The Economics of Early Response and Resilience: Lessons from Ethiopia

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Acronyms

ASALs	Arid and semi-arid lands
BCR	Benefit to Cost Ratio
CCA	Climate Change Adaptation
DFID	Department for International Development
DPP	Disaster Preparedness and Prevention
DRMFSS	Disaster Risk Management and Food Security Sector
DRR	Disaster Risk Reduction
ETB	Ethiopian Birr (local currency)
EWS	Early Warning Systems
FEWSNET	Famine Early Warning Systems Network
FTS	Financial Tracking Service
GDP	Gross Domestic Product
HEA	Household Economy Analysis
HERR	Humanitarian Emergency Response Review
HRF	Humanitarian Response Fund
IGAD	Intergovernmental Authority for Development
MT	Metric Tonne
O&M	Operations and Maintenance
PCDP	Pastoral Community Development Programme
PDNA	Post Disaster Needs Assessment
PSNP	Productive Safety Nets Programme
SPIF	Strategic Programme of Investment Framework
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WFP	World Food Programme
WHO	World Health Organization
WSDP	Water Sector Development Program

1 Introduction

The impacts of natural disasters and complex emergencies have been increasing over recent decades, putting the humanitarian system under considerable pressure. The costs of humanitarian crises are also growing – not only do disasters and complex emergencies result in significant economic losses, but they also require mobilization of large amounts of humanitarian aid from the international community.

It is widely held that, broadly speaking, investment in early response and/or building the resilience of communities to cope with risk in disaster prone regions is more cost-effective than the ever-mounting humanitarian response. Yet little solid data exists to support this claim, and there is a clear need for a greater evidence base to support reform.

The UK Government commissioned an independent study to contribute to filling these evidence gaps. This report presents the findings from the country study on Kenya, and sits within a suite of reports within the Economics of Early Response and Resilience (TEERR) Series (Table 1). More detail and data used to build the findings presented here can be found in the Ethiopia "Country Supporting Document".

1.1 Structure of this Report

This report analyzes available data for Ethiopia, along with data modelled using the Household Economy Approach (HEA), to compare the cost of three scenarios:

- Late humanitarian response;
- Early annual humanitarian response; and
- Investment in resilience.

The report is structured as follows:

- **Section 2** provides a very brief overview of the country context.
- **Section 3** assesses the comparative costs from a bottom-up perspective – using disaggregated project and sector level estimates to compare the cost of response.
- **Section 4** assesses the comparative costs from a top-down perspective – using aggregate level costs and losses for the country as a whole.
- **Section 5** draws conclusions from the findings.
- **Annex A** contains detailed calculations that support the analysis.

Table 1: Reports in the Economics of Early Response and Resilience (TEERR) Series

Report Title	Report Content
TEERR Synthesis of Findings:	Summarizes the key findings
TEERR Approach and Methodology:	This report includes the introduction to the study objectives, and the detailed methodology as well as limitations to the analysis.
TEERR Country Reports: • Ethiopia • Kenya • Bangladesh • Mozambique • Niger	The country reports contain a very brief introduction, description of the country/study context, the detailed findings from the analysis, and conclusions/recommendations. These draw together the data presented in the country supporting documents (see below) as well as the HEA report, to model outcomes.
TEERR HEA report:	Contains details of the HEA modelling, assumptions and parameters, as well as modelling output.
Country Supporting Documents	Each country is supported by a report that contains country level detail and data.

2 Disaster and Resilience in Ethiopia

2.1 Humanitarian Crises due to Drought

The Horn of Africa is dominated by arid and semi-arid lands (ASALs). These areas are characterized by low and irregular rainfall as well as periodic droughts. The droughts can vary in intensity, but the region is no stranger to devastating conditions brought on by weather, conflict, government neglect or a combination of each. Between 1900 and 2011, more than 18 famine periods were registered in the region's history.[1] In 1985 a highly destructive drought in the area killed nearly 1 million people and in the last decade major droughts have occurred in 2001, 2003, 2005/06, 2008/09 and 2011. The most recent crisis—the 2011 drought—still affects large segments of the population. Ethiopia is vulnerable to drought, with greater than a 40% annual probability of moderate to severe drought during the rainy season.[2] In Ethiopia, 70% of the country's land is categorized as drylands.

Table 1: Historical Comparison of Drought Events in Ethiopia

Major drought events	International Humanitarian Aid Received (US$)[3]	Number People Affected[4]
2011	823m	4.5m
2008	1,078m	6.4m
2005	545m	2.6m
2003	496m	12.6m

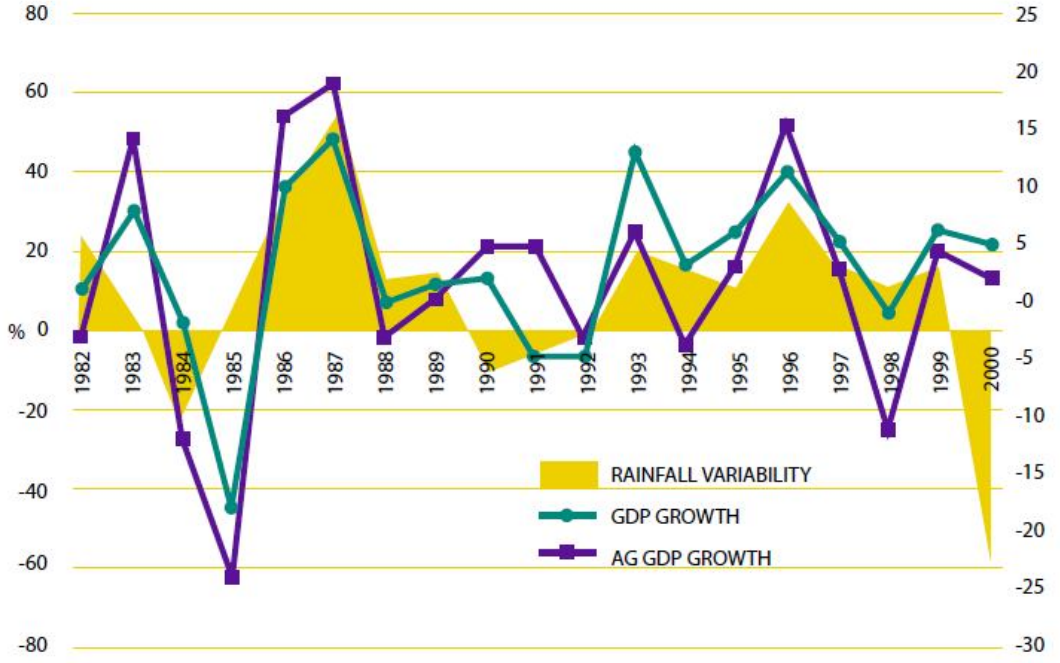
In Ethiopia droughts have a significant effect on the national economy. Oxfam estimates that drought alone costs the country $1.1 billion per year.[5] By comparison, in 2011 Ethiopia's GDP was $95 billion.[6]
Figure 1 below shows how Gross Domestic Product (GDP) growth tracks rainfall variability in Ethiopia.

In drought affected areas like the Horn of Africa, aid organizations have come to play a significant role in providing humanitarian response. Food aid comprises the majority of humanitarian aid. While food aid can save lives and fend off famine, it

[1] http://www.globalhumanitarianassistance.org/wp-content/uploads/2011/07/gha-food-security-horn-africa-july-20111.pdf l
[2] Horn of Africa Natural Probability and Risk Analysis, Bartel and Muller, June 2007.
[3] Financial Tracking Service of UNOCHA
[4] Based on the CRED database (http://www.emdat.be)
[5] Oxfam. (2011). "Briefing on the Horn of Africa Drought 2011: Disaster Risk Reduction – fundamental to saving lives and reducing poverty."
[6] CIA World Factbook, https://www.cia.gov/library/publications/the-world-factbook/geos/ke.html.

also arrives with its own set of problems, mainly because it almost always arrives late. During the 2006 drought, despite warnings that came as early as July 2005, substantial interventions did not start until February 2006. Additionally, during the recent 2011 drought, early warnings of poor rainfall were noted as early as May 2010. In February of 2011, the Famine Early Warning Systems Network (FEWSNET) issued a further warning that poor rains were forecasted for March to May. However, as
Figure 2 shows, humanitarian funding did not increase significantly until the UN declared a famine in July 2011. At this point, thousands had already suffered.

