APPLYING COST BENEFIT ANALYSIS AT A COMMUNITY LEVEL

A review of its use for community based climate and disaster risk management

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This report reviews 23 studies that have applied cost benefit analysis (CBA) to assess community-based disaster risk reduction and climate change adaptation projects. The review shows that CBA at a community level is adding value to our understanding of the effectiveness of efforts to reduce climate and disaster risk – often with unexpected findings. This report identifies common methodological approaches and differences in the application of CBA and also highlights methodological limitations. Finally, after summarizing gaps in our understanding, the report concludes with key messages emerging from the study and outlines recommendations for addressing gaps and moving the agenda forward.

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ABBREVIATIONS

ADWAC	Agency for the Development of Women and Children
AP	Andhra Pradesh
BCR	Benefit to cost ratio
BRC	British Red Cross
CBA	Cost benefit analysis
CBO	Community-based organization
CBDRM	Community-based disaster risk management
CBDRR	Community-based disaster risk reduction
CCA	Climate change adaptation
CCAP	Church of Central Africa Presbyterian
CDD	Community-driven development
CFW	Cash for work
CSEDR	Community-based Sigmoid Exponential Disaster Risk
CSOs	Civil society organizations
CU	Concern Universal
DFID	UK Department for International Development
DMP	Disaster mitigation and preparedness
DPC	Disaster preparedness committees
DRR	Disaster risk reduction
DRM	Disaster risk management
EcB	Ecosystem-based approaches
EWS	Early warning system
FAOSTAT	Food and Agriculture Organization Statistics Division
FGD	Focus group discussions
FJ$	Fiji dollar
GAR	Global Assessment Report
GEF	Global Environment Facility
GIS	Geographic Information System
GTZ	The German Organisation for Technical Cooperation
IFRC	International Federation of Red Cross and Red Crescent Societies
IRR	Internal rate of return
ISDR	International Strategy for Disaster Risk Reduction
ISET	Institute for Social and Environmental Transition
JICA	Japan International Cooperation Agency
KAPB	Knowledge, Attitude, Practice and Behaviour (survey)
KDRRI	Kailali Disaster Risk Reduction Initiative
LCDRR	Livelihood-centred approaches to DRR

M&E	Monitoring and evaluation frameworks
NPR	Nepalese rupees
NPV	Net present value
NRC	Nepal Red Cross
NGOs	Non-government organizations
OA	Oxfam America
PACC	Pacific Adaptation to Climate Change
PCVA	Participatory capacity and vulnerability assessment
SCBA	Social cost benefit analysis
SLM	Sustainable land management
SRCS	Sudanese Red Cross Society
SROI	Social return on investment
SOPAC	The Pacific Islands Applied Geoscience Commission
SPREP	Secretariat of the Pacific Regional Environment Programme
SWC	Soil and Water Conservation
TEERR	The Economics of Early Response and Disaster Resilience
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollars
VCA	Vulnerability and capacity assessment
VFM	Value for money
WB	World Bank
WKCDD/FM	Western Kenya Community Driven Development and Flood Mitigation
WST	Samoa Tala (currency)

CONTENTS

EXECUTIVE SUMMARY

BACKGROUND

Cost benefit analysis (CBA) is an economic tool used to compare the benefits against the costs of a given project or activity. Its use as part of a participatory process with communities in a disaster and climate risk context has become more widespread. It is increasingly being used to provide a more robust analysis of the costs of community-based disaster risk reduction and climate change adaptation: *before* a programme is implemented to decide on the most appropriate package of interventions; or *after* a programme has been implemented to evaluate the effectiveness of activities. More recently there has been a convergence of CBA with social return on investment (SROI) methodologies, as CBAs increasingly incorporate community participation and broaden their scope to account for social and environmental issues.

STUDY AIM AND APPROACH

The aim of this report is to present a *high-level* review of recent studies that have field-tested CBA either to inform or evaluate community-based climate and disaster risk management initiatives. This report updates a synthesis report (that was written in 2010 and included 11 original studies) and involved a desk-based review of a total of 23 studies. A synopsis of each study is provided in *Annex A* of this report.

STUDY FINDINGS

Overall, the findings demonstrate that CBA plays a valuable role and has added to the evidence base demonstrating 'value for money' of community-based disaster risk reduction, climate change adaptation and more recently early response activities. The review highlights the potential for positive economic returns for programmes that are implemented effectively; very few interventions showed negative returns.

In terms of methodological approaches, the studies build on a common approach and all incorporate a hazard assessment, an impact assessment and an analysis of risk reduction costs and benefits. However, they differ in terms of whether they are 'forward-' or 'backward-looking', in their scope, data sources and process.

A number of methodological limitations were identified as part of the review. These include: variations in the timing and therefore results of the studies; a focus on single hazards; uncertainty in estimating hazard probability; complexity of climate change for probabilistic risk modelling; differences in the scope and assumptions of CBAs and resultant benefit to cost ratios; data limitations and significant data requirements; difficulties in valuing non-monetary benefits; the inability to accommodate the distribution of benefits between beneficiaries including women; and difficulties in comparing results across CBAs including attribution of findings given the lack of a consistent methodology across studies.

A number of key gaps were highlighted during the review. Notably, few studies have been carried out in South and Central America and the Middle East and limited attention has been paid to slow onset disasters, geophysical hazards and multi-hazard contexts. Similarly, fewer studies are forward-looking; although increasingly, CBA is being used as a forecasting tool.

A number of lessons have been learned from the CBA studies. The studies have highlighted a number of benefits to using CBA at a community level: it introduces another layer of evaluation, supports social accountability and engages community members in a concrete way. More recently it is being used to allow donors and governments to see the value of disaster risk reduction (DRR) and climate change adaptation (CCA) projects and is increasingly advocated as a powerful forward-looking planning and decision support tool. In addition, some unexpected findings have emerged adding value to the decision-making process. For example, a focus on interventions that bring wider development gains were generally found to be more cost-effective than soft/non-structural measures in the face of uncertainties. Similarly, designing fit-for-purpose and long-term soft and hard measures for risk reduction were found to secure positive returns. Finally, it is important to link local level findings to the broader policy context, in order that the fundamental building blocks (e.g. security, basic services and infrastructure) can support the benefits of local approaches to address risk. In terms of methodological lessons learned, the studies highlighted a need for more systematic and organized recording of project inputs and observed outputs, and ensuring that sufficient time has elapsed for all impacts to emerge before analysis takes place.

