape-scale distribution of alien plants and their threat to plant diversity. *Conservation Biology* 13:303-313.
- Hulme, P.E. (2006) Beyond control: wider implications for the management of biological invasions. *Journal of Applied Ecology* 43:835–847.
- Irrigation Act (2001). Retrieved from <http://extwprlegs1.fao.org/docs/pdf/mlw137603.pdf>
- Jones, C.G., Lawton, J.H., Shachak, M. (1997) Positive and negative effects of organisms as physical ecosystem engineers. *Ecology* 78:1946-195.
- Kibata, G.N., Maina, J.M., Thurair, E.G., et al. (2002) Participatory development of weed management strategies in maize based cropping systems in Kenya. Thirteenth Australian Weeds Conference. 343-344.
- Kriticos, D.J., Filmer, M. (2007) 'Weeds will thrive on climate change', *Farming Ahead* 182: 38–40.

- Kriticos, D.J., Sutherst, R.W., Brown, J.R., Adkins, S.W., Maywald, G.F. (2003) Climate change and the potential distribution of an invasive alien plant: *Acacia nilotica* spp. *Indica* in Australia. *Journal of Applied Ecology* 40: 111- 124.
- Kuniata, L.S. (1994) Importation and establishment of *Heteropsylla spinulosa* (Homoptera: Psyllidae) for the biological control of *Mimosa invisa* in Papua New Guinea. *International Journal of Pest Management* 40(1):64-65.
- Maerz, J.C., Brown, C.J., Chapin, C.T., Blossey, B. (2005) Plant secondary metabolites affect larval amphibian performance. *Functional Ecology* 19:970-975.
- Markin, G.P., Lai, P.Y., Funasaki, G.Y. (1992) Status of biological control of weeds in Hawaii and implications for managing native ecosystems. In: Stone, C.P., Smith, C.W. and Tunison, J.T. (eds). *Alien Plant Invasions in Native Ecosystems of Hawaii: Management and Research*. University of Hawaii Cooperative National Park Resources Studies Unit, Honolulu, pp. 466- 482.
- Mauambeta, D.C.D. (2003) Private investments to support protected areas: Experiences from Malawi. 5<sup>th</sup> World Parks Congress: Sustainable Finance Stream, September 2003, Durban South Africa.
- McFadyen, R.E. (2000) Biology and host specificity of the stem galling weevil *Conotrachelus albocinereus* Fielder (Col: Curculionidae), a potential biocontrol agent for parthenium weed *Parthenium hysterophorus* L. (Asteraceae) in Queensland, Australia. *Biocontrol Science and Technology* 10:195-200.
- National Environmental Policy (2004). Retrieved from <http://www.chmmw.org/publications/mwnep.pdf>
- National Fisheries and Aquaculture Policy (2001). Retrieved from <https://cepa.rmpportal.net/Library/government-publications/National%20Fisheries%20and%20Aquaculture%20Policy%202016.pdf/view>
- National Forest Policy (1996). Retrieved from [http://www.nccpmw.org/index.php/documentation/doc\\_download/4-national-forestry-policy-1996](http://www.nccpmw.org/index.php/documentation/doc_download/4-national-forestry-policy-1996)
- National Forest Policy (2016). Retrieved from <https://cepa.rmpportal.net/Library/government-publications/malawi-government-national-forest-policy-june-2016/view>
- National Invasive Species Council (2001) Meeting the invasive species challenge: National invasive species management plan. 80 pp.
- National Land Resources Management Policy and Strategy (2000). Retrieved from <http://www.nrjnmalawi.mw/Publications/Policy%20Documents/National%20Land%20Resources%20Management%20Policy%20and%20Strategy%20July%202000.pdf>
- National Parks and Wildlife Act No. 11 of 1992. Retrieved from <http://malawilaws.com/n/247-CHAPTER%2066-07NATIONAL%20PARKS%20AND%20WILDLIFE.html>
- National Wildlife Policy (2000). Retrieved from [http://www.chmmw.org/publications/Forestry\\_Act\\_1997.pdf](http://www.chmmw.org/publications/Forestry_Act_1997.pdf)
- Nichols, V., Verhulst, N., Cox, R., Govaerts, B. (2015). Weed dynamics and conservation agriculture principles: A review. *Field Crops Research* 183:56-68.
- Noxious Weeds Act (1936). Retrieved from <https://www.ecolex.org/details/legislation/noxious-weeds-act-cap-6402-lex-faoc118066/>

- Orr, A., Mwale, B., and Saiti, D. (2002) Modelling Agricultural 'Performance': Smallholder weeds management in Southern Malawi. *International Journal of Pest Management*. 48(4): 265-278.
- Parsa, S., Morse, S., Bonifacio, A., Chancellor, T.C., Condori, Crespo-Pérez, B.V., Hobbs, S.L., Kroschel, J., Ba, M.N., Rebaudo, F. (2014) "Obstacles to integrated pest management adoption in developing countries." *Proceedings of the National Academy of Sciences* 111(10):3889-3894.
- Perre, P., Loyola, D.R., Lewinsohn, T.M., Almeida-Neto, M. (2011) Insects on urban plants: contrasting the flower headfeeding assemblages on native and exotic hosts. *Urban Ecosystems* 14: 711-722.
- Pesticides Act (2002). Retrieved from <https://www.ecolex.org/details/legislation/pesticides-act-cap-3503-lex-faoc118068/>
- Plant Protection Act (1969). Retrieved from <https://www.ecolex.org/details/legislation/plant-protection-act-1969-no-11-of-1969-lex-faoc063795/>
- Republic of Malawi constitution (1995). Retrieved from <http://www.cssr.uct.ac.za/sites/cssr.uct.ac.za/files/Constitution%20Malawi.pdf>
- Rutherford, C., Rorabaugh, J. (1995) Endangered and threatened wildlife and plants: Proposed rule to determine five plants and a lizard from Monterey County, California, as endangered or threatened. *Federal Register* 60: 39362-39337.
- Sakai, A., Allendorf, F.W., Holt, J.S., Lodge, D.M., Molofsky, J., With, K.A., Baughman, S., Cabin, R.J., Cohen, J.E., Ellstrand, N.C., McCauley, D.E., O'Neil, P., Parker, I.M., Thompson, J.N., Weller, S.G. (2001) The population biology of invasive species. *Annual Reviews of Ecology and Systematics* 32:305-332.
- Scheiman, D.M., Bollinger, E.R., Johnson D.H. (2003) Effects of leafy spurge infestation on grassland birds. *Journal of Wildlife Management* 67(1):115-127.
- Science and Technology Act (2003). Retrieved from <https://www.ncst.mw/wp-content/uploads/2014/03/State-of-ST-in-Malawi-2010-11.pdf>
- Shackleton, R.T, Witt, A.B.R., Aool, W., Pratt, C. (2017) Distribution of the invasive alien weed, *Lantana camara*, and its ecological and livelihood impacts in eastern Africa. *African Journal of Range and Forage Science* 34:1.
- Shanugu, G.K. (2009) Management of the invasive *Mimosa pigra* L. in Lochinvar National Park, Zambia. *Biodiversity* 10 (2): 56-60.
- Strayer, D.L. (2012) Eight questions about invasions and ecosystem functioning. *Ecology Letters* 15:1199–1210.
- Tanner, R.A., Varia, S., Eschen, R., Wood, S., Murphy, S.T., Gange, A.C. (2013) Impacts of an invasive non-native annual weed, *Impatiens glandulifera*, on above- and below-ground invertebrate communities in the United Kingdom. *PLoS ONE* 8(6): e67271. <https://doi.org/10.1371/journal.pone.0067271>.
- The National Fisheries and Aquaculture Policy (2001). Retrieved from <http://www.unpei.org/sites/default/files/dmdocuments/Government%20of%20Malawi%20National%20Fisheries%20and%20Aquaculture%20Policy-%202016.pdf>
- Turpie, J. (2004) The role of resource economics in the control of invasive alien plants in South Africa. *South African Journal of Science* 100.
- Valentine, L.E. (2006) Habitat avoidance of an introduced weed by native lizards. *Australian Journal of Ecology* 31: 732–735.
- van Hengstum, T., Hooftman, D.A.P., Oostermeijer, J.G.B., van Tienderen, P.H. (2014) Impact of plant invasions on local arthropod communities: a meta-analysis. *Journal of Ecology* 102: 4-11.

- Van Lill, W.S., Kruger, F.J., Van Wyk, D.B. (1980) The effect of afforestation with *Eucalyptus grandis* Hill ex Maiden and *Pinus patula* Schlecht et. Cham. on streamflow from experimental catchments at Mokobulaan, Transvaal. *Journal of Hydrology* 48:107-118.
- van Wilgen, B.W., Moran, V.C., Hoffmann, J.H. (2013) Some perspectives on the risks and benefits of biological control of invasive alien plants in the management of natural ecosystems. *Environmental Management* 52:531–540.
- Versfeld, D.B., Le Maitre, D.C., Chapman, R.A. (1998) Alien invading plants and water resources in South Africa: a preliminary assessment. WRC Report No. TT 99/98 and CSIR No. ENV/S-C 97154.
- Vila, M., Espinar, J.L., Hejda, M. et al. (2011) Ecological impacts of invasive alien plants: a meta-analysis of their effects on species, communities and ecosystems. *Ecology Letters* 14:702-708.
- Water Resources Act (1969). Retrieved from <https://www.ecolex.org/details/legislation/water-resources-act-1969-act-no-15-lex-faoc001269/>
- Water Resources Management Policy (1994). Retrieved from <https://www.ircwash.org/sites/default/files/824-MW-16154.pdf>
- Winston, R.L., Schwarzlander, M., Hinz, H.L., Day, M.D., Cock, M.J.W., Julien, M.H., (eds.) (2014) *Biological control of weeds: A world catalogue of agents and their target weeds* (5th edn.) USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, FHTET-2014-04, pp 838.
- Zimmermann, H.G., Moran, V.C., Hoffmann, J.H. (2004) Biological control of invasive alien plants in South Africa, and the role of the working for water programme. *South African Journal of Science* 100, 34-40.

## **APPENDICES**

**Appendix 1: Budget by project components and  
UNEP budget lines (see separate file)**

**Appendix 2: Co-financing by source and UNEP  
budget lines (see separate file)**



## Appendix 3: Incremental cost analysis

BASELINE	ALTERNATIVE	INCREMENT
(B)	(A)	(A) – (B)
<b>COMPONENT 1: Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems</b>		
<ul style="list-style-type: none"> <li>• Only four IAS are listed under the Noxious Weeds Act, including <i>Eichhornia crassipes</i> and <i>Lantana camara</i>. There has been some management of the former but no management interventions for lantana or other widespread and abundant invasive alien plants</li> <li>• The National Parks and Wildlife Act makes reference to preventing the introduction of exotic species into PAs but based on preliminary surveys this is not being done – there are no references to the management of established IAS in PAs</li> <li>• The Forestry Act makes no references to the management of environmental weeds in PAs</li> <li>• From 2015/2016 to 2018/2019 the GoM through its MoNREM is supporting several environment related programs including “Environment and Climate Change Management” (US\$ 8,941,513) and “Wildlife Conservation and Management” (US\$ 3,224,300), the latter much focused on species protection, anti-poaching, tourism development, and some activities related to management of their habitat. A very meagre US\$ 21,326 of this will be available for biodiversity conservation and management, which is the government program coming closest to IAS issues.</li> </ul>	<ul style="list-style-type: none"> <li>• A NISSAP developed and endorsed to address IAS threats, especially in protected areas and adjoining agro-ecosystems. An over-arching strategy will resolve many of the policy gaps, especially where sector policies contradict each other.</li> <li>• National IAS coordination enhanced, and national competent agency agreed and established for taking the lead on this. Will result in less duplication and a common and shared vision for IAS management.</li> <li>• High risk pathways identified and managed, allowing for improved prevention interventions, especially in protected areas and adjoining agro-ecosystems. Report on the same will be developed and made available to other PA managers.</li> <li>• Prevention will be enhanced by undertaking and/or improving Pest Risk Assessments (PRAs) which will be further strengthened by undertaking cost-benefit analyses (CBAs). Training and subsequent research on CBAs will lead to the publication of CBAs for three IAS.</li> <li>• Those IAS already present, but as yet undetected, will be found and eradicated through the development and implementation of surveillance systems which will benefit from the development</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced IAS management through a better understanding of IAS pathways, improved mechanisms for prevention, early detection and rapid response, and enhanced coordination among different government agencies and the private sector to respond to new IAS.</li> <li>• Improved knowledge base of IAS in Malawi, especially in PAs and adjoining agro-ecosystems,</li> <li>• Increased ability of stakeholders to address IAS, especially those ‘conflict’ species through adoption of cost-benefit analyses</li> <li>• Increased budgets and programming with the national and local authorities for implementing IAS prevention and control in and around PAs</li> </ul>

BASELINE	ALTERNATIVE	INCREMENT
(B)	(A)	(A) – (B)
<ul style="list-style-type: none"> <li>•PRAs are mostly concerned about introduced species that may pose a threat to agriculture with no cost-benefit analyses being undertaken of beneficial yet invasive plant species</li> <li>•In general there is a weak legislative, policy and institutional framework with no multi-agency and consolidated national strategy for guiding action, investments and policy to deal with IAS</li> <li>•Efforts to implement IAS management is uncoordinated, with little collaboration/communication between various stakeholders, especially at PA level and adjoining communities, resulting in duplication and a continued waste of limited resources.</li> <li>•Risk of intentional and unintentional plant introductions will remain high with many agencies continuing to promote the introduction of exotic species without an evaluation of their potential risk.</li> <li>•New pest incursions will also not be detected early, especially in protected areas and adjoining agro-ecosystems</li> <li>•No inventory on IAS present in National Parks and Wildlife Reserves, inhibiting ability to develop and implement effective management strategies</li> <li>•Some of the issues above may be resolved through the recently promulgated Environmental Management Act which makes provision for the establishment of an</li> </ul>	<p>of a an IAS inventory and Field Guide.</p> <ul style="list-style-type: none"> <li>•An inventory of IAS in National Parks and Wildlife Reserves will be produced facilitating the development and implementation of management interventions.</li> </ul>	

BASELINE	ALTERNATIVE	INCREMENT
(B)	(A)	(A) – (B)
Environmental Management Authority which will be mandated to coordinate and undertake IAS management activities		
<b>COMPONENT 2: Strengthening IAS management in existing protected areas and adjoining agro-ecosystems</b>		
<ul style="list-style-type: none"> <li>• A Master Plan for Nyika NP was completed in 2004 and makes reference to invasive plants with some plans for control. However, there are no references with regard to awareness creation, capacity development, prevention, and EDRR. A Management Plan is currently being developed for MMFR. The Management Plan for NNP is currently being revised.</li> <li>• No budget allocation for IAS management in NNP and MMFR</li> <li>• There have been some trials to develop best IAS management practices for bracken but not for other IAS. <i>Pinus patula</i> is the only IAS that has been targeted for control across a wider area in both PA's.</li> <li>• In the past Malawi implemented a programme for the control of water hyacinth (<i>Eichhornia crassipes</i>) which resulted in the introduction of biocontrol agents – no other agents have been released for the control of other invasive alien plants</li> <li>• There is no established group working on the biological control of invasive plants</li> <li>• Most priority IAS in PAs and adjoining agro-ecosystems are either not managed or are being managed in a manner that does not involve</li> </ul>	<ul style="list-style-type: none"> <li>• PA management plans for NNP and MMFR take cognizance of IAS issues such as awareness raising, capacity development, prevention, EDRR and best management practices for the worst IAS.</li> <li>• Increased budget for IAS management in NNP and MMFR</li> <li>• Awareness and capacity on IAS issues improved among PA staff and farmers, with increased cooperation between them regarding IAS management.</li> <li>• Reduced pressure on PAs by enhancing livelihoods through improved farming practices, including biological control.</li> <li>• Best management practices developed and implemented for four target IAS</li> <li>• Rigorous monitoring protocols developed and implemented at the sites to ensure effective adaptive management, measurement of biodiversity impacts, as well as replication and dissemination of lessons learnt.</li> <li>• Increase in practical experience with regard to best management practices, and willingness to replicate elsewhere</li> </ul>	<ul style="list-style-type: none"> <li>• Revised PA Management Plans contributing to improved IAS management by reducing the negative impacts of IAS on key biodiversity habitats and important agro-ecosystems.</li> <li>• Increased understanding and awareness with regard to best management practices among PA staff and communities living adjacent to them leading to improved biodiversity conservation, enhanced crop yields and improved rangeland productivity</li> <li>• Development of surveillance and communication systems to produce up to date information on abundance, distribution and biological impact of selected invasive plants.</li> <li>• 80 PA staff can now identify and manage IAS</li> <li>• 50 households in adjoining agro-ecosystems adopt and promote sustainable farming practices</li> <li>• Targeted IAS cleared in pilot areas (minimum of 100 ha in NNP and minimum of 50 ha in MMFR), through agreed and tested IAS control measures</li> <li>• Minimum of 50 ha in each of surrounding agro-ecosystems of MMFR and NNP cleared</li> <li>• 15% enhanced tree cover in PA buffer zones</li> <li>• Increased collaboration between PA staff and</li> </ul>

BASELINE	ALTERNATIVE	INCREMENT
(B)	(A)	(A) – (B)
<p>cross-sectoral collaboration and local community involvement</p> <ul style="list-style-type: none"> <li>• Sustainable farming practices such as FMNR, CA, crop rotation, crop integration and cover cropping not actively developed and implemented in areas adjoining the two selected PA's</li> <li>• Very little capacity with regard to the identification and management of invasive plants or sustainable farming practices</li> </ul>		<p>communities in IAS management</p> <ul style="list-style-type: none"> <li>• Stabilized agricultural production enabling better uptake of community and economic development programs towards community welfare around the two targeted PAs.</li> <li>• M&amp;E capacity developed resulting in the development and distribution of a manual with tested standardized M&amp;E protocols for replication in the national PA network</li> </ul>
<b>COMPONENT 3: Knowledge management and broader adoption</b>		
<ul style="list-style-type: none"> <li>• Lack of information on identity and impacts of invasive plants</li> <li>• National publicity and awareness efforts on IAS are very few, isolated, limited in scope, single species focussed and sectoral – or most often agricultural pest related.</li> <li>• National information on IAS is difficult to access, collate and synthesize to aid effective control and management</li> <li>• No national or site IAS monitoring plans to determine changes in awareness and biodiversity levels</li> <li>• Restricted capacity of government institutions to establish and conduct regular monitoring and reporting</li> </ul>	<ul style="list-style-type: none"> <li>• Information on presence, impact and management of IAS integrated into national information systems, especially that of the Malawi national PA systems</li> <li>• National awareness raised emphasizing prevention, including pathway risk analysis; surveillance; and best management practices targeting different stakeholders, especially PA staff and communities</li> <li>• Awareness enhanced through the development of a Guide on the identification and management of invasive plant species in Malawi.</li> <li>• A project M&amp;E program developed, IAS monitoring capacity built and implemented in PAs and their agro-ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>• Up to date information on abundance, distribution and biological, social and economic impacts of invasive plants, especially in the selected PA's and adjoining agro-ecosystems.</li> <li>• Implementation of comprehensive multisectoral national communication strategies on IAS, targeting PA staff and adjoining communities, leading to increased awareness and improved co-management of IAS</li> <li>• IAS monitoring plans in place, and through the project start conducting surveys and reporting</li> <li>• Capacity building of governments and other stakeholders on IAS monitoring</li> <li>• Project M&amp;E Plan designed and operational</li> <li>• MTR and TE conducted</li> </ul>

## Appendix 4: Results framework

**Project objective:** To prevent new invasions and reduce the current impacts of invasive alien species (IAS) in protected areas and adjoining agro-ecosystems in Malawi

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
<b>Component 1: Establishing a national framework and capacity to enhance IAS management</b>						
1.1 Strengthened national IAS frameworks and improved national capacity and coordination among different Government agencies and the private sector to respond to new invasive species problems throughout Malawi, with focus on protected areas and their adjoining agro-	<ul style="list-style-type: none"> <li>• NISSAP with focus on preventing and managing IAS in the national PA system, based on broad coordination and representation.</li> <li>• # of NISSAP strategic targets initiated towards implementation and/or integrated in sector policy.</li> </ul>	<ul style="list-style-type: none"> <li>• Malawi does not have a NISSAP with no IAS management interventions based on national policy and strategic guidance</li> </ul>	<ul style="list-style-type: none"> <li>• NISSAP content in final draft based on broad national partnership and consultations – sections on PA management included</li> <li>• At least one (1) NISSAP target/action item in process for inclusion in at least one sector policy/program/or budget</li> </ul>	<ul style="list-style-type: none"> <li>• NISSAP finalized and adopted by central government</li> <li>• At least 2 (two) targets/programs in process for inclusion in at least one sector policy/program/ or budget (e.g. expanded pathway risk management systems included in PA management plans etc)</li> </ul>	<ul style="list-style-type: none"> <li>• NISSAP consultations documentation</li> <li>• Project/program documents</li> </ul>	<ul style="list-style-type: none"> <li>• GoM willing to adopt NISSAP</li> <li>• Stakeholders recognize the need for unified national strategy and broad partnership towards its formulation</li> </ul>
	<ul style="list-style-type: none"> <li>• Levels of coordination /cooperation between various stakeholder groups like local communities, private</li> </ul>	<ul style="list-style-type: none"> <li>• No or little coordination between various agencies with regard to the management of</li> </ul>	<ul style="list-style-type: none"> <li>• Project multi-stakeholder forum/steering committee operational in PY 1, and meeting at least</li> </ul>	<ul style="list-style-type: none"> <li>• At least 10 forum/steering committee meetings held and agreement reached on</li> </ul>	<ul style="list-style-type: none"> <li>• Project reports and minutes of meetings</li> <li>• TOR for National</li> </ul>	<ul style="list-style-type: none"> <li>• Stakeholders willing to participate and coordinate activities recognizing long term benefits of IAS management</li> </ul>

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
ecosystems	sector and Government agencies in the management of IAS	IAS	twice annually, especially at PA and community level	national key IAS issues, strategies and action items  • NISSAP implementation enabled and monitored through a National Designated Agency or Cross-sectoral coordination mechanism – especially on co-management of IAS in and around PA's	Designated Agency or coordination mechanism	• Local government and communities adjoining PA's recognize long term benefits of managing weeds, especially conflict species
	• # of High risk pathways and most damaging species, incorporated in at least one modified or new national policy and/or PA Management Plans and operations	• No information on high risk pathways or a prioritized list of IAS threatening PAs	• High risk pathways for invasive alien plants identified and communicated by way of workshops/meetings involving PA staff and communities  • NISSAP drafting process incorporating pathway information	• Key pathways (information) and mitigation strategy incorporated in NISSAP and/or modified national policy  • Identified pathways for high risk species included in PA Management Plans –	• Report on pathways and list of high risk species  • NISSAP	• Sufficient baseline information available to determine high risk pathways

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
				<p>supported by specific resources, especially for targeted Pas (output level)</p> <ul style="list-style-type: none"> <li>• NISSAP based on understanding and analysis of pathway risks</li> </ul>		
	<ul style="list-style-type: none"> <li>• Levels of application/mainstreaming of IAS Pest Risk Analysis (PRA) procedures and vigilance systems developed for the two PAs (NNP and MMFR) to other PA's and adjoining agro-ecosystems</li> </ul>	<ul style="list-style-type: none"> <li>• National PRA mainly focussed on crop pests with insufficient analysis of introduced plants, especially agro-forestry species</li> <li>• No PRA at PA level</li> <li>• No surveillance or rapid response system</li> </ul>	<ul style="list-style-type: none"> <li>• National PRA process reviewed and recommendations for strengthening in the fisheries, agriculture and fisheries sectors made</li> <li>• PRAs developed for 2 targeted PAs</li> <li>• Surveillance and rapid response system developed for 2 PAs</li> </ul>	<ul style="list-style-type: none"> <li>• PRA conducted for at least 50% of legally imported plant species and five agro-forestry species already present in Malawi</li> <li>• Inclusive PRA developed and adopted at PA level and at least 10 exotic species present in agro-ecosystems evaluated for risk to targeted PAs</li> <li>• Surveillance and rapid response</li> </ul>	<ul style="list-style-type: none"> <li>• Progress and technical reports including PRA's for five agro-forestry species and 10 exotic species in areas adjoining PA's</li> <li>• Report on surveillance and rapid response system and list of invasive or potentially</li> </ul>	<ul style="list-style-type: none"> <li>• Sufficient capacity at national and PA level to strengthen and develop PRA procedures</li> <li>• PA staff and community members willing to undertake surveys and report on new pest incursions</li> </ul>

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
				systems (i) part of the new PA Management Plans, and (ii) trialled in and around (buffer zones) the 2 PAs for invasive and/or potentially invasive species.	invasive	
	<ul style="list-style-type: none"> <li>• Results of cost-benefit analysis (CBA) of selected priority IAS, including ‘conflict’ species present in agro-ecosystems adjoining PAs, leading to positive change, allocations, safeguards or policy, to reduce or prevent promotion and further spread</li> </ul>	<ul style="list-style-type: none"> <li>• No evaluations have been undertaken on the costs and benefits of some highly invasive agro-forestry species such as <i>Acacia mearnsii</i>, <i>Pinus patula</i>, and <i>Prosopis juliflora</i></li> </ul>	<ul style="list-style-type: none"> <li>• Training on cost-benefit analyses undertaken by end PY1;</li> <li>• Cost-benefit analysis methodology agreed and stratified for gender access, use, benefits and costs.</li> <li>• Enhanced capacity and implementation/use of CBAs by partner institution(s) undertaking PRAs to evaluate risks of exotic species – incorporated by Plant Protection Services as part of</li> </ul>	<ul style="list-style-type: none"> <li>• Results of cost-benefit analyses of 3 ‘conflict’ species (<i>A. mearnsii</i>, <i>P. patula</i>, <i>P. juliflora</i>) reported by PY3, and results: (i) communicated with &gt; 3 key national agencies; (ii) incorporated in NISSAP action plan; (iii) incorporated in at least 2 PA management plans.</li> </ul>	<ul style="list-style-type: none"> <li>• Report on costs and benefits of selected species</li> <li>• NISSAP</li> <li>• PA management plans</li> </ul>	<ul style="list-style-type: none"> <li>• Sufficient information available on costs and benefits of selected species</li> <li>• Agro-forestry industry makes information available on the benefits of intentionally introduced agro-forestry species</li> </ul>



Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
			PRA procedures			
	<ul style="list-style-type: none"> <li>• Level of national knowledge and technical capacity to detect presence and distribution of invasive and potentially invasive plants – applied to five NP's (including NNP), four Wildlife Reserves, and MMFR (related to Outcome target in terms of responding and reducing risks of potential spread and impact of new IAS)</li> </ul>	<ul style="list-style-type: none"> <li>• No detailed information on presence and distribution of all invasive and potentially invasive plant species in these PAs. Only pines and bracken in NNP and pines in MMFR.</li> </ul>	<ul style="list-style-type: none"> <li>• Information available of all invasive and potentially invasive plants in these selected PAs</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge on distribution of invasive and potentially invasive plants in these PAs in Malawi leading to initial steps towards a national inventory of all IAS incursions in PAs using the Guide developed under Component 3.</li> </ul>	<ul style="list-style-type: none"> <li>• Inventory and distribution maps on invasive alien plants present in these selected PAs</li> </ul>	
<b>Outputs for component 1:</b>						
1.1.1. National framework for the cross-sectoral management of IAS operational and supporting long-term development planning						
1.1.2. Evidence base informing policy and supporting IAS prevention and management in and around PAs						
2.1 Reduced IAS impacts in two PAs (Mulanje FR and Nyika NP) resulting in enhanced	<ul style="list-style-type: none"> <li>• PA management effectiveness enhanced on IAS prevention and management in two PAs (strategies, budgets, control and</li> </ul>	<ul style="list-style-type: none"> <li>• No IAS management strategies and budgets (USD 0.0) included in PA management plans and operations for</li> </ul>	<ul style="list-style-type: none"> <li>• PA Management Plans amended/developed – specifically on IAS; extra budget requests submitted with GoM and/or</li> </ul>	<ul style="list-style-type: none"> <li>• Increased budgets for IAS management in Mulanje Mountain FR and Nyika NP involving a total</li> </ul>	<ul style="list-style-type: none"> <li>• Revised PA management plans</li> <li>• PA budgets and audit reports</li> </ul>	<ul style="list-style-type: none"> <li>• PA management authorities are willing to invest in PA management</li> </ul>

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
conservation outcomes for endangered or threatened species	restoration)	Mulanje FR and Nyika NP • METT score of 61 for Mulanje Mountain FR and 63 for Nyika NP	local partners • METT score of 64 for Mulanje Mountain FR and 66 for Nyika NP	of 50,000 ha. under IAS management • METT score of 67 for Mulanje Mountain FR and 69 for Nyika NP	• GEF Tracking Tools	
	• Level of capacity and on-the-ground implementation of IAS prevention and management in pilot PAs leading to measurable reduction in invaded areas (and associated BD impacts)	• Two pilot sites (Mount Mulanje FR and Nyika NP) confirmed during PPG • No ecosystem management plans available focussing on IAS • Control practices have been applied for a few species but there is too little information available on best IAS management practices	• At least two IAS control intervention areas agreed, control measures designed through partnership with national and international specialised agencies. • At least three different control practices initiated for each of four target spp. ( <i>Rubus</i> spp., <i>Acacia mearnsii</i> , <i>Pteridium aquilinum</i> and <i>Dolichandra unguis-cati</i> ) • Ecosystem management plans amended/developed and endorsed by PA	• Control practices tested and efficacy determined for each of four target species • Invaded areas (minimum of 150 ha in total) in two protected areas cleared and restored • Lessons on IAS management collated and disseminated to PA managers, communities and other stakeholders • GEF TT scores up with 50% on IAS	• Pilot site management plans • Publications in best IAS management practices • Project progress reports • Changes in capacity recorded at baseline, midterm and end of project (pre- and post-knowledge surveys) • GEF Tracking	• Conflicts of interest can be resolved • Support for IAS management plans is maintained by PA staff and communities • At least some control trials effective

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
			management and community leaders living adjacent to PAs		Tools	
	<ul style="list-style-type: none"> <li>Changes in skills of protected area staff in IAS identification and management applied to their conservation work</li> </ul>	<ul style="list-style-type: none"> <li>PA staff have little knowledge in IAS identification and management</li> <li>Baseline capacity/ knowledge levels determined at project inception</li> </ul>	<ul style="list-style-type: none"> <li>Measured increase in knowledge of &gt;50 PA staff on IAS identification (with at least 25% women)</li> </ul>	<ul style="list-style-type: none"> <li>Measured increase in knowledge of 80 PA staff on IAS identification (with at least 25% women)</li> <li>At least 4 staff of each targeted PA (incl. at least one woman each) have applied their new skills on IAS prevention and management in project PAs. (measured through involvement in management work within and outside the project)</li> </ul>	<ul style="list-style-type: none"> <li>(Project) Capacity Impact Monitoring reports at start and end of project</li> <li>Staff involvement in PA and other conservation work</li> </ul>	<ul style="list-style-type: none"> <li>Staff have adequate existing understanding/knowledge on conservation</li> <li>Trained staff stay in post and use new knowledge</li> </ul>
	<ul style="list-style-type: none"> <li>Biocontrol programs supported</li> </ul>	<ul style="list-style-type: none"> <li>Little to no awareness as to biological control with no agents for</li> </ul>	<ul style="list-style-type: none"> <li>IAS Biocontrol Working Group established by Q1-PY 2 and action</li> </ul>	<ul style="list-style-type: none"> <li>Approval for introduction and release of three biocontrol</li> </ul>	<ul style="list-style-type: none"> <li>Biocontrol Action Plan</li> <li>RA for introduction</li> </ul>	<ul style="list-style-type: none"> <li>GoM issues permits for introduction and release of biocontrol agents</li> </ul>

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
		terrestrial weeds released in the past 50 years • Baseline awareness levels on biocontrol determined in PY1, as part of the overall awareness baseline assessment (for PA staff and those in the MoNREM and MoAIWD)	plan agreed • High priority target IAS agreed and agents identified, Q4-PY2 • Biocontrol aspects integrated in the project communications and capacity building program • Application for import of three agents made	agents • 50% increase in awareness of biocontrol above baseline for PA staff and those in the MoNREM and MoAIWD	of biocontrol agents • Import and release permits • Agents present in areas of introduction	• Support for biocontrol from all sectors • Potential conflicts of interest can be minimized
2.2. Reduced IAS impacts in adjoining agro-ecosystems of Mount Mulanje FR and Nyika NP contributing to improved livelihoods and biodiversity conservation	• Enhanced collaborative targeting and management of shared and high risk IAS species through collaboration between PA managers and adjoining communities	• Little to no collaboration/cooperation between PA staff and communities on IAS management	• PA and community representatives identified and participatory meetings being held • Agreement on participatory sustainable farming and acknowledgement w/r to non-monetary benefits of IAS control • Agreed IAS action plans and actors agreed (PY 1), and in process of	• PA staff and community members meeting at least three times annually to discuss IAS issues • IAS in agro-ecosystems incorporated in the two PA management plans and conflict management operations	• Minutes of meetings	• PA staff and adjoining communities willing to work together on IAS management

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
			incorporation in the PA management plans (PY 2)			
	<ul style="list-style-type: none"> <li>Invaded areas in agro-ecosystems reduced and semi-natural vegetation cover improved though increased capacity of farmers' on IAS management and adoption of sustainable farming practices for weed/IAS management</li> </ul>	<ul style="list-style-type: none"> <li>Areas around two PAs (Mount Mulanje FR and Nyika NP) identified during PPG</li> <li>Farmers have little to no knowledge on IAS identification, management and sustainable farming practices</li> <li>No effective management plans available for many IAS in adjoining agro-ecosystems (rangelands and croplands)</li> <li>Continued deforestation and land degradation</li> </ul>	<ul style="list-style-type: none"> <li>Rangelands/natural pasture identified for development and implementation of IAS management practices including restoration (native tree planting)</li> <li>Croplands identified for the development and implementation of sustainable farming practices such as FMNR, Conservation Agriculture including crop rotation, crop integration and cover cropping to enhance crop yields and reduce weed impacts and herbicide-use</li> <li>Sustainable crop production practices adopted by 15 households, incorporating IAS</li> </ul>	<ul style="list-style-type: none"> <li>Control practices tested and efficacy determined for each of three target species in rangelands</li> <li>Invaded areas (minimum of 100 ha total) in areas adjoining rangelands around PAs cleared and restored</li> <li>15% enhanced native tree cover in PA buffer zones</li> <li>Sustainable farming practices adopted by 50 households and incorporating IAS prevention and control</li> <li>100 farmers</li> </ul>	<ul style="list-style-type: none"> <li>IAS management plans</li> <li>Publications on best IAS management practices</li> <li>Project progress reports</li> <li>Results of pre- and post-knowledge assessments</li> </ul>	<ul style="list-style-type: none"> <li>Conflicts of interest can be resolved</li> <li>Support for IAS management plans is maintained by communities</li> <li>At least some control trials effective</li> </ul>

Outcome	Indicators	Baseline conditions	Objectively verifiable indicators			
			Mid-term targets	End of Project targets	Means of verifications	Assumptions
			prevention and control  • 70 farmers trained in FMNR, Conservation Agriculture and other sustainable land-use practices  • Measured increase in knowledge of >50 community members on IAS identification and sustainable farming practices (with at least 25% women)	trained in IAS identification sustainable land-use practices such as Conservation Agriculture and FMNR		
<b>Outputs for component 2:</b>  2.1.1. Two revised PA Management Plans including strategies and budgets for IAS prevention and control 2.1.2. Test management plans for four IAS, including IAS control and habitat restoration in two PAs 2.1.3. Capacity of 80 PA staff improved and applied in the identification and management of IAS 2.1.4. Biocontrol Working Group established and operational leading to the introduction of three host specific and damaging biocontrol agents 2.2.1. Invaded rangelands (100 ha total) in buffer zones/agro-ecosystems of two adjoining PAs cleared and restored (native trees) through enhanced partnerships between PA staff and farmer communities, including the training of 100 farmers on IAS identification and management 2.2.2. Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping adopted and promoted by 50 households as a result of training and demonstration trials						

Outcome	Objectively verifiable indicators					
	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
<b>Project component 3: Knowledge management and broader adoption</b>						
Outcome	Indicators	Baseline conditions	Mid-term targets	End of Project targets	Means of verifications	Assumptions
3.1 Replication and increased adoption in the Malawi PA system of IAS prevention and management though national dissemination of best practice and awareness programs	Key national decisions makers and adjacent communities awareness increased through project communications, dissemination of best practice and targeted outreach	<ul style="list-style-type: none"> <li>• PA staff have limited knowledge beyond awareness of the major invasive species</li> <li>• Baseline IAS awareness levels of PA staff and communities living adjacent to Mount Mulanje FR and Nyika NP set at Inception (PY1)</li> </ul>	<ul style="list-style-type: none"> <li>• IAS Communication Strategy developed for use at a local level- focussed on PA and related actors and sectors (end PY1)</li> <li>• Communities reached with communications (including gender-sensitive topics such as weeding, wood harvesting)</li> </ul>	<ul style="list-style-type: none"> <li>• Surveys show increased average awareness 50% over baseline</li> <li>• PA staff and communities show increased knowledge and skills of prioritized IAS and IAS management mechanisms, including biocontrol</li> </ul>	<ul style="list-style-type: none"> <li>• Awareness baseline &amp; end-of-project impact survey report</li> <li>• Communication strategy</li> <li>• Communication products and materials</li> </ul>	<ul style="list-style-type: none"> <li>• Communication strategy supported and implemented by all stakeholders</li> <li>• Communications received positively, resulting in behaviour change</li> </ul>
<b>Outputs for Component 3:</b> 3.1.1. Communication strategy and outreach campaign including use of media, workshops and meetings (targeting government officials, PA staff and affected communities) 3.1.2. National information sharing procedures including the development of a Guide on identification and management of invasive plant species in Malawi 3.1.3. Project M&E program, evidence of IAS monitoring capacity built and implemented in PA's and their agro-ecosystems						

## Appendix 5: Work plan and timetable

Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Output 1.1.1. National framework for the cross-sectoral management of IAS operational and supporting long-term development planning</b>																				
<b>1.1.1.1. Establish National Invasive Species Strategy and Action Plan (NISSAP)</b>																				
i) Develop TOR for the National Steering Committee (NSC)																				
ii) Establish NSC																				
iii) Meetings to take place every quarter																				
iv) Produce NSC minutes																				
v) Based on the NSC establish a national IAS Coordination Unit																				
<b>1.1.1.2. Develop content of NISSAP</b>																				
i) Identify and engage consultant/task team																				
ii) Collate information on status of IAS and IAS policies and plans, including those relevant to PA's																				
iii) Hold national stakeholder consultations																				
iv) Prepare draft document																				
v) Review draft and prepare final version																				
vi) Print and deliver to relevant stakeholders																				
vii) Produce non-technical version, print and disseminate to relevant stakeholders																				
<b>1.1.1.3. Identify high risk pathways, especially those for PA's</b>																				
i) Identify and engage consultant/task team																				
ii) Identify most damaging IAS in Malawi, especially those threatening PA's, and determine their pathways																				
iii) Produce, print and disseminate report																				
<b>1.1.1.4. Strengthen national IAS Risk Analysis (RA) procedures and develop RA systems for PA's</b>																				
i) Identify and engage consultant/task team																				
ii) Review current RA procedures at national, local and PA level																				
iii) Consult with relevant stakeholders and identify gaps and needs, especially those at PA level																				
iv) Based on consultations propose changes to current RA procedures, especially those relevant																				



Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
to PA's, and produce report																				
v) Possible endorsement and adoption of revised RA procedures at national and PA level																				
<b>1.1.1.5. Early Detection and Rapid Response (EDRR) systems established, especially for PA's and adjoining agro-ecosystems</b>																				
i) Identify and engage consultant/task team																				
ii) Review national and international EDRR procedures, especially those used in PA systems elsewhere																				
iii) Based on consultations propose changes to current EDRR procedures, especially those relevant to PA's and produce report																				
iv) Possible endorsement and adoption of intersectoral surveillance and rapid response system, with focus on PA's and adjoining agro-ecosystems																				
<b>Output 1.1.2. Evidence base informing policy and supporting IAS prevention and management in and around PA's</b>																				
<b>1.1.2.1. Undertake cost-benefit analysis of three 'conflict' species and produce report</b>																				
i) Identify and engage consultant/task team																				
ii) Based on consultations identify/confirm three species and collect and collate relevant data on costs and benefits – may include socio-economic surveys among communities to determine their perceptions																				
iii) Produce and disseminate report to key stakeholders																				
<b>1.1.2.2. Produce national inventory on presence and distribution of priority invasive plants in National Parks and Wildlife Reserves</b>																				
i) Identify and engage consultant/task team																				
ii) Review literature, visit herbaria, and undertake surveys																				
iii) Collate information, develop inventory and disseminate findings																				
<b>1.1.2.3. Make results of 1.1.2.1. and 1.1.2.2. available to policy and decision-makers under Component 3</b>																				
i) Collate information and produce relevant awareness material																				

Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
ii) Disseminate information under Component 3																				
<b>Output 2.1.1. Two revised PA Management Plans including strategies and budgets for IAS prevention and control</b>																				
<b>2.1.1.1. Revise existing management plans and identify gaps</b>																				
i) Identify and engage consultant/task team																				
ii) Review current PA management plans for Mulanje FR and Nyika NP and identify gaps (one for MMFR is currently under development) with regard to IAS management interventions/strategies																				
iii) Based on consultations revise current management plans, integrating IAS issues.																				
iv) Produce revised PA Management Plans, including sustainable budget programs for IAS management, and disseminate to relevant stakeholders																				
<b>Output 2.1.2. Tested management plans for four IAS, including IAS control and habitat restoration in two PA's</b>																				
<b>2.1.2.1. Pilot sites established through effective partnerships</b>																				
i) Species targeted for management trials and methodologies agreed																				
ii) Determine baseline biodiversity levels prior to control interventions																				
iii) Implement control interventions and monitor efficacy and biodiversity impacts																				
iv) Produce report and disseminate results of best management practices																				
v) Implement best management practices across wider area (50 ha in MMFR and 100 ha in NNP) and monitor impacts																				
<b>Output 2.1.3. Capacity of 80 PA staff improved and applied in the identification and management of IAS</b>																				
<b>2.1.3.1. Develop and conduct training programs on the identification and management of invasive plants targeting PA staff.</b>																				
i) Identify gaps and needs and determine baseline knowledge levels																				
ii) Draft and review course outlines in consultation with PA staff																				
iii) Develop and implement training programs (workshops)																				

Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
iv) Assess feedback and undertake post-implementation knowledge surveys																				
<b>Output 2.1.4. Biocontrol Working Group established and operational leading to the introduction of three host specific and damaging biocontrol agents</b>																				
<b>2.1.4.1. Establish Biocontrol Working Group</b>																				
i) Identify agencies and individuals in Malawi working on biocontrol																				
ii) Produce a contacts database																				
iii) Establish contact with identified agencies and individuals																				
iv) Develop TOR																				
v) Establish Biological Control Working Group																				
<b>2.1.4.2. Identify target species and potential biocontrol agents</b>																				
i) Biocontrol Working Group confirm target species and agents																				
ii) Consultant/task team undertake Risk Analysis and submit import application																				
iii) If import application approved (ii) import agents and undertake HR testing to confirm host specificity.																				
iv) Based on results of (iii) submit application for release of agent																				
v) Mass rear and release agents																				
vi) Undertake post-release evaluation to confirm host specificity and impact																				
<b>Output 2.2.1. Invaded rangeland (100 ha total) in buffer zones/agro-ecosystems of two adjoining PA's cleared and restored (native trees) through enhanced partnerships between PA staff and farmer communities, including the training of 100 farmers on IAS identification and management</b>																				
<b>2.2.1.1. Develop and conduct training programs on IAS identification and management</b>																				
i) 100 farmers identified through community consultations																				
ii) Identify gaps and needs and determine baseline knowledge levels																				
iii) Draft and review course outlines in consultation with communities or community leaders																				
iv) Develop and implement training programs																				
v) Assess feedback and undertake post-																				

Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
implementation knowledge surveys																				
vi) Produce report and disseminate results																				
<b>2.2.1.2. Local IAS coordination units established</b>																				
i) Identify community leaders/representatives and PA staff																				
ii) Hold meetings and establish TOR																				
iii) Establish local IAS coordination units at NNP and MMFR																				
<b>2.2.1.3 Invaded areas cleared and restored using native trees</b>																				
i) Identify areas (100 ha – 50 ha adjoining each of the PA's) for management interventions and restoration based on community participation																				
ii) Determine baseline biodiversity levels prior to control interventions																				
iii) Implement control interventions and monitor efficacy and biodiversity impacts, especially tree survival																				
iv) Produce report and disseminate results																				
<b>Output 2.2.2. Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping adopted and promoted by 50 households as a result of training and demonstration trials</b>																				
<b>2.2.2.1. Develop and conduct training programs on sustainable farming practices</b>																				
i) 50 farmers identified through community consultations																				
ii) Identify gaps and needs and determine baseline knowledge levels																				
iii) Draft and review course outlines in consultation with communities																				
iv) Develop and implement training programs																				
v) Assess feedback and undertake post-implementation knowledge surveys																				
vi) Produce report and disseminate results																				
<b>2.2.2.2. Implementation of sustainable farming practices</b>																				
i) Working with 50 farmers identified above implement sustainable farming practices																				
ii) Monitor practices and provide feedback																				
iii) Assess changes in biodiversity and yields																				
2.2.2.3.4. Produce report and disseminate results																				

Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Output 3.1.1. Communication strategy and outreach campaigns including use of media, workshops and meetings targeting government officials, PA staff and affected communities</b>																				
<b>3.3.1.1 Develop Communication strategy and undertake comprehensive local and targeted national awareness campaign</b>																				
i) Identify and engage consultant/task team																				
ii) Via consultation agree on key messages and identify target groups at national and local level																				
iii) Develop methodology to determine baseline awareness levels among identified target groups																				
iv) Determine baseline awareness levels																				
v) Produce and distribute awareness material																				
vi) Hold workshops and/or meetings to enhance awareness on IAS																				
vii) Measure changes in awareness levels																				
<b>Output 3.1.2. National information sharing procedures including the development of a Guide on identification and management of invasive plant species in Malawi</b>																				
<b>3.1.2.1. Produce invasive alien plant Field Guide</b>																				
i) Undertake literature reviews and active surveys to determine presence and distribution of naturalized and invasive plants in Malawi																				
ii) Collate survey data and produce distribution maps																				
iii) Produce invasive alien plant Field Guide																				
iv) Print invasive alien plant Field Guide																				
<b>Output 3.1.3. Project M&amp;E program, evidence of IAS monitoring capacity built and implemented in PA's and their agro-ecosystems</b>																				
<b>3.1.3.1. Establish and implement Monitoring and Evaluation Plan</b>																				
i) Identify and engage consultant/task team																				
ii) Develop M&E plan, indicators and baseline																				
iii) Implement M&E plan																				
iv) Monitor the achievement of all benchmarks and outputs as specified in annual workplans with special reference to measuring changes in biodiversity at pilot sites and awareness levels																				
v) Produce reports																				
<b>3.1.3.2. External audits</b>																				
i) Organize annual audit																				
ii) Monitor audit reports																				

Outputs, Activities and Tasks	Project Year 1				Project Year 2				Project Year 3				Project Year 4				Project Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>3.1.3.3. Midterm evaluation (UN Environment Independent study)</b>																				
i) Identify and engage consultant/task team																				
ii) Undertake midterm evaluation																				
iii) Produce midterm evaluation report and circulate																				
iv) Incorporate midterm evaluation report findings into modified workplans																				
<b>3.1.3.4. Terminal evaluation (UN Environment Independent study)</b>																				
i) Draft TOR and identify and engage consultant/task team																				
ii) Perform terminal evaluation (3-6 months after project closure)																				
iii) Produce terminal evaluation report and circulate among identified stakeholders																				

## Appendix 6: Key deliverables and benchmarks

OUTPUTS	ACTIVITIES	DELIVERABLES	BENCHMARKS
<b>1. Component 1: Establishing a national framework and capacity to enhance IAS management in protected areas and associated agro-ecosystems</b>			
<b>Outcome 1.1:</b> Strengthened national IAS policy and improved national capacity and coordination amongst different government agencies and the private sector to respond to existing and new invasive species problems throughout Malawi, with a focus on protected areas and their adjoining agro-ecosystems.			
1.1.1 National framework for the cross-sectoral management of IAS operational and supporting long-term development planning.	National invasive species multi-stakeholder mechanisms established for cross-sectoral IAS management	<b>National IAS Coordination Mechanism established and functional</b>	TOR and hosting institution endorsed by all stakeholders (PY2; Q4)
	National Invasive Species Strategy and Action Plan addressing IAS threats, especially those to PA's developed and published	<b>National Invasive Species Strategy and Action Plan addressing IAS threats, especially those to protected areas</b>	NISSAP document disseminated to stakeholders (PY2; Q4)
	Surveys/research undertaken to identify and record/collate/publish information on high risk pathways and most damaging species in Malawi, especially those threatening PA systems	High risk pathways and most damaging species in Malawi, especially those threatening PA systems identified and report produced	Pathway risk assessment report circulated with action for reducing risks (PY3; Q1)
	IAS Risk Analysis procedures reviewed and strengthened or developed , especially ones for PA's	Report on IAS Risk Analysis procedures, including ones for PA's produced	Risk analysis procedures which incorporates IAS in PA's endorsed and implemented (PY3; Q2)
	Improved surveillance mechanisms and rapid reponse systems enhanced to deal with new pest incursions	Report on improved national vigilance and surveillance systems, including rapid response to alerts	Monitoring system to detect new infestations endorsed by all stakeholders, especially at local level (PY3; Q4)
1.1.2. Evidence base informing policy and supporting IAS prevention and management in and around PA's	Studies/research on the costs and benefit of three IAS, including 'conflict' species, present in agro-ecosystems adjoining PA's undertaken	<b>Report on the costs and benefits of three so-called 'conflict' species</b>	Cost-benefit reports disseminated and endorsed by all stakeholders leading to the adoption of CBA's in the PRA process (PY4; Q1)
	Surveys, including literature reviews, undertaken to determine the presence	<b>National inventory on presence and distribution of priority invasive plants in</b>	List of priority species circulated and action for

	and distribution of priority invasive plants in National Parks and Wildlife Reserves in Malawi	<b>National Parks and Wildlife Reserves</b>	control acknowledged/endorsed (PY3; Q1)
	Information collated/recorded made available to all interested and affected parties through communications	Information made available as part of a comprehensive communication strategy	Increased awareness among relevant individuals/agencies as to the costs and benefits of IAS and which IAS are present in NP's and WR's (PY5; Q1)
<b>Component 2 Strengthening IAS management in existing protected areas and adjoining agro-ecosystems</b>			
<b>Outcome: Reduced IAS impacts in two PA's (Mulanje FR and Nyika NP) resulting in enhanced conservation outcomes for endangered or threatened</b>			
2.1.1. Two revised PA Management Plans including strategies and budgets for IAS prevention and control	Review existing PA Management Plans, identify gaps, and make inputs/revisions/changes with regard to IAS management strategies including increased budgets for IAS prevention and control	<b>Revised IAS strategies, including enhanced budgets for IAS prevention and control in PA Management Plans for NNP and MMFR</b>	PA Management Plans disseminated, endorsed and implemented by all relevant stakeholders resulting in improved METT scores of ~10% in NNP and MMFR (PY5; Q2)
2.1.2. Tested management plans for four IAS, including IAS control and habitat restoration in two PA's	Management plans for four IAS trailed/tested in demonstration plots in order to determine best management practices	<b>Report and/or brochures on best management practices for four IAS, including information on cost-effectiveness and benefits to biodiversity</b>	Best management practices widely adopted by PA staff and communities in adjoining agro-ecosystems (PY5; Q2)
	Best management practices determined during trials replicated across wider area followed by restoration	Technical reports on management activities including distribution maps and other relevant information	100 and 50 ha. cleared and restored in NNP and MMFR, respectively, increasing GEF TT scores on IAS by 50% (PY5; Q2)
2.1.3. Capacity of 80 PA staff improved and applied in the identification and management of IAS	Training workshops to enhance capacity of 80 PA staff in the identification and management of IAS	Training modules produced and workshops undertaken	Increased knowledge of PA staff in IAS identification and management (PY5; Q2)
2.1.4. Biocontrol Working Group (BWG) established and operational leading to the introduction of three host specific and damaging biocontrol agents	Meetings/workshops undertaken to establish BWG	Cooperation framework (TOR) defined and working group set up	IAS Biocontrol Working Group established (PY2; Q1)
	Workshops to agree/endorse target species and biocontrol agents followed by development of Risk Assessments and permitting	Risk Assessment reports and import and release permits	Risk Assessments completed and submitted (PY2; Q3); Biocontrol agents introduced (PY3; Q2) and released (PY4; Q2)



<b>Outcome 2.2. Reduced IAS impacts in adjoining agro-ecosystems of Mount Mulanje FR and Nyika NP contributing to improved livelihoods and biodiversity conservation</b>			
2.2.1. Invaded rangelands (100 ha total) in buffer zones/agro-ecosystems of two adjoining PA's cleared and restored (native trees) through enhanced partnerships between PA staff and farmer communities, including the training of 100 farmers on IAS identification and management	Host meetings to establish partnerships between PA staff and communities in adjoining agro-ecosystems	Results of meetings indicating enhanced collaboration between PA staff and communities with regard to IAS management	Collaborative agreements established resulting in improved cooperation between PA staff and communities in the control of IAS (PY2; Q1)
	Training workshops to enhance capacity of 100 community members/farmers in the identification and management of IAS	Training modules produced and workshops undertaken	Increased knowledge of farmers in IAS identification and management (PY5; Q2)
	Best management practices developed under 2.1 replicated across wider area in rangelands in areas adjoining PA's followed by restoration using native trees	Technical reports including distribution maps and other relevant information on areas cleared	50 ha. cleared and restored in each of the rangelands adjoining NNP and MMFR resulting in a 15% increase in tree cover in the PA buffer zones(PY5; Q2)
2.2.2. Sustainable farming practices such as Farmer Managed Natural Regeneration (FMNR), Conservation Agriculture (CA), including crop rotation, crop integration and cover cropping adopted and promoted by 50 households as a result of training and demonstration trials	Training workshops and demonstration trials on the development and implementation of sustainable farming practices among community members	Training modules produced and demonstration plots on sustainable farming practices such as CA, FMNR, crop rotation, crop integration and cover cropping established	50 households adopted sustainable farming practices (PY5; Q2)
<b>Component 3: Knowledge management and broader adoption</b>			
<b>Outcome: 3.1 Lessons learnt, documented and disseminated and awareness programs established to facilitate replication and broader adoption in the Malawi PA system.</b>			
3.1.1. Communication strategy and outreach campaigns including used of media, workshops and meetings (targeting government officials, PA staff and affected communities)	Communication strategy developed based on consultations	<b>Communication strategy produced</b>	Communication strategy endorsed and implemented (PY2; Q2)
	Comprehensive national awareness/communication campaign including development and dissemination of awareness material	Relevant awareness material as determined by the Communication Strategy produced and disseminated, focussing on key stakeholders	Assessments of changes in attitude of targeted individuals/groups due to public awareness campaigns (Continuous)
3.1.2. National information sharing procedures including the development of a Guide on	Undertake surveys and produce a Guide on the Naturalized and Invasive plants	Guide on the naturalized and invasive plants of Malawi including species descriptions,	Guide used by PA staff, communities and other

identification and management of invasive plant species in Malawi	of Malawi	distribution maps and information on control	interested and affected parties to identify invasive alien plants and implement management strategies (PY5; Q2)
3.1.3. Project M&E program, evidence of IAS monitoring capacity built and implemented in PA's and their agro-ecosystems	Consultant identified and M&E Plan developed and implemented	M&E plan finalized and implemented with monitoring systems for all activities/outputs in place	M&E plan finalized and evaluation reports circulated to stakeholders (PY1; Q2); progress against results framework indicators in relation to targets (continuous)
	M&E protocols to measure changes in biodiversity after IAS interventions at pilot sites developed and implemented	Baseline levels determined and monitoring system in place	Biodiversity and indices improved from baseline (PY5; Q3)
	M&E protocols to measure changes in awareness levels developed and implemented	Baseline levels determined and monitoring system in place	Awareness levels improved from baseline (PY5; Q3)
	Undertake audits	Audit reports produced	Annual audits
	Undertake mid-term and terminal evaluations	Reports produced	Improved management of IAS (PY5; Q4)

## Appendix 7: Costed Monitoring and Evaluation Plan

Type of M&E activity	Responsible Parties	GEF Budget US\$	Co-financed Budget - US\$	Time Frame
Inception Workshop	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> <li>PMU</li> <li>UN Environment</li> </ul>	8,000 – 100% of costs under PMC	5,000	Within 2 months of project start-up
Inception Report	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> </ul>	No additional M&E costs	None	1 month after project inception meeting
Development and implementation of the Project Impact Monitoring System: IAS control pilots, capacity building and awareness & Logframe and GEF TTs	<ul style="list-style-type: none"> <li>Lead: National Project M&amp;E Consultant/Institution (9 pm: 3 months in PY1; 1,5 months/year in PY2-5)</li> <li>Co-lead: National Project Coordinator</li> <li>local implementing partners at two Pas</li> </ul>	36,000 (US\$4,000/month (includes travel, accommodation and reporting costs – 24K under Comp 3 and 12K under PMC)	None	<ul style="list-style-type: none"> <li>Design of Project Impact Monitoring System: 6 months after start project.</li> <li>M&amp;E Manual</li> <li>Impact M&amp;E reports: Midterm and end of project</li> <li>Reporting on logframe indicators: Semi-annually</li> <li>GEF Tracking Tools: Start, mid and end of project</li> <li>Progress/performance review: annually at NSC meeting</li> <li>Gender, as part of M&amp;E reports, PIR and SA progress reports</li> </ul>
Communications on M&E activities	<ul style="list-style-type: none"> <li>Lead NEA/National Project Coordinator</li> <li>Administrator</li> </ul>	1,394 – 46% of total costs under PMC		Regularly during project period
Semi-annual Progress Reports to UN Environment	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> </ul>	No additional M&E costs	No additional M&E costs	Every 6 months
Quarterly Expense reports	<ul style="list-style-type: none"> <li>PMU finance &amp; NEA</li> </ul>	No additional M&E costs	No additional M&E costs	Every 3 months
PIR	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> <li>UN Environment</li> </ul>	No additional M&E costs	No additional M&E costs	Annually, part of reporting routine
Project Steering Committee meetings	<ul style="list-style-type: none"> <li>Lead: NEA/National Project Coordinator</li> <li>Secretariat to NSC – by PMU</li> <li>NPSC</li> </ul>	20,592 – 100% of costs under PMC	20,000	Once a year minimum
Mid-Term Evaluation – supported by Comp 3 M&E data	<ul style="list-style-type: none"> <li>National Project Coordinator</li> <li>Lead: National Project M&amp;E Consultant</li> </ul>	25,000 – 100% of costs under Comp 3	-	At mid-point of project implementation; PY2.5

Type of M&E activity	Responsible Parties	GEF Budget US\$	Co-financed Budget - US\$	Time Frame
	<ul style="list-style-type: none"> <li>• UN Environment</li> <li>• NSC</li> <li>• MTR consultant(s)</li> </ul>			
Terminal Evaluation	<ul style="list-style-type: none"> <li>• UN Environment</li> <li>• External TE consultant</li> </ul>	35,000 – 100% of costs under PMC	-	During last 2 months of project implementation
5 annual Financial Audits	<ul style="list-style-type: none"> <li>• NEA/PMU finance staff</li> <li>• UN Environment</li> </ul>	12,000 – 100% of costs under PMC	-	Annually
Project Terminal Report	<ul style="list-style-type: none"> <li>• NEA/National Project Coordinator</li> </ul>	No additional M&E costs	No additional M&E costs	During last 2 months of project implementation
Capturing lessons and best practice	<ul style="list-style-type: none"> <li>• National Project Coordinator</li> </ul>	No additional M&E costs	No additional M&E costs	Part of Semi-annual reports, PIR & Project Final Report
Monitoring visits to field sites	<ul style="list-style-type: none"> <li>• M&amp;E Specialist</li> <li>• NEA/National Project Coordinator</li> <li>• Project Technical Advisor</li> </ul>	10,000 – 100% of costs under component 2 (local travel)	10,000	
<b>Indicative budget for M&amp;E Plan</b>	<ul style="list-style-type: none"> <li>• <b>Master Total</b></li> </ul>	<b>US\$147,986</b> (of which US\$88,986 under PMC and US\$59,000 from other component budgets)		

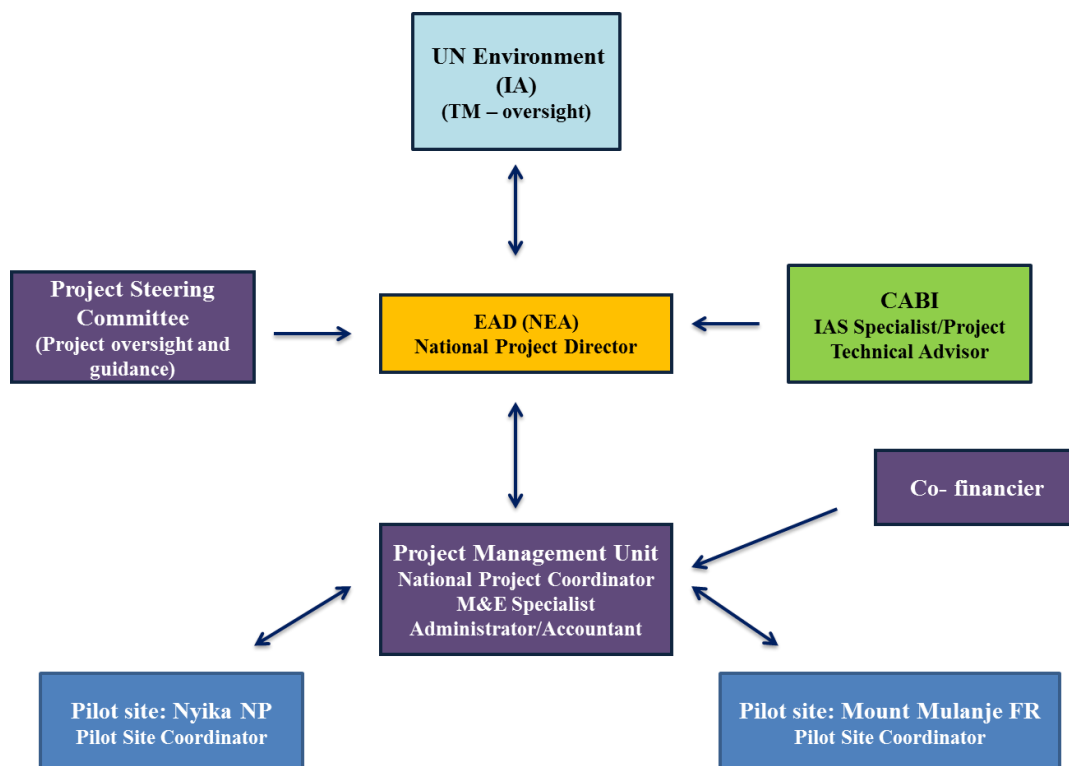
## Appendix 8: Summary of Reporting Requirements and Responsibilities

Reporting requirements	Due date	Format appended to legal instrument as	Responsible Party
Procurement plan (goods and services)	2 weeks before project inception meeting	N/A	NPC, NEA
Inception Report	1 month after project inception meeting	N/A	NPC
Expenditure report with appropriate notes	Quarterly on or before 30 April, 31 July, 31 October, 31 January	in Anubis system	NPC
Cash Advance request and details of anticipated disbursements (to be submitted in Anubis along with the expenditure reports)	Quarterly or when required	in Anubis system	NPC
SA Progress Report	Half-yearly on or before 31 January, 31 July	Annex 8 (to be uploaded in Anubis)	NPC
Audited report for expenditures for year ending 31 December	Yearly on or before 30 June	N/A	NEA, FMO
Inventory of non-expendable equipment	Yearly on or before 31 January	in Anubis system	NPC
Co-financing report (to be reported quarterly along with the GEF expenditure in the quarterly expenditure reports)	Yearly on or before 31 July	in Anubis system	NPC
Project implementation review (PIR) report	Yearly on or before 15 July	Annex 9	NPC, TM
Minutes of steering committee meetings	Twice Yearly	N/A	NPC, NEA
Final Report	2 months after project closure / technical completion	Annex 10	NPC, NEA
Final inventory of non-expendable equipment	2 months after project closure/ technical completion	in Anubis system	NPC
Equipment transfer letter	2 months after project closure/ technical completion	Annex 10	NPC, NEA, FMO
Final expenditure statement	3 months from project completion date	Annex 11	NPC, FMO
Mid-term evaluation	Midway through project	N/A	TM or EO

Final audited report for expenditures of project	6 months from project completion date	N/A	NEA
Independent Terminal evaluation report	At the end of project or 6 months from project completion date	Available with UN Environment	EO

## Appendix 9: Decision-Making Flowchart and Organogram

This project will be operated under the supervision of UN Environment as Implementing Agency (IA), and EAD in the Ministry of Natural Resources, Energy and Mines as the Executing Agency (EA) with guidance and inputs from the Project Steering Committee (PSC), as depicted in the project's governance structure below.



## **Appendix 10: Terms of Reference of key project staff and management units**

### **Project Steering Committee (PSC)**

This will be chaired by the National Project Director (NPD) (Director of EAD), and include the National Project Coordinator (NPC), representatives from various government agencies (DNPW, Forestry Department, etc.), the UN Environment Task Manager, and representatives of key organizations with expertise in IAS that have a strategic, funding or practical interest in the project such as individuals from CABI, MMCT, NVT, LWT and others.

The PSC will provide political and strategic guidance to the project, especially in regard to national political and administrative issues and will take decisions on issues related to legislation, regulations and guidelines on IAS management, especially in PA and neighbouring agro-ecosystems. The PSC will meet at least once a year in person and have the following responsibilities:

- overseeing project implementation and performance based on reports provided by the NEA/PMU;
- approving annual project work plans and budgets for submission to UN Environment;
- approving any major changes in project implementation arrangements for submission to UN Environment for endorsement;
- providing technical input and advice;
- reviewing the quality of major project deliverables;
- ensuring commitment of co-funding resources to support project implementation;
- coordinating conflicts within the project and/or negotiating solutions between the project and any parties beyond the scope of the project;
- ensuring coordination amongst member agencies, and
- reviewing findings and recommendations

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### **The Project Management Unit (PMU)**

Responsible for the day-to-day planning, management and implementation of the project. The PMU to be housed at EAD and supervised by the National Project Director (NPD) will assist EAD with project coordination and management, including financial aspects, procurement and contract management, management of equipment and supplies, and monitoring and reporting on the project operations, and the coordination of project work plans.

EAD will appoint or select a full- time national project coordinator (NPC) who will be responsible for the day to day running of the project including leading the PMU, on behalf of his supervisor, the NPD. This specifically involves the selection and contracting of consultants and service providers required under the various project Components, a.o related to policy, outreach and communications, national IAS information and C/B analysis, prevention and management and capacity building.

The NPC will be supported by an accountant and administrator, both part-time positions. The NPC will also appoint two part-time technical assistants to oversee project activities, one in



NNP and the other in MMFR, drawn from staff of DNPW in the case of NNP and MMCT and the Forestry Department in Mulanje, respectively.

EAD, through a dully appointed specialized institution or consultant is also responsible for the design, implementation and reporting on monitoring of project progress as well as project impact against the set Indicators and Targets, as per the draft Monitoring and Evaluation Plan described in Section 6 and detailed in Appendix 7.

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### **National Project Director (NPD)**

1. *Title of Position:* National Project Director (co-financed)
2. *Position Location:* Malawi
3. *Reports to:* NEA and Project Steering Committee (PSC)
4. *Date of TOR:* 01 January 2018 - 31 December 2022
5. *Supervises:* The project; Project Coordinator, and the Project Management Unit (PMU)

#### *6. Major Functions:*

- Be accountable to the NEA for the delivery of agreed national project outputs
- Supervise the work of the Project Management Unit (PMU), signing off on all formal project reports, budgets, expense reports and audits; and forging/facilitating national partnerships
- Chairing the Project Steering Committee

#### *7. Context and Tasks*

- Recruit and supervise staff of the Project Management Unit (PMU)
- Ensure the smooth running of the Project Management Unit (PMU)
- Ensure that financial and technical outputs are effectively delivered
- Liaise with counterparts in other sectors to ensure that cross-sectoral linkages are developed and maintained
- Maintain regular contact with UN Environment and international partners such as CABI
- Chair the Project Steering Committee

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### **National Project Coordinator (NPC)**

1. *Position Location:* Environmental Affairs Department, MNREM, Lilongwe, Malawi
2. *Reports to:* Project Director, NEA
3. *Date of TOR:* 01 January 2018 – 31 December 2022
4. *Supervises:* PMU; Project Accountant/Administrator
5. *Major Functions:*

The NPC acts as Project Manager and heads the Project Management Unit (PMU) at EAD.

- The NPC's task is to provide leadership and coordination in the implementation of the three national components of the project.
- He/she will have overall responsibility for the direction of the project, detailed work planning, financial management and the timely delivery and quality of outputs including reports
- Keeping UN Environment informed, to ensure project management meeting GEF and UN Environment standards.

6. *The Project Manager will assume the following responsibilities (duties):*

- Ensure that essential steps in the implementation of the MSP are undertaken in a technically sound, timely and transparent fashion.
- Operational management of the project according to the project document.
- Organising and managing project activities according to the work plan in order to produce the outputs in a timely manner; updating and regular reviewing of the project work plan
- Reporting to UN Environment on a regular (quarterly) basis: submission of the semi-annual progress reports to the UN Environment - GEF Task Manager, draft Final Project Report and any other required reports
- Reviewing biannual progress and quarterly financial reports and provide input to the annual PIR reports (with UN Environment)
- Ensuring that reports prepared by project personnel, consultants and sub-contractors are prepared as required.
- Managing the M&E system, including the risk mitigation plan; Participating in M&E missions
- Drafting the terms of reference for all consultants/Task Teams and establishing the contracts
- Revising budgets and allocations to ensure MSP output delivery within budget
- Attracting further co-financing from international, regional and national sources to finance project components of the MSP as these evolve.
- Providing policy guidance to the project
- Oversee public relations of the project
- To act a secretary to the PSC:
- Inform PSC members at regular basis, prepare meeting agenda's and minutes;
- Report to UN Environment and the PSC any irregularities in project execution, misuse of funds or procedures, or problems in project execution at a timely basis;
- Coordinating and participating in meetings (virtual and/or personal) of the PSC where MSP management, activities, and expected outputs are be discussed
- Working in close collaboration with all members of the PMU, including:
- Reviewing terms of reference and selection of sub-contractors, consultants and conduct procedures for initiating sub-contracts
- Convene, co-organize chair and/or facilitate meetings
- Sourcing relevant expertise from regional / international subject matter specialists and manage their inputs and deliverables according to the work plan and UN Environment guidelines, in order to produce deliverables in a timely manner and within budget
- Coordinating provision of committed in-kind and in-cash co-finance contributions for the project.
- Compiling the national report and circulate to stakeholders
- Participate in the preparation of publications that may result from the project
- Participate in external scientific meetings (conferences, seminars, workshops, and electronic networks) as required

7. *Deliverables:*

The Project Manager will be responsible for delivering the following outputs:

- National project staff recruited (year 1)
- PSC and PMU established
- Ensure efficient functioning of the PMU
- Project activities implemented efficiently and on schedule
- One PSC meeting convened each year, agenda agreed and minutes prepared

- Annual work plan and budget approved by PSC and UN Environment/GEF
- All financial and technical reports, according to specifications in the project document, submitted on schedule and approved
- Timely transfers of GEF funds
- Terms of reference produced for consultants and technical experts
- Inaugural, mid-term and project completion workshops convened – as applicable
- M&E Plan finalized and agreed with UN Environment, and implemented
- Project outcomes and deliverables met
- Effective public relations

#### 8. *Contract duration and nature*

The contract covers a duration of one (1) year, renewable up to the end of the project which covers a period of four (5) years, with a probation period of 6 months, subject to good performance. GEF funds will support the NPC for 50 pm.

#### 9. *Qualifications, Experience and Qualities Required*

- Postgraduate degree, preferably Ph.D., in a technical field related to agriculture and/or the environmental sciences or a related field
- 10 years professional experience with at least 3 years spent in international multi- or bilateral cooperation
- Understanding of IAS and their impacts, including field management options, as well as national frameworks needed to contain the spread of IAS in countries.
- Project management experience, including technical and financial reporting, of internationally-funded projects
- Proven successful project implementation in Malawi in the fields of agriculture, environment, biodiversity conservation or related fields
- Excellent communications skills and ability to work as part of, as well as lead, a multi-disciplinary and multi-cultural team.
- Excellent command of spoken and written English
- Ability to work with senior government officials, research institutes, NGOs, and local communities, etc.
- Excellent organizational and time management skills
- Excellent computer skills
- Experience in participatory approach
- Self-motivated personality
- Willingness to travel frequently, sometimes under difficult conditions

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#### **Project Technical Advisor (PTA) on IAS Management (CABI) – part-time**

1. *Position Location:* CAB International, Nairobi, Kenya
2. *Reports to:* National Project Coordinator, NEA
3. *Date of TOR:* 01 January 2018 – 31 December 2022
4. *Supports and reports to:* NPC, reporting at a quarterly basis
5. *Major Functions:*

- Administrative support to the NPC (EAD) especially with regard to the sourcing of consultants/sub-contractors and compilation of TOR
- Technical support/backstopping to the NPC (EAD) with regard to the review of all consultancy reports.

*6. The PTA will assume the following responsibilities (duties), in collaboration with the NPC:*

- Assist in the sourcing of relevant expertise from national/regional/international subject matter specialists
- Drafting the TOR for all consultants/Task Teams and establishing the contracts
- Guide consultants and Sub-contractors during their contracts, ensuring that all submitted draft, final draft and final reports/deliverables prepared by consultants/Sub-contractors are of an acceptable scientific standard and adhere to the TOR – the PTA will review all technical reports prior to submission to UN Environment
- Contribute to the preparation of publications that may result from the project
- Develop, provide inputs and supervise all IAS field management activities undertaken during the project – and report to the NPC on a quarterly basis. This involves development and implementation of IAS management trials in PA's and surrounding communities in partnership with other agencies
- Provide policy guidance to the project
- Contribute to attracting further co-financing from national, regional and international sources to finance project components of the MSP as these evolve.
- Contribute to public relations of the project if requested to do so
- Participate in external scientific meetings (conferences, seminars, workshops, and electronic networks) as required
- Attend PSC meetings
- Communicate at a minimum, bi-weekly with the NPC, and reports to him/her at a quarterly basis

*6. Deliverables:*

- TOR for consultants/sub-contractors, including summary of performance based milestones, deliverable, and suggested formats of reporting for inclusion in personal or institutional contracts
- Reviewed technical reports that are of an acceptable scientific standard and adhere to the TOR as outlined in the consultant/Task Team contracts
- Publications

*7. Contract duration and nature*

The contract for this part-time input covers a period of at least 2 person months per year up to the end of the project period of five years.

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**Project Impact Monitoring Specialist/Institution (M&E)**

1. *Position Location:* PMU, Lilongwe
2. *Reports to:* National Project Coordinator, NEA
3. *Date of TOR:* 01 January 2018 – 31 December 2022
4. *Supervises:* M&E staff in the two PAs; as well as Project staff/PTA/Consultants/Sub-contractors related to monitoring and reporting on Communications/Outreach/Gender/Capacity building, and IAS control and restoration pilots.
5. *Major Tasks:*
  - In consultation with the NPC and PTA design of project M&E Impact Performance System
  - Organising and budgeting for field data collection

- Organising and writing of consolidated M&E Impact Performance reports for Midterm and End of project
  - Preparation of M&E Impact Performance System manual, for enabling continuation and replication of the work beyond the project period and beyond the two targeted PA's
6. *The M&E/Impact specialist will assume the following responsibilities (duties):*
- Liaise with consultants/staff/sub-contractors in the two PA's with regard to the development and implementation of a monitoring system to measure changes in biodiversity from baseline levels
  - Interact with the communications consultant to develop and implement a monitoring system to record changes in awareness levels, capacity development, and meeting gender targets
  - Interact with community members/consultants/sub-contractors in determining benefits of implementing sustainable farming practices – improved IAS management and increased yields
7. *Deliverables:*
- M&E plan
  - Reports on changes in biodiversity levels at pilot sites; changes in awareness levels among target groups; and changes in capacity among trainees
  - Reports on meeting pre-determined targets with regard to gender and related issues

8. *Contract duration and nature:*

The contract will be for a period of 6 months (6pm) only (2pm PY1, 1pm annually for PY2-5)

**Pilot Site Coordinator – part-time**

1. *Position Location:* PMU, Lilongwe
2. *Reports to:* National Project Coordinator, NEA
3. *Date of TOR:* 01 January 2018 – 31 December 2022
4. *Supervises:* Control teams on the ground
5. *Major Tasks:*
  - Implement and supervise IAS management interventions at pilot sites
6. *The Pilot Site Coordinator will assume the following responsibilities (duties):*
  - Ensure that all management interventions are undertaken timeously following protocols as developed by the Project Technical Assistant
  - Ensure that all staff involved in management interventions are provided with the correct equipment, including protective gear
  - Ensure that non-target impacts are avoided or reduced, especially when herbicides are used
  - Ensure the safe storage of all chemicals
  - Keep daily records (monitor) of areas cleared
7. *Deliverables:*
  - Records of areas cleared
8. *Contract duration and nature:*

54 pm starting in PY1, Q3 and ending PY5, Q3

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**Project Administrator – part-time**

6. *Position Location:* PMU, Lilongwe
7. *Reports to:* National Project Coordinator, NEA
8. *Date of TOR:* 01 January 2018 – 31 December 2022
9. *Supervises:* NA
10. *Major Tasks:*
- Maintain project documentation
  - Support development and management of project contracts
  - Following instructions from the NPC make logistic and administrative arrangements for seminars, workshops, and meetings, including NPSC meetings
  - Collate information on project performance
  - Management (physical verification, distribution and electronic inventory) of all assets, and consumables
  - Office supplies management.
6. *Contract duration and nature:*
- 30 pm (6 months/year)

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**Project Accounts Manager – part-time**

1. *Position Location:* PMU, Lilongwe
2. *Reports to:* National Project Coordinator, NEA
3. *Date of TOR:* 01 January 2018 – 31 December 2022
4. *Supervises:* NA
5. *Major Tasks:*
- Maintain financial records and monitoring systems to record and reconcile expenditures, balances, payments, statements and other data
  - Prepare recurring reports as scheduled and special reports as required for budget preparation, audits and other reasons
  - Maintain an inventory of capital equipment and prepare the annual inventory report
  - Prepare budget revisions to reflect previous and planned expenditure
  - Advise and assist project staff on their allowances, salaries, travel claims and other financial matters
  - Give basic instruction in accounting procedures to consultants and recipients of small grants
  - Facilitate annual audit.
6. *Contract duration and nature:*
- 15 pm (3 months/year)

## **Appendix 11: Co-financing commitment letters from project partners (see separate file)**

## Appendix 12: Endorsement letter of GEF National Focal Point

Telephone: +265 1 771111  
Tele fax No: +265 1 773379

Our Reference No:  
EAD/99/08/01B Your  
Reference No: .....



ENVIRONMENTAL AFFAIRS DEPARTMENT  
LINGADZI HOUSE  
CITY CENTRE  
PRIVATE BAG 394  
LILONGWE 3  
MALAWI

8 January 2016

To: Ms Brennan van Dyke,  
UNEP,  
P.O. Box 30552, Nairobi, Kenya.

Subject: Endorsement for "Enhancing sustainability of Protected Area systems and stabilizing agro-production in adjoining areas through improved IAS management"

In my capacity as GEF Operational Focal Point for Malawi, I confirm that the above project proposal (a) is in accordance with my government's national priorities including the National Biodiversity Strategy and Action Plan, National Adaptation Plan and National Capacity Self-Assessment and our commitment to the relevant global environmental conventions; and (b) was discussed with relevant stakeholders, including the global environmental convention focal points.

I am pleased to endorse the preparation of the above project proposal with the support of the GEF Agency listed below. If approved, the proposal will be prepared and implemented by UNEP in conjunction with CABl and relevant national parties/institutions. I request the GEF Agency to provide a copy of the project document before it is submitted to the GEF Secretariat for CEO endorsement.

The total financing (from GEFTE, LDCF, or SCCF) being requested for this project is US\$1,700,000, inclusive of project preparation grant (PPG), if any, and agency fees for project cycle management services associated with the total GEF grant. The financing requested for Malawi is detailed in the table below.

Source of Funds	GEF Agency	Focal Area	Amount (in US\$)			
			Project Preparation	Project	Fee	Total
GEFTF	UNEP	Biodiversity	54,750	1,502,511	142,739	1,700,000
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
<b>Total GEF Resources</b>			54,750	1,502,511	142,739	1,700,000

I consent to the utilization of Malawi's allocation in GEF-6 as defined in the System for Transparent Allocation of Resources (STAR).]

Sincerely,

Shamiso Najira  
Chief Environmental Officer  
GEF Operational Focal Point

GEF Operational Focal Point Endorsement Template April 2015



## Appendix 13: Draft Procurement Plan

### 1. General Terms

Funds from GEF will be disbursed through contracts or letters of agreement between the executing agency and individual consultants, in accordance with rules and procurement procedures for corresponding project deliveries outlined under the three Components (see **Appendix 4 – Results Framework**). A general outline of international and national technical assistance consultants to attain proposed project deliveries are presented below. More specific terms of reference for international and national consultants will be developed during the project inception period. The description below also includes an outline of equipment needed to attain the proposed project deliveries, with specifications to be drawn during the project inception period.

### 2. Procurement Capacity Assessment

The Environmental Affairs Department (EAD) in the Ministry of Natural Resources, Energy and Mines will be the National Executing Agency has an annual budget of US\$300,000 to 400,000, dependent on GoM priorities. It has been the core agency or a partner in the implementation of a large number of donor-funded projects worth millions of dollars on, among others, conservation, natural resource utilization, and climate change mitigation and adaptation. Procurement within EAD is governed by the GoM Procurement Act which provides strict guidelines with regard to procuring goods and services.

CABI will support the NEA in the procurement of goods and services. CABI has considerable experience in this area, having successfully implemented over 600 projects. Under the invasive species theme CABI has been the executing agency on three regional GEF IAS projects in Africa, Asia and the Caribbean. As such CABI has extensive experience in UN and GEF approved procurements processes. CABI is also guided by its own “Procurement Policy and Procedure.” CABI’s purchasing philosophy is to obtain goods and services which provide maximum total value for money. Whilst purchase price is a major element of this, other significant factors which are taken into consideration are: whole of life cost; quality, both of product and service; delivery; method of payment, e.g. lease/purchase options; technical specification/performance; continuity of supply; cost reduction opportunities; safety; and environmental considerations

The Project Steering Committee (PSC) and Project Management Unit (PMU) will also provide guidance and inputs with regard to the procurement process. The PSC which will be chaired by the National Project Director (NPD) (Director of EAD), and include the Project Coordinator (NPC), representatives from various government agencies (DNPW, Forestry Department, etc.), the UN Environment Task Manager, and representatives of key organizations with expertise in IAS that have a strategic, funding or practical interest in the project such as individuals from CABI, MMCT, NVT, LWT and others will provide guidance with regard to procurement. The PMU will be responsible for the day-to-day planning, management and implementation of the project. EAD will house the PMU in Lilongwe and will assist EAD with project coordination and management, including financial management, procurement and contract management, management of equipment and supplies, monitoring and reporting on the project operations, and the coordination of project work plans.

### 3. Principles for procurement

As the NEA implements its approved work plan activities, it will procure goods and services. These procurement actions will conform to generally accepted good business practices. Each NEA will follow its home ministry and national government accounting standards, procurement procedures, and of course, comply with all applicable local laws and regulations. Import tax exemptions will be sought from countries where equipment is required for the pilot

projects. Given the significant number of consultants and experts envisaged during implementation, particular importance will be placed on the development of Terms of Reference (TOR), a process in which CABI will provide significant support, that are complete and clearly specify services to be performed and deliverables to be produced, and their contribution to the achievement of outputs.

#### 4. Procurement steps

All NEA procurement actions, regardless of value, shall follow these five steps:

**Specifications:** This is the process of determining what the project needs (not wants) to procure. In most cases, specifications are based on minimum required performance characteristics, not factors such as style, color, design, etc.

**Competition:** Procurement is predicated on the belief that open and unrestricted competition – to the maximum extent practical – over the life of the project will result in accumulated best value. However, competition has real cost in terms of documentation preparation, staff time, etc. The determinant of what constitutes practical competition is that estimated competition costs should not outweigh anticipated best value gain.

**Selection:** NEAs should do business with reputable vendors, i.e., known, established vendors who offer products and services that fully meet stated specifications. When competition is involved, and there are three or more offers, NEAs should select the vendor who offers best value. When cost is the primary consideration, selection is straightforward: the NEA awards to the lowest offered price. When other factors are involved, such as warranties, delivery time, installation, etc., then price is just one of the evaluation factors. The proven test one can apply when selecting for best value is: “if it was your personal money being used, which vendor would you select for best value?”

**Negotiation, Acceptance and Documentation:** Procurement actions are brought to closure by means of negotiation and/or acceptance with the selected vendor. In some cases, this can be accomplished by issuing a purchase order and having the vendor sign acceptance, or accepting a product “over the counter” and paying against an invoice. For more complex procurements, there may be need to reach agreement on such items as payment, deliverables and delivery terms, i.e. these need to be negotiated and specified in a subcontract. In all cases, a procurement action is closed by mutual acceptance, whether it be a purchase order, letter of agreement, subcontract, or payment of vendor invoice. All transactions, without exception, require supporting documentation such as a receipt. In small value situations when a vendor receipt is not available, this can be a pre-printed form or memo note that the NEA staff member fills out, signs and submits. For large value procurement, this could consist of an entire package of documents including the specifications, the request for quotation or invitation for bids, an award memo describing the rationale for selection, the purchase contract or order, and a commercial grade receipt on the vendor’s pre-printed letterhead.

**Thresholds:** The work input for the NEA varies with the size and importance of the procurement action. This is best explained by the following threshold table:

Threshold Value	Procedures, Documentation & Responsibilities
<b><u>Small value</u></b> <b>US\$0 to</b> <b>US\$100</b>	<p>Specifications – NEA employee’s professional assessment; if required, consultation with technical staff; may or may not be written.</p> <p>Competition – Based on convenience, expediency and proven relations with responsible vendors.</p> <p>Selection – Employee’s discretion regarding best value.</p>

	Negotiation, Acceptance & Documentation – Vendor receipt or employee’s personal memo note.
<b><u>Mid-range</u></b> <b>US\$101 to</b> <b>US\$1,499</b>	<p>Specifications – Employee’s professional assessment; consultation with technical staff and/or management required; must be written.</p> <p>Competition – Three quote from vendors; by telephone, email, fax, Internet or over-counter. Written quotes preferred for value in excess of \$500.</p> <p>Selection – Employee in consultation with technical staff and/or management for determining best value.</p> <p>Negotiation, Acceptance &amp; Documentation – Written specifications; award memo; vendor receipt.</p>
<b><u>High-range</u></b> <b>&gt;US\$1,500</b>	<p>Specifications – Written and jointly reviewed and approved by technical and management staff.</p> <p>Competition – Written specifications are delivered to three or more reputable vendors, if available.</p> <p>Selection – Employee in consultation with technical staff and management for determining best value.</p> <p>Negotiation, Acceptance &amp; Documentation – Written specifications; vendor’s offers; award memo; purchase order or contract; vendor receipt.</p>

## 5. Exceptions to Competition (Waiver of Competitive Bidding)

Competition is the foundation of UN Environment procurement. Strict review and approval processes therefore, have been established to ensure that the waiver process is not abused. All requests seeking waiver of competitive bidding (i.e. for contracts exceeding US\$15,000) must be submitted to the UN Environment Task Manager for final approval, following review by the PSC of the Project. The final list of equipment will be presented, discussed and approved by UN Environment during the project Inception meeting or first PSC meeting.

Submissions to UNEP Representative for waivers shall be reviewed against the following list of permissible reasons and the justification for its use.

Permissible Reasons	Justifications/Practical Considerations
Established prices/rates.	Indicate name of regulatory body or law that controls rates or establishes prices. Attach a current printed rate schedule, if available.
Proprietary product or service.	Explain why other sources do not have the capacity to perform adequately.
Standardization	Provide plain, simple, direct information based upon facts so that a person without technical expertise can follow the rationale.
Cooperation with other UN organizations.	To piggy-back the agreement entered into by another UN organization. Please provide the copy of their agreement.

Competitive bidding conducted for the same item during the last year.	Provide detailed information on prices and delivery. There should be no increase in prices.
Competitive bidding conducted during the last year has not produced satisfactory results.	Provide detailed summary of the previous competitive bidding process and its outcome.
Procure or lease property.	Provide the prevalent market rates in that area.
Urgency	Include the following in your justification: (1) A description of the urgency (the urgency cannot be the result of slow administrative processing or a general lack of planning).; (2) An explanation of how the non- competitive purchase will meet the schedule; (3) A discussion of the adverse impact that the UNEP would suffer if the delivery schedule were modified to permit competition.
Professional services that cannot be objectively evaluated.	This relates to Research and Development Services.
Formal solicitation will not give satisfactory results.	Please provide the detailed cost estimates.

### Appendix 13A - Procurement Plan for Goods and Equipment Using GEF Resources

Goods and equipment purchased using GEF resources. Descriptions below are general and detailed specifications, procurement methods, annual procurement plans and so on will be developed during the inception phase in accordance with this **Procurement Plan** and implementation scheduled as defined in **Appendix 5 - the Workplan**.

Goods & equipment	Units	Per/ Unit US\$	Total cost US\$	Purpose of Purchase
Chainsaws	4	920	3680	To be used during control operations at pilot sites
Back-pack sprayers	4	170	680	To be used during chemical control operations at pilot sites – basal-bark treatments and foliar sprays
Handsaws, machetes, picks, hoes, spades, etc.	20	9	180	Manual removal of IAS
Herbicides	20 litres		2,500	Chemicals to be used for control operations
<b>Total goods &amp; equipment</b>			<b>7,040</b>	

**Appendix 13B. Management Staff to be Hired Using GEF Resources**

The project will hire four full or part-time staff: National Project Coordinator, Administrator, Project Accounts Officer and Pilot Site Coordinator for Nyika NP to support the National Project Director in delivery of the project objectives. Specific tasks and budgets are as follows:

<b>Technical Assistance</b>	<b>US\$/month</b>	<b>Person months</b>	<b>Total cost (US\$)</b>	<b>Tasks to be Performed</b>
National Project Coordinator	3165*	50	174,896	See TOR (Appendix 10) for tasks to be performed
Pilot Site Coordinator (NNP)	783*	54	46,698	See TOR (Appendix 10) for tasks to be performed
Administrator	595*	30	19,716	See TOR (Appendix 10) for tasks to be performed
Project Accounts Officer	783*	15	12,978	See TOR (Appendix 10) for tasks to be performed
<b>Total cost Management Staff</b>			<b>254,288**</b>	

\*Please note that we have allocated a 5% annual increase in salaries

\*\* This cost is shared across Components – only US\$46,606 is allocated to PMC

### 3.15. Appendix 13C: Technical Consultants to be Hired Using GEF Resources

Technical consultants will be funded through GEF resources. Descriptions below are general and detailed TOR for individual technical consultants will be developed during the inception phase (the costs below include preparation costs but exclude travel and accommodation costs which are included under international travel and workshop costs).

Position Titles	US\$/month	Estimated person months	Grant Amount (US\$)	Co-Financing (US\$)	Tasks to be Performed
<b>A. International Consultants</b>					
Project Technical Advisor (CABI)	10,000	10	100,000	0	See TOR (Appendix 10)
Trainer – Pathway RA, PRA and EDRR	10,000	1	10,000	0	Provide training on pathway Risk Analysis, Pest Risk Analysis, and Early Detection and Rapid Response
Trainer - CBA	20,000	2	20,000	0	Provide training on the costs and benefits of ‘conflict’ invasive alien plant species such as <i>Acacia mearnsii</i> and <i>Prosopis juliflora</i>
Trainer – Identification and management of IAS	10,000	1	10,000	0	Provide training on the identification and management, including biological control of invasive alien plans
Development of national IAS inventory	10,000	1	10,000	0	Responsible for the development of an inventory of invasive alien plants in National Parks and Wildlife Reserves
Development and implementation of IAS management	10,000	5	50,000	0	Development of best management practices for four target species. Invasive alien plant control interventions in protected areas and adjoining agro-ecosystems
Development of IAS Field Guide	10,000	2	20,000	0	Undertake surveys and develop Field Guide which should include detailed descriptions, distribution maps, information on impacts and best management practices
<b>Sub-total</b>			<b>220,000</b>	<b>0</b>	

<b>B. National Consultants</b>					
M&E Specialist	6,000	6	36,000	0	See TOR (Appendix 10)
<b>Sub-total</b>			<b>36,000</b>	0	
<b>TOTAL</b>			<b>256,000</b>	0	

**Appendix 13D: Sub-contracts (MOUs/LOAs for Cooperating Agencies)**

Sub-contracts (MOUs/LOAs for Cooperating Agencies) will mainly entered into with national agencies that will be cooperating/collaborating with the international consultants. It should be noted that a lead agency will be sub-contracted to undertake the activity (e.g. produce the report) but many agencies will be involved in contributing data/information. As such the co-funding includes allocations for multiple agencies involved in each activity. Many of the details of these sub-contracts will be determined during the inception phase.

<b>Component</b>	<b>GEF (US\$)</b>	<b>Co-financing (US\$)</b>	<b>Project Total (US\$)</b>
<b>Component 1</b>			
Develop NISSAP	41,000	145,000	186,000
Identify and manage high risk pathways	30,000	225,000	255,000
Develop and implement PRA procedures	33,000	187,648	220,648
Establish EDRR procedures	30,000	199,000	229,000
Undertake CBA analyses	20,000	45,000	65,000
Conduct IAS inventory	20,000	170,000	190,000
<b>Sub-total</b>	<b>174,000</b>	<b>971,648</b>	<b>1,145,648</b>
<b>Component 2</b>			
Develop PA & IAS management plans	20,000	65,000	85,000
Develop best management practices	41,000	863,500	904,500
IAS management and restoration	185,000	746,695	931,695
Development and implementation of sustainable farming practices	150,000	665,000	815,000
<b>Sub-total</b>	<b>396,000</b>	<b>2,340,195</b>	<b>2,736,195</b>
<b>Component 3</b>			
Communication and outreach	91,000	516,000	606,000



campaigns			
Surveys/literature reviews by local institutions to support development of Field Guide	10,000	75,000	85,000
<b>Sub-total</b>	<b>101,000</b>	<b>591,000</b>	<b>691,000</b>
<b>TOTAL</b>	<b>671,000</b>	<b>3,902,843</b>	<b>4,573,843</b>

## Appendix 14: UNEP Environmental, Social and Economic Review Note (ESERN)

### I. Project Overview

<b>Identification</b>	<i>Malawi ISPA project, GEF ID # 9539</i>
<b>Project Title</b>	<i>Enhancing sustainability of Protected Area systems in Malawi, and stabilizing agro-production in adjoining areas through improved IAS management</i>
<b>Managing Division</b>	<i>Ecosystems Division</i>
<b>Type/Location</b>	<i>Malawi</i>
<b>Region</b>	<i>Africa</i>
<b>List Countries</b>	<i>Malawi</i>
<b>Project Description</b>	<i>To prevent new invasions and reduce the current impacts of IAS in protected areas and adjoining agro-ecosystems in Malawi. The project will seek to (1) establish national framework and capacity to enhance IAS prevention and management in protected areas and associated agro-ecosystems (2) strengthen on-the-ground IAS management in existing protected areas through invasive species control and habitat restoration, as well as in adjoining agro-ecosystems through sustainable farming for improved welfare, and to (3) improve knowledge management and broader adoption of developed strategies in Malawi protected areas.</i>
<b>Estimated duration of project:</b>	<i>2018-2022</i>
<b>Estimated cost of the project :</b>	<i>GEF Grant: 1,502,511 Co-finance: 5,164,147</i>

## II. Environmental Social and Economic Screening Determination

### A. Summary of the Safeguard Risks Triggered

Safeguard Standard Triggered by the Project	Impact of Risk <sup>1</sup> (1-5)	Probability of Risk (1-5)	Significance of Risk (L, M, H)
SS 1: Biodiversity, natural habitat and Sustainable Management of Living Resources	2	2	L
SS 2: Resource Efficiency, Pollution Prevention and Management of Chemicals and Wastes	1	1	L
SS 3: Safety of Dams	1	1	L
SS 4: Involuntary resettlement	1	1	L
SS 5: Indigenous peoples	1	1	L
SS 6: Labor and working conditions	1	1	L
SS 7: Cultural Heritage	1	1	L
SS 8: Gender equity	1	1	L
SS 9: Economic Sustainability	3	2	M
Additional Safeguard questions for projects seeking GCF-funding (Section IV)			

### B. ESE Screening Decision<sup>2</sup> (Refer to the UNEP ESES Framework (Chapter 2) and the UNEP's ESES Guidelines.)

Low risk ☒ Moderate risk ☐ High risk ☐ Additional information required ☐

### C. Development of ESE Review Note and Screening Decision:

Prepared by: Name: Arne Witt Date: 30 September 2017

Safeguard Advisor: Name: Yunae Yi Date: 21 November 2018

<sup>1</sup> Refer to UNEP Environment, Social and Economic Sustainability (ESES): Implementation Guidance Note to assign values to the Impact of Risk and the Probability of Risk to determine the overall significance of Risk (Low, Moderate or High).

<sup>2</sup> **Low risk:** Negative impacts negligible: no further study or impact management required.

**Moderate risk:** Potential negative impacts, but less significant; few if any impacts irreversible; impact amenable to management using standard mitigation measures; limited environmental or social analysis may be required to develop a ESEMP. Straightforward application of good practice may be sufficient without additional study.

**High risk:** Potential for significant negative impacts, possibly irreversible, ESEA including a full impact assessment may be required, followed by an effective safeguard management plan.

Project Manager:	Name: Mphatso Kalembe	Date: 30 September 2017
<p><b>D. Recommended further action from the Safeguard Advisor:</b></p> <p>The project team identified economic sustainability a moderate risk. This makes the overall risk of the project in the moderate risk category. It also deals with sensitive biodiversity dynamics. Precautionary, science-based approach using the latest understanding and local traditional knowledge would avoid/minimize the potential risks.</p> <p>SS1: The project mentioned that there is potential risk associated with environmental damage from IAS management. The project works in the PA buffer zones while the overall capacity of identifying and handling of IAS is limited in the country. Therefore, while the intension is to improve the biodiversity through elimination of IAS, there is potential risk of adversely affecting it.</p> <p>SS5: Indigenous people will be present near the project sites. Indigenous people and the concerned communities should be involved from the beginning. Implementation approach should respect their tradition, knowledge and concerns. They should be represented in the stakeholder consultation.</p> <p>SS 9: There is potential conflict of interest by those who get benefits from IAS. IAS are often and continuously introduced by some who consider them profitable. There is lack of information on impact of IAS on biodiversity and the economies of Malawi. As it may be for profits for some while majority of community may suffer, economic dynamics, justice and equity should be factored in the project approach for the long-term sustainability of the project outcomes.</p>		

### III. ESES Principle and Safeguard checklist

(Section III and IV should be retained in UNEP)

Precautionary Approach
The project will take precautionary measures even if some cause and effect relationships are not fully established scientifically and there is risk of causing harm to the people or to the environment.
Human Rights Principle
The project will make an effort to include any potentially affected stakeholders, in particular vulnerable and marginalized groups; from the decision making process that may affect them.
The project will respond to any significant concerns or disputes raised during the stakeholder engagement process.
The project will make an effort to avoid inequitable or discriminatory negative impacts on the quality of and access to resources or basic services, on affected populations, particularly people living in poverty or marginalized or excluded individuals or groups. <sup>3</sup>

Screening checklist	Y/N/ Maybe	Comment
<b>Safeguard Standard 1: Biodiversity, natural habitat and Sustainable Management of Living Resources</b>		
Will the proposed project support directly or indirectly any activities that significantly convert or degrade biodiversity and habitat including modified habitat, natural habitat and critical natural habitat?	N	Not anticipated, on the contrary the project will improve the targeted areas with protected PA habitats and ecosystems, as well as agro-ecosystems in the PA buffer zones, through the effective management of IAS
Will the proposed project likely convert or degrade habitats that are legally protected?	N	No negative impacts are expected to existing Protected Areas. The project seeks to improve the management of IAS inside the PA where IAS infestation have already occurred, and as a result contribute to biodiversity conservation
Will the proposed project likely convert or degrade habitats that are officially proposed for protection? (e.g.; National Park, Nature Conservancy, Indigenous Community Conserved Area, (ICCA); etc.)	N	No negative impacts are anticipated in any of the targeted buffer zones around the PA's the project will be working in; and instead will contribute to securing the habitat quality (e.g. through a larger tree/scrubs component) and more environment friendly farming of these lands. This will enhance connectivity, and partly , additional habitat for

<sup>3</sup> Prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or other opinion, national or social or geographical origin, property, birth or other status including as an indigenous person or as a member of a minority. References to "women and men" or similar is understood to include women and men, boys and girls, and other groups discriminated against based on their gender identities, such as transgender people and transsexuals.

Screening checklist	Y/N/ Maybe	Comment
		wildlife
Will the proposed project likely convert or degrade habitats that are identified by authoritative sources for their high conservation and biodiversity value?	N	No negative impacts are anticipated in any of the targeted buffer zones around the PA's the project will be working in; and instead will contribute to securing the habitat quality (e.g. through a larger tree/scrubs component) and more environment friendly farming of these lands. This will enhance connectivity, and partly , additional habitat for wildlife
Will the proposed project likely convert or degrade habitats that are recognized- including by authoritative sources and /or the national and local government entity, as protected and conserved by traditional local communities?	N	Not anticipated.
Will the proposed project approach possibly not be legally permitted or inconsistent with any officially recognized management plans for the area?	N	Not anticipated – Risk Assessments will be undertaken prior to the introduction of any biological control agents followed by due process with regard to authorizations and procedures. The same will apply to the used of any herbicides within or adjacent to PA's
Will the proposed project activities result in soils deterioration and land degradation?	N	No negative impacts are anticipated. On the contrary, project activities will contribute to soil improvement in the agro-ecosystems, as well as rehabilitation of protected habitat and associated biodiversity inside the PAs.
Will the proposed project interventions cause any changes to the quality or quantity of water in rivers, ponds, lakes or other wetlands?	N	Not anticipated
Will the proposed project possibly introduce or utilize any invasive alien species of flora and fauna, whether accidental or intentional?	N	Not anticipated. On the contrary, project activities will result in the control of IAS
<b>Safeguard Standard 2: Resource Efficiency, Pollution Prevention and Management of Chemicals and Wastes</b>		
Will the proposed project likely result in the significant release of pollutants to air, water or soil?	N	No
Will the proposed project likely consume or cause significant consumption of water, energy or other resources through its own footprint or through the boundary of influence of the activity?	N	No
Will the proposed project likely cause significant generation of Green House Gas (GHG) emissions during and/or after the project?	N	Not anticipated.
Will the proposed project likely generate wastes, including hazardous waste that cannot be reused, recycled or disposed in an environmentally sound and safe manner	N	Not anticipated.

Screening checklist	Y/N/ Maybe	Comment
Will the proposed project use, cause the use of, or manage the use of, storage and disposal of hazardous chemicals, including pesticides?	Y	The project will use registered herbicides to control invasive plant species. Only those chemicals approved by the FAO and WHO will be used. All unused chemicals will be disposed of in an approved manner. The use of chemicals in any of the proposed IAS control measures will involve a due process of EIA, if required, as well as formal approval by the conservation authorities in charge of the PA's.
Will the proposed project involve the manufacturing, trade, release and/or use of hazardous materials subject to international action bans or phase-outs, such as DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Convention on Persistent Organic Pollutants or the Montreal Protocol?	N	No.
Will the proposed project require the procurement of chemical pesticides that is not a component of integrated pest management (IPM) <sup>4</sup> or integrated vector management (IVM) <sup>5</sup> approaches?	N	No. Herbicides will be used as part of an integrated management strategy, combining chemical with mechanical control, as well as habitat management and restoration. Additionally, the introduction of Conservation Agriculture in the buffer zones is aimed at reducing the spread and impact of IAS through herbicide free weed management.
Will the proposed project require inclusion of chemical pesticides that are included in IPM or IVM but high in human toxicity?	N	No
Will the proposed project have difficulty in abiding to FAO's International Code of Conduct <sup>6</sup> in terms of handling, storage, application and disposal of pesticides?	N	No. See above.
Will the proposed project potentially expose the public to hazardous materials and substances and pose potentially serious risk to human health and the environment?	N	Not anticipated.
<b>Safeguard Standard 3: Safety of Dams</b>		
Will the proposed project involve constructing a new dam(s)?	N	Not applicable

<sup>4</sup> "Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/en/>

<sup>5</sup> "IVM is a rational decision-making process for the optimal use of resources for vector control. The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. The ultimate goal is to prevent the transmission of vector-borne diseases such as malaria, dengue, Japanese encephalitis, leishmaniasis, schistosomiasis and Chagas disease." ([http://www.who.int/neglected\\_diseases/vector\\_ecology/ivm\\_concept/en/](http://www.who.int/neglected_diseases/vector_ecology/ivm_concept/en/))

<sup>6</sup> Find more information from [http://www.fao.org/fileadmin/templates/agphome/documents/Pests\\_Pesticides/Code/CODE\\_2014Sep\\_ENG.pdf](http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/CODE_2014Sep_ENG.pdf)

Screening checklist	Y/N/ Maybe	Comment
Will the proposed project involve rehabilitating an existing dam(s)?	N	Not applicable
Will the proposed project activities involve dam safety operations?	N	Not applicable
<b>Safeguard Standard 4: Involuntary resettlement</b>		
Will the proposed project likely involve full or partial physical displacement or relocation of people?	N	Not applicable
Will the proposed project involve involuntary restrictions on land use that deny a community the use of resources to which they have traditional or recognizable use rights?	N	No.
Will the proposed project likely cause restrictions on access to land or use of resources that are sources of livelihood?	N	Not anticipated.
Will the proposed project likely cause or involve temporary/permanent loss of land?	N	No.
Will the proposed project likely cause or involve economic displacements affecting their crops, businesses, income generation sources and assets?	N	No.
Will the proposed project likely cause or involve forced eviction?	N	No.
Will the proposed project likely affect land tenure arrangements, including communal and/or customary/traditional land tenure patterns negatively?	N	Not anticipated.
<b>Safeguard Standard 5: Indigenous peoples<sup>7</sup></b>		
Will indigenous peoples be present in the proposed project area or area of influence?	Y	Indigenous people are present in areas adjoining PA's where there will be some project interventions in agro-ecosystems related to the management of plant pests and IAS
Will the proposed project be located on lands and territories claimed by indigenous peoples?	N	Not anticipated.
Will the proposed project likely affect livelihoods of indigenous peoples negatively through affecting the rights, lands and territories claimed by them?	N	No.
Will the proposed project involve the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples?	N	No.
Will the project negatively affect the development priorities of indigenous peoples defined by them?	N	Not anticipated. On the contrary, project interventions will contribute to improved livelihoods through enhanced agriculture practices, and strengthened working relations with the PA management.
Will the project potentially affect the traditional livelihoods, physical and	N	Not anticipated.

<sup>7</sup> Refer to the Toolkit for the application of the UNEP Indigenous Peoples Policy Guidance for further information.



Screening checklist	Y/N/ Maybe	Comment
cultural survival of indigenous peoples?		
Will the project potentially affect the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices?	N	No.
<b>Safeguard Standard 6: Labor and working conditions</b>		
Will the proposed project involve the use of forced labor and child labor?	N	No.
Will the proposed project cause the increase of local or regional un-employment?	N	No.
<b>Safeguard Standard 7: Cultural Heritage</b>		
Will the proposed project potentially have negative impact on objects with historical, cultural, artistic, traditional or religious values and archeological sites that are internationally recognized or legally protected?	N	No.
Will the proposed project rely on or profit from tangible cultural heritage (e.g., tourism)?	N	No.
Will the proposed project involve land clearing or excavation with the possibility of encountering previously undetected tangible cultural heritage?	N	Not anticipated.
Will the proposed project involve in land clearing or excavation?	N	Not anticipated although some land may be cleared of IAS as part of the land restoration efforts.
<b>Safeguard Standard 8: Gender equity</b>		
Will the proposed project likely have inequitable negative impacts on gender equality and/or the situation of women and girls?	N	Not anticipated
Will the proposed project potentially discriminate against women or other groups based on gender, especially regarding participation in the design and implementation or access to opportunities and benefits?	N	Not anticipated
Will the proposed project have impacts that could negatively affect women's and men's ability to use, develop and protect natural resources, taking into account different roles and positions of women and men in accessing environmental goods and services?	N	Not anticipated. Women and men, especially those residing in areas adjoining the targeted PA's, will be consulted prior to and during all project interventions, as outlined in the project document, to ensure that they are not negatively impacted and that interventions will contribute to improved livelihoods.
<b>Safeguard Standard 9: Economic Sustainability</b>		
Will the proposed project likely bring immediate or short-term net gain to the local communities or countries at the risk of generating long-term economic burden (e.g., agriculture for food vs. biofuel; mangrove vs. commercial shrimp farm in terms of fishing, forest products and protection, etc.)?	N	Not anticipated. Project interventions will bring short and long-term gains

Screening checklist	Y/N/ Maybe	Comment
Will the proposed project likely bring unequal economic benefits to a limited subset of the target group?	N	Not anticipated

#### IV. Additional Safeguard Questions for Projects seeking GCF-funding

<b>Community Health, Safety, and Security</b>			
Will there be potential risks and negative impacts to the health and safety of the Affected Communities during the project life-cycle?			
Will the proposed project involve design, construction, operation and decommissioning of the structural elements such as new buildings or structures?			
Will the proposed project involve constructing new buildings or structures that will be accessed by public?			
Will the proposed project possibly cause direct or indirect health-related risks and impacts to the Affected Communities due to the diminution or degradation of natural resources, and ecosystem services?			
Will the proposed project activities potentially cause community exposure to health issues such as water-born, water-based, water-related, vector-borne diseases, and communicable diseases?			
In case of an emergency event, will the project team, including partners, have the capacity to respond together with relevant local and national authorities?			
Will the proposed project need to retain workers to provide security to safeguard its personnel and property?			
<b>Labor and Supply Chain</b>			
Will UNEP or the implementing/executing partner(s) involve suppliers of goods and services who may have high risk of significant safety issues related to their own workers?			

## Appendix 15: Baseline analysis of the two Pilot Sites, and Programming

### Pilot site 1: Nyika National Park (NNP)

Nyika NP (10°40'S; 33°50'E) occupies a tract of mountain plateau and associated hills and escarpments in northern Malawi. It is 3,200 km<sup>2</sup> (320,000 ha) in extent and straddles the districts of Chitipa, Karonga, and Rumphi in the northern region. It shares parts of its western boundary with the Zambia border, and a section is contiguous with the Zambian Nyika NNP. Most of the plateau lies at 1,800 m, ranging from 600 m on the Ruwile River in the northwest to 2,607 m at Nganda Hill on the northeastern side of the plateau.

Nyika is a water catchment of considerable economic value to the people of the northern region of Malawi, including hydro-electricity generation. Most streams and rivers run throughout the year, and flow rates measured on rivers for more than 15 years have a mean annual variation of 28 to 45 percent. Stream flow characteristics are ascribed to high overall rainfall with some rain throughout the year, low evaporation (cloudiness and low ambient temperature), good vegetation cover to promote infiltration, and deep, freely draining soils.

### Biodiversity

Nyika NP has high levels of biodiversity and endemism. The Nyika plateau is part of the Eastern Afromontane Biodiversity Hotspot, which encompasses several widely scattered but biogeographically similar mountain ranges in eastern Africa. Endemism levels in the hotspot are high, with 31% of plants, 21% of mammals, 30% of reptiles, 30% of amphibians, and 69% of fish occurring nowhere else in the world. A total of 1,927 plant species and subspecies have been identified in NNP, of which 33 are endemics only found in the park, and a further 13 are considered near-endemics. The NP contains approximately 150 terrestrial and c.50 epiphytic species of orchids, four of which are endemic and two others near-endemic. Several montane forest trees (including *Hagenia abyssinica*, *Euphorbia obovalifolia*) reach their southern limits of distribution here. Nyika's butterfly fauna is the richest in Malawi, with some 120 of the 200 species present in the country, including four species believed to be endemic (*Charaxes dowsetti*, *Axiocerces nyika*, *Lepidochrysops handmani*, *L. chalceus* and *L. nyika*). Endemic amphibians include the black-striped sedge frog (*Hyperolius quinquevittatus mertensi*), the Nyika dwarf toad (*Mertensophryne nyikae*), and the Nyika Squeaker (*Arthroleptis xenodactyloides*), while endemic reptiles include the Nyika variable skink (*Mabuya varia nyikae*), Hilda's skink (*Mabuya hildae*), and Goetz's Nyika chameleon (*Chamaeleo goetzi nyikae*). Over 420 species of birds have been recorded in Nyika NP, including Malawi's largest breeding population of wattled cranes (*Bugeranus carunculatus*) (VU), a large breeding population of Denham's bustard (*Neotis denhami*) (NT), and a breeding population of Blue Swallow (*Hirundo atrocaerulea*) (VU) in Nyika NP estimated at 300 pairs. Several bird species including Red-winged Francolin (*Francolinus levaillantii*), Mountain Yellow Warbler (*Chloropeta similis*), Churring Cisticola (*Cisticola njombe*), Scarlet-Tufted Sunbird (*Nectarinia johnstoni*), Montane Widowbird (*Euplectes psammocromius*) and Baglaffeht Weaver (*Ploceus baglaffeht*) occur nowhere else in Malawi. *Circus macrourus* is a common winter visitor, while *Falco naumanni* and *Gallinago media* are annual visitors in small numbers, and *Crex crex* is recorded

occasionally. The endemic and very isolated race *whytei* of *Nectarinia graueri* breeds commonly in montane shrubland. The little-known swift *Schoutedenapus myoptilus* is locally common over the larger patches of forest. The NP also harbours globally significant mammals. Mammal species for which the Nyika is especially important include Leopard (*Panthera pardus*), Common Eland (*Tragelaphus oryx*) (LR/cd), Roan Antelope (*Hippotragus equinus*) (LR/cd) (Figure 1) and Southern Reedbuck (*Redunca arundinum*) (LR/cd). Nyika is the only known locality in Malawi for the greater dwarf shrew (*Suncus lixus*), the lesser dwarf shrew (*S. varilla*), the fruit bat (*Plerotes anchietae*) and the rodents *Otomys typus* and *O. denti*.



Figure 1. Roan Antelope in Nyika NP.

### Surrounding land-use

Land outside the park is mostly used for agriculture by smallholder farmers on land occupied according to customary tenure (Customary Land) or medium to large-scale commercial farmers on leasehold estates (Estate Land). About 40% of the land available is suitable for crop production, with about 20% of this already occupied by estates. The remaining land is either marginal or unsuitable for agriculture because of steep slopes and poor soils.

Many of the estates grow tobacco for cash and produce maize, groundnuts, beans, and other food crops for subsistence. Some coffee is grown on the moister slopes of the eastern Nyika escarpment. Cattle are relatively common in the drier areas to the north of the NP. Other livestock kept include goats, sheep and pigs.

Many of the small-scale subsistence farmers are unable to produce sufficient food to maintain their families. Primary causes cited are increasing human populations, insufficient land, and declining soil fertility. Increased population pressure has resulted in considerable land degradation largely brought about through cultivation on steep slopes without implementation of any conservation measures, poor ridge alignment, stream bank

cultivation, short return periods of shifting cultivation, mono-cropping and continuous growing of the same crops, which have all lead to accelerated soil loss and declining soil fertility (Master Plan, 2004). Agricultural run-off also carries fertilizer and pesticide into the water affecting biotic communities. There has also been a significant decline in woodlands, estimated to be decreasing at 3% per annum (Maescher, 1997). Trees are the primary source of building material, fuel for domestic purposes, brick making and tobacco curing. There is a growing wood and charcoal trade to provide fuel to urban areas in the southern and central regions of the country. Much of this land degradation is also facilitating plant invasions.

### **Collaboration**

In order to foster better relationships between DNPW staff and surrounding communities a collaborative management programme was developed and implemented. However, it has not been without its problems as highlighted in the Master Plan (2004):

- The extension and education unit does not have sufficient skilled manpower and resources, to service the collaborative management programmes in all adjacent communities;
- To date 53 Natural Resource Committees (NRCs) around Nyika have been established in pilot areas. The process of developing effective village level institutions is continuing but is constrained by insufficient capacity and resources;
- Some resource harvest groups use illegal harvest methods (e.g., poisoning fish or setting fire to protect beehives) or are being used as a cover for illegal activities such as hunting and woodcutting;
- Data returns from resource use groups are low and often incomplete and actual quantities harvested are difficult to assess and monitor;
- Inadequate involvement of traditional leaders at the implementation level;
- The programme focus to date is primarily on the rural population bordering the protected area. There is need to expand the programme to include other stakeholders (e.g. at the District level, other government organisations, NGOs);
- Community Management (CM) roles and responsibilities between the individual DNPW sections are not always clear. Inadequate information exchange is compounded by compartmentalisation;
- The CM policy is unclear some issues and requires clarification especially on roles and responsibilities of the various parties involved;
- Conflict between extension scouts and other DNPW staff. The programme is not fully accepted by most DNPW staff and extension scouts are often not enforcing rules.

### **Invasive alien plant species**

Many of the invasive plants currently in NNP were intentionally introduced. In the 1950s the Colonial Development Corporation established a plantation of 542 ha of pines (*Pinus patula* and *P. elliotii*) (Figure 2), eucalyptus and wattle (*Acacia mearnsii*) at Chilinda, and some smaller plantations elsewhere on the plateau. Other invasive species in NNP include *Acacia melanoxylon*, *Rubus ellipticus*, *R. niveus*, and *Pteridium aquilinum*. A number of species introduced as ornamentals around tourist lodges and staff housing have



also escaped cultivation such as *Desmodium uncinatum* and *Erigeron karvinskianus*. Species such as *Tithonia diversifolia*, *Mimosa diplotricha*, *Hyptis suaveolens* and *Lantana camara* are abundant in the foothills and pose a potential future threat.



Figure 2. *Pinus patula* invading a *Hagenia abyssinica* stand in NNP

Past invasive alien plant management has largely focused on the reduction of the 542 ha pine plantation, seeds of which are a source of invasion in surrounding grasslands.

According to the Master Plan (2004) the plantation is to be eradicated with only 90 ha to be replaced with non-invasive exotics as a source of fuelwood and building materials for use by the NP staff. However, according to the Plan past attempts at doing so have not been successful. In fact the Plan states that “control measures have not been consistently implemented” and that “staff requires on-site training in control techniques.” The Plan also states that plant species are being lost through the expansion of exotic tree species from the Chilinda plantation and forestry trial plots and that “past attempts to remove the plantations and plots have been unsuccessful.”

According to the Master Plan (2004) the priorities for control are:

- To reduce the pine plantation to approximately 90 hectares with 10 ha to be cleared per year – at this rate it will take 40 years to clear the plantation assuming that current stands will not expand during this period;
- To control regrowth of *A. mearnsii* in one of the areas from where it has been cleared and to prevent one large stand from expanding;
- To ‘eradicate’ *A. mearnsii*, *P. patula* and *Eucalyptus* spp. along streams, dams and *A. mearnsii* around chalet 4;
- To eliminate the *P. patula* pine stand between the airstrip and Chilinda plantation;

- To investigate the present situation of *R. ellipticus* and possible methods of control and make recommendations for implementation;
- To prevent any other exotic species from invading and spreading into NNP.

The issue of sisal (*Agave* spp.) and *L. camara* invading from surrounding villages is raised in the Plan but no plans for control are mentioned, other than recording the presence of these plants. According to the Master Plan (2004) the area invaded by bracken (*P. aquilinum*) increased from 2 ha in 1998 to 10 ha in 2003, yet no management interventions were mooted in the Master Plan (2004) – not stated in which area this increase occurred. However, some trials were undertaken in 2013/2014 to ascertain if slashing of the bracken would be effective in enhancing plant diversity. Using remote sensing the Peace Parks Foundation has determined that the bracken fern invasions have expanded from 1788.8 ha in 1986 to 4361.93 ha in 2016 (see Figure 3)

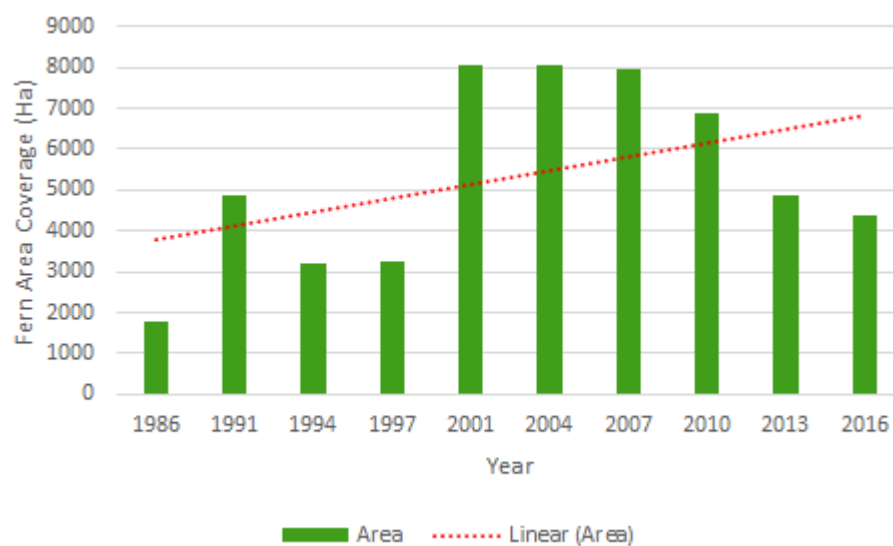


Figure 3: Expansion of *P. aquilinum* invasions in Nyika NP from 1986 to 2016 (Peace Parks Foundation)

### Proposed project invasive alien plant management interventions

The Master Plan (2004) makes no references to prevention or EDRR and does not list any of the exotic species which have been planted around tourist accommodation and staff villages – some of these have already escaped cultivation such as *Desmodium uncinatum*. There is little mention of awareness creation and capacity development with a few suggestions as to how IAS control could be financed. In fact there is no costing of proposed control interventions. Best management practices have not been proposed. In fact it is recommended that pine stumps be burnt to prevent coppicing – it is well known that pines do not coppice so resources have been wasted in the past through a failure to develop and implement the most cost-effective intervention strategies.

Based on past management activities outlined in the Master Plan (2004) the following management interventions will be developed and implemented in NNP during the project period. Various measures, including changes in biodiversity and control costs, will be recorded/monitored during trials. Determined best management practices will be implemented across a wider area. It is envisaged that a minimum area of 100 ha in Nyika

NP and a minimum of 50 ha in the surrounding agro-ecosystems will be cleared and restored (see Appendix 18 for more information):

- All exotic ornamentals growing in and around lodges and staff villages will be removed. These include species such as *Tecoma stans*, *Agave angustifolia*, *Senna siamea*, *Bryophyllum fedtschenkoi*, *B. proliferum*, *Tradescantia zebrina*, *Desmodium uncinatum*, *Cestrum nocturnum* and others. These will be removed by hand-pulling and/or felling and then destroyed.
- Development of best management practices for *P. aquilinum* – trials will be undertaken to compare manual control (slashing and hand-pulling) versus the use of two herbicides in combination with fire. Some trials will also include the use of lime in order to neutralize the soils – it is suspected that bracken thrives on acidic soils. Once determined, best management practices will be implemented over 10 ha.
- Best management practices will also be developed for the control of *Acacia mearnsii*. Cut-stump treatments will be compared to that of basal bark and manual removal. Once determined, the most cost-effective practices will be implemented over an area of less than 1 ha. Current invasions cover less than 1 ha.
- According to the Master Plan (2004) about 400 ha of pine should be cleared. Based on clearing norms from South Africa it requires approximately 17 person days to fell 1 ha of mature pine trees using chain saws. As such it will require 6800 person days to remove 400 ha of the plantation. Follow-up operations, to remove emerging seedlings after clearing of mature trees requires 10.4 person days/ha. The project plans to clear a minimum of 100 ha of pines with two follow-ups – most of this will be supported through co-funding. Control, especially of seedlings/saplings, will be undertaken with community members.
- Based on roadside surveys *Rubus ellipticus* and *R. niveus* have invaded approximately 10 ha of NNP. Cut-stump treatments will be compared to manual control. All current invasions of invasive *Rubus* spp. will subsequently be cleared using the most cost-effective intervention.
- In adjoining agro-ecosystems bracken fern, *Tithonia diversifolia*, and *Lantana camara* will be cleared from a minimum of 50 ha of rangelands.

### **Pilot site 2: Mount Mulanje Forest Reserve (MMFR)**

Mount Mulanje (15°55'S; 35°38'E), known locally as 'chilumba mu mlengalenga' ('island in the sky') rises sharply and dramatically above the surrounding Phalombe Plain, which lies between 600 and 700 m above sea level (Dowsett-Lemaire 1988). The massif covers an area of 650 km<sup>2</sup> (65,000) and is comprised of high plateaus and basins lying about 2,000 m, incised by several deep ravines. The plateaus are surmounted by 20 rocky peaks, which generally reach about 2,500 m in altitude. One of these, Sapitwa Peak (3,200 m), is the highest point in South-Central Africa. To the north, Mchese Peak (2,289 m) is separated from the main mass of Mulanje by a broad saddle called the Fort Lister Gap, which is about 2 km wide and lies 340 m above the Phalombe Plain.

The Mulanje Massif, acts as a rain barrier. The plateau level, at around 2,000 metres above sea level, annually experiences more than 2500 mm of rain, however, in the low



plains around the foot of the Massif the annual rainfall, range around 1000 mm. In the plains around the Mountain, it normally only rains in the rainy season, while it rains year round on the plateau level. As such it is an important source of rain water at the head of almost every river that runs through the south of Malawi: nine large rivers and hundreds of streams supply water to communities below and beyond the reserve. In the Phalombe district, the Phalombe and Sombani rivers drain into Lake Chilwa Wetland, an important Ramsar site. Several tributaries of the Sombani river, flowing from the northern slopes of the massif, carry water for the greater part of the year. All communities depend on this water supply, which they mainly use for crop irrigation and household use.

### **Biodiversity**

Mount Mulanje Forest Reserve is the highest massif in the country, located in the southeast near the border with Mozambique. The MMFR occupies 60,000 hectares, including montane grassland and shrubland, small patches of Widdringtonia cedar forest, and lowland, mid-altitude and montane rainforest (Figure 4). In all there are over 1,100 species of plants in Mulanje/Michesi of which 57 are strict endemics including one subspecies and four varieties. The high altitude zone includes the endemic plant species *Aloeacheete oreogena*, *Aloe arborescense*, *Aloe mawii*, *Helichrysum whyteanum* (Whyte's everlasting sunflower) and *Xerophytica splendens* (Stag horn lily) while the plateau grassland zone contains many temperate species, including *Erica johnstonia* and *Morea schimperi* (Mulanje Iris) both of which are endemic. There are also four endemic forest trees: *Widdringtonia whytei* (Mulanje cedar), *Rawsonia burtt-davyi*, *Pyrostria chapmanii* and *Vepris elegantissima*. The number of invertebrate species is estimated between 25,000 and 30,000. There are 60 species of snails (8 endemics), 10 of slugs, 22 of dragonflies, 233 of butterflies (11 endemics or near endemics), and 145 of beetles (7 endemics or near endemics). There are 14 endemic reptile species and 4 near endemics. Two dwarf chameleons, *Chamaeleo milanjensis* and *Rhampholeon platyceps*, are strictly endemic to Mount Mulanje, as are two geckos (*Lygodactylus bonisi* and *L. rex*), one skink (*Proscelotes mlangensis*) and one lizard (*Platysaurus michelli*). A further nine species of reptile are regarded as near endemic to the ecoregion, including the Mozambique wolf snake (*Lycophidion acutirostre*) and the Angola dwarf gecko (*Lygodactylus angularis*). Amongst the amphibians, one frog subspecies (*Rana johnstoni johnstoni*), a squeaker frog (*Arthroleptis francei*) and a ridged frog (*Ptychadena broadleyi*) are strictly endemic to the ecoregion. The *Rana* species and the squeaker frog are restricted to Mount Mulanje, while the ridged frog is found on Mulanje and on the Zomba Plateau. Seven of the bird species recorded are endemic or near endemic. Mulanje is the only known locality in Malawi for the rodent *Aethomys namaquensis*. Due to its species richness and high levels of endemism, Mt. Mulanje was identified by the World Wildlife Fund as one of 200 global ecoregions in the world for the conservation of biodiversity, and designated as an Afromontane Regional Centre of Endemism, and as a UNESCO World Heritage Site.



Figure 4. Grasslands on Mount Mulanje

### **Surrounding land-use**

Mulanje Mountain Forest Reserve spans the two districts of Mulanje and Phalombe. Approximately 37,000 people reside around the mountain in 85 villages, with the average land holding being about 0.4 hectares. Mulanje is considered a maize-deficit area that contains approximately 66% of the poorest households in Malawi. Poverty is therefore a particularly important factor in resource use (Sambo, 2001). The most commonly grown crops other than maize include bananas, pigeon peas, tomatoes and cassava. Yields are compromised by the small size of land holdings, nutrient-poor soils, and pests, including weeds (Figure 5). Poor land-use practices as those described for NNP are also evident around MMFR. As such many community members are largely dependent on natural resources within MMFR for building materials, medicinal plants and building materials.. Community members are often involved in illegal logging (timber, firewood, charcoal production), encroachment and farming close to rivers, resulting in increased erosion and river siltation (see Figure 6). Most community members are employed in the tea estates which dominate many of the landscapes around MMFR.



Figure 5. Pineapples invaded by bracken fern (*Pteridium aquilinum*)



Figure 6. Landscape around Mount Mulanje FR showing encroachment on river banks and deforestation.

### **Collaboration**

Mount Mulanje Conservation Trust (MMCT) believes that sustainable development is at the heart of conservation efforts and thus it pursues its mission to facilitate responsible management of the mountain's resources by involving the communities around the reserve whose livelihoods are dependent on its resources. MMCT believes that solutions to conservation issues must involve local people and they should acknowledge the importance of the mountain and the forest reserve to them. It achieves much of this by working in close collaboration and partnership with various government departments, non-governmental organizations, community-based organizations, schools, youth groups,



faith organisations, individuals and institutions with similar objectives to the Trust or with interest in Mulanje Mountain and its unique forest reserve.

In terms of partnerships a Local Forest Management Board (LFMB) has been established. It is representative of the surrounding communities and assists the Department of Forestry resolve issues and discusses possibilities of joint work. There are 18 Collaborative Management contracts between the Forestry Department and village groups, all in various stages of completion and operation that allow for formal use of the PA – these need to be further developed and strengthened. There are also active Area Development Committees within the villages surrounding the mountain where issues concerning the MMFR are discussed and information on interventions/actions then made available to the Village Development Committees for further action. There are a wide range of sustainable livelihood activities that are primarily facilitated by MMCT and partners around the MMFR such as small scale irrigation, fish-farming, gravity water supply, hydro-power generation, beekeeping, fruit tree growing, agricultural intensification and diversification, tourism activities, etc. Communities are engaged in mountain management activities such firebreak clearance, early burning, standby fire-fighting teams, path and infrastructure work, etc. Community groups are also involved in local policing through crime prevention committees and broader community policing. The project will focus on strengthening the LFMB and the Forest Collaborative Management agreement actions.

### **Invasive alien plant species**

Proliferation of invasive plants has put many highly vulnerable endemics at great risk of extinction, a situation which is further compounded by the increasing frequency of wildfires and climate change. The main invasive species in Mount Mulanje are Mexican pine (*Pinus patula*), Himalayan raspberry (*Rubus ellipticus*), bracken fern (*Pteridium aquilinum*) (Fig. 7) and American foxglove (*Digitalis purpurea*). In addition to these species there are over 50 other invasive plant species such as *Lantana camara*, *Mimosa diplotricha*, *Acacia mearnsii*, *Dolichandra unguis-cati*, *Argemone* spp., *Tithonia diversifolia*, and *T. rotundifolia*, growing in the foothills within the Forest Reserve boundary that have the potential to transform habitats and displace native species.

The source of the *Pinus patula* invasions on MMFR were two former plantations at Chambe Basin (650ha) and Sombani Basin (175ha), both established in the 1950s. However, other plantation areas were found to be more productive and as a result management of these stands ceased. Eradication of these plantations was attempted by the Department of Forestry in the 1980s with little success. A renewed attempt at eradication of the Sombani plantation was initiated in 2002 resulting in its total eradication in 2008. In subsequent years efforts were made to locate and eradicate all occasional across the mountain heights. This eradication has also been successful although follow-up is required because pine seeds are relatively long-lived.

The plantation in Chambe Basin (650 ha) was targeted for management in 2006. It took approximately 500 community members six years to remove the mature seed-bearing pines. However, there has been no follow-up to remove emerging seedlings and larger saplings. Delayed interventions now will result in the previously cleared area being

reinvaded, a waste of resources. In addition, changes in soil nutrient and mineral content have compromised natural regeneration.

With regard to *R. ellipticus* small eradication efforts have been undertaken over the past ten years. Invasions are currently restricted to Chambe Basin and Lichenya Plateau on the mountain heights with the situation on the former being a considerable problem due to the previous establishment of the pine plantation (see above). Elsewhere around the mountain it is found in remote locations.

Bracken fern has substantively increased its infestation of the montane grassland ecology on Mt Mulanje over the past thirty years primarily as a result of wildfire damage. There is clear impact of intense bracken fern displacing the endemic wildflower species within the grassland areas and so there is a priority biodiversity threat. MMCT has been supporting the Museums of Malawi to experiment on trial plots within differing ecological sites utilising the application of the herbicide Asulam. However, there is concern about the use of herbicides in a PA and additional studies need to be undertaken to investigate impacts on biodiversity and water resources. It is also important to investigate other management options.

Despite the presence of a host of other invasive alien plants in the foothills of MMFR there has been little attempt to manage them.



Figure 7. Bracken fern (*Pteridium aquilinum*) invasion in MMFR

### **Proposed project invasive alien plant management interventions**

The Management Plan for MMFR is currently under development. There has been no opportunity to review the draft but a recommendation has been made that CABI review the proposed IAS management interventions and make any changes/inputs if required.

Important issues to include would be prevention, EDRR, awareness creation, and cost-recovery.

It is envisaged that a minimum area of 50 ha in MMFR and 50 ha in the surrounding agro-ecosystems will be cleared and restored (see Appendix 18 for more information):

- Bracken fern invasions are one of the biggest challenges facing MMFR. Similar trials as those undertaken in NNP will be undertaken here. Foliar sprays of two herbicides will be compared to manual control. Fire will also be used as well as the application of lime to test if a reduction in soil acidity may enhance restoration and reduce re-invasion. At least 10 ha of invaded land in MMFR will be controlled.
- One of the biggest priorities for the Chambe Basin is to remove all pine seedlings and saplings over an area of about 650 ha. This will require 10.4 person days/ha – a total of 6760 person days. Community members will be employed to remove young trees over an area of at least 50 ha.
- Areas invaded by *R. ellipticus* will be controlled using best management practices as determined by trials where cut-stump treatments will be compared to that of manual control. It is envisaged that at least 10 ha will be cleared within MMFR.
- American foxglove (*Digitalis purpurea*) will be manually removed with the goal of eradicating all invasions in MMFR. Invasions are currently small and localized.
- *Dolichandra unguis-cati* has invaded the foothills of MMFR, including tea estates. Best management practices will be determined by comparing scrape and paint to cut-stump and manual control. Best management practices will then be implemented over at least 5 ha.
- *Tithonia diversifolia*, *Lantana camara*, and *Mimosa diplotricha* will be cleared from 50 ha of adjoining rangelands using cut-stump treatments.

## **Appendix 16: Impacts of the targeted invasive plants and their physical and chemical control**

### **Invasive alien plants have a range of impacts:**

- interfere with crop and pasture production and native plants through competition for available light, water and nutrients;
- physically interfere with the growth of a crop or native plant species;
- displace crops, pasture and native plant species through the production of toxins that inhibit the growth of other plants (allelopathy);
- permanently alter natural ecosystems and the services and benefits they provide in nature and to people;
- impact on soil nutrient cycling (e.g. nitrogen-fixing plants);
- contaminate harvested crops with their seeds or by tainting (e.g. the seeds of some weeds are toxic, and may result in poisoning if consumed);
- act as secondary hosts for crop pests (i.e. harbour insects, pests or diseases which attack crops);
- provide suitable habitats for organisms that may pose a threat to human or animal health (e.g. waterweeds provide ideal habitats for vectors of human and animal diseases);
- increase shading (in the case of invasive shrubs or trees), which can alter soil temperatures, affecting the growth, reproduction and/or survival of organisms residing in the soil;
- have a negative impact on human and animal health (e.g. pollen from invasive plants may contribute to respiratory ailments in people);
- interfere with the harvesting of crops or forage (e.g. thorny or woody weeds can make it difficult to harvest crops);
- lead to the need for additional cleaning and processing (e.g. weeds with burs may lodge in sheep's wool);
- reduce the amount of available pasture (i.e. weeds may displace valuable pasture species or prevent access to valuable forage);
- be poisonous to people, livestock or wildlife;
- cause physical injuries to people, livestock or wildlife (e.g. weeds with spines, such as cactus species, can cause serious injuries);
- reduce the quality of animal products such as meat, milk, fleeces or hides (e.g. consumption of some weeds, such as parthenium, by livestock, may render their milk and meat unpalatable);
- invade water bodies, affecting water quality and quantity (e.g. waterweeds can dramatically increase water loss through evapotranspiration);
- inhibit water transport (e.g. waterweeds can inhibit or prevent the movement of boats);
- inhibit or prevent hydroelectricity generation (e.g. waterweeds may block turbines);
- block water courses, including irrigation canals (e.g. aquatic or semi-aquatic weeds), leading to flooding;
- inhibit the ability of people to catch fish (e.g. waterweeds, such as water hyacinth, which by covering entire water surfaces can make fishing impossible);
- alter river flows and contribute to riverbank erosion (e.g. semi-aquatic weeds, such as giant sensitive plant, which can reduce water flow rates);
- contribute to erosion of sand from beaches (i.e. weeds used to stabilize coastal dunes can alter soil movement dynamics, reducing sand deposition on beaches);
- interfere with the recreational use of certain areas, especially water bodies;
- reduce tourism potential (i.e. unpalatable weeds can reduce the abundance of wildlife);
- increase the frequency and intensity of fires (e.g. weeds, such as chromolaena, which are highly flammable);
- provide cover for dangerous animals and in many instances for poachers as well;
- prevent access to natural resources (i.e. weeds forming dense impenetrable thickets can prevent access to water and grazing);
- encroach on roads, paths and villages;

- contribute to the abandonment of homes and villages (i.e. a reduction in crop yields and pasture production may force people to move elsewhere);
- are drivers of human conflict (i.e. invasive plants, by eroding the natural resource base on which millions of people depend, may spark conflict, especially over access to water and grazing); and
- reduce visibility along transport corridors.

#### **Impacts of targeted invasive alien plants:**

##### ***Tecoma stans***

Forms dense monospecific thickets that restrict the regeneration of native species (GISD, 2016). Introduced into Brazil, it now occupies more than 10,000 ha of degraded Alto Paraná Atlantic Forests (Bredow *et al.*, 2004). Infestations there have also led to the abandonment of productive land, including pastures. Losses to the cattle industry alone reportedly amount to some US\$ 7.5-million annually (Pedrosa-Macedo, 2004). In south Florida it invades dry disturbed sites, pine rocklands, and rockland hammocks. Invasive in many parts of Africa including South Africa, Kenya, Tanzania and Zimbabwe.

##### ***Agave angustifolia***

Has escaped from areas where it was planted as a living fence or ornamental, forming dense stands to the detriment of native flora and fauna. Regarded as an environmental weed in south-eastern Queensland, Australia, where it is considered to be one of the 200 most invasive plant species in the region; commonly “recorded on coastal sand dunes, sea cliffs and offshore islands” (Environmental Weeds of Australia, 2016). Also recorded as a weed of “roadsides, railway lines, disturbed sites, waste areas, abandoned gardens, urban bushland, riparian vegetation, hillsides and open woodlands in other parts of the region” (Environmental Weeds of Australia, 2016). As with other *Agave* species the sap is also allergenic. Individuals on social media who have been exposed to the plant sap have mentioned “itching hands and arms” and “legs and stomach covered with an instant burn and then blisters” followed by comments such as “demon” and “horror” and that “it will spread everywhere” (Dave’s Garden, 2016). In South Africa it has invaded rocky outcrops and drainage lines (Henderson, 2001). Other impacts are similar to those of *A. americana* and *A. sisalana*.

##### ***Senna siamea***

It has escaped cultivation in southern and eastern Africa, forming stands that may have a negative impact on native plant species. Contact with the wood shavings can irritate the skin. The leaves, pods and seeds are toxic to pigs and to poultry, and possibly to other species (CABI, 2016). The leaves are said to be poisonous to people. Cultivated in the regions of Eritrea West, Eritrea East and Ilubabor and “no doubt elsewhere”, it is not recorded as being naturalized or invasive in Ethiopia (Thulin, 1989). Widely planted throughout East Africa, it is naturalized and invasive in some areas, although infestations appear to be limited to areas around mother plants.

##### ***Bryophyllum fedtschenkoi***

Has the ability to form dense stands, displacing native plant species, especially in semi-arid areas where soil moisture is limited. As with other *Bryophyllum* species (~ *Kalanchoe* species) the plants contain cardiac glycosides and are toxic to animals, often resulting in cattle and sheep poisonings, especially in Africa and Australia (Smith, 2004). Most poisonings occur in the summer months because the flowers have much higher concentrations of glycosides than the stems, leaves or roots. In calves the lethal dose is about 7 g of flowers/kg body weight or 40 g of leaves/kg of body weight (McKenzie and Duster, 1986; McKenzie *et al.*, 1987). Symptoms of poisoning include “collapse, cyanosis, arrhythmias, dyspnea, and persistent diarrhoea” (Smith, 2004). In South Africa, long term ingestion of plants results in a syndrome referred to as “krimpsiekte,” which involves “progressive paresis of the limbs and neck (torticollis),” with animals eventually becoming paralyzed and then having to be euthanized (Smith, 2004). This condition has also been reported in dogs in South Africa. In the USA, “neurologic signs, including nystagmus, delirium, mild



seizures, and tetany, have been reported in dogs consuming *Kalanchoe* species (Plumlee, 2002, in Smith, 2004). Other impacts are similar to those of other *Bryophyllum* species.

### ***Bryophyllum proliferum***

Forms dense stands which exclude plants of native species and the organisms associated with them. Produces large numbers of bulbils on its inflorescence, facilitating invasions, and establishes easily from discarded plant material. Considered to be naturalized in South Africa (Walters *et al.*, 2011). Many impacts are considered to be similar to those of other *Bryophyllum* species. Present in Addis Ababa, Ethiopia, where it is “establishing itself in the wild” (Gilbert, 1989). Has previously been recorded as naturalized in East Africa (Wickens, 1987). It has readily established in forest edges and gaps in parts of Nairobi, Kenya, and has become established in the wild from garden refuse dumps in Laikipia County, Kenya. It has also been recorded in Kakamega Forest, Kenya (Fischer *et al.*, 2010). Invasive in South Africa.

### ***Tradescantia zebrina***

Has the ability to form dense monospecific stands, displacing native plants and animals. It tends to grow in disturbed secondary forest and in moist semi-open areas. It also readily establishes in “waste areas, disturbed sites, roadsides, urban bushland, riparian vegetation, open woodlands and forests in sub-tropical and warmer temperate regions” (Environmental Weeds of Australia, 2016). It has become invasive in a World Heritage Site on Saint Lucia on the middle slopes of Gros Piton, where its dense carpets are displacing indigenous plant species such as *Peperomia trifolia* (L.) A. Dietr. (Piperaceae); *P. myrtifolia* (Vahl) A. Dietr.; *Callisia repens* (Jacq.) L. (Commelinaceae), and *Gibasis geniculata* (Jacq.) Rohweder (Commelinaceae) (Graveson, 2012). In a regenerating Atlantic Forest fragment, *T. zebrina* proved to be a strong competitor, influencing species richness and abundance (Mantoani *et al.*, 2013). In Australia, “it has formed dense infestations (up to 1 m thick) along the edges of rainforests, particularly near settlements” (Humphries and Stanton, 1992, in Csurhes and Edwards, 1998). Contact with the foliage can cause irritations of the skin (Floridata, 2012; Dave’s Garden, 2013). Recorded as invasive on many Pacific Islands and in Australia, China, Philippines, Singapore, Taiwan, Canary Islands, Brazil and Portugal (PIER, 2009; CABI, 2016). Naturalized in Nairobi and Thika and perhaps elsewhere in Kenya (Agnew and Agnew, 1994). This observation is supported by Faden (2012), who found it to be “naturalized and sometimes an invasive weed” in East Africa. According to KHS (1995) “the garden varieties will cover large areas and may become a nuisance” an observation supported by our surveys. It has been recorded in the regions of Shewa and Harerge, in Ethiopia (Kelbessa and Faden, 1997).

### ***Desmodium uncinatum***

Has the ability to climb into and over vegetation, smothering plants, to the detriment of native fauna and flora. In parts of Australia, it is a weed of creek banks, roadsides, fence lines, forest margins, disturbed sites, waste areas and even plantation crops such as sugarcane. It is ranked as one of the top 100 most invasive plant species in some regions of Australia (Batianoff and Butler, 2003). There, it has reportedly “trapped” and killed native wildlife, including small frogs, birds, lizards and micro-bats, which easily become stuck in its stems and fruit. By fixing nitrogen it may also alter natural nutrient cycling processes. It is now locally naturalised in many tropical and sub-tropical parts of Africa and Southeast Asia (FAO, undated; Kretschmer *et al.*, 2001).

### ***Cestrum nocturnum***

Forms dense stands, to the detriment of native fauna and flora. In New Zealand, *C. nocturnum* has become established in forest understoreys, but has also invaded open forests, forest margins, shrub lands and streambanks (Environmental Weeds of Australia, 2016). *C. nocturnum* is thought to be one of the invasive species that drove *Acalypha wilder* Merr. (Euphorbiaceae), a rare endemic species of the Rarotonga Islands, to possible extinction (GISD, 2014). The plant is highly toxic, and its consumption has reportedly resulted in many livestock deaths. The toxicity of a congener, *C. laevigatum*, was first uncovered when livestock died, after consuming the plant, in Chase Valley, just outside Pietermaritzburg, South Africa (Thorburn, 1934). Chase Valley disease, as it became known, causes severe symptoms with the animal struggling and

kicking “as if in terrific pain and death seems to come as a welcome relief” (Thorburn, 1934). *C. laevigatum* is also toxic to goats and sheep where the symptoms appear “suddenly and are very severe” leading to death in a few hours (Thorburn, 1934). The flowers *C. nocturnum* emit a strong scent at night, which may contribute to respiratory problems in people, irritation of the nose and throat, headache and nausea. It is also invasive in wet forests and open areas on many Pacific islands. In Australia, it is naturalized in coastal areas of New South Wales (Environmental Weeds of Australia, 2016).

### ***Digitalis purpurea***

In Victoria, Australia, it has invaded moist and wet sclerophyll forest, riparian areas and rainforest. Infestations also exist in alpine areas (Csurhes and Edwards, 1998). In New Zealand it has invaded “mostly open disturbed areas, especially poor pastures, scrub and forest margins, stony river beds, roadsides, tracksides” (Webb *et al.*, 1988;). Due to the cardiac glycoside digitoxin, in the leaves, flowers and seeds of this plant, it is poisonous to humans and some animals and can be fatal if eaten.

### ***Dolichandra unguis-cati***

Has the ability to climb into trees and forest canopies, smothering plants and causing canopy collapse, often leaving only dead tree trunks (Grice and Setter, 2003). It can also form a thick carpet of leaves and stems on the forest floor, displacing native plants and preventing their regeneration. Widely considered to be “one of the most destructive exotic vines” (McClymont, 1996), its infestations have been described as “troublesome”, “obnoxious” (FLEPPC, 2015), and “serious” (PIER, 1999). Ranked as the fourth most invasive alien plant species in south-eastern Queensland, Australia, it is now regarded as a priority environmental weed in five Natural Resource Management regions in Australia. Out of 340 invasive environmental weeds in New South Wales, Australia, *D. unguis-cati* was ranked 11th for its threat to biodiversity (Downey *et al.*, 2010). Also considered to be an agricultural weed (Groves *et al.*, 2005; Randall, 2007), it is a “significant invader” of plantations and orchards (King *et al.*, 2011). It is invasive in South Africa and naturalized within and around the cities of Harare and Mutare in Zimbabwe, while having also escaped around Lusaka, Zambia.

### ***Pinus patula***

*P. patula* has the ability to form dense stands, displacing native plant and animal species. In South Africa, *Pinus* species have invaded numerous conservation areas, displacing native plant species and reducing water run-off (Richardson and Higgins, 1998; van Wilgen and van Wyk, 1999). Species richness and diversity among invertebrates has been found to be lower in pine plantations (which are similar to dense pine infestations) than in indigenous vegetation (Samways *et al.*, 1996). In terms of water-use, pine plantations on the Drakensberg in KwaZulu-Natal, South Africa, have reduced stream flows by 82% (Bosch, 1979), while in the Western Cape stream-flows from invaded fynbos water catchments have declined by 55%. In South Africa’s Mpumalanga Province, the replacement of grassland catchment areas with pines and eucalypts led, within 6–12 years, to the drying up of streams (van Lill *et al.*, 1980). There, removal of dense stands of pines and wattles from river banks has resulted in a 120% increase in stream-flows (Dye and Poulter, 1995). *P. patula* is also invasive in Hawaii (USA), Zimbabwe, Botswana and Malawi (Haysom and Murphy, 2003), as well as in both Madagascar and New Zealand (Richardson and Rejmánek, 2004). In Zimbabwe, *P. patula* is considered to be one of the most aggressive invaders of afromontane forests, grasslands and miombo woodlands in localities above 1,600 metres above sea level where it is able to produce viable seed.

### ***Acacia mearnsii***

By shading out plants of native species, and by shedding large quantities of litter, black wattle reduces floral diversity (Weber, 2003), including grass communities and reduces the carrying capacity of the land (Sanakaran and Suresh, 2013). By fixing nitrogen, the species alters nutrient cycling, making soils unsuitable for some native plant species. In South Africa, costs associated with black wattle infestations include reduced stream flows, a heightened fire risk, increased erosion, destabilization of riverbanks, loss of

grazing, nitrogen pollution, impairment of recreational activities, and diminished aesthetic appeal (de Wit, 2001). Losses in water runoff in South Africa, attributed to infestations of *A. mearnsii*, amount to an estimated 577 million m<sup>3</sup> of water annually (Versfeld *et al.*, 1998). *A. mearnsii* is considered to be the “most aggressive invader” of stream banks, forest margins and miombo woodlands above 1 600 metres above sea level in the mist belts of the eastern highlands of Zimbabwe. It has already invaded large tracts of land in the Nyanga and Chimanimani National Parks and in the botanical gardens of La Rochelle and Vumba. Black wattle is also extremely invasive in India, having invaded shola forests and associated grasslands.

### ***Rubus niveus***

*R. niveus* has the ability to form dense, thorny thickets up to 4.5 m tall, which out-compete and displace native vegetation, inhibiting the regeneration of native species and threatening rare endemic plants (Rentería *et al.*, 2012). It is a transformer species in that it alters the structure and condition of ecosystems over large areas. Its invasion success can be attributed to its rapid growth and ability to produce very large numbers of seeds (Rentería *et al.*, 2012). It spread extremely rapidly after being introduced to the Galápagos, covering an estimated 30,000 ha by 2008, while having the potential to spread over 90,000 ha (Atkinson *et al.*, 2008). In the *Scalesia* (daisy tree) forests of Los Gemelos, Santa Cruz, thickets of *R. niveus*, by blocking access to available light, are preventing the regeneration of shade-intolerant understorey plants such as *Scalesia pedunculata* Hook.f. (Asteraceae), an endemic species (Rentería and Buddenhagen, 2006). *R. niveus* infestations have led to declines in both the species richness and abundance of native plants (Rentería, 2011), with serious consequences for wildlife dependent on them (Weber, 2003). *R. niveus* has also invaded agricultural land, causing serious economic problems for farmers.

### ***Pteridium aquilinum***

Bracken fern is considered one of the most powerful weeds with respect to its ability to invade and colonize lands (McWhirter and Kemp, 2010). It quickly and easily suppresses all co-existing vegetation (specifically grasses and shrubs) by intensive competition over survival resources such as water, nutrients and sunlight (Marrs *et al.*, 2000). This is primarily in effect of its complex rhizomatous root system (Stewart *et al.*, 2008). Marrs *et al.* (2000), Eastman (2003), Schneider (2004), Schneider (2006) and Bond *et al.* (2007) state that bracken fern is known to secrete allelopathic substances which changes soil composition. This change in soil composition in its immediate surrounding either limits or totally inhibits the growth of other vegetation. This allows bracken fern to spread uncontrollably and produce a monoculture that crowds out other vegetation (Schneider, 2006; Schneider and Fernando, 2010). Thereafter bracken fern replaces secondary vegetation it then dominates areas (Schneider and Fernando, 2010). The dense thickets that bracken can form prevent the regeneration of other plants in the ecosystem (Schneider, 2006; Bond *et al.*, 2007). The fronds of bracken fern are poisonous and can be harmful to livestock (Eastman, 2003; Bond *et al.*, 2007). Young bracken fern fronds are and cause ulceration and blood loss, leucopenia, thrombocytopenia and haemorrhagic syndrome in cattle (Hirono and Yamada, 1987; Bond *et al.*, 2007). Bracken fern also causes a thiamine deficiency in horses that can result in anorexia, stagger and a loss of coordination (Hirono and Yamada, 1987; Bond *et al.*, 2007). In sheep it is known to cause night-blindness and tumours on live stock (Hirono and Yamada, 1987; Cooper-Driver, 1990). It also creates an environment suitable for the transmission of Lyme disease via sheep ticks (Eastman, 2003; Bond *et al.*, 2007). It affects farmers in many parts of the world, with lost opportunity costs associated with the invasion of productive grazing land, veterinary costs associated with poisoning and tumours, ticks and associated disease problems and direct bracken control costs. In forestry plantations, control is often required during the establishment phase (Pakeman *et al.*, 2003). There is unproven speculation that drinking water taken from catchments that are predominantly covered with *P. aquilinum* may contain carcinogens or other toxins that are harmful to human health.

### ***Tithonia diversifolia***

Forms dense stands which can displace native plant species and the animals associated with them. Its production of numerous small, light seeds, coupled with its ability to spread vegetatively, allows it to invade and to establish readily and rapidly in new locations (Muoghalu and Chuba, 2005). In Nigeria, where it is displacing native vegetation in the wetlands of the Apete River, Eleyele Lake and Oba Dam near

Ibadan, *T. diversifolia* is considered to be one of the most damaging of all invasive species (Borokini, 2011). There, it is reported to be out-competing even the formidable invasive shrub *Chromolaena odorata* (L.) King & H.E. Robins (Asteraceae) (Olubode *et al.*, 2011). Mexican sunflower has the ability to compete with agricultural crops (Illori *et al.*, 2010), and is contributing to the local extinction of valued native species, including some important medicinal plants (Oludare and Muoghalu, 2014). Infestations have reportedly led to the abandonment of some farms in the Copperbelt region of Zambia.

### ***Lantana camara***

*Lantana* forms dense, impenetrable thickets, reducing biodiversity and threatening a host of rare and endangered species. In Australia, Turner and Downey (2010) identified 275 native plant species and 24 native animal species which are threatened by the presence of *lantana*. In crop production systems in Southeast Asia, *lantana* has both reduced yields and increased management costs incurred by growers of durian, pineapples, bananas and rubber (Waterhouse, 1993). *Lantana* is also toxic to livestock, causing pastoral losses that in Queensland, Australia, were in 1985 estimated at A\$ 7.7 million, and which included 1,500 animal deaths, reduced productivity, loss of pasture, and higher control costs (van Oosterhout, 2004). In South Africa, *lantana* poisoning accounts for about 25% of all reported cases of livestock poisoning by plants (Wells and Stirton, 1988). There have even been recorded fatalities in people, especially children, after consuming the green fruit. *Lantana* can also alter fire regimes, allowing fires to penetrate into forests and woodlands.

### ***Mimosa diplotricha***

*Smother*s other plants, shading out light-demanding species and preventing their natural regeneration. Dense stands may prevent or inhibit the movement of livestock and wildlife. In Nigeria, *M. diplotricha* densities have reached 630,000 plants per hectare, reducing cassava-root yields, 12 months after planting, by 80% (Alabi *et al.*, 2001). The species readily invades orchards and rice paddies, reducing yields and increasing management costs (Waterhouse, 1993). Invaded cattle ranches in the Markham Valley, Papua New Guinea, are spending up to US\$ 130,000 annually on chemical control (Kuniata, 1994). It is apparently also toxic to livestock. In Thailand, 22 swamp buffaloes died 18–36 hours after eating *M. diplotricha* (Tungrakanpoung and Rhienspanish, 1992). Trials in Queensland, Australia, have indicated its toxicity to sheep, and a report from Flores, Indonesia, suggests that it is also toxic to pigs (Parsons and Cuthbertson, 1992).

## **Physical and chemical control**

Invasive plant species present in the two PAs and surrounding agro-ecosystems will be controlled using physical and chemical means (Table 1). Others will also be targeted using biocontrol agents (see Appendix 17).

### **Physical control**

**Manual and mechanical:** Manual control involves the direct removal of the above-ground parts of a plant with an axe or a slasher, or the uprooting of plants using a hoe, a garden fork or a spade, or by hand pulling. It may also include ring- and strip-barking. Mechanical control may involve the use of machinery or equipment (e.g. bulldozers or tractors and can, among others, involve pushing, stick-raking, blade ploughing and/or chaining of larger plants or medium density infestations). Mechanical control is often used to remove dense stands of woody weeds but can be expensive and may leave soils bare and so susceptible to erosion and re-invasion by invasive plants of the same species or of other species. Soil disturbance associated with manual control may stimulate the germination of weed seeds in the soil seed bank.

**Uprooting:** Physically removing a weed from the ground using tools such as hand-hoes, picks, garden forks, mattocks or even the “tree popper”. Suitable for most weeds, especially when in the seedling stage. Not suitable for weeds with deep root systems or which produce suckers. All below-ground plant parts,

which can result in the re-establishment of the target species, need to be removed and disposed of in a safe and effective manner.

**Hand pulling:** Similar to uprooting and widely used to remove seedlings and young plants of most invasive plant species; works best when the soil is moist. Take hold of the stem at ground level and pull out vertically. Try to remove plants when they are not fruiting in order to limit the spread of seeds. All below-ground parts of target species, which have rhizomes, tubers or other regenerating vegetative structures, need to be removed and disposed of to prevent their re-establishment.

#### **Advantages of physical/manual control**

- In most cases, little training or supervision is required.
- Tools are simple, cheap and easily obtainable in all countries – and with hand pulling no tools are required.
- In most cases, little or no harm is caused to the environment – desirable vegetation is not damaged by the hand pulling or uprooting of weeds.
- It can be used in countries where no herbicides are registered for use against a particular weed species.

#### **Disadvantages of manual control**

- Procedures are labour intensive, and can be expensive in countries with high labour costs.
- It is physically demanding and slow, and it usually requires repeated follow-up operations.
- Where machinery is used, manual control can be expensive – incurring fuel and maintenance costs.
- Soil disturbance may stimulate seed germination among weeds, and on steep slopes or on riverbanks this may also exacerbate soil erosion.
- In dense infestations, native species are often inadvertently damaged or removed.

#### **Chemical control**

Chemical control is the use of herbicides, applied alone or in combination with other methods. A herbicide is a naturally occurring or man-made substance that alters the metabolic processes of a plant, so the plant is either killed or suppressed, or its growth habit altered. Herbicides can be divided into groups according to their modes of action. Non-selective herbicides will affect any plant they come into contact with, whereas selective herbicides can, for example, be used in crop production systems to kill weeds without impacting on the crop itself. However, it is important to recognize that non-selective herbicides can be applied selectively. For example, tree stumps can be treated with little risk to other plants growing nearby. Non-selective herbicides can also be injected into target species without affecting nearby plants.

Contact herbicides affect only the plant tissue they come into contact with, whereas systemic herbicides are translocated or moved throughout the plant from the initial point of application. So, for example, a chemical applied to the stem can be translocated to the roots and leaves, eventually killing the whole plant. Translocated herbicides may move either through the phloem (the living tissue which transports carbohydrates from the leaves or storage organs) or the xylem (non-living tissue that moves water and minerals from the roots to the shoots). Translocated herbicides can be selective or non-selective. Chemicals can be applied in a number of ways:

**Foliar spraying** is the use of a herbicide, diluted with water, sprayed over the foliage (leaves and stems) of seedlings, shrubs, grasses or dense vine infestations to the ‘point of runoff’ (until every leaf is wet). Some herbicides will require the addition of stickers and wetters in order to improve efficacy. With plants that have been slashed or cut down, the coppice or regrowth should ideally have reached a height of 50–100 cm before spraying, if effective control is to be achieved. This method of control should generally be considered only for large and dense infestations where risks to non-target species are minimal. Efficacy may be influenced by: (i) the available surface area of the leaves; (ii) the position of the leaves; (iii) hair density on the leaves; and (iv) the thickness of the waxy layer on the leaves.

**Basal stem application:** Usually applied to thin-barked woody weeds, tree saplings, regrowth and multi-stemmed shrubs and trees with basal diameters of no more than 20 cm. The entire circumference of the trunk or stem from ground level to a height of 30–100 cm is sprayed or painted. To help bark penetration, an oil-soluble herbicide is mixed in diesel/kerosene/mineral turpentine/penetrating oil/mineral oil or in other formulated oil blends. The full circumference of every stem or trunk rising from the ground needs to be saturated with the herbicide solution. Trees with old or rough bark may require increased coverage. Application may be made at any time. Bark should not be cut or removed before a basal stem application. Herbicide uptake will be reduced in plants with trunks that have been scorched by previous fires.

**Cut stump application:** Sometimes also referred to as “cut and spray” or “lopping/pruning”. Sever the plant completely at its base (no higher than 15 cm above the ground), preferably horizontally using a chainsaw, brush-cutter, machete or even secateurs or pruning loppers (tool selection will depend on ease of cut, as determined by the thickness of the stem/trunk), and IMMEDIATELY apply herbicide (with a paint brush, a squeeze bottle, a sponge-tipped bottle or a spray bottle). Application delays of more than 15 seconds for water-based herbicides and 1 minute for diesel-soluble herbicides, from cutting to chemical application, will give poor results. For trees with trunks of large circumference, the herbicide solution should be applied only around the edges of the stump, targeting only the cambium layer. Apply to the point of wetting, but not to the point of runoff. Treatments can be applied at any time of the year.

**Scrape and paint application:** Scrape a very thin layer of bark, using a sharp knife, from a 10–30 cm section of stem (taking care not to cut through the vine), and IMMEDIATELY apply the herbicide to the exposed green underlying soft tissue (before the plant can seal). Removing a small portion of the bark will allow the herbicide to penetrate into the plant’s sapwood. For large shrubs and vines, several scrapes, placed approximately 7.5 cm apart, may be required.

#### **Advantages of chemical control**

- In many cases, there are no other effective options.
- In most cases, chemical control is more cost-effective than other methods, especially manual control.
- Results are quicker than with manual control, especially when compared with ring-barking or stripping.
- Use of the correct herbicides, applied according to label recommendations, has little to no negative impacts on the environment.

#### **Disadvantages of chemical control**

- The purchase of specialized equipment and the training of applicators are essential, and can add to costs.
- Herbicides can be expensive – incorrect formulations can result in poor control, requiring repeated applications, which can add to costs.
- Target species must be ‘healthy’, and weather conditions suitable, at the time of a herbicide’s application.
- Foliar application can affect non-target species.
- Herbicide misuse may cause environmental damage.
- Manual control of plants may be necessary before herbicide application (e.g. in cut-stump treatments) or in the spraying of re-growing or coppicing plants that were too tall to spray initially.

**Table 1: Species in the two PAs and surrounding agro-ecosystems targeted for physical and chemical (active ingredients) control**

Species	Site	Current cover	Impact	Control	Responsibl e
<i>Tecoma stans</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Agave angustifolia</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Senna siamea</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Bryophyllum fedtschenkoi</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>B. proliferum</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Tradescantia zebrina</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Desmodium uncinatum</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Cestrum nocturnum</i>	Nyika – few individual trees around staff village	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Digitalis purpurea</i>	Mulanje – some plants around some of the hikers huts on the mountain	Low	Low but potential high	Uprooting and destroying	PA staff
<i>Dolichandra unguis-cati</i>	Mulanje – surrounding agro-ecosystems	Medium	Medium	Cut-stump (picloram/aminopyralid ) versus manual	Arne Witt
<i>Pinus patula</i>	Nyika and Mulanje	High and widespread	High	Cutting above ground level and subsequent hand-pulling of emergent seedlings	PA staff and communities
<i>Acacia mearnsii</i>	Mulanje and Nyika and surrounding agro-ecosystems	High and localized	High	Cut-stump (picloram/triclopyr) vs basal bark (picloram/triclopyr) vs manual followed by hand-pulling of seedlings	CABI/PA staff and communities
<i>Acacia melanoxylon</i>	Nyika	Low and localized	Medium but potential high	Cut-stump (picloram/triclopyr) vs basal bark (picloram/triclopyr) vs manual followed by hand-pulling of seedlings	CABI/PA staff and communities
<i>Rubus niveus</i>	Nyika	Medium and widespread	High	Cut-stump (picloram/aminopyralid ) vs manual	CABI/PA staff
<i>Rubus ellipticus</i>	Nyika and Mulanje	Medium and widespread	High	Cut-stump (picloram/aminopyralid ) vs manual	CABI/PA staff
<i>Pteridium aquilinum</i>	Nyika and Mulanje and adjoining agro-ecosystems	High and widespread	High	Repeated uprooting vs foliar spraying of metsulfuron methyl vs asulam vs manual (hand-pulling).	CABI/PA staff and communities
<i>Tithonia diversifolia</i>	Surrounding agro-ecosystems – Nyika and Mulanje	High and widespread	High	Cut-stump (picloram/aminopyralid ) vs manual	CABI and communities
<i>Lantana camara</i>	Surrounding agro-ecosystems – Nyika and Mulanje	High and widespread	High	Cut-stump (picloram/aminopyralid ) vs manual	CABI and communities
<i>Mimosa diplotricha</i>	Surrounding agro-ecosystems – Nyika and Mulanje	High and widespread	High	Foliar (dicamba) vs manual	CABI and communities

## **Appendix 17: Safety and efficacy of biological control agents**

Thousands of plant species have been introduced for various purposes. Alien or introduced species often become invasive when introduced into a new country without their natural suite of plant-feeding insects and pathogens that suppress them in their native regions. Relieved of their natural enemies and pre-adapted to conditions in the new country they out-compete native plant species, form dense stands, spread rapidly and transform the landscape.

*What is classical biocontrol?*

The impacts of invasive plant species are severe and measures need to be taken to curtail these invasions. This generally takes the form of mechanical and/or chemical control. Mechanical and chemical controls are generally expensive and in many cases harmful to the environment. In addition, many weed species have built up a resistance to herbicides. In fact more than 270 weed species are now considered to be resistant to herbicides. An alternative to these conventional control measures is biological control, which is the use of phytophagous insects, mites and pathogens to control invasive plant species.

Introduced plants generally become invasive because the natural enemies associated with these plant species have been left behind in their country of origin. In the absence of natural enemies, and under suitable environmental conditions, many of these introduced plant species will grow prolifically, and produce an abundance of flowers and seeds. In these ideal situations they will out-compete indigenous plants for limited resources because native species have to deal with a host of natural enemies. The goal of classical biological control is thus to restore the natural balance, to stress introduced plants so that indigenous plants can compete with them on an equal footing. The main aim of biological control is therefore to:

- suppress plant vigour;
- reduce seed production;
- slow plant growth; and
- reduce the density of the weed infestation.

The main benefits of biocontrol are (Greathead, 1995):

- agents establish self-perpetuating populations, often throughout the range of a target weed, including areas that are not accessible using chemical or mechanical control methods;
- the control of a target weed is permanent;
- there are no negative impacts on the environment;
- the cost of biocontrol programmes is low, relative to other approaches, and requires only a one-off investment;
- benefits can be reaped by many stakeholders, irrespective of their financial status or of whether they contributed to the initial research process.



Biological control agents include: (i) gall-forming insects; (ii) defoliators (e.g. leaf-feeding beetles); (iii) leafminers; (iv) sap-suckers such as insects and mites with piercing and sucking mouthparts; (v) flower-, bud- and seed-feeders; (vi) stem-borers; (vii) crown-feeders; (viii) root-feeders; and (ix) disease-causing microorganisms such as bacteria, viruses, fungi and nematodes. In some cases, just one introduced biocontrol agent has been needed for success in controlling an invasive plant infestation. In many cases, however, effective suppression of a target plant species has been achieved through the release of multiple biocontrol agents, which attack different parts of the plant.

### *Is biocontrol safe?*

Weed biological control, as it is practiced today, is considered to be extremely safe and is the most cost-effective and sustainable management strategy available, especially for environmental weeds. Negative reports on the safety and efficacy of biocontrol agents are almost always based on old examples, such as the Cane Toad in Australia, where protocols were not followed and predicted non-target impacts ignored. It should also be noted that biocontrol practitioners active today would never consider using generalist natural enemies in weed biocontrol programs. It should also be noted that many phytophagous insects, by their very nature have a limited host range as reported in a number of publications:

- About 75% of all terrestrial plant-feeding insect species feed on only a limited range of plant species; plants outside this range are rejected if they are encountered” (Chapman, 1994);
- 20% of insect herbivore spp. were host specific to *Luehea seemannii* (Tiliaceae) in Panama (Erwin, 1982);
- Caterpillar fauna of a dry forest in Costa Rica – over 50% of the spp. were monophagous (Janzen, 1988);
- “In temperate woodlands, many arboreal insect herbivores show a high degree of host specificity” (see reviews in Crawley, 1983; Lawton *et al.*, 1984);
- “Most insect herbivores are relatively specific, feeding on only one or a few genera or on a single plant family or subfamily” (Bernays and Graham, 1988)

One of the key elements in biocontrol research is to carry out safety testing to prove/confirm that a potential biocontrol agent is host specific (monophagous) ie. it will only feed and produce viable offspring on the target species. In some cases oligophagous (feed on more than one species in the same genus) species may also be acceptable provided that there are no indigenous species or crops within that particular genus. Host range trials or host specificity tests are generally undertaken in quarantine glasshouses where the agents and the test plants are exposed to natural light. These trials or tests normally take the form of no-choice, paired-choice or multiple-choice trials. In no-choice trials the potential agent is only exposed to one plant species at a time. Researchers will place the potential agent (10 adults for example) in one cage on one

plant and monitor its survival, damage it causes and its ability to reproduce on the target or non-target species. The results of these trials are often conservative – they usually indicate a wider host range than what would occur naturally in the field because the experimental design is not in any way similar to plant distributions found in the field. The non-target species used in these trials are not selected randomly, as is often thought, but are selected based on their taxonomic relationship with the target species with more closely related than distantly related plants being tested. Most indigenous plants within the same genus as the target are tested while fewer species in more distantly related families are used. Distantly related species that are similar morphologically to the target species are often also used in trials, and may include crop plants.

Choice trials are a more accurate reflection of the potential agent's host range as they mirror more accurately the natural situation in the field – the female can make a decision as to which plant she favours for feeding or oviposition. In paired-choice trials one plant of the target species (natural host) and one plant of a non-target species is placed in each cage. For example, ten adults will then be placed in the cage and the damage, number of eggs, surviving nymphs/larvae etc. on each plant will be recorded after a certain time period. If the agent is extremely host specific there will only be feeding damage, oviposition and nymphal/larval survival on the target plant.

Multiple-choice trials are an attempt to replicate as close as possible what the potential agent may find in the field – it will be exposed to a number of different species and will have to select one specific species to feed and develop on. In this case we place a large number of plants of different species, including the agent's natural host, in a large walk-in cage and a large number of agents are released into the cage.

Additional support for the host specificity of an agent can be gleaned from undertaking surveys in the country of origin. Closely related plants in the field are surveyed to determine if the proposed agent is present. Post-release surveys in the country of introduction can also support and guide the decision to release the agent elsewhere. For example, the *Neochetina* species that have been released for the control of water hyacinth have been intentionally released in more than 50 countries with no non-target impacts.

### *Efficacy of biological control*

It was estimated (Winston *et al.*, 2014) that by the end of 2012, there were 1555 separate and intentional releases of 469 species of weed biological control agents against 175 species of non-native target weeds (when related taxa of unidentified plant species, such as some *Opuntia* species, are counted as single target weeds). These so-called 'classical' biocontrol projects have been conducted in a total of 90 countries (Winston *et al.*, 2014). At a national level, biocontrol programmes have achieved success rates of 83%, 80%, 61%, 51% and 50%, respectively, in New Zealand (Fowler, 2000), Mauritius (Fowler *et al.*, 2000), South Africa (Zimmermann *et al.*, 2004), Australia (McFadyen, 2000) and Hawaii (Markin *et al.*, 1992).

An analysis of some biocontrol research programmes in South Africa found that benefit:cost ratios ranged from 34:1 for *Lantana camara* to 4,331:1 for golden wattle, *Acacia pycnantha* Benth. (van Wilgen *et al.*, 2004). It is also estimated that biocontrol

agents present in South Africa have reduced the financial costs of mechanical and chemical control by more than 19.8%, or ZAR 1.38 billion (Versfeld *et al.*, 1998). It is further estimated that biocontrol programmes, if fully implemented in the future, may reduce control costs by an additional 41.4%, or ZAR 2.89 billion (Versfeld *et al.*, 1998). In fact an economic assessment of the contribution of biological control to the management of invasive plants and to the protection of ecosystem services in South Africa found the estimated value of potential ecosystem services to be in the region of ZAR 152 billion annually of which an estimated ZAR 6.5 billion was lost to invading alien plants (de Lange *et al.*, 2010). However, without any control this would have amounted to an estimated ZAR 41.7 billion had no control been carried out, and 5-75% of this protection could be attributed to biocontrol (de Lange *et al.*, 2010). In Australia it was found that for every dollar invested in the weed biocontrol effort there was a return of A\$ 23.10 (Page and Lacey, 2006). There, the benefit:cost ratio for agriculture alone (in terms of both cost savings on control and increased production) was 17.4. If current annual expenditures on biocontrol research continue into the future, it is expected that weed biocontrol projects in Australia may provide, on average, an annual net benefit of A\$95.3 million, of which A\$ 71.8 million is expected to flow into the agriculture sector (Page and Lacey, 2006).

In southern Benin, the reduction of water hyacinth as a result of biocontrol has been credited with an increase in income of US\$ 30.5 million per year to a community of about 200,000 people (de Groote *et al.*, 2003). If one assumes that the benefits stay constant over the next 20 years, the accumulated present value would be US\$ 260 million – a benefit:cost ratio of 124:1 (de Groote *et al.*, 2003).

#### *Biocontrol releases planned for Malawi*

Biocontrol agents will only be introduced and released in Malawi based on the submission of a Risk Assessment (RA) to the Regulatory Authorities. Applications will be submitted for three agents in the 1<sup>st</sup> year of the project (Table 1). Based on the outcome of these submissions a RA for the introduction of the agent *Dasineura rubiformis* for the control of *Acacia mearnsii* will also be considered. It should be noted that all agents we intend to introduce have been tested to confirm their host specificity. There have also been no non-target impacts post release.

Table 1: The following agents will be considered for introduction and release in Malawi

Species	Biocontrol agent	Countries released to date	Date released	Established
<i>Pistia stratiotes</i> L.	<i>Neohydronomus affinis</i> Hustache	Australia	1982	Yes
		Benin	1995	Yes
		Botswana	1987	Yes
		Cote d'Ivoire	1998	Yes

		Ghana	1996	Yes
		Kenya	1999	Yes
		Nigeria	1997	Yes
		Papua New Guinea	1985	Yes
		Puerto Rico	1998	Unknown
		DRC	1999	Yes
		South Africa	1985	Yes
		Togo	2001	Yes
		Senegal	1994	Yes
		USA	1987	Yes
		Vanuatu	2006	Yes
		Zambia	1991	Yes
		Zimbabwe	1988	Yes
<b><i>Mimosa diplotricha</i></b> <b>C. Wright</b>	<i>Heteropsylla spinulosa</i> Muddiman, Hodkinson & Hollis	American Samoa	1997	Yes
		Australia	1988	Yes
		Cook Islands	1994	Yes
		Federated states of Micronesia	1992	Yes
		Fiji	1993	Yes
		Guam	2008	Yes

		Niue	1994	Yes
		Northern Mariana Islands	2008	Yes
		Palau	1999	Yes
		Papua New Guinea	1993	Yes
		Samoa	1988	Yes
		Solomon Islands	1994	Yes
		Timor Leste	2008	Yes
		Tonga	2008	Yes
		Vanuatu	1994	Yes
<b><i>Lantana camara</i> L.</b>	<i>Aceria lantanae</i> (Cook)	Australia	2012	Unknown
		South Africa	2007	Yes

**Appendix 18: GEF IAS Tracking Tool (see separate file)**

**Appendix 19: Protected Area Management Effectiveness  
Tracking Tool for NNP and MMFR (see separate file)**