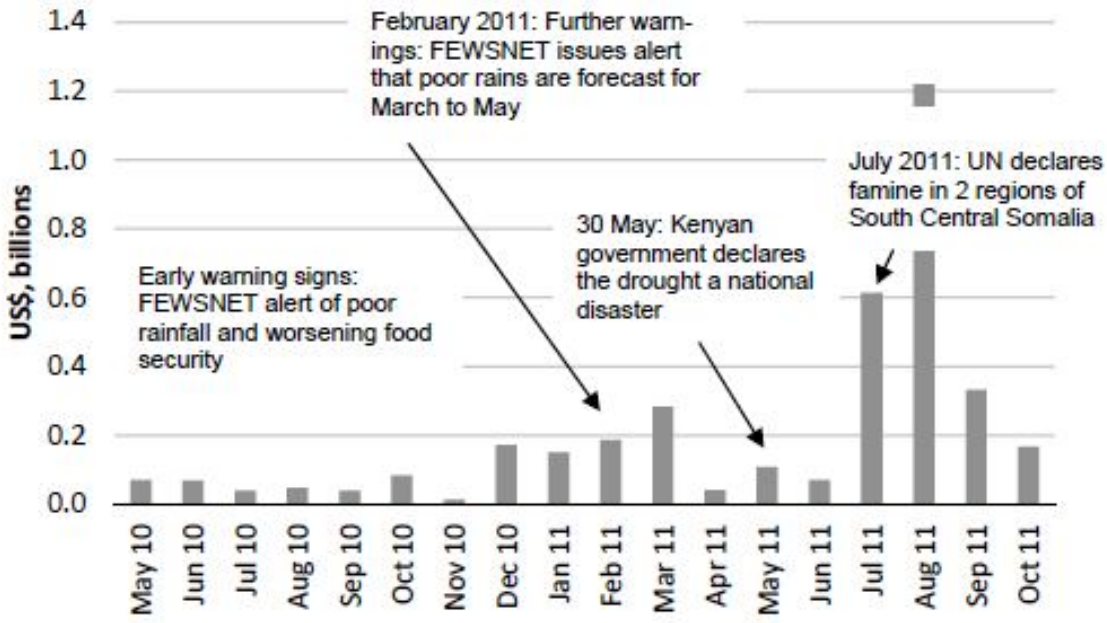
Figure 1: Economic Growth and Climate in Ethiopia[7]



When humanitarian aid is late, which occurs for a variety of reasons from lack of understanding of the on the ground situation to organizational and administrative delays, it not only directly affects lives but can also disrupt the market. By the time food aid is mobilized and distributed, an affected region may have already passed their time of need. With an influx of outside food sources, local market prices are then skewed. Even when food aid is still needed, the delayed distribution can create problems. For example, in Kenya during the 2011 drought, by the time food supplies were secured for the full caseload of affected people, the short rains had arrived and the saturated road network became impassable. Though humanitarian relief can and does help save lives, long-term initiatives should be implemented to help communities deal with a crisis in real time and to help prevent future crises.

[7] De Jong, the World Bank (2005) in World Bank (2010) "The Economics of Adaptation to Climate Change: Ethiopia". The World Bank Group, Washington, DC.

Figure 2: Humanitarian Funding for Ethiopia, Somalia and Kenya, 2010/2011[8]



2.2 Pastoralism

The drylands of the Greater Horn of Africa are inhabited by over 20 million pastoralists, whose livelihood is dependent on movement with livestock.[9] Pastoralism developed out of the need to constantly adapt to the extreme climatic uncertainty and marginal landscapes of the drylands, and has been practiced for centuries. Pastoralists have sophisticated methods to optimize water and land, moving and selling animals to deal with the effects of drought.

Yet, in recent years, the drylands of the Horn have become some of the most vulnerable areas in the world. This is due in part to decades of political and economic marginalisation, which has led to an erosion of the pastoral asset base. These structural forces disrupt migration routes and access to dry season grazing areas, severely curtailing pastoralists' abilities to move animals to different pasture, a key mechanism for coping with drought. This is particularly true for poorer pastoralists, with smaller herd sizes. Rather than address this marginalisation and reinforce adaptive capacities, there has instead been a focus on providing emergency assistance, which has often been either too late or inappropriate, and which has

[8] Save the Children, Oxfam (2012). " A Dangerous Delay: The cost of late response to early warning in the 2011 drought in the Horn of Africa". Data taken from OCHA Financial Tracking Service (FTS)

[9] "Disaster Risk Reduction in the Drylands of the Horn of Africa" (2011). REGLAP Newsletter.

further undermined sustainable development in these areas.[10]

Pastoralists in Ethiopia are mainly found in seven regions including Afar, Somali, SNNP, Oromia, Dire Dawa, Benshangul, Gumuz, and Gambella. The main livelihoods systems include pastoralism, farming and ex-pastoralism – those who have dropped out of pastoralism and now survive on petty income-earning activities.[11] Pastoralists constitute a minority in Ethiopia, with an estimated 12–15 million of Ethiopia's 77 million people.[12] Livestock in pastoral regions accounts for an estimated 40% or so of the country's total livestock population.[13] The Intergovernmental Authority for Development (IGAD) estimates that in 2008/09 the pastoral livestock population contributed 34.8 billion ETB (Ethiopian Birr) out of the total national livestock value of 86.5 billion ETB to the national economy. According to the Ministry of Agriculture, Ethiopia's total livestock population has reached more than 88 million—the largest in Africa—and the livestock sub-sector contributes an estimated 12% to the total GDP and over 45% to the agricultural GDP.

Pastoralism is adapted to dryland environments, and operates effectively as a livelihoods system in low and highly variable rainfall conditions. On the one hand, pastoralism as a system is growing in some ways, for instance as formal livestock export markets are expanded. However, large sub-populations within pastoral areas i.e. poorer households with few or no animals, are becoming increasingly vulnerable, for a variety of reasons, including:

- Declining sustainability as livestock holdings decrease for the poorer households, and the human population grows.
- Reduced rangelands due to overgrazing and tighter boundary controls and sale and enclosure of lands for a range of uses such as settled agricultural, reserves and conservancy. Wealthier pastoralists with larger herds control more land for commercialized pastoralism.
- Declining livestock and agricultural productivity due to low investment, poor husbandry practices and technologies (despite a growing livestock export trade).
- Environmental degradation and deterioration of natural resources to the point that production may decline below recovery levels.
- Loss of productive assets (livestock/farming/irrigated land) due to drought,

[10] Ibid; HPG Briefing note (2006). "Saving Lives through Livelihoods".

[11] Behnke et al (2007). "Piloting the Productive Safety Net Programme in Pastoral Areas of Ethiopia, Revised Programme Proprosal."

[12] PFE (2006). Inclusion of a 'Chapter on Pastoralism'. Ethiopia: Building on Progress: A Plan forAccelerated and Sustained Development to End Poverty (PASDEP). In Pantuliano, S. and M. Wekesa (2008). "Improving Drought Response in Pastoral Areas of Ethiopia". Overseas Development Institute.

[13] Pantuliano, S. and M. Wekesa (2008). Specifically pastoralists account for 20% of sheep, 25% of goats, 73% of cattle, and 100% of camel population in the country. Source: PFE, 2010

floods, disease and livestock theft, particularly for poorer households.

- Breakdown of traditional institutions and social relations as migration patterns change.
- Limited access to markets for selling animals.
- Low socio-economic empowerment of women and youth.
- Geographic isolation in terms of infrastructure, communications and basic services.
- Increasing impoverishment of some communities and more vulnerable households.[14]

In a drought, pastoral households sell animals in order to buy staple cereals. Because everyone is selling, and there are few buyers, prices fall substantially. If the animals have a buyer, this does not necessarily represent a loss to the overall economy, but their low value represents a loss of a key capital asset to the seller household. Further, many animals die from starvation. These pressures predominantly affect poorer households with smaller herd sizes, and can be a common reason for household descent into poverty.

2.3 Building Resilience for Pastoralists in the Face of Drought

For the purposes of this study, drought responses in Ethiopia (and much of the Horn) have been broadly categorised into the following:

1) **Late humanitarian/emergency relief –** Interventions that address the direct impacts of a crisis or disaster on the target population. Primarily these take place during the crisis itself although may continue after (often as a result of late response).
2) **Early / pre-planned responses** – Interventions undertaken to prepare for, mitigate or reduce the impact of the next anticipated/likely disaster. These may be on-going activities or those which intensify or scale up as a crisis is becoming evident. It assumes appropriate Early Warning systems (EWS) are in place and responded to. Many of these activities overlap with the late humanitarian activities, the key difference being the timing of implementation.
3) **Disaster resilience activities** – This category encompasses a broad range of activities, each should fundamentally increase a community's resilience to disasters. The outcomes produced by these interventions should contribute to reducing the impact of a drought so that external humanitarian relief is reduced, less regularly required or, ideally, eliminated. The interventions listed in the table overleaf are not exhaustive but indicative of the wide range of activities considered 'resilience' building by many (views clearly vary). It should be noted that many 'normal' development activities are included.

[14] Ibid.

Table 3 further expands on these categories by listing typical drought response interventions in various sectors. The list is not exhaustive, but merely illustrative, showing how relief interventions in one sector can become more 'resilient' as they move along the relief to development continuum.

Table 2: Categories of Support for Drought Response

Category	Humanitarian/Emergency Relief – when the disaster hits	Early response – anticipating the next disaster	Disaster resilience – Increased ability to withstand repeated disasters
Food / Cash Transfers	• Food aid in response to twice yearly long/short rains assessments and emergency 'flash' appeals. • Emergency ad hoc cash transfers (primarily by NGOs).	• Multi-year, planned food and/or cash transfers assessed using ongoing seasonal / EW assessments / information. Levels and targeting adjusted/upscaled as needs vary. • Food stores in place in all locations for pre-positioning stocks. • Mechanisms in place to purchase local food products for food aid, especially when surpluses available.	• Multi-year, planned food and/or cash transfers provided for most vulnerable. • Distribution systems privatised and local food commodities used whenever appropriate.
Effective Early Warning / Food Security Information Systems		• Timely, regular information analysed into reports for use by local and national stakeholders to trigger, upscale and downscale activities. • Communities and districts contribute to and receive EW/FSIS data and analysis monthly. Supported to implement drought contingency in plans.	• Timely, regular information analysed into reports for use by local and national stakeholders to plan and organise on-going development and emergency response. • Communities and districts active participation in EW/FSIS data collection and regular use. • Develop and implement local contingency / resilience building plans. On-going community development support.
WASH	• Water tankering, emergency borehole repairs, maintenance, fuel subsidies.	• Water user / management committees and local Water Authorities implement drought contingency plans with reserved funds.	• Implementation of Regional/District water strategies: expansion of water pans, boreholes, shallow wells, bikads etc. • Drip feed irrigation schemes where appropriate. • Ongoing training and capacity building support to District Water Offices/ Water user association.
Nutrition and Health	• Outreach therapeutic and supplementary feeding programmes (OTP/SFP). • Blanket supplementary	• MoH supported to scale up facility-based and outreach therapeutic and supplementary feeding programmes (OTP/SFP).	• MoH supported to scale up high impact nutrition and health interventions to all locations. • Trained and equipped community based health care workers able to provide basic preventative and curative health care to

Category	Humanitarian/Emergency Relief – when the disaster hits	Early response – anticipating the next disaster	Disaster resilience – Increa c
	feeding programmes (BSFPs). • Emergency vaccination campaigns, cholera response etc.	• Early blanket supplementary feeding programmes (BSFPs). • Pre-positioning of medical and nutrition supplies. • Timely vaccination campaigns, cholera response etc	remote communities. • Local health committees care. • Comprehensive coverage and nutrition services (inc and nutrition supplies.
Livestock	• Fodder distribution and water tankering, slaughter, de-stocking. • Emergency deworming and vaccination campaigns.	• Interventions as per Livestock Emergency Guidelines (LEGs). • Timely facilitation of commercial de-stocking, herd mobility and grazing agreements. • Timely deworming and vaccination campaigns with support of trained cadres of community health workers.	• A comprehensive livestoc including components to move out of the sector. • Ongoing facilitation of live information systems and • Fodder production and st • Communities facilitated t grazing agreements. • Support comprehensive c drug supply able to imple vaccination campaigns. • Livestock insurance schen
Education	• School feeding programmes • Water tankering to schools and emergency sanitation	• School feeding incorporated into single food / cash pipeline planning. • School / community water and sanitation clubs/ committees implement school drought contingency plans	• Ensure comprehensive ac traditional and alternative • Expand provision of boar and boys), teacher trainin colleges.
Infrastructure			• Road construction, electri networks, expanded finar

3 Cost Comparison of Drought Response - Ethiopia

3.1 Introduction

This analysis approaches the cost comparison from a bottom-up perspective – using disaggregated project and sector level estimates to compare the cost of response. The HEA and herd dynamics modelling estimates the food aid requirements and animal losses for a high magnitude drought in southern Ethiopia, assuming a drought in year 1, and calculating losses over 5 years. This analysis is done for three storylines:

- Storyline A, in which humanitarian aid arrives late;
- Storyline B1, in which early response uses commercial destocking of 50% of adult animals that would have otherwise died[15] ; and
- Storyline B2, in which destocking is combined with additional early response measures, such as supplementary feeding and veterinary services, which are assumed to improve animal condition and hence conception and production. These improvements have been modelled using improvements in rainfall as a proxy determinant for these herd parameter changes, equivalent to approximately 25% increase in annual rainfall compared to the short term mean rainfall amounts.

The destocking Storyline B1 results in similar levels of destocking on a household basis to levels actually seen in previous events, and hence there is confidence around these figures. Storyline B2 attempts to simulate improved animal condition, using improved rainfall characteristics to model the resulting change in production and consumption, and therefore provides an initial indication of potential benefits only.

Table 4 summarizes the findings for a high magnitude event, defined using the characteristics of the most recent drought (2011). These data are used throughout the analysis below. In the HEA modelling, early response brings some households out of a deficit, and hence the number of beneficiaries declines in each scenario.

[15] Note that the modelling accounts for adult and immature animal deaths, but only 50% of adults are destocked. This results in a similar level of destocking on a per capita basis to actual evidence, though it is clear that there is not the current capacity to do destocking at this level across either country.

Table 4: Summary of HEA Analysis for Southern Ethiopia (USD), high magnitude drought

Scenario	Number Beneficiaries Year One	Food Deficit MT Total (5 years)	a. Costs of Food and Non-Food Aid	b. Excess Animal Deaths	Total Losses (a+b)
A	2,848,854	441,149	465,963,631	1,148,356,061	1,614,319,692
B1	1,787,978	273,281	166,379,903	783,148,375	949,528,278
B2	600,132	122,106	74,341,006	135,069,454	209,410,460

It should be noted that the aim of the study is to test a methodology for evaluating the *economics* of building resilience, particularly as compared with humanitarian response. Economic analysis is only one facet of the analysis – social, moral, political and institutional factors all have a bearing on prioritization. As a result, ***this study is not trying to provide a list of interventions that should be prioritized for reducing the impact of crises – rather it is providing insight into the economics of various choices, to contribute to a much wider decision-making framework.*** Along similar lines, this study is not looking to evaluate what types of interventions deliver impact at scale – this is dependent on a whole host of factors that are outside the scope of this analysis. Rather, it is attempting to assess the level of impact that could occur if things are done differently, using specific measures as proxies.

3.2 Late Humanitarian Response

Estimating the cost of food and non-food aid:

The WFP estimates a cost of $845 per Metric Tonne (MT) of food aid in Ethiopia.[16], When this is multiplied by the household deficit, measured in MT of food required in the HEA model, this equates to a total cost of food aid per high magnitude drought for Southern Ethiopia of $373m.

The Kenya Post Disaster Needs Assessment (PDNA)[17] assessed the Kenya drought from 2008-2011 and found that food aid over the four years accounted for 60-80% of the total cost of response. It is assumed that a similar rule of thumb can be used

[16] The estimated cost of delivering food aid is based on figures from the WFP EMOPS costs for Kenya and Ethiopia, as presented in the 2011 DFID Nairobi paper "Value-for-Money in Humanitarian Aid for Kenya and Somalia." The cost includes purchase, landside transport, storage and handling, and hence is a good representation of the total cost of delivering food aid.

[17] Republic of Kenya (2012) "Kenya Post Disaster Needs Assessment (PDNA): 2008-2011 Drought". With technical support from the European Union, United Nations and World Bank.

for Ethiopia, and the cost of food aid can therefore be inflated to incorporate non-food aid requirements, to a total of $466m for a total beneficiary population of 2.8m. This figure is the total household deficit, measured in food aid, that results over five years as a result of a drought in year one – with the largest impact in year one but residual impacts in subsequent years due to continuing deficits. In order to simplify the analysis, the impacts are summed together and presented in the model in the first year. These costs are solely in relation to a drought in year one, and do not account for the fact that other events are likely to occur in the four subsequent years that could deepen this condition.

Using the HEA modelled figures, the per capita cost of food aid in year one alone is $104. For comparison, on a per capita basis, the World Food Programme (WFP) estimates that food aid costs approximately $77 per person per year in Ethiopia.[18] When this is scaled up to include the cost of non-food aid, this equates to a total cost of food and non-food aid of approximately $96 per person per year, in line with the HEA model predictions.

Estimating losses:

The herd dynamic model developed alongside the HEA model estimates the number of animals (camel, cattle, shoats) that would die under a high magnitude drought. These animals are valued using the livestock prices cited in Table 5.

Table 5: Estimated Value of Livestock

	Ethiopia[19]
Camel	$635
Cattle	$328
Shoat (sheep/goat)	$61

Livestock related losses are estimated at $1,148m for southern Ethiopia for a high magnitude drought. This is equivalent to $403 per capita over five years, or $81 per person per year – this is an average and clearly will differ significantly by household.

Total cost of late humanitarian response

The total cost of late humanitarian response is estimated at $1,614m in a high magnitude drought for a total population of 2.8m (equivalent to $466m in aid costs

[18] The estimated cost of delivering food aid is based on figures from the WFP EMOPS costs for Kenya and Ethiopia, as presented in the 2011 DFID Nairobi paper "Value-for-Money in Humanitarian Aid for Kenya and Somalia."

[19] Data is taken from the Ethiopian Livestock Market Information System, for February to May 2012. http://www.lmiset.net/Pages/Public/Home.aspx

plus $1,148m livestock losses). This is assumed to occur every five years in the model.

3.3 Early Humanitarian Response

Under HEA modelling, early response with commercial destocking of 50% of excess adult mortality reduces total costs and losses by 41%, from $1,614m to $950m. When the cost of destocking is incorporated, early response could save $662m for southern Ethiopia in one high magnitude drought event. This represents both the reduced need for food aid and a lower unit cost of food aid (representing a 35% decrease), as well as a reduction in animal losses (representing a 68% decrease).

The estimated cost of delivering food aid under Ethiopia's Productive Safety Nets Programme (PSNP) is used, with a value of $487 per MT of food aid (2010/11).[20] The cost of commercial destocking per household is approximately $4.50 per household (this assumes that commercial traders are introduced to engage in destocking, rather than NGOs or others buying the animals themselves).[21] The Feinstein International Center conducted a similar comparison, for a single event (see Box 1), and found that local food aid plus restocking cost 125 times more than commercial destocking (note that their model assumes no food aid required with commercial destocking, in contrast to the findings here which assume that deficits persist though at a lower level).

When destocking is combined with improved animal condition, the decrease is much more significant, with total costs and losses decreasing to $209m. When the costs of destocking, veterinary services and supplementary feeding are incorporated, this is equivalent to a saving of $1,303m in a single event.

When these figures are considered in a single high magnitude drought, the cost of introducing a destocking programme is $2.1m. Assuming an early response scenario that also results in lower food aid costs as described previously, the total benefit is

[20] DFID (2012). "Ethiopia's productive Safety Net Programme 2010-2014: A value for money assessment". This estimate also includes internal transport, storage and handling costs. Other estimates suggest that the cost of food aid provided early could be even lower; for example, see World Bank (2009), "Project Appraisal Document for a Productive Safety Net APL III Project" which cites a cost of $422 per MT (2009 data). A "Cost Benefit Analysis of Africa Risk Capacity Facility" found that the cost could be even lower, citing an example of food aid in Niger where early food aid was 1/3 the cost of late food aid.

[21] The cost of commercial destocking is estimated at $4.5 per person (including overheads and administrative costs), based on a Save the Children programme in Ethiopia. (Save the Children, 2008. " Cost Benefit Analysis of Drought Response Interventions in Pastoral Areas of Ethiopia, Draft Report). This figure is further confirmed by Catley A and Cullis A (2012) who estimate $4.5 per person as well based on a specific project budget.

$665m, for a population of 2.8m. This benefit is a result of both destocking as well as lower aid costs. When the costs of destocking are offset against these benefits, the benefit to cost ratio is 311 : 1. **In other words, for every $1 spent on commercial destocking and early response, $311 of benefit (avoided aid and animal losses) are gained.**

Box 1: Money to Burn? Comparing the Costs and Benefits of Drought Responses in Pastoralist Areas of Ethiopia[22]

A recently published paper from the Feinstein International Center compares the cost of two drought response scenarios. The "food aid plus restocking" scenario involved provision of food aid, substantial livestock herd depletion, followed by restocking. The "commercial destocking" scenario involved a timely commercial destocking program at the onset of drought, without the need for food aid or restocking. The scenarios were modelled for a household comprised of 6 people, with a herd size of 30 shoats. The cost of commercial destocking was estimated at $4.53 per household, the cost of local food aid plus restocking was $565 per household, and the cost of imported food aid plus restocking was $620 per household.

Local food aid plus restocking costs 125 times more than commercial destocking, and imported food aid plus restocking costs 137 times more than commercial destocking.

3.4 Resilience

As described in the methodology, the Kenya study estimates the cost per person of a full package of resilience measures for pastoralists, at $137 per capita per year, assumed to be incurred for 10 years, and this figure is also used for the Ethiopia analysis. **This figure is applied to the total population under the southern Ethiopia HEA modelling to arrive at a total cost of $390m per year.**

[22] Catley, A and A Cullis (2012). "Money to Burn? Comparing the Costs and Benefits of Drought Responses in Pastoralist Areas of Ethiopia." The Journal of Humanitarian Assistance, Feinstein International Center.

Box 2: Cost Comparison with the Pastoral Community Development Programme

The Pastoral Community Development Programme (PCDP) was a World Bank/Government of Ethiopia programme that ran from 2003 to 2008. The programme specifically aimed to sustainably improve the livelihoods of pastoralists living in the arid and semi-arid Ethiopian lowlands, by increasing, stabilizing and diversifying incomes, improving infrastructure, and increasing access to public services. *The intention here is not to suggest that the PCDP is a model for improving resilience – but rather to simply use the costs of the programme as an indication of what was considered a reasonable investment cost for pastoral development.*

The programme aimed to reach 450,000 households, at a total cost of $60m, equivalent to $130 per household, or approximately $22 per person. The parameters under the community investment fund were:

- Up to $600 per small community (defined as 100 people) was designated for micro-projects, or $6 per person;
- Up to $15k per larger community (defined as 500 households) was designated for micro-projects, or $5 per person; and
- Up to $75k was designated for inter-community subprojects for larger social infrastructure.

Clearly there is no clear rule for how many micro-projects would be required to build resilience. However, if we consider the aid costs alone incurred under late humanitarian response, estimated at $104 per capita, this money could have been spent on between 17 and 20 micro-projects per person, per year under the PCDP.

Along similar lines, the PCDP comprehensively targeted a range of community development interventions, at a cost of $22 per person. In other words, for every one person reached with humanitarian aid, 5 people could have been reached under the PCDP.[23]

3.5 Ethiopia - Cost Comparison of Response

Table 6 compares the costs associated with each of the storylines presented above, using HEA data for southern Ethiopia. Because the effects of resilience interventions do not all impact the population immediately, but rather take time to reduce vulnerability, the aid and losses from Storyline B2 are assumed to persist - with full costs occurring in Year 1 (in addition to resilience costs), 50% in year 5, and 25% thereafter (to reflect the fact that there are likely to always be segments of the population in need of aid).

[23] Clearly this does not suggest that the PCDP was implemented such that it achieved "resilience" for $22 per person – rather the aim is to compare the costs of resilience building programmes with humanitarian aid.

Table 6: Cost Comparison of Response for Storylines – Southern Ethiopia (USD Million)

	Storyline A	Storyline B1	Storyline B2	Storyline C	Storyline C – with benefits
Interventions	**Late Hum. Response**	**Destocking**	**Destocking + Improved animal condition**	**Resilience**	**Resilience – with benefits**
Aid required costs assumed every fifth year.	$466m	$166m	$74m	Residual risk: Full costs under B2 in year 0, decreased by 50% year 5, 25% carries on every event thereafter	Residual risk: Full costs under B2 in year 0, decreased by 50% year 5, 25% carries on every event thereafter
Losses (animal deaths) – losses assumed every fifth year.	$1,148m	$783m	$135m	Residual risk: Full costs under B2 in year 0, decreased by 50% year 5, 25% carries on every event thereafter	Residual risk: Full costs under B2 in year 0, decreased by 50% year 5, 25% carries on every event thereafter
Cost of programme		$2.1m	$102m	$390m ($137 per capita for beneficiary population)	$390m ($137 per capita for beneficiary population)
Additional Benefits		In addition to a reduction in aid costs and losses, the additional income from destocking can be used for other household needs		**EXTENSIVE:** Additional benefits from MDGs are extensive – increased income through education and ability to access services, reduced morbidity and mortality from health and food security interventions, etc.	Valued at a return of $1.1 for every $1 spent
Total Net Cost over 20 years	**$3,800m**	**$2,240m**	**$734m**	**$2,945m**	**($1,075m)**
Total Net Cost over 10 years, discounted at 10%	**$2,667m**	**$1,572m**	**$515m**	**$2,912m**	**$11m**

The modelling suggests that early response through commercial destocking in southern Ethiopia would save $1.6 billion in humanitarian aid and losses over a 20-year period, (this is for a population of approximately 2.8m)**.** Under a scenario where interventions are applied to improve animal condition, such as vet services, or supplementary feeding, **the difference could be as much as $3.1 billion.**

The cost of building resilience is nearly $1billion less than late humanitarian response (A). However, this analysis takes no account of the significant benefits that would arise from resilience interventions – the costs and benefits will depend very much on the different types of interventions that are used.

Sector specific cost benefit analysis is used below to show how the benefits, when quantified and incorporated into the analysis, significantly offset the costs of resilience. **If we assume that we only generate $1.1 of benefit, for every $1 spent on resilience measures, a very conservative assumption, the net cost over 20 years is converted to a net benefit of $1.1 billion,** presenting a very strong case for investing in resilience.

These factors are combined to model the "value for money" of investing in resilience. The costs of building resilience are offset against the benefits – the reduced aid cost and avoided losses of animals under Storyline B2[24], as well as a very conservative assumption around the additional benefits that would accrue from investments in resilience that deliver significant health, education and other gains. **When the costs of building resilience are offset against the benefits, the benefit to cost ratio is 2.8 : 1. In other words, for every $1 spent on resilience, $2.8 of benefits (avoided aid and animal losses, development benefits) are gained.** When this is modelled over a 10-year time frame – in other words, within the context of two high magnitude droughts - every $1 spent on resilience generates $2 in avoided losses.

3.6 Ethiopia - Sector-based Cost Benefit Analysis

In order to investigate costs and benefits a bit further, this section presents both the costs and benefits for various interventions that could contribute to building resilience. Two sectors are considered – livestock and water.

It should be noted that this does not imply that these interventions will always contribute to building resilience – it is essential that they are implemented in a participatory way, with dedicated resources for maintenance over the longer term to ensure that these measures

[24] It is likely that these avoided losses would be greater if communities are more resilient, but they represent a good proxy value.

are implemented well. There are many examples of these types of interventions that do not deliver any benefits because of the way in which they are implemented.

Livestock Interventions

Over the longer term, resilience can be built by ensuring that pastoralists have access to functioning livestock markets, veterinary care, and adequate feed and water. For the Ethiopia analysis, the range of measures included in Scenario B2 are considered for longer term resilience of livestock – e.g. access to commercial destocking (in other words, in its fullest sense, functioning livestock markets), veterinary care, and access to feed. These are valued using data gathered in the Ethiopia report, and are described in greater detail in Annex A.

The benefits of such a package of measures, under the assumption that they are implemented well and ensuring that the livestock trade is working well, would include avoided costs of aid and animal losses. There would also be numerous unquantifiable benefits, for instance increased sense of security and confidence on the part of pastoralists, as a result of greater control over how they manage their herd.

If not implemented well, some of these measures can result in greater conflict, for example if markets are inappropriately cited, they can result in new tribal interactions. Equally, there are numerous examples of livestock market infrastructure being installed without the appropriate management systems or commercial buyers in place and hence a waste of money.

Table 7: Benefits and Costs of Livestock Resilience Measures - Ethiopia

	Package of Livestock Resilience Measures
Assumed population (HEA beneficiaries)	2.8million
Cost for total population	$102m per year; decreasing by half after 10 years.
Benefits	87% of aid and excess mortality losses in a high magnitude drought are avoided in line with Storyline B2
Benefit to Cost Ratio (BCR) (20 years, 10% discount)	**3.8 : 1**

A full package of livestock interventions that build resilience would result in at least $3.8 of benefit for every $1 spent. This analysis only considers benefits that accrue in a high magnitude event, whereas clearly access to functioning livestock markets and effective animal health can reap significant benefits in non-drought times as well.

Water

A key requirement for communities in the face of drought is access to water. Humanitarian response largely involves the use of trucks to deliver water to communities, a very expensive (but necessary) measure.

Community based water schemes can be considered as both an early response and/or resilience building measure. As with all of these measures, how and where they are implemented has a massive effect on whether they deliver benefits, and there is a great deal of discussion around permanent water posts both building and eroding resilience.

However, assuming that these schemes are implemented appropriately, there is the potential for significant gains. Two types of intervention are compared – underground water cisterns (a commonly used measure in drought-affected areas), and a full package of water investment costs as costed in the Water Sector Development Program (WSDP), of the Ministry of Water. Clearly, there are numerous other water measures that may be appropriate, as described in the Kenya analysis. These were selected because cost data was available for the analysis.

In the case of the underground cistern, the model assumes a 10% recurring Operations & Maintenance (O&M) costs. A further 50% of capital cost is allocated in year 10 to account for overhaul/upgrade.

The additional benefits of access to clean water are numerous, and include decreased incidence of water borne illness, reduced time collecting water, and increased attendance at school. The analysis values reduced time collecting water, using the assumption that rural households typically travel over an hour to water sources, and international standards for water access to be within half an hour walking distance. The time spent collecting water is high in drought periods, when pastoralists often have to travel for a full day to get water on a regular basis, decreasing in normal times.

Further to this, the World Heath Organization (WHO) published a global study on the costs and benefits of access to water and sanitation. The study estimates the benefits for access to clean water for East Africa, and includes a range of benefits, including time savings, increased productive days, avoided health costs, and avoided morbidity and mortality. The benefits for time savings are excluded, given that these are calculated separately for this study, and the remainder used as a proxy for the additional benefits.

Benefits will also include the reduced cost of food and non-food aid, as well as the reduced loss of animals. It is not known how much clean water can contribute to this reduction. Therefore, as a very conservative proxy, the avoided cost of water tankering as one part of

the aid package (estimated at $2 per person[25]) is included in the model. The Ethiopia report that accompanies this report uses a more complex modelling of water deficits based on the HEA modelling, and estimates a cost of $7 per person if everyone was provided with minimum water requirements – indicating that the avoided cost could be higher. (See Annex A for full details.)

Table 8: Benefits and Costs of Water Interventions

	Underground Cistern/Tank	WSDP
Assumed population (HEA beneficiaries)	2.8m	2.8m
Cost for total population, installation and O&M (discounted over 20 years)	$24m	$119m
Benefits, including avoided cost of water aid, time savings and other benefits (discounted over 20 years)	$659m	$659m
BCR	**27 : 1**	**5.5 : 1**

Both water interventions yield positive benefit to cost ratios, suggesting that they are value for money. **The underground cisterns yield an estimated $27 of benefit for every $1 dollar spent.** The more comprehensive water management plan yields a benefit of $5.5 for every $1 spent. While the underground cistern yields the highest ratio, it is likely that a variety of measures will be required. Furthermore, benefits will be maximized when measures are implemented in a participatory manner, with full community buy-in, and sufficient budget and resources to ensure that capacity and O&M issues are addressed.

[25] ILRI (2010), "An Assessment of the Response to the 2008-2009 Drought in Kenya: A report to the European Union Delegation to the Republic of Kenya." ILRI, Nairobi.

4 Top-Down Assessment

The top down assessment uses national level estimates on humanitarian costs, and efforts to build resilience, to make an assessment from an aggregate level.

4.1 Late Humanitarian Response

As described in the methodology, the cost of late humanitarian response was estimated using three components:

- The cost of food aid;
- The cost of non-food aid; and
- Estimated losses.

Estimating the cost of food and non-food aid

There are a number of estimates for humanitarian aid in Ethiopia. These are described in greater detail in the Ethiopia report, and are summarized here:

- The Humanitarian Response Fund (HRF) for Ethiopia was established in March 2006 to harmonize and improve coordination of humanitarian and emergency funding. According to HRF, during the last six years, the cost of drought related humanitarian response was on average $351.7 million per year, which was allocated only from the HRF (this figure excludes funding for refugee operations).
  However, these figures obtained from UNOCHA[26] on HRF utilisation do not include emergency response interventions supported by other donors such as USAID/ OFDA. According to a USAID report on funding to the region, they have supplied an additional $3.8 billion during the last 10 years (an average of more than $380 million per year).[27] Since this funding was used mainly for drought related emergencies, it increases Ethiopia's average annual drought emergency cost to more than **$732.6 million** per year.
- According to the Financial Tracking Service (FTS) at OCHA, emergency aid for droughts has averaged **$509m per year** over the last 10 years (excluding the cost of refugee operations for the major camps on the border with Somalia). This figure was used in the modelling, because the FTS is widely used for recording humanitarian aid and therefore considered to be comprehensive.

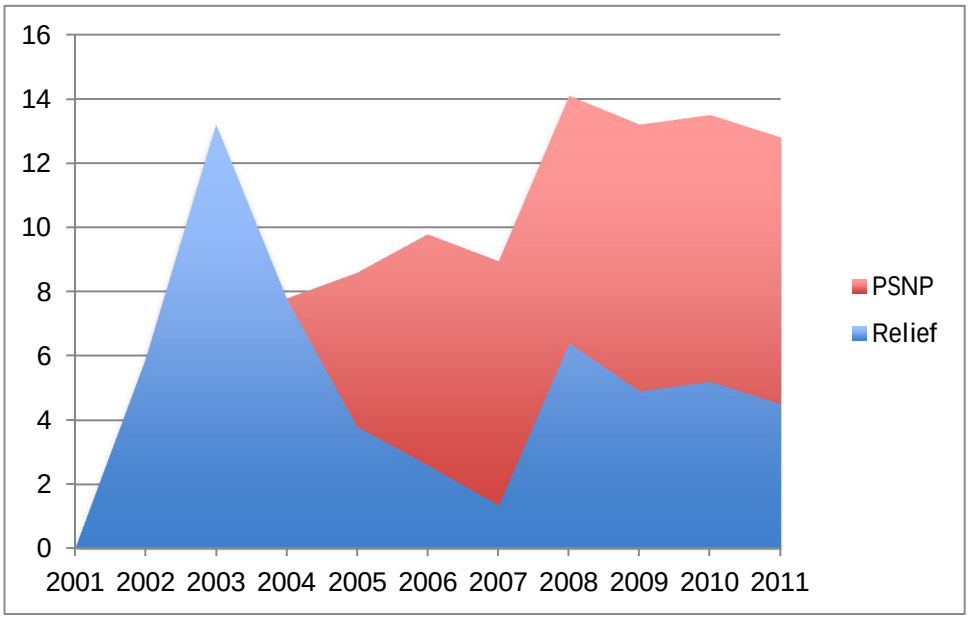
It is also important to note that relief spending has changed over the last decade in Ethiopia due to the Productive Safety Nets Programme (PSNP). Figure 3 shows how relief figures

[26] United Nations Office for the Coordination of Humanitarian Affairs
[27] USAID (n.d.) "The Productive Safety Net Programme" USAID

alone may mask the total need as PSNP transfers appear to have begun to displace relief spending.

Figure 3: Beneficiary numbers – PSNP versus relief

The Y-Axis indicates the caseload of beneficiary numbers in millions



Source: Sida, L, B Gray, and E Asmare (2012). "IASC Real Time Evaluation of the Humanitarian Response to the Horn of Africa Drought Crisis: Ethiopia."

Estimating Losses

In the case of Ethiopia, there is not an equivalent report to the PDNA for Kenya, which estimated losses from drought quite extensively, including needs, damages and reconstruction costs. The Ethiopia modelling therefore relies more heavily on a quantification of lost animals, using the HEA modelling. As a result, these figures are quite a bit lower than those presented in the Kenya study.

The HEA modelling estimates that in southern Ethiopia (Oromiya and Somali regions), under late humanitarian response, the value of animals lost over 5 years is $1,148 million, or an average of $230m per year. This figure is only for one part of the country, and therefore is an underestimate, but would bring the total yearly cost of drought to $739m (using the FTS figure of $509m).

Table 9: Summary Table of Cost of Humanitarian Aid and Losses

	Amount (USD, millions)
Humanitarian Aid – yearly average	$509m
Losses – yearly average	$230m
Total Yearly Average	$739m

Total cost of late humanitarian response

The combined impact of the average cost of humanitarian aid year on year, with estimated livestock losses, **results in a total economic cost of humanitarian response of $7.3 billion, discounted over 20 years.**

These figures are an underestimate for the following reasons:

- It is believed that these types of events are increasing, and may be occurring as often as every 3 years.
- This estimate does not include the loss of life, health costs and loss of education, all of which represent a substantial economic loss.
- While loss of livestock is included for high magnitude events every five years, they are only estimated for the regions included in the HEA modelling. Furthermore, these losses also occur in medium and smaller magnitude droughts, but the data was not available to quantify this.
- Further to this, the livestock loss figures presented here are significantly less than those modelled under the PDNA in Kenya, which was able to account for more categories of loss (such as economic flows from livestock loss). This suggests that this more simple analysis may be underestimating the full economic cost.
- The PSNP is displacing some of the aid costs, providing essential needs earlier in the lifecyle of a drought, but these costs are not included here.

4.2 Early Humanitarian Response

The scenario of early response assumes that if aid is delivered on time, as a crisis is becoming evident, that deficit levels are lower and therefore the magnitude of response required is less, and the unit cost of providing that aid is less due to reduced procurement, delivery and distribution costs. It also assumes that early response measures such as commercial destocking, and measures that improve animal condition (such as early supplementary feeding, and veterinary services) can reduce mortality of animals, and increase conception and milk production.

HEA modelling for southern Ethiopia estimates that early response through commercial destocking alone can reduce the cost of food aid by 64% and the value of animal losses by 32%, as a result of household deficits decreasing through additional income from destocking. (These figures are conservative, and are higher if other interventions that improve the condition of the animals are included – see the bottom-up analysis for greater detail). It is also estimated that it costs approximately $0.75 per person for commercial destocking (see bottom up analysis for greater detail). When this percentage reduction is applied to the total estimated cost of late humanitarian response, this would equate to $339m per year. **Discounted over 20 years, this would equate to a total cost of $3.3 billion.**

Similarly, when we apply the reductions in aid and losses that can occur under Storyline B2 in the HEA modelling (food aid by 84% and animal losses by 88%), and incorporate the cost of a package of destocking and measures to improve animal condition, **the total cost discounted over 20 years is $1.4 billion.**

4.3 Resilience

A variety of national level plans that aim to build resilience to drought are present in Ethiopia, and these are used as a proxy value for estimated costs for resilience.

- The Disaster Risk Management and Food Security Sector (DRMFSS) of the Government of Ethiopia was established to coordinate and lead on the implementation of the disaster risk management approach of the Government. The DRMFSS recently developed a Strategic Programme of Investment Framework (SPIF) that guides identification of priority interventions and estimates investment cost of disaster mitigation (or resilience building). Table 10 details the various costs included in the SPIF; approximately $324m over five years is allocated to resilience-based components. The money allocated for five years of response could fund approximately 15 years of resilience building measures.
- The Government also has an Agriculture Sector Policy and Investment Framework. In this framework, the Ministry of Agriculture committed, on average, $350m per annum for disaster risk management, which constitutes more than 58% of agriculture sector investment. This is a much higher estimate than the SPIF.

Table 10: SPIF Breakdown of Costs (USD)

Programme Component	Total Budget (2010-2015)	% of Total
Prevention (disaster risk profiling, information mgmt support, DRM research)	10,422,655	1%
Prevention and mitigation (CBDRM, mainstreaming, disaster programmes)	312,922,500	27%
Preparedness (rapid assessment)	1,845,500	<1%
Response (food and non food emergency response)	807,589,799	71%
Recovery and rehabilitation	10,302,058	1%
Institutional strengthening	1,076,804	<1%
Grand Total	**1,144,159,316**	

For this analysis, the figure of $350m per year is used as this is more in line with the Kenya estimates. It is also the higher estimate, and better to err on the side of over-budgeting for resilience than under-budgeting. It further assumes that residual risk will occur, e.g. ongoing

aid and losses that would occur under Storyline B2. These are assumed to be 100% of aid and losses under early response in the first five years, 50% in the second five years and 25% thereafter (i.e. in each drought event). This would result in a total discounted cost over 20 years of **$4.0 billion.** Clearly, this estimate does not account for the myriad of benefits that would occur from building resilience - benefits such as health and education occur year round and can be substantial (these are brought in with greater detail in the bottom-up analysis below).

4.4 Ethiopia - Comparison of National Level Costs

Table 11: Summary of National Level Cost Estimates over 20 years - Ethiopia

	Humanitarian	Early Response (B1)	Early Response (B2)	Resilience	Resilience with Benefits
USD billion	$7,254m	$3,331m	$1,426m	$3,956m	$350m

These findings suggest that late humanitarian response costs $3.3 billion more than resilience building activities over 20 years. Using a very conservative estimate, assuming a return of $1.1 for every dollar spent on resilience, which is assumed to persist for the full 20 years of the model, **the resilience scenario reduces costs even further, adding an additional $3.6b in savings.**

These factors are combined to model the "value for money" of investing in resilience. The costs of building resilience are offset against the benefits – the reduced aid cost, as well as a very conservative assumption around the additional benefits that would accrue from investments in resilience that deliver significant health, education and other gains. **When the costs of building resilience are offset against the benefits, the benefit to cost ratio is 3.1 : 1. In other words, for every $1 spent on resilience, $3.1 of benefits are gained.**

When this analysis is conducted on a 10-year timeframe, the outcome is similar. However, as detailed in the bottom up analysis, the cost of resilience is reversed when the benefits of building resilience are incorporated.

Table 12: Summary of National Level Cost Estimates over 10 years (discounted) - Ethiopia

	Humanitarian	Early Response (B1)	Early Response (B2)	Resilience	Resilience with Benefits
USD billion	$5,091m	$2,338m	$1,008m	$2,964m	$362m

Box 3 presents a costed plan for the Dhas District Disaster Management Contingency Plan. The plan breaks out costs according to stages – normal, alert, emergency and recovery. The emergency and recovery response is estimated to cost a total of $3.2m. This is compared with an estimated $183,000 for alert stage interventions, and $137,000 for resilience building measures. While there is no indication of whether these activities are comprehensive for the full range of resilience building activities that would be necessary, the magnitude of difference is substantial. The total investment required for emergency response and recovery could fund investment in resilience at the levels specified for 24 years consecutively.

Box 3: The Dhas District Disaster Management Contingency Plan, Ethiopia

The Dhas district disaster management contingency plan was prepared in 2008 by the Dhas District Disaster Management Committee, Borana Zone, facilitated by Care International. Community level assessment was the main input.

Hazard assessment and risk analysis were used to categorize impacts of hazards based on historic data. Three categories were defined – catastrophic, major and moderate – and impact levels were defined for each. Types of interventions required were identified for the four stages of response – normal, alert, emergency and recovery. Populations requiring assistance were identified for each set of interventions, and costs specified.

Stage	Resource Requirement (USD)
Normal – activities targeted at "building livelihood resiliency" including rangeland resource management, water resource development, market accessibility, enhancing capacity of community level organizations, alternative livelihoods, etc.	$140,038
Alert – early destocking, livestock vaccination, enclosure management, peacebuilding activities, etc.	$186,566
Emergency – food and non-food aid, emergency animal offtake, monitoring	$2,883,659
Recovery – rehabilitation of rangeland, restocking, resettlement, livestock vaccinations, disease surveillance, etc	$396,065
Grand Total	**$3,606,327**

5 Conclusions and Recommendations

5.1 Conclusions

The evidence above clearly points to three conclusions:

Early response is far more cost effective than late humanitarian response. The assumptions used in this analysis were conservative, and the findings nonetheless indicate that early response can decrease costs and losses substantially, with very high benefit to cost ratios indicating tremendous potential to improve value for money. In southern Ethiopia, with a beneficiary population of 2.8m, household level data suggest that early response could save between $662m and $1.3billion in a single event. A perceived risk in responding early is that humanitarian funds will be released incorrectly to situations that turn out not to be a disaster. However, these figures suggest that donors could mistakenly release funds six times in Ethiopia, before the cost is even equivalent to the cost of humanitarian aid in one event.

There is a great deal of uncertainty around the cost of building resilience. Nonetheless, the estimates presented here suggest that, while the cost of resilience is comparatively high, the wider benefits of building resilience can significantly outweigh the costs, leading to the conclusion that investment in resilience is the best value for money. The model accounts for the time lag in resilience benefits reducing humanitarian cost, and therefore is a reasonable estimate of how the shift in balance from humanitarian aid to resilience might look over time. The cost of resilience would have to approach $200 per capita per year for 10 years (almost 50% higher than the figure assumed in this paper) before the modelled costs of resilience begin to approach the cost of humanitarian response.

Early response and resilience building measures should be the overwhelming priority response. These two categories of response are not mutually exclusive – indeed commercial destocking, if taken to its fullest extent, would represent a functioning livestock marketing system, which would be considered a resilience building measure. The findings in this study fully support an economic imperative for a shift to greater early response and resilience building.

There are also a number of important conclusions that can be drawn from the HEA modelling:

Drought recovery takes longer (or may be impossible) when a community is not resilient. The HEA modelling shows that the impact of a drought is not only felt in the drought year but for several years after. In fact, deficits persist beyond the drought year throughout the

entire 5-year scenario period at levels higher than reference year levels, for both Storylines A and B1. Herd recovery also takes time – at least 5 to 6 subsequent consecutive years of average rainfall levels – an infrequent occurrence in Ethiopia or Kenya.

Destocking interventions alone are often not sufficient to meet deficit levels faced by in-need households. One of the main reasons for this is that destocking primarily benefits middle and better off households, who have more animals that could be destocked and sold that would otherwise die. Poor households have very few animals to begin with, and can usually only destock one or two animals at most – which is usually not sufficient to meet the significant deficits faced mostly by those very households.

Other intervention types, such as supplementary feeding interventions, are required to have an impact on animal mortality, conceptions, abortions, births, and milk production rates. It is only these interventions that affect herd dynamics that will limit herd mortality rates and buoy birth rates, which will in turn speed recovery periods so that deficits in subsequent years are lower and resilience is higher.

These conclusions are mainly intuitive – most people can reason that resilience and early response are likely to be more cost effective strategies than repeated humanitarian aid and erosion of assets. So then why does response come late? A variety of issues were mentioned in the literature and consultations:

- Institutional inertia and rigidity – systems are set up for humanitarian response.
- Procurement procedures in agencies are not responsive and flexible enough.
- Poor coordination amongst NGOs – many are trying to do the same thing and lack of coordination results in late response.
- Lack of evidence of disaster – donors don't want to fund early and end up funding a non-disaster.
- Political will – it is more visible to fund a disaster, where results can be clearly demonstrated, as compared with funding resilience, where the result is that the disaster did not happen.

Table 13 shows just how little is spent on disaster preparedness and prevention (DPP).

Table 13: Donor Spend on DPP and DRR (USD)

	Average annual donor spend on DPP	Average donor spend on DPP as a percentage of humanitarian aid	Average annual donor DPP spend per beneficiary of the current drought	Donor spend on DRR as a percentage of total ODA
Ethiopia	3.3m	0.59%	69 cents	0.9%

Source: Oxfam (2011), "Briefing on the Horn of Africa Drought 2011". Donor spend figures adapted from Global Humanitarian Assistance Report 2011.

5.2 Recommendations

"The separation of relief and development is both artificial and unhelpful. Not only are the recipients the same, but also the underlying causes that create the need are the same—the vulnerability of dryland communities. But what often takes place, are emergency interventions that undermine development (for example some food aid and water trucking interventions), and long term programming and investments that do not pay sufficient attention to the inevitability of drought."[28]

Funding models must be changed to integrate relief and development in a coherent cycle. The findings of this analysis fully support the HERR recommendation to change funding models by increasing predictable multi-year funding. Humanitarian funding is often restricted to a very short time frame, and has a clearly delineated humanitarian mandate. Development financing is longer term but does not have the flexibility to be re-allocated in times of crisis. Too often, NGOs lament that they could do much more with $1m over three years for a consistent and reliable water and sanitation programme, as compared with $25m that has to be spent in six months for humanitarian aid (for example). USAID has pioneered a crisis modifier in Ethiopia, in which development funding can be shifted into a humanitarian mode when needed – this was seen as a very successful innovation. These types of mechanisms need to be more widespread. Along similar lines, funding should be allocated under an umbrella mechanism that covers all four stages of drought cycle management – mitigation, preparedness, relief and reconstruction.

In the short term, a more cost effective approach would be to prioritize early response measures. Even if there is hesitation over whether a high magnitude drought will occur, the cost difference is such that it will still be much more cost effective to invest in measures such as commercial destocking, and measures to improve animal condition. Further, these

[28] REGLAP MAGAZINE, Disaster Risk Reduction in the Drylands of the Horn of Africa: Good practice examples from the ECHO DCM partners and Beyond, Edition Two, December 2011

services as an early response measure also help to build resilience in the longer term. Ways to take these types of interventions to scale should be investigated.

Spending on resilience needs to increase significantly, both in the short and the long term. Current efforts to build resilience for pastoralists have remained largely at a pilot/demonstration level. Donors and governments need to shift far greater portions of funding into resilience, and in the short term this will also require continued funding to humanitarian aid as asset depletion is reversed. The gap in general development spending by governments and donors between the most drought affected areas and other higher potential parts of the countries requires further examination. Findings can be used to advocate for higher long term revenue and capital allocations to these areas.

Adequate resources and capacity must be committed to building resilience. Short-term interventions, with no provision for long-term operations and maintenance, are unsustainable. Value for money can be justified for many resilience interventions, but these can quickly become a waste of money if they are not part of a longer-term plan of support and founded on participatory approaches.

5.3 Areas for further work

- Investigate innovative funding mechanisms that integrate development and relief, such as the crisis modifier introduced by USAID in Ethiopia.

- It would be useful to replicate and build on this work in another region experiencing drought, to test the methodology, particularly given that HEA data is not available in many areas and therefore a different approach may be required.

- Undertake a similar analysis within the context of a complex emergency (e.g. natural hazard and conflict), as well as rapid onset disaster. These are likely to bring up a very different set of issues to slow onset drought.

- Develop a more systematic approach to determining the relative costs and benefits of resilience measures, using both qualitative and quantitative data, so that measures can be prioritized.

- Conduct further research into the potential reductions in aid that can occur as a result of building resilience. This analysis assumed a stage reduction, with full aid and losses occurring in year 0, 50% in year 5, and 25% thereafter, but this was purely based on expert opinion and the evidence base on this is very thin.

- Expand the HEA and herd dynamic modelling to look at impacts by wealth group. This could be very informative, both in terms of targeting of the PSNP/HSNP, as well as showing the differential impacts by group.

ANNEX A: Detailed Calculations

This annex provides greater detail on the calculations included in the main report, both for the main model, as well as sensitivity analyses as follows:

- The discount rate is reduced from 10% to 5%;
- The percentage of need averted by resilience measures is reduced to 75% in the first year/drought, 25% in year 5, and 10% each year thereafter (from 100%/50%/25%/25%); and
- The potential benefits that can arise as a result of investing in resilience, outside of reduced aid and losses, is increased from a ratio of 1.1:1 to 2:1.

The first set of tables contains summary outcomes of the main model, and each of the sensitivity analyses. This is followed by snapshots of the modeling results for the main model.

Table A1: Ethiopia, Bottom-Up Assessment, 20 years

Analysis	Late Humanitarian Response	Early Response – B1	Early Response - B2	Resilience
Main findings	**$3,800m**	**$2,240m**	**$734m**	**$2**
Discount rate – 5%	**$4,934m**	**$2,909m**	**$953m**	**$3**
Percentage of need averted – 75%/25%/10%/10%	**$3,800m**	**$2,240m**	**$734m**	**$2**
Potential additional benefits - 2:1	**$3,800m**	**$2,240m**	**$734m**	**$2**

Table A2: Ethiopia, Top-Down Assessment, 20 years

Analysis	Late Humanitarian Response	Early Response – B1	Early Response – B2	Resilience
Main findings	**$7,254m**	**$3,331m**	**$1,426m**	**$3**
Discount rate – 5%	**$10,268m**	**$4,714m**	**$1,970m**	**$5**
Percentage of need averted – 75%/25%/10%/10%	**$7,254m**	**$3,331m**	**$1,426m**	**$3**

Ethiopia – Bottom Up Assessment

Table A3: Cost Comparison of Response, 20 years, 10% discount, USD

USD						
YEAR	Humanitarian (A)		Early Response B1		Early Response B2	
	COSTS		COSTS		COSTS	
	aid + losses	Present value	aid+losses + cost of destock	Present value	aid+losses + cost of destock/vet/supp	Present va
0	1,614,319,692	1,614,319,692	951,664,918	951,664,918	311,797,393	311,79
1						
2						
3						
4						
5	1,695,035,677	1,052,483,795	999,248,164	620,454,492	327,387,263	203,28
6						
7						
8						
9						
10	1,779,787,461	686,185,112	1,049,210,573	404,516,095	343,756,626	132,53
11						
12						
13						
14						
15	1,868,776,834	447,370,316	1,101,671,101	263,731,303	360,944,458	86,40
16						
17						
18						
19						
Total	6,957,919,664	3,800,358,915	4,101,794,757	2,240,366,809	1,343,885,740	734,01

Resilence				Resilence with Benefits			
Costs	Costs	Total Cost					
$137 per person for 10 years	Ongoing aid + losses (B2)	Total	Present value	$137 per person for 10 years	Ongoing aid + losses (B2)	Potential benefits	
390,292,998	209,410,460	599,703,458	599,703,458	390,292,998	209,410,460	(429,322,298)	
390,292,998		390,292,998	354,811,816	390,292,998		(429,322,298)	
390,292,998		390,292,998	322,556,197	390,292,998		(429,322,298)	
390,292,998		390,292,998	293,232,906	390,292,998		(429,322,298)	
390,292,998		390,292,998	266,575,369	390,292,998		(429,322,298)	
390,292,998	104,705,230	494,998,228	307,354,955	390,292,998	104,705,230	(429,322,298)	
390,292,998		390,292,998	220,310,222	390,292,998		(429,322,298)	
390,292,998		390,292,998	200,282,020	390,292,998		(429,322,298)	
390,292,998		390,292,998	182,074,564	390,292,998		(429,322,298)	
390,292,998		390,292,998	165,522,331	390,292,998		(429,322,298)	
	52,352,615	52,352,615	20,184,199		52,352,615	(429,322,298)	
						(429,322,298)	
						(429,322,298)	
						(429,322,298)	
						(429,322,298)	
	52,352,615	52,352,615	12,532,800		52,352,615	(429,322,298)	
						(429,322,298)	
						(429,322,298)	
						(429,322,298)	
						(429,322,298)	
3,902,929,980	418,820,920	4,321,750,900	2,945,140,838	3,902,929,980	418,820,920	(8,586,445,956)	(4,

Table A4: Cost Comparison of Response, 10 years, 10% discount, USD

USD						
YEAR	Humanitarian (A) COSTS		Early Response B1 COSTS		Early Response B2 COSTS	
	aid + losses	Present value	aid+losses + cost of destock	Present value	aid+losses + cost of destock/vet/supp	Present value
0	1,614,319,692	1,614,319,692	951,664,918	951,664,918	311,797,393	311,797,393
1						
2						
3						
4						
5	1,695,035,677	1,052,483,795	999,248,164	620,454,492	327,387,263	203,281,733
6						
7						
8						
9						
Total	3,309,355,369	2,666,803,487	1,950,913,083	1,572,119,411	639,184,656	515,079,126

Resilence				Resilence with Benefits			
Costs	Costs	Total Cost					
$137 per person for 10 years	Ongoing aid + losses (B2)	Total	Present value	$137 per person for 10 years	Ongoing aid + losses (B2)	Potential benefits	T
390,292,998	209,410,460	599,703,458	599,703,458	390,292,998	209,410,460	(429,322,298)	1
390,292,998		390,292,998	354,811,816	390,292,998		(429,322,298)	(
390,292,998		390,292,998	322,556,197	390,292,998		(429,322,298)	(
390,292,998		390,292,998	293,232,906	390,292,998		(429,322,298)	(
390,292,998		390,292,998	266,575,369	390,292,998		(429,322,298)	(
390,292,998	104,705,230	494,998,228	307,354,955	390,292,998	104,705,230	(429,322,298)	
390,292,998		390,292,998	220,310,222	390,292,998		(429,322,298)	(
390,292,998		390,292,998	200,282,020	390,292,998		(429,322,298)	(
390,292,998		390,292,998	182,074,564	390,292,998		(429,322,298)	(
390,292,998		390,292,998	165,522,331	390,292,998		(429,322,298)	(
3,902,929,980	314,115,690	4,217,045,670	2,912,423,839	3,902,929,980	314,115,690		(

Ethiopia – Top Down Assessment

Table A5: Cost Comparison of Response, 20 years, 10% discount, USD millions

USD MILLIONS										
YEAR	Late Humanitarian Response				Early Response (B1)			Early Response (B2)		
	Aid (needs)	Animal losses	Total	Present Value	Aid+losses	Cost Destock	Present Value	Aid+losses	Cost Destock+ Vet/Supp	Present Value
0	509	230	739	739	339	3	342	108	162	270
1	509	230	739	672	339		308	108		98
2	509	230	739	611	339		280	108		89
3	509	230	739	555	339		254	108		81
4	509	230	739	505	339		231	108		74
5	534	242	776	482	356	3	223	114	162	171
6	534	242	776	438	356		201	114		64
7	534	242	776	398	356		182	114		58
8	534	242	776	362	356		166	114		53
9	534	242	776	329	356		151	114		48
10	561	254	815	314	373	3	145	119	162	108
11	561	254	815	286	373		131	119		42
12	561	254	815	260	373		119	119		38
13	561	254	815	236	373		108	119		35
14	561	254	815	215	373		98	119		31
15	589	266	855	205	392	3	95	125	162	69
16	589	266	855	186	392		85	125		27
17	589	266	855	169	392		78	125		25
18	589	266	855	154	392		70	125		23
19	589	266	855	140	392		64	125		20
Total	10,969	4,957	15,926	7,254	7,297	14	3,331	2,333	647	1,426

Table A6: Cost Comparison of Response, 10 years, 10% discount, USD millions

USD MILLIONS											
YEAR	Late Humanitarian Response				Early Response (B1)			Early Response (B2)			
	Aid (needs)	Animal losses	Total	Present Value	Aid+losses	Cost Destock	Present Value	Aid+losses	Cost Destock+ Vet/Supp	Present Value	To
0	509	230	739	739	339	3	342	108	162	270	
1	509	230	739	672	339		308	108		98	
2	509	230	739	611	339		280	108		89	
3	509	230	739	555	339		254	108		81	
4	509	230	739	505	339		231	108		74	
5	534	242	776	482	356	3	223	114	162	171	
6	534	242	776	438	356		201	114		64	
7	534	242	776	398	356		182	114		58	
8	534	242	776	362	356		166	114		53	
9	534	242	776	329	356		151	114		48	
Total	5,217	2,358	7,575	5,091	3,471	7	2,338	1,110	323	1,008	

Ethiopia – Sector Assessment

Livestock

- The cost of a livestock resilience package of interventions is estimated as follows:
  - The cost of destocking is estimated at $4.5 per person.
  - The cost of vet care is assumed to be $3 per animal, applied to the total number of animals that
  - The cost of supplementary feeding is assumed to be $8 per animal for 6 months for shoats, and $
    cattle and camel.
  - It is assumed that the full cost of this package of measures is required through year 10, at which
    private services and commercialization take over.
- Benefits accrue every fifth year in a high magnitude drought, and are represented by avoided aid costs a
  the HEA.

Table A7: Livestock Interventions, USD

YEAR	COST (USD)		BENEFITS	
	Total	Present Value	Avoided Aid + losses	Present Value
0	102,386,934	102,386,934	1,404,909,232	1,404,909,232
1	102,386,934	93,079,030		0
2	102,386,934	84,617,300		0
3	102,386,934	76,924,819		0
4	102,386,934	69,931,653		0
5	102,386,934	63,574,230	1,404,909,232	872,338,099
6	102,386,934	57,794,755		0
7	102,386,934	52,540,686		0
8	102,386,934	47,764,260		0
9	102,386,934	43,422,055		0
10	51,193,467	19,737,298	1,404,909,232	541,653,327
11	51,193,467	17,942,998		0
12	51,193,467	16,311,816		0
13	51,193,467	14,828,924		0
14	51,193,467	13,480,840		0
15	51,193,467	12,255,309	1,404,909,232	336,324,100
16	51,193,467	11,141,190		0
17	51,193,467	10,128,354		0
18	51,193,467	9,207,595		0
19	51,193,467	8,370,541		0
Total	1,535,804,003	825,440,586	5,619,636,929	3,155,224,759
BCR			**3.82**	

Water

- The Ethiopia report estimates the cost of an underground cistern between US$ 3.22 and US$ 3.87 – an a analysis. These figures are then multiplied by the total number of beneficiaries under the HEA modeling year one, 10% of total capital cost is assumed year on year for O&M, with 50% of the total cost allocated upgrades/rehabilitation of infrastructure.
- The Water Sector Development Plan of the Ministry of Water estimates the average investment cost pe and US$3 during the short, medium and long term investment plan respectively. This analysis assumes a
- Benefits include:
    - The avoided cost of providing water tankering (water aid), estimated at $2 per capita, assumed t drought).
    - Time savings: In year one of a drought, it is assumed that 2 people out of each household (assum every other day travelling to a water source. During the other 4 years, it is assumed that existing again, and that travel times are reduced to one person per household travelling 1 hour. In both c presence of water supply reduces travel time to a minimum of 30 minutes (according to water av valued using average rural wage rates at $1.50 per day.
    - WHO savings are calculated using the WHO estimated total benefits arising from access to clean capita.[29] The WHO benefits encompass a wider range of impacts, including avoided mortality, inc avoided health care costs. Time savings account for 65% of total benefits in the WHO study. To a savings already calculated specific to Kenya, the benefits of $6.5 are reduced by 65%, resulting in $2.30.

[29] Hutton, G. and L. Haller (2004). "Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Leve

Table A8: Water Interventions, USD

YEAR	Underground tank - COST		WSDP - COST		BENEFITS	BENEFITS OF B/C		
	Total	Present Value	Total	Present Value	Avoided cost of tankering	Time Savings	WHO Savings	Tota
0	11,110,531	11,110,531	14,244,270	14,244,270	19,941,978	194,968,446	6,481,143	2
1	1,111,053	1,010,048	14,244,270	12,949,336		16,247,370	6,481,143	
2	1,111,053	918,226	14,244,270	11,772,124		16,247,370	6,481,143	
3	1,111,053	834,751	14,244,270	10,701,931		16,247,370	6,481,143	
4	1,111,053	758,864	14,244,270	9,729,028		16,247,370	6,481,143	
5	1,111,053	689,877	14,244,270	8,844,571	19,941,978	194,968,446	6,481,143	2
6	1,111,053	627,160	14,244,270	8,040,519		16,247,370	6,481,143	
7	1,111,053	570,146	14,244,270	7,309,563		16,247,370	6,481,143	
8	1,111,053	518,314	14,244,270	6,645,057		16,247,370	6,481,143	
9	1,111,053	471,195	14,244,270	6,040,961		16,247,370	6,481,143	
10	11,110,531	4,283,591	14,244,270	5,491,783	19,941,978	194,968,446	6,481,143	2
11	1,111,053	389,417	14,244,270	4,992,530		16,247,370	6,481,143	
12	1,111,053	354,016	14,244,270	4,538,663		16,247,370	6,481,143	
13	1,111,053	321,832	14,244,270	4,126,058		16,247,370	6,481,143	
14	1,111,053	292,575	14,244,270	3,750,961		16,247,370	6,481,143	
15	1,111,053	265,977		0	19,941,978	194,968,446	6,481,143	2
16	1,111,053	241,798		0		16,247,370	6,481,143	
17	1,111,053	219,816		0		16,247,370	6,481,143	
18	1,111,053	199,833		0		16,247,370	6,481,143	
19	1,111,053	181,666		0		16,247,370	6,481,143	
Total	42,220,016	24,259,632	213,664,050	119,177,355	79,767,912	1,039,831,710	129,622,857	1,2
BCR Underground		**27.17**						
BCR WSDP		**5.53**						