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WILDMEAT interventions database: A new database of interventions addressing unsustainable wild meat hunting, consumption and trade

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1 | INTRODUCTION

Wild meat has long been used as a source of food and income by many communities across the tropics (Ingram et al., 2021). Recently, however, growing human populations and increasing commercial trade to urban markets have driven up demand and prices for wild meat products and led to unsustainable levels of wildlife harvesting in many places (Coad et al., 2019). Overexploitation of wildlife has been linked to significantly reduced wildlife populations (Benítez-López et al., 2017) and increased extinction risk for many medium and large-bodied species (Dirzo et al., 2014). The loss of these species poses food and income security risks for those dependent on wild meat for livelihoods (Ingram, 2020), disproportionately impacting the poorest households whose reliance on the resource is greatest (Nielsen et al., 2018). Despite the clear need to manage unsustainable wild meat harvesting to protect wildlife and the ecosystems they live in, management is poor in many areas, and in others, absent (Ingram et al., 2021; Wicander & Coad, 2018).

The urgent need to manage wild meat for the sake of both local livelihoods and wild ecosystems means that many and varied interventions have been implemented with the aim of increasing the sustainability of wild meat use. Management responsibility for these interventions can rest with different actors, from central governments (which often contract nongovernmental organisations (NGOs) to support their resource management) to private sector concessionaries (e.g. timber companies), or devolved directly to wildlife-hunting communities. Although management goals may be similar—sustainable wildlife populations and local livelihood security—the range of interventions selected, the resources invested and the expertise available differ vastly. However, the effectiveness of these interventions is generally held back by an insufficient understanding of wildlife population biology, the complexities of managing multispecies harvests, weak and inadequate laws protecting wildlife, low enforcement capacity, unclear user rights, lack of suitable alternative proteins or revenues in rural areas and high demand for wild meat products in urban areas (Coad et al., 2019; Ingram et al., 2021). Furthermore, details of interventions and their conservation and development outcomes often remain unpublished (Wicander & Coad, 2018). As a result, there is a vast knowledge gap which impedes researchers and practitioners from learning from the experiences and lessons of previous projects.

Here, we outline the creation of a database of projects that used interventions designed to reduce, or render sustainable, the hunting, consumption or trade of wild meat, starting with those conducted in Central Africa. We then discuss the patterns and trends in studies collated in the interventions database and the research

gaps revealed by its compilation. We build on this new knowledge to provide recommendations for future interventions within the context of recent discussions surrounding the sustainability of wild meat hunting, consumption and trade.

2 | METHOD

We specifically focussed on identifying projects that implemented wild meat interventions in Central Africa, including Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Republic of the Congo, Rwanda and São Tomé and Príncipe. A selection of publicly accessible databases and the websites of major conservation NGOs and donors (including the World Wide Fund for Nature (WWF), the Wildlife Conservation Society (WCS), the Rufford Foundation and the Global Environment Facility) were searched using keywords ('wild meat'; 'wildmeat'; 'bushmeat'; 'bush meat'; 'viande de brousse') to identify wild meat management projects active between 2000 and 2021 in Central Africa (Appendix 1). In addition, we were provided with a database of USFWS- and USAID-funded projects, directly from both organisations. Eligible projects were those whose aims included managing or reducing wild meat use (including hunting, consumption and sales) or reducing negative impacts of wild meat use in a specific site.

The database consists of parent projects, projects and interventions (Figure 1). An intervention is a specific project component that implements a certain activity, which could be an alternative livelihood, hunting management, a demand reduction campaign, awareness raising activities or law enforcement. Projects can consist of multiple interventions at one location. Large projects with multiple locations were split so each location is a separate project with an overarching 'parent' project, for example, parent project: Sustainable Wildlife Management Program (SWM), consisting of SWM Democratic Republic of the Congo, SWM Republic of the Congo and SWM Gabon, each with three interventions.

Interventions were categorised into five types:

1. *Alternative livelihood*: An intervention that seeks to replace or reduce dependency on wild meat as a source of income and protein for a community with a 'low cost, easily implementable, low-environmental impact' livelihood activity (Coad et al., 2019). Alternative livelihoods often include rearing of small and fast-reproducing species, such as cane rat or snails, as well as alternative income sources such as eco-tourism and beekeeping (Brittain et al., 2021).
2. *Law enforcement*: An intervention that enforces laws relating to wild meat (e.g. regulations for wild meat hunting and trade, or bans on hunting of protected species). This could involve creating new regulations to manage or prevent wild meat hunting and trafficking, strengthening existing regulations or increasing law enforcement capacity and activity (e.g. increasing the frequency and/or range of enforcement patrols, and upgrading equipment).
3. *Hunting management*: An intervention that aims to manage legal wild meat hunting within a community or landscape, to ensure hunting offtake levels are sustainable. This may be achieved through, for example, the setting of harvesting quotas or creation of rotational hunting zones.
4. *Demand reduction campaign*: An intervention that seeks to reduce demand for wild meat products in those for whom they are not necessary for food security, by creating voluntary behaviour change in consumers—from unsustainable consumption of wild meat products to a more sustainable food choice (Veríssimo & Wan, 2018). Demand reduction campaigns use behaviour change techniques such as social marketing campaigns and price incentives (e.g. Chaves et al., 2018; Thomas-Walters et al., 2020).
5. *Awareness raising activity*: These activities typically provide information to local communities or urban consumers regarding the impacts of unsustainable wild meat hunting, the laws pertaining to wild meat use and different options for wild meat management. Awareness raising activities are often used to support other interventions (e.g. law enforcement, hunting management, demand reduction strategies or alternative livelihoods).

3 | RESULTS

As of July 2021, the wild meat intervention database contained details of 285 projects that had attempted to improve sustainability of

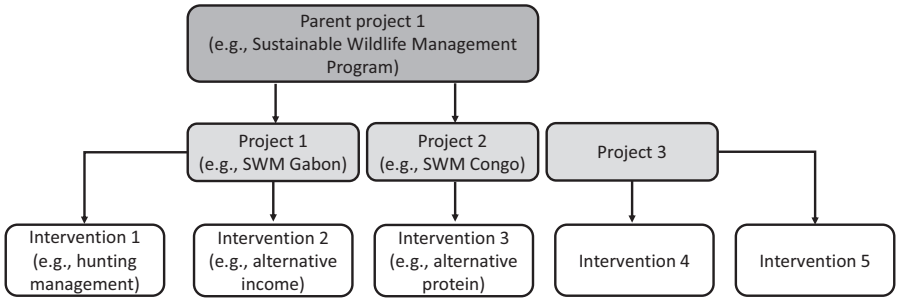

FIGURE 1 Structure of the WILDMEAT Interventions Database. An intervention is one component of a project that implements a certain activity (e.g. alternative livelihood, law enforcement, hunting management, demand reduction campaign or awareness raising activity). Projects can consist of multiple interventions at one location. Projects with multiple locations were split so each location is a separate project with an overarching parent project

hunting in Central African countries (272 since 2000), implemented by 225 organisations and funded by 116 donors. We were rarely able to access information on the total funds allocated to each project, thus we present information in terms of number of projects and interventions.

3.1 | Geographical distribution

Of the 10 Central African countries in the database, we identified the highest number of wild meat management projects in Cameroon (82), followed by the Democratic Republic of the Congo (69) and the Republic of the Congo (67; Figure 2). We found only four projects for Burundi and one for Chad.

3.2 | Most active donors and implementation organisations

Large international organisations featured most frequently as both donors and implementers, although many smaller scale local NGOs and independent researchers were also project implementers. Of the donors, the United States Fish and Wildlife Service (USFWS) was a donor for the highest number of identified projects (92 projects, approximately 32%), although we note that we did acquire project lists directly from the USFWS. This was followed by The Rufford Foundation through its Small Grant Programme (42) and the United States Agency for International Development (USAID), mostly through its Central Africa Regional Program for the Environment (CARPE; 24 projects; Figure 3a). International NGOs featured most frequently as implementation organisations, including the Wildlife Conservation Society (WCS; 54) and the World Wildlife Fund (WWF; 26 projects; Figure 3b).

3.3 | Types of wild meat interventions

Over half of the identified projects (148 projects) implemented alternative livelihood (alternative protein and income combined) interventions to reduce hunting and trade, including alternative protein and income sources, or a combination (Figure 4a). Projects employing awareness raising (136) and law enforcement (121) were the next most frequent types of intervention. Of the projects that used awareness raising activities, 47% did so as the only or primary intervention. The number of awareness-raising, law enforcement and alternative income interventions started since 2000 have all been invariably increasing until 2020 (Figure 4b). The number of demand reduction interventions was low overall (10 projects), especially until 2010, after which time the number of projects has increased at a faster rate, although there is a tail-off after 2017.

Within alternative livelihoods projects, terrestrial animal farming, including pig (Family: Suidae), snail (Order: Stylommatophora) and cane rat (*Thryonomys* sp.), was the most frequently used alternative income (52 when including 'income' and 'both' categories), closely followed by eco-tourism (43; Figure 5). Similarly, animal farming, including pig, poultry, goat and sheep farming, was the most common alternative protein alternative (62 when including 'protein' and 'both' categories). Demand reduction campaigns (for instance social marketing campaigns) were the least common intervention method (10).

4 | DISCUSSION

The large number of projects already identified and collated in the WILDMEAT Interventions Database suggests that donors and policymakers are aware of both the importance of sustainably managing wild meat use in Central Africa; this is an encouraging finding. Our results also demonstrate the large number and wide range of projects that have been employed to test wild meat management options to date. However, whether this effort is translating into

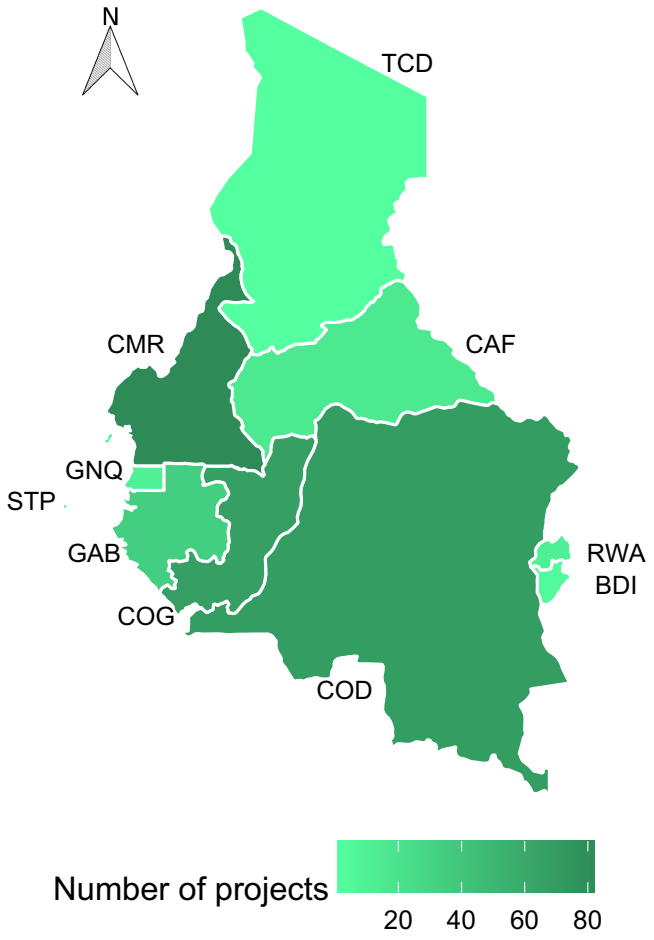

FIGURE 2 The number of wild meat intervention projects in each Central African country (including 14 projects starting from 1990 to 1999 and 272 since 2000): Burundi (BDI), Cameroon (CMR), Central African Republic (CAF), Chad (TCD), Democratic Republic of the Congo (COD), Equatorial Guinea (GNQ), Gabon (GAB), Republic of the Congo (COG), Rwanda (RWA) and São Tomé and Príncipe (STP). Country codes follow the internationally standardised ISO alpha-3 codes scheme

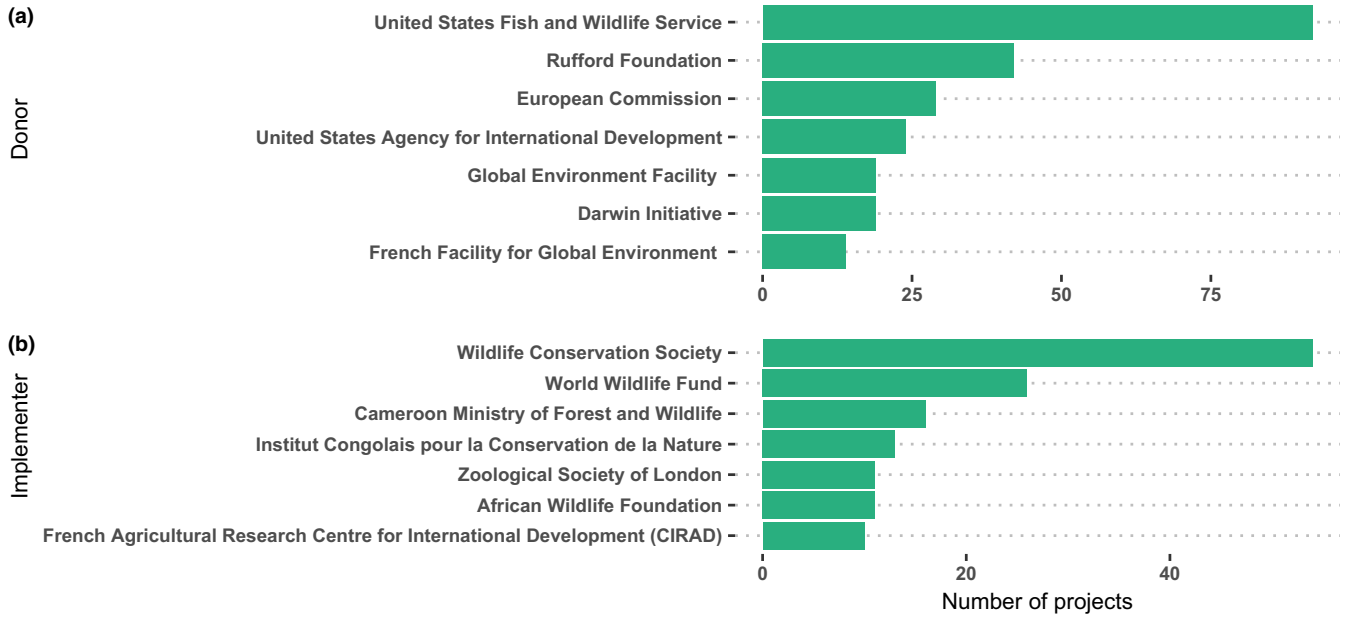

FIGURE 3 Donors (a) and implementing organisations (b) funding (or part-funding)/implementing more than 10 wild meat intervention projects

long-term improvements in management—in terms of more sustainable hunting and enhanced local livelihoods—is still largely unknown. Although large international NGOs implemented the most projects individually, they rarely provide systematic reviews of success (Wicander & Coad, 2018). Projects are also often small-scale (single site, short-term), and/or run by local NGOs or independent researchers (Wicander & Coad, 2018). While small-scale projects can have benefits—for instance, they can be tailored to the needs of a specific community—they often have small budgets and consequently are rarely able to monitor their impact beyond the project term (Wicander & Coad, 2018) nor widely disseminate their findings. Some examples of evaluated small projects were found in our review (e.g. Thomas-Walters et al., 2020); however, these projects are still very much in the minority. Identifying projects which have conducted monitoring and evaluation, and analysing the outcomes of these projects, is a future priority for the WILDMEAT project.

Our results show that between 2005 and 2020 there was a close to linear rate of utilisation of all intervention strategies except demand reduction campaigns, which became more popular from 2012 (Figure 4b). This broad stability in approach is possibly a result of the lack of lessons learned and the resulting default of donors and practitioners to 'business as usual' scenarios, which preclude innovation and change. World Bank Group (2016) showed that international investments to combat the illegal wildlife trade totalled over US$1.3 billion dollars between 2010 and 2016 and, after support to protected areas (45% of funds), the most funding was allocated to law enforcement activities (19%), followed by sustainable livelihoods (15%). In comparison, less than 5% of funding was allocated to demand reduction interventions (World Bank Group, 2016). Yet, one of the key emerging drivers of wildlife hunting for trade in Central Africa is the demand for wildlife from rapidly expanding urban populations, where wild meat is largely eaten as a preference (East et al., 2005; Wilkie et al., 2005) and a reduction in consumption—in most cases (but see van Vliet et al., 2015)—is unlikely to impact food security (Coad et al., 2019; Ingram et al., 2021). While only few projects implementing demand reduction campaigns were found by our review, the number of demand reduction interventions have been increasing since 2010 (at least until 2017), and several large-scale, multidonor projects in major cities in the Democratic Republic of the Congo and the Republic of the Congo, aimed at decreasing urban demand, are underway (e.g. Nyama Congo, www.cifor.org/yangambi/nyamacongo). With the percentage of the urban populations in sub-Saharan Africa predicted to grow from 41.1% in 2020 to 58.1% of the population by 2050 (UNPD, 2018), an increased focus on demand reduction in urban areas seems warranted.

Over half of the interventions database consists of 'alternative livelihood' projects (alternative income and/or protein combined). These projects aim to reduce the negative impacts of overexploitation in situ, while mitigating the reduced local incomes and food availability that might result from reduced hunting. It is, therefore, key that livelihood impacts are thoroughly considered in intervention design. However, few projects that implement alternative livelihood interventions measure their impacts on either reducing wild meat hunting/consumption/trade, or on wellbeing and the long-term viability of the alternative income/protein livelihoods they encouraged (Wicander & Coad, 2018). Therefore, much more information is needed on the efficacy of different alternative livelihood approaches (Wright, 2021; Wright et al., 2016).

Awareness raising was the most frequently used intervention (when alternative protein and income were not aggregated into 'livelihoods'), with nearly half of the projects implemented awareness

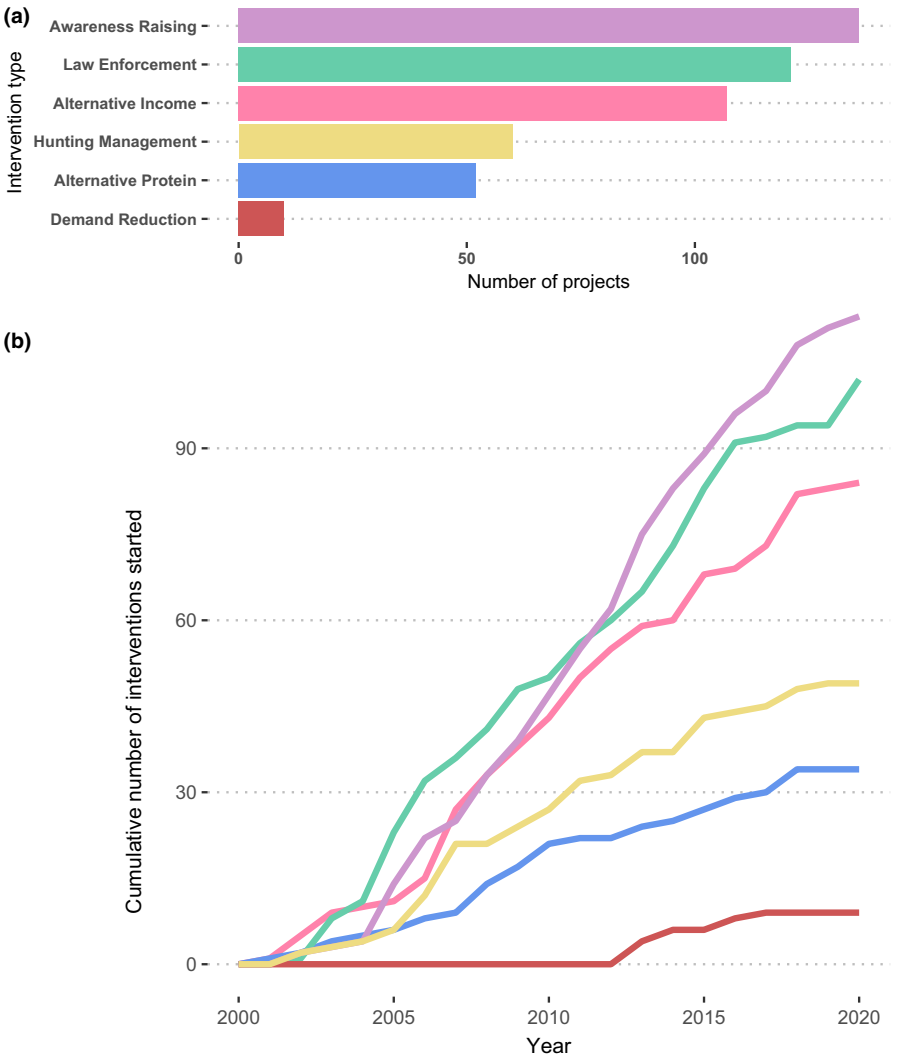

FIGURE 4 Total number of projects in the database that used each of the five intervention types (a), and the cumulative number of times each intervention type was started in a project from 2000 onwards for projects we had a start year for (b)

raising activities. Of the projects that employed awareness raising, nearly half used it as the only or primary intervention. The other half of projects used awareness raising activities to support other interventions, where it is likely to be more effective compared to awareness raising as a standalone activity, which may not enable participants to act on the newly acquired awareness.

Our results highlight a geographical bias in project countries, whereby the greatest proportion of projects have been concentrated in Cameroon, the Democratic Republic of the Congo, and the Republic of the Congo. This concentration may reflect the priorities of donor organisations, the presence of implementing organisations or the political situations within other countries that may hinder project implementation (e.g. civil conflict in Central African Republic). It is not yet clear whether management effort across countries is proportionate to the scale of wild meat use, however, it does seem to reflect the focus of wider academic literature on wild meat on areas of high forest cover (Ingram et al., 2021). Wild meat use is known to be common in other central African countries such as Equatorial Guinea and the Central African Republic (e.g. East et al., 2005; Fargeot et al., 2017), thus we recommend that the lack of active management projects in such countries warrants more attention.

Given our results, we recommend that organisations conducting interventions designed to reduce wild meat use (1) conduct monitoring and evaluation of their interventions to ascertain success levels, and (2) make their intervention designs (including Theory of Change), monitoring and evaluation framework, and results available so that others can learn from such experiences. The WILDMEAT Interventions Database, as part of the wider WILDMEAT project, aims to provide policy makers, practitioners, donors and other stakeholders with the best available evidence with which to design effective management interventions for sustainable and equitable wild meat use. The interventions database provides a starting point to collate our current knowledge of the use of different management approaches, and we envisage that it will also become a hub for information on the effectiveness of used interventions. Following this review, we will expand the project to collate more detailed information on project impacts and lessons learned. If wild meat use is expected to be successfully managed sustainably for wildlife and people in the future, experiences and lessons from past projects must be learnt.

FIGURE 5 The number of times that each product/activity category were used by alternative livelihood projects by livelihood type (alternative income, protein or both)

ACKNOWLEDGEMENTS

This paper is part of the WILDMEAT project. The WILDMEAT project is working to create an open-access evidence base for researchers and practitioners, such that efforts to sustainably manage wild meat harvests, trade and consumption in the tropics are based on the best available evidence (http://www.wildmeat.org/). This research was funded by the USFWS (grant number F17AP00421-001), the USAID and the UKRI TRADE Hub.

CONFLICT OF INTEREST

We would like to highlight that we received a database directly from USFWS, who, along with USAID and UKRI, also funded the research to create this paper. While this is a potential source of advantage in the number of USFWS-related projects we were able to review, we also carried out extensive research to include as many other relevant studies as possible and minimise this bias. The aim of the paper is not to compare success between projects or organisations, but to demonstrate the general need for improved and standardised project evaluations and to showcase how an open-access database might be of value to the sector.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon request. The WILDMEAT Interventions Database will continue to be updated and will also be available at http://www.wildmeat.org/.

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APPENDIX 1

List of major NGOs and donors used as sources to identify wild meat interventions

Category	Organisation name	Acronym
Donors	United States Fish and Wildlife Service	USFWS
	United States Agency for International Aid	USAID
	The Rufford Foundation	RF
	Global Environment Facility	GEF
	French Facility for Global Environment	FFEM
	Darwin Initiative	DI
NGOs	Wildlife Conservation Society	WCS
	World Wildlife Fund	WWF
	International Institute for Environment and Development	IIED
	Conservation International	CI
	Flora and Fauna International	FFI
	African Wildlife Foundation	AWF