Key messages[1]

- *The studies show that no one size fits all* – all interventions need to be tailored to the community context. Decision-making with respect to channelling funds and scaling up needs to be based on context-specific CBAs.
- *If we want to deliver value for money at scale, our attention needs to refocus from 'what' to 'how'.* The debate around this question has tended to focus on 'what' types of interventions can be scaled up as opposed to 'how' to design and implement a programme of work so that it delivers good value for money.
- Community-based disaster risk management (CBDRM) should be designed to deliver value for money by focusing on key characteristics of the intervention process rather than just the intervention itself. The studies demonstrate that interventions should be designed in consultation with communities to ensure buy-in and longevity; they should be designed as part of a holistic and integrated approach alongside existing approaches; and they should be integrated into a longer-term pathway of change.

RECOMMENDATIONS

To address gaps in our understanding, a number of recommendations emerge from the review:

- *Build the body of evidence* on the use of CBAs for: 1) assessing CBDRM in new geographic areas; 2) analysing interventions in the face of slow onset disasters; 3) implementing more forward-looking studies; 4) understanding how community CBAs can support investment in early response and resilience-building; 5) addressing non-monetary impacts on ecosystem services and social capital; and 6) analysing gender outcomes.

- *Develop a consistent CBA methodology* with a clear set of assumptions and procedures for data collection specifically integrating data needs with existing procedures and developing standardized guidance and tools to support consistency.

- *Investigate the use of CBA in other areas* of development practice and document current lessons/approaches that can be transferred across.

- *Establish a CBA website/blog* where practitioners can upload case studies, document methodological approaches and raise technical questions with a community of CBA practitioners.

1 INTRODUCTION

BACKGROUND

Cost benefit analysis (CBA) is increasingly[1] used to inform and evaluate a range of interventions that can address climate and disaster risk. The findings from these analyses are being used for multiple purposes – first and foremost, CBA can be used as a decision support tool, to help decide between a range of possible interventions that reduce risk and maximize the benefits for every dollar of investment spent. CBA can also be used to make an economic argument for investment in risk reduction (rather than responding to the impacts of a future disaster event).

While CBA has historically been used to assess larger scale infrastructure and public investment projects, its use at a local or community level is becoming more widespread. Clearly, CBA is not a panacea; there are many benefits of community-based disaster risk reduction (CBDRR) that cannot be valued, such as social impacts and many environmental impacts. As a result, CBA can never be used as a stand-alone decision-making tool, but rather needs to sit within a wider context of qualitative assessment. Further to this, CBA at a community level is never going to provide a complete picture – effective intervention on disaster risk reduction/climate change adaptation (DRR/CCA) requires an understanding of issues and impacts at regional and national levels as well, which is not always captured through community level analysis. Nonetheless, acknowledging its limitations, CBA is one of several tools that can be used to contribute quantitative evidence to this agenda.

A variety of case studies looking at the impacts, costs and benefits of community-based disaster risk management (CBDRM) and CCA have been undertaken in recent years. Further, non-government organizations (NGOs) and others[2] are beginning to look more closely at the applicability of CBA as a tool to sit alongside existing processes, such as vulnerability and capacity assessment (VCA) and monitoring and evaluation frameworks (M&E), to help project partners examine in greater detail the quantifiable, as well as the more qualitative impacts of their programming.

The challenge lies in identifying a range of potential interventions that are suited to different situations, identifying basic principles that are universally applicable, and finally developing the analytical tools that enable measures to be tailored to local contexts.

STUDY CONTEXT

The research for this report was originally conducted in 2010. In the three years since the first draft of this report was released, many more organizations have field-tested CBA in the context of CBDRM. As result, this report has changed quite substantially.

- It reviews more than double the number of CBA studies than the first report.
- In the last three years, CBA or related processes have become a greater focus for aid agencies; for example, the UK Department for International Development (DFID) now requires 'value for money' assessments as part of the project approval process.
- Whereas the previous report had a greater focus on *how* and *when* to implement a CBA, and therefore the recommendations were more practical in nature, this report

[1] Over the past three years (2010 to 2013 inclusive) 12 studies were identified, compared to 11 over a much longer period – the six years between 2004 and 2009 (inclusive).

[2] For example, Red Cross, Tearfund and Oxfam have all made efforts to streamline CBA into their M&E, and most donors have guidance for using CBA as part of project appraisal. The UNFCCC (2011) provides examples showing that CBA is beneficial following solid impact and vulnerability assessments and also one of multiple approaches for assessing options.

builds on the significant increase in the number of studies to draw more strategic recommendations and wider lessons learned.

The growing momentum behind the use of CBA in this particular field would suggest that it is a process that organizations find useful. However, many of the recommendations in the first report, such as the development of a standardized methodology for CBA of DRR programmes, to allow comparability across studies, have not been taken forward. It was therefore felt that an update of the 2010 report could prove useful to the international community.

STUDY AIM, SCOPE AND APPROACH

Aim: the aim of this report is to present a brief synthesis that takes stock of the significant efforts on CBA of CBDRM/CCA to date. The study reflects not only on findings, methodological approaches and lessons learned, but also highlights gaps and methodological constraints that could usefully be addressed going forward.

Scope: it is important to note that this synthesis is very much focused on the application of CBA to *community-based* initiatives for disaster and climate risk management. Initiatives may be structural or non-structural, hard or soft, but are part of a community-driven process for disaster risk management/climate change adaptation (DRM/CCA) and are very much bottom-up.

This report is intended as a first step towards a broader and more in-depth discussion around the cost-effectiveness of various resilience and adaptation strategies, and the applicability and usefulness of CBA at a community level to help inform decision-making by NGOs, government and donors alike. It is intended as a high-level review of recent work – it is not within the scope to conduct a detailed review or in-depth analysis. However, it is hoped that this report will act as a stepping stone for further development and discussion.

Research approach: the research was conducted by undertaking a literature review for relevant recent studies in the area of CBDRM/CCA and CBA, alongside consultation with key experts. The findings from the 23 studies identified were condensed into a brief synopsis (see *Annex A*) and summarized in this report (see *Table 1*).

STRUCTURE OF THIS REPORT

This report is structured as follows:

- *Section 2* provides a brief overview of CBA – what it is and how it is used.
- *Sections 3-7* look back at recent work on CBA applied at a community level. They also:
    - summarize the key findings *(Section 3)*;
    - highlight the key elements of the methodological approaches used *(Section 4)*;
    - identify some of the methodological issues and limitations faced in applying CBA at a community level *(Section 5)*;
    - outline the gaps in the reviewed studies *(Section 6)*; and
    - document some of the key lessons learned in relation to both the CBA process as well as the cost-effectiveness of various interventions *(Section 7)*.
- *Section 8* looks ahead and presents initial thoughts on the usefulness and applicability of CBA at a community level. It is intended to stimulate discussion moving forward.

- *Annex A* provides a brief synopsis of each of the studies included in the synthesis.
- *Annex B* lays out a potential road map for applying CBA.

2 WHAT IS COST BENEFIT ANALYSIS?

OVERVIEW

CBA is an economic tool used to compare the benefits against the costs of a given project or activity. CBA has traditionally been used to investigate more structural measures on a larger scale. As such, it is often perceived as a tool that is resource-intensive, and that requires specialized technical skills.

However, the principles of CBA are applied to everyday decisions – people and organisations regularly weigh up the costs and the benefits of activities when deciding which crop to plant, which materials to use to build a house, or whether to hire more staff. As such, the principles that underpin a CBA process are highly intuitive, though rarely applied in a systematic manner (see *Annex B* for further guidance on applying CBA).

Where CBA is used as part of a participatory process with communities, it can be extremely valuable by helping communities and programme staff to think through the costs and benefits of different programme options, and by targeting resources towards achieving 'outcomes' rather than 'outputs'.

Data-gathering for a CBA does not necessarily require a great deal of extra resource or technical capacity (depending on the availability of data and the level of analysis undertaken). Rather in many cases, it relies on additional lines of questioning around the quantitative impacts of programme interventions, and is often very similar to existing baseline data collection and VCA processes. The analysis of data, however, does require more technical expertise, and may require the input and oversight of an economics professional to ensure that data are assessed appropriately.

Where data are limited, a quantitative CBA may not be appropriate and could present misleading results. However, the CBA process can nonetheless generate a great deal of added value to decision-making, especially in the context of an uncertain future.

Box 1: Glossary of CBA terminology

- **Benefit to cost ratio (BCR):** The BCR indicates the level of benefit that will be accrued for every $1 of cost. A ratio greater than one indicates that the project is worth investing in from a *financial* perspective, whereas anything less than one indicates a negative return.
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- **Net present value (NPV):** The NPV takes the net benefit (benefit minus costs) each year and discounts these to their present-day value. If the result is greater than zero, this indicates that the benefits outweigh the costs. The higher the value, the greater the financial argument for initiating the project.
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- The **discount rate** is used to discount costs and benefits occurring in the future, as people place a higher value on assets provided in the present and a lower value on benefits that may accrue further into the future. The discount rate is normally equivalent to the average return one might expect if the same money was invested in an alternative project.

WHY IS CBA USEFUL FOR DRR/CCA?

CBA can be a particularly useful tool in a disaster/climate risk context. Firstly, CBA can help communities and local partners, as well as governments, NGOs and donors, decide on programme options, by entering into a more robust process of weighing up costs and benefits of different interventions, both qualitative and quantitative. This can be done either before a programme is implemented to decide on a package of interventions, or after a programme has been implemented, to assess the effectiveness of activities. Secondly, risk reduction requires significant resources to be spent before a disaster, and the benefits are not always overtly obvious. CBA can provide a powerful tool for demonstrating the value of pre-emptive action and investment in risk reduction.

In order to be effective, CBA must be linked with other tools – such as VCA, multi-criteria assessment, etc. – and it needs to be conducted in a transparent and accessible manner, using participatory processes. CBA for DRR/CCA is very similar to SROI, which is a newer approach to valuing social outcomes (see *Box 2* for a more detailed description).

Box 2: CBA versus SROI

Social return on investment (SROI) is a methodology for reviewing the inputs, outputs, outcomes and impacts made and experienced by stakeholders of an organization in relation to the activities of that organization. It puts a monetary value on the social, economic and environmental benefits and costs created by an organization. The outcome is expressed through a ratio – the SROI – that is equivalent to a BCR (see *Box 1*). SROI is built on the following principles: 1) involve stakeholders; 2) understand what changes; 3) value the things that matter; 4) only include what is material; 5) do not over-claim; 6) be transparent; and 7) verify the result.

There are few differences between CBA and SROI. Both combine a discounted cash flow of costs and benefits to give a final ratio. Key differences are that SROI puts a much greater emphasis on stakeholder involvement to quantify benefit; it is also designed to be used as more of an internal management tool than an external evaluation. However, the case studies reviewed demonstrate that CBA for community-based initiatives such as DRR are increasingly using a similar approach to SROI, by incorporating a strong focus on participation and by facilitating programme decisions.

The Care International study in Kenya is the most explicit of all the case studies in its attempt to merge the processes of CBA with the principles of SROI (2012). Its 'Social Cost Benefit Analysis' (SCBA) methodology followed a 'triple bottom line approach' and incorporated not only social returns under different intervention scenarios, but the equality of social impacts (e.g. reciprocity structures and gender equality) as well as ecological impacts (e.g. key ecosystems services). It emphasised stakeholder engagement and participation, and included separate focus groups for women employing the 'willingness-to-pay technique'.

Source: www.thesroinetwork.org/what-is-sroi

3 A SUMMARY OF CBA STUDIES

INTRODUCTION

This section looks back at the work conducted to date and provides a synthesis of the CBA studies identified on CBDRM/CCA. This and the subsequent sections that look back at the evidence base are used to support the recommendations made in *Section 8*, which are intended to stimulate discussion and debate on the usefulness and applicability of CBA at a community level going forward.

KEY ELEMENTS OF THE STUDIES REVIEWED

In total, 23 studies were reviewed for this report. *Table 1* below highlights some of the key elements of each of the studies, such as: where they were conducted, the type of hazard addressed, and the main findings. This table is supported by a more detailed *Annex A*, which contains a brief synopsis on each of the studies.

In addition to these studies at a community level, which focus on specific sets of DRR/CCA interventions, a recent study for DFID used CBA and cost-effectiveness analysis to compare the economics of early response and resilience to late humanitarian response to disasters. The study was different from the others in numerous ways – it assessed impacts at a regional/national level, and looked at the total impact of response, rather than assessing specific interventions. Nonetheless, the study is relevant to this discussion because it shows how CBA can be used at a national level, and specifically adds in a comparison with (much more expensive) humanitarian interventions. A summary is included in *Box 3*.

CBA FINDINGS

The findings from the 23 CBA studies reviewed vary significantly. The vast majority of interventions are positive (i.e. a BCR of one or greater), with only a few showing negative returns. However, agencies are more likely to select successful projects for analysis when conducting a backward-looking assessment, and hence there is bound to be bias in these findings. Nonetheless, the findings do demonstrate the potential for positive returns for programmes that are implemented effectively.

Those with positive returns range from ratios of 1:1 to double digits, with the highest yielding a return of 87:1 (in other words, every dollar spent yields $87 in benefits). A Tearfund programme using self help groups in Ethiopia has yielded returns ranging from 58:1 to 173:1. While this programme is not a DRR programme per se, it is substantially contributing to the ability of poor households to cope with shocks, and hence is included here. The range of interventions assessed also varies significantly, including measures such as water investments, structural pro-

tection measures such as dams or embankments, alternative livelihoods, irrigation and other agricultural measures, early warning and first aid training, to name a few. Some of these are assessed individually, while others are grouped and evaluated as part of a holistic programme.

Box 3: The Economics of Early Response and Disaster Resilience (TEERR) Report

The scale and frequency of natural disasters and conflicts are putting ever-greater pressure on the humanitarian system. Not only do these crises result in significant economic losses, but they also require large amounts of humanitarian aid from the international community and the costs of this are rising. DFID commissioned a study that, using case studies of pastoralists hit by drought in Kenya and Ethiopia, compared the costs of three scenarios: late humanitarian response to drought; early humanitarian response, through commercial destocking of excess livestock and early procurement and transportation of aid supplies; and building disaster resilience.

The study estimated the cost of each scenario by examining the impact of a severe drought, equivalent to the 2011 Horn of Africa Crisis, upon food deficits, livestock losses and national-level indicators for drought impact and cost.

Early response is far more cost-effective than late humanitarian response. Over a 20-year period, early response in southern Ethiopia, through early procurement and transport of aid supplies and commercial destocking, was shown to save between $1.6bn and $3.1bn. This indicates significant potential to improve value for money on later humanitarian responses. In Wajir, in Kenya, savings from early response, for the same time period, are estimated at between $250m and $392m.

Early response carries the risk that investment is made without a full-blown crisis developing. Figures from the study suggest however, that donors could fund early response twice in Kenya, and seven times in Ethiopia, before the cost is even equivalent to that of one single late response. The analysis also looked at commercial destocking as a specific early response measure and found that the benefits of destocking far outweighed the costs, with a BCR of 390:1 in Kenya and 311:1 in Ethiopia.

Building resilience could represent the best value for money. The study suggests that while resilience costs more than early response, building resilience offers the best value for money of the three scenarios when its wider development benefits are considered. Every $1 spent on disaster resilience resulted in benefits of $2.8 in Ethiopia and $2.9 in Kenya, in the form of reduced humanitarian spend, avoided losses and development gains.

Source: Cabot Venton *et al.* 2012

Table 1: Summary of CBAs of community-based disaster and/or climate risk management

Organization	Date	Country	Hazard	Key elements	Key findings
Tearfund	2004	India	Flood, drought	• Backward-looking • Interventions include construction of an escape road, provision of boats for evacuation, raised hand pumps • Data collected through transect walks, focus groups • Qualitative and quantitative	• Bihar BCR = 3.76 • Andhra Pradesh BCR = 13.38
World Bank	2007	Kenya	Flood	• Forward-looking • Community-driven development, including woodlots, medicinal plants, indigenous vegetables, beekeeping • Data collected primarily from research institutions with pilot projects on related activities	• A wide variety of initiatives and scenarios are estimated, some viable, some not • Woodlots, production and processing of medicinal plants and indigenous vegetables are potential micro-projects found to be economically viable • The financial viability of beekeeping was determined by the number of hives per hectare
Risk to Resilience Study	2008	Nepal	Flood	• Backward-looking • Purely qualitative assessment, uses ‘Shared	• Structural measures cannot be an effective primary strategy for responding to the increased

Organization	Date	Country	Hazard	Key elements	Key findings
Team				Learning Dialogue' • Addressed distributional issues • Hard and soft measures • Addresses climate change – qualitative	flood risk anticipated as a consequence of climate change since increased flow peaks and sediment-loading are likely to undermine embankments, spurs etc. • People-centred interventions appeared relatively resilient to climate change impacts
Risk to Resilience Study Team	2008	India	Flood	• Backward- and forward-looking • Addresses climate change • Embankments compared with a more people-centred basket of interventions (raised house plinth, raised fodder storage, early warning, flood shelters, community seed banks, self help groups, etc.) • Data collected through a household survey	• Embankments have not been economically beneficial. The analysis generates a BCR of 1 and it is predicted that this would decrease with climate impacts • BCRs for people-centred approaches range from 2 to 2.5 under current and future climate scenarios
Risk to Resilience Study Team	2008	India	Drought	• Insurance mechanisms for addressing drought risk, groundwater irrigation • Forward-looking • Risk-based modelling framework used to generate probabilistic drought shocks to farmers • Incorporates climate change • Resource and time intensive due to complex modelling needs	• All interventions seem economical, with the integrated package of both interventions delivering similar benefits at lower cost
Risk to Resilience Study Team	2008	Pakistan	Flood	• Four measures addressed: warning system, concrete lining of the channel, construction of a dam in the upper reaches of the stream, and relocation of the most exposed population to higher ground	• The over-designed early warning system in place is the only one with a BCR of less than one

Organization	Date	Country	Hazard	Key elements	Key findings
				• Backward-looking • A simplified downscaling technique and rainfall runoff model were used to investigate potential climate change impacts • Used data from 2001 floods	
British Red Cross/Nepal Red Cross Society	2008	Nepal	Flood	• Qualitative and quantitative approach • Quantifiable measures include mitigation works (flood defence), income generation loans, protection of water sources, and first aid training • Backward-looking	• Full suite of quantifiable measures: BCR = 18.6 • Without flood mitigation (only loans, water sources, training): BCR = 2
SOPAC	2008	Samoa	Flood	• Forward-looking • Interventions assessed include: floodwalls, a diversion channel, an improved flood forecasting system, and development control through the construction of homes with elevated floor heights • Flood hazard maps created using impacts of previous floods from public records, household and business surveys • Direct and indirect monetary losses estimated • Distribution of impacts is accounted for across sectors	• Non-structural measures were found to be the most economically viable. Improved forecasting system: BCRs range from 1.72 to 1.92. Homes with raised floors: BCRs range from 2 to 44, dependent on the type of structure, floor height, and discount rate used in the analysis • Structural measures were found to be not economically viable, and it is not believed that other non-quantifiable benefits would be enough to raise ratios above one
SOPAC	2008	Fiji	Flood	• Forward-looking • Survey used to assess impacts to a range of sectors including household, business, gov-	• Overall: BCR of 3.7 to 7.3 • Navua community: BCR is infinite (no costs borne)

Organization	Date	Country	Hazard	Key elements	Key findings
				ernment and donors • Intervention assessed is an effective flood warning system • Assessed distributional issues	• Government of Fiji: BCR = 1.1 to 2.2
Oxfam America	2009	El Salvador – ex post	Flood	• Field-testing of a CBA tool with local partners • Qualitative and quantitative analysis • Participatory approaches with communities used to gather primary data • Backward-looking CBA of a DRR programme to improve evacuation and shelters	• The programme yields a BCR of 0.97 using conservative assumptions. Sensitivity testing yields BCRs of 1.05 to 1.60
IFRC (International Federation of Red Cross and Red Crescent Societies)	2009	Philippines	Flood	• Qualitative and quantitative analysis • Participatory approaches with communities used to gather primary data • Conducted as part of a wider evaluation • CBA of three specific interventions: a hanging footbridge for evacuation, a sea wall and a dyke • Backward-looking	• Two of three interventions are cost-effective: • Hanging footbridge: BCR = 24 • Sea wall: BCR = 4.9 • Dyke: BCR = 0.67
IFRC	2010	Sudan	Drought	• Backward-looking • Qualitative and quantitative analysis • Participatory approaches with communities used to gather primary data • Conducted as part of a wider evaluation • CBA of individual activities	• Earthdams/embankments and water interventions were all found to be economically efficient • However, some of the most important impacts were qualitative, namely educational benefits and women's groups
Oxfam America	2010	El Salvador – ex	Drought, pests, livestock dis-	• Field-testing of a CBA tool with local partners • Qualitative and quantitative	• A wide range of interventions were assessed, including silos, alternative food sources for cat-

Organization	Date	Country	Hazard	Key elements	Key findings
		ante	ease	• Participatory approaches with communities used to gather primary data • Forward-looking CBA to assess a range of possible project interventions for investment	tle, vaccination, alternative seeds, vegetable gardens and community organizing • The BCRs range from 0.42 to 86.70. Silos yield a negative BCR – for cultural reasons they need to be provided on a household basis at high cost • Community organizing for collective bargaining on agricultural inputs yields the highest BCR
Mercy Corps	2010	Nepal	Flood	• Backward-looking CBA using the hypothetical approach • Quantitative and qualitative data collection and assessment • Risk assessment using local knowledge of flood probability and expert advice on causation • Measures including local capacity-building and training, EWS, small-scale mitigation (e.g. bio-engineering, embankments), education and facilitation of coordination • Assessment excluded impacts occurring a year after flood; included direct losses to economic capital (personal assets) and in the second stage included health impacts • Designed a computer programme: 'Community-based Sigmoid Exponential Disaster Risk' (CSEDR) for the risk-based community CBA	• BCR of 3.49 (assuming four-year benefit duration, a 12 per cent discount rate, best estimates for cost and benefits and inclusion of health benefits) • Qualitative assessment suggests that the impacts of floods are most significantly reduced by the initiative and yet these were not included in the quantitative assessment (as they were long term and difficult to quantify)
Tearfund	2010	Malawi	Drought	• Backward-looking	• Significant positive impact on target communi-

Organization	Date	Country	Hazard	Key elements	Key findings
				• Three programme sites and one control site • Three of the 10 programme activities included: crop diversification, soil and water conservation, and drought-resilient livestock • Quantitative impacts for household income/assets, education gains and impacts on health, and mortality assessment with and without project • Qualitative benefits identified but not incorporated • Addressed climate change (i.e. analysis across three differing rainfall scenarios) • Sensitivity testing for different assumptions (increased frequency of drought) • 10-year timeframe, 10 per cent discount rate	ties specifically in terms of household income, assets, education, health and reduced mortality rates • BCR is significant 24.30, even though not all qualitative benefits included • Positive financial return provides powerful argument for investing in preventive activities
Oxfam America & ADWAC	2010	Gambia – ex ante	Drought	• Forward-looking • OA CBA Workbook tools used for analysis • Quantitative analysis for several interventions prioritized following hazard and impact assessments e.g. cereal/seed banking, storage, fertilizers, capacity-building, quick yielding rice and water points • Insufficient data to quantify pest management and milling machines • Ten per cent discount rate over 10-year project lifetime	• Large difference in cost-effectiveness of interventions • Quick yielding rice showing positive results (BCR without fertilizer 73.16 and with costly fertilizer 31.22) • Storage facilities and vegetable gardens showing negative returns (0.81 and 0.44 respectively) • CBA helped develop more concrete project proposal for ADWAC, highlighting areas for cost-effectiveness
Oxfam America & Concern	2011	Gambia – ex post	Drought	• Backward-looking • Where there were significant levels of uncer-	• DRR programme has wide range of positive impacts on communities

Organization	Date	Country	Hazard	Key elements	Key findings
Universal				tainty, sensitivity analysis was used to test lower and upper bounds of analysis • Analysis looked at each intervention discretely: seeds and fertilizers; fire belts and tree-planting to create woodlots • Costs included specific activity costs and proportion of overhead costs • CBA not used for installation of improved pit latrines due to difficulty quantifying health benefits	• All three interventions are cost-effective with the following BCRs: seeds and fertilizers (3.3); fire belts (38.7); and tree-planting (2.6) • Net costs of livestock vaccinations outweigh yet to be realised benefits (due to implementation difficulties)
Practical Action	2011	Nepal	Flood, drought, wildlife intrusion, landslides	• Backwards hypothetical analysis • Focused only on community-level projects (e.g. irrigation, electric fencing, off-farm diversification) and not on advocacy/capacity-building • Economic social cost benefit analysis comparing present value of real income gains compared to a 'no-project' baseline • Includes expected future gains beyond 2010 (discounted) • Cautious and conservative evidence-based quantitative evaluation of productivity gains, avoided losses and additional income • Excludes potential ancillary gains identified through anecdotal evidence (e.g. reduction of losses from landslides, health impacts due to food security etc.)	• For the central social discount rate of 10 per cent, the BCR ranges from 1.27 to 1.50 • Measures for raising agricultural productivity accounted for nearly 57 per cent of total benefits (flood risk reduction and livelihood diversification were only five per cent) • Serious consideration to making CBA integral component of future livelihood-centred approaches to DRR (LCDRR) projects • CBA approach most powerful if used as a forward-looking planning and decision support tool to channel scarce project resources into activities with the highest expected net benefits
IFRC	2012	Bangla-	Flood	• Backward-looking	• Investments worthwhile and in all four communi-

Organization	Date	Country	Hazard	Key elements	Key findings
		desh		• Data collection in four communities using qualitative and quantitative tools • Measures included: raising community awareness, small-scale mitigation measures (e.g. housing plinths), enhancing livelihood security and strengthening local disaster response • No annual expenditure overviews available allowing translation of original expenditure to present values • Protective benefits and direct economic benefits calculated	ties, benefits exceeded costs • BCR at present (i.e. efficiency to date) between 1.18 to 3.04 • If future protective benefits over coming 15 years included, BCR between 3.05 and 4.90 • 'Real' benefits much higher because a number of benefits excluded (e.g. community development, lives saved, future benefits from hybrid seeds, health improvements etc. • CBDRR programme could have been more efficient if measures to protect paddy fields and agricultural assets from flood damage were included
SPREP	2012	Pacific	Climate change	• Forward-looking • CBA being incorporated into PACC pilot demonstration projects to help decision-making on project option selection and design and to support replication and scaling up • For example, Solomon Islands and Tuvalu completed a CBA of its food security project and water sectors respectively	• Solomon Islands CBA highlighted three broad options including: measures to reduce salt water contamination in food production areas; introducing root crop varieties and plants tolerant to salinity; and modifying the soil and food production environment • *[N.B. Final country reports not released at time of printing]*
Care International	2012	Kenya	Drought, flood	• Forecasting/forward-looking CBA • Addressed climate change • Merged traditional CBA with SROI • Modelled costs and benefits of 'action' against 'business as usual scenario' • Identified impacts of climate change up to 2030 by constructing a systems dynamics	• Unequivocal economic justification for taking action and financing community-based adaptation to climate change in Garissa (Kenya) even accounting for risk and uncertainty • Most realistic scenarios, BCRs of between 1.45 and 3.03 • Even using higher discount ratios, costs of in-

Organization	Date	Country	Hazard	Key elements	Key findings
				model taking into account multiple scenarios reflecting uncertainty • Stakeholder engagement and extensive literature reviews to fill gaps • Deductive bottom-up methodology to identify potential costs and benefits of adaptation • Model included economic, social *and* ecological impacts • DRR programmes modelled included: education, spread of early warning systems, dykes, fencing and community insurance schemes • Adaptation programmes modelled included: income diversification and investment in animal health and human health	tervention 2.6 times lower on average than the costs of not intervening to address climate change • Even without climate change, benefits outweigh costs
Oxfam Intermon	2013	Burkina Faso, Chad, Mauritania, Niger	Drought	• Backward-looking • Studies carried out in four countries in villages included in the Cash for Work programme (CFW) • Included 'training of trainers' to increase capacity of programme staff to conduct CBA fieldwork • Besides cash transfers works aimed at improving soil conditions and rehabilitating land (e.g. bunds, demi-lunes), the development of water retention pools, and the rehabilitation of roads (the latter was not included in the analysis)	• Findings suggest that early response through cash transfer is a very important part of a more effective response (preventing negative coping strategies and minimising humanitarian response) • Benefits outweigh the costs for all four country studies by a reasonable margin with BCRs of: 3.38 for Burkina Faso; 2.21 for Chad; 3.65 for Mauritania; and 1.11 for Niger • Findings may suggest that the use of demi-lunes (stone/soil semi-circular barriers supporting water retention) for rehabilitation may be more cost-effective than bunds
Tearfund	2013	Ethiopia	Drought	• Backward-looking • Study carried out in six different programme	• BCRs range from 58:1 to 173:1 – some of the highest returns demonstrated in the literature.

Organization	Date	Country	Hazard	Key elements	Key findings
				sites. • Formation of self help groups to foster transformational change. While the programme was not directly in response to shocks or crises, self help group households show increased ability to cope with shocks, hence the programme is included here.	• Programmes grow internally with time, and hence returns to donor spend are upwards of 210:1.

4 METHODOLOGICAL APPROACHES

INTRODUCTION

This section reviews the key elements of the methodological approaches used in the CBA studies reviewed and identifies both similarities and differences in their approaches.

STUDY SIMILARITIES

Broadly speaking, the studies reviewed are built on a common methodological approach in as much as they all incorporate the following elements (though to varying degrees of complexity and detail).

- A **hazard assessment** that investigates the hazards affecting the population in question, their magnitude and frequency. The studies reviewed here included a range of hazards, notably floods and droughts. This review is not comprehensive and there are likely other CBA assessments for other types of hazards, environmental and other.

- An **impact assessment** that investigates the impacts of hazards on the community, specifically in relation to a population's vulnerabilities, capacities, and exposure to hazards, 'without' CBDRM.

- An **analysis of risk reduction costs and benefits** that investigates the costs of the interventions (that have been or can be introduced to reduce risk) and the difference in impact 'without' and 'with' CBDRM, thus representing benefits (or avoided costs) of undertaking CBDRM.

STUDY DIFFERENCES

There are also a number of notable differences in the CBA study approaches reviewed primarily in terms of purpose, scope, data and process.

Purpose

Ex post versus ex ante: CBA at a community level has been used to assess projects or programmes that have already occurred – referred to as 'backward-looking' or 'ex post'. It can also be used to decide between a suite of interventions, to identify those that are most cost-effective

going forward – referred to as 'forward-looking' or 'ex ante'. Some assessments have elements of both – for example, the 2009 Oxfam America study in El Salvador was backward-looking, but found that several interventions were too recent to have taken hold, and hence a forward-looking assessment, using anticipated impacts and sensitivity testing, was used for those elements. Increasingly, the studies are being used to forecast the most appropriate interventions in the light of future risk and in particular climate change and variability (e.g. SPREP studies 2012). The Care International study presented an economic analysis model for testing a range of possible climate and adaptation scenarios in Garissa, north-east Kenya (2012).

Scope

Types of risk reduction measures assessed: the risk reduction measures included in the CBAs vary, and depend on what has been or is being considered under the project or programme. By their very nature, community-level interventions tend to encompass a range of types of activities; hence the different studies cover a variety of types and numbers of risk reduction measures.

- **Types of measures.** The CBA studies include the following:
    - **Prevention versus preparedness.** For example, a dam to 'prevent' the flood versus grain stores to ensure food is available during flood times.

    - **Structural/hard versus non-structural/soft**. Hard structural measures typically refer to the strengthening of physical systems (for example, water pumps, dams and embankments), whereas soft non-structural measures typically refer to activities such as training, advocacy and awareness-raising measures that reduce the impact of shocks and stresses on people. The impacts of softer measures can often be hard to quantify, and if included in a programme, they require an approach that includes both qualitative and quantitative techniques.

- **Individual measures versus programme.** The CBA studies either evaluate individual activities under a programme (as in the IFRC Philippines study 2009) or the programme as a whole (as in the BRC Nepal study 2008).

Types of hazards assessed: CBA studies have tended to be reductive in approach rather than looking at broader 'multi-risk' options and outcomes. The findings are inevitably impacted by the extent to which the range of shocks, stresses and uncertainties facing people have been taken into account, and the multiple outcomes that this could have.

Data

Data sources: the data used for CBA assessments comes from a mixture of primary and secondary sources depending on the study and the availability of data in the country. Examples of secondary data collection include: datasets from government records on hazards and their impacts; data from research institutions on hazards, their impacts, and the viability of alternative approaches to activities such as agriculture; projected impacts of climate change from meteorological institutions and research bodies; GIS maps from relevant authorities and research organizations; and data on community-level impacts from existing NGO baseline studies. Examples of primary data collection include: participatory processes such as transect walks and focus groups to gather data on hazards and their impacts; surveys of affected populations to gather data on hazards and their impacts as well as demographic data and indicators of vulnerability; and semi-structured interviews with local officials, community-based organizations (CBOs), and other relevant stakeholders.

Data on hazard impacts: data on hazard impacts can take a number of forms.

- **Direct/indirect.** In most cases, only direct impacts are included in the analysis (e.g. loss of assets, damage to houses, etc.). In some cases, efforts are made to identify indirect impacts as well – for example, floods may result in business interruption for several months after the fact. Some studies only incorporate impacts occurring within a year of a hazard (e.g. Mercy Corps, Nepal 2010), others take a longer-term view.

- **Monetary/non-monetary.** Many impacts are non-monetary. In other words, they cannot be numerically measured, or they may be too complex to measure, for example social benefits such as an improvement in confidence. In the case of placing a value on loss of life, some studies chose not to place a monetary value on this loss from an ethical standpoint.

- **Financial/economic.** Financial analysis consists of comparing revenues and expenses, whereas economic analysis attempts to identify and value a full range of economic and social benefits to the economy as a whole (some of which can be monetized, and some of which cannot, as referenced in the previous point). In theory, CBA is used to account for economic impacts – all those impacts that affect the well-being of a population. However, in practice most CBAs at the community level are financial in nature, with a focus on those impacts that can be easily monetized. Wider economic benefits, such as protection of natural resources, can be valued but usually require time-intensive studies to do so. Nonetheless, most of the studies incorporate economic benefits at least from a qualitative perspective.

- **Social/environmental impacts.** More recently however, attempts are being made to quantify social and environmental impacts for example through the use of proxies (e.g. Care International in Kenya 2012).

Process

Theoretical approaches. The review found a range of different approaches to the CBA process, although most adopted the 'hypothetical approach'.

- **'Hypothetical' approach**. This involves comparing the impact of a given disaster in a community with DRR to the hypothetical impact of this same community had it not had the DRR programming (i.e. the backward-looking method). Or it can be in order to evaluate a potential DRR project (by comparing the realised impacts in a community without DRR programming to the hypothetical impacts of the same disaster in that community had there been DRR) (i.e. the forward-looking method). The limitation of this approach is that it relies on inferences of impacts rather than realised impacts. Most studies fall into this category.

- **'Comparative' approach**. This involves comparing two different communities – one with and one without DRR. This is especially possible if the effective magnitude of disasters is exactly the same in both communities. For example, the Tearfund Malawi study compared three programme sites with one control site (2010). Oxfam's resilience measurement tool uses a similar comparison of control and project communities.[3]

- **'Before-and–after' approach**. This involves comparing impact data from the same community for similar disasters before and after programming. Impact data for pre-DRR programming disasters may not be available in the same format if conducted with the same methodology as impact data collected immediately following a disaster. This relies on the assumption that nothing besides the implementation of DRR has changed.

[3] **Oxfam GB** (2013) 'A Multidimensional Approach for Measuring Resilience', Oxfam Working Paper, Oxford: Oxfam GB.

Qualitative versus quantitative. Studies range from purely qualitative analysis, as in the example of Nepal (Risk to Resilience) where shared learning dialogues were used to understand the costs and benefits of risk reduction from a purely qualitative perspective through discussion; to a mixture of qualitative and quantitative assessments where the full range of impacts are assessed, but a subset of those that can be quantified are investigated in further detail (2008). The Care International study is a good example of the more recent trend to broaden the scope beyond quantifying only economic returns and capital (2012). Less reductive in scope, it uses proxies to quantify environmental and broader aspects of climate change impacts (see *Box 2*).

Efficiency versus effectiveness. Most appraisals and evaluations of DRR/CCA interventions focus on *efficiency* as opposed to *effectiveness*. For example cost per mosquito net delivered rather than what mosquito nets achieve in terms of reducing infections and knock-on impacts for community livelihoods. The Care International study (in Kenya) seeks to do both and assesses whether investing in community-based adaptation is economically efficient *and* effective (2012).

Use of models. The vast majority of climate change models are not tailored to analyse climate change impacts and adaptation interventions on a local scale. A notable exception is the CSEDR model used by Mercy Corps for the CBA in Nepal (2010). However, this focuses primarily on avoided damage (from extreme weather events) associated with DRR interventions as opposed to long-run productive transformations. Conversely, the use of a systems dynamics model developed by Care International allowed for the incorporation of climate and socioeconomic impact interactions as well as their long-run dynamics. This therefore allowed forecasting of socioeconomic impacts of climate change under numerous scenarios reflecting uncertainty (2012).

Development of tools. Some organisations have developed user-friendly tools to support their assessments and promote consistency (see *Box 4*).

Box 4: The Oxfam America CBA Toolkit

Oxfam America (OA) has developed a Toolkit that will help regional offices and partners to undertake CBA as a routine part of the project cycle. OA wants to progressively introduce CBA in its DRR programmes to appraise and present the cost and benefits of their interventions and the inherent trade-offs in their investment in risk reduction. In 2009, DRR staff at OA's headquarters developed a user-friendly CBA methodology, designed to enable effective decision-making in DRR projects in every region.

The Toolkit is designed to sit alongside existing VCA processes, and is composed of three modules that are in a range of associated templates and tools:

Module 9a: Introduction to Community-Based CBA for DRR

Module 9b: Methodology for Community-Based CBA for DRR

Module 9c: Valuation Worksheets

The methodology has been piloted in four studies – two in El Salvador and two in the Gambia.

5 METHODOLOGICAL LIMITATIONS

INTRODUCTION

The methodological approach for applying CBA at a community level can clearly take a number of forms, as highlighted in the previous section. There are aspects of the approach that are intuitive and work well, and other aspects that are harder to apply at a community level. There is also no doubt that conducting CBA at a community level has its methodological limitations. This section therefore highlights some of the key methodological issues emerging from the studies reviewed. These are discussed in terms of the following:

- the timing and scope of an assessment;
- data constraints and uncertainty;
- methodological constraints.

THE TIMING AND SCOPE OF AN ASSESSMENT

For backward-looking CBAs, *the timing of the study* with respect to implementation of project interventions can significantly impact on methodology and results. If a project intervention took place too long ago, community members can find it difficult to reconstruct the 'without' scenario when assessing impacts. For example, in the IFRC Philippines study, the project had been implemented 10 years previously and thus there was a large degree of variation in recounting of impacts (2009). In Samoa, the household survey was conducted six years after the event and resulted in values that were so unreliable they had to be replaced with other estimates (Woodruff 2008). On the other hand, if interventions have occurred too recently, it may not yet be possible to observe the impacts of the intervention (as was found in the 2009 Oxfam America study in El Salvador). This is particularly true for activities such as changes in cropping patterns or the introduction of new seeds, which require a longer timeframe to take hold, and for which impacts are not always easily attributable (a new crop could reduce impacts of drought, but it can be hard to quantify this in the immediate term because so many exogenous factors impact on crop yields).

The scope of CBAs to date tends to focus on single hazards. A *multi-hazard approach* may present a more realistic view of DRR/CCA outcomes. In theory, many DRR measures can provide benefits for a range of hazards. For instance, access to water, training on first aid, or safety net transfers can all improve outcomes across a range of shocks, 'natural' and otherwise. However, for the sake of simplifying assumptions, most studies focus on single hazards. Conflict and fragile states could provide an opportunity to examine multi-hazard contexts in greater detail.

The scope of the CBA can have significant impacts on the resultant benefit to cost ratio. Clearly the number of measures, the selection process (i.e. random or chosen by stakeholders) and whether the CBA is combined or kept separate for individual activities governs the final benefit to cost ratio.

- **The scope of assessment.** It is not always possible to include all programme activities in the analysis; clearly how and which activities are selected will govern the final outcome.

- **The choice of benefits** incorporated in the study will affect the outcome. For instance, many studies do not include non-market impacts (e.g. loss of life or their proxies given the difficulty of putting a monetary value on this benefit). However, whether these are included can have a significant impact on the outcome.

- **The range of costs** included in the studies varies. These costs may include: total programme costs; the costs of only certain activities; the opportunity costs of human and material resources contributed by the target households and other local stakeholders (i.e. local labour time inputs diverted to project activities); material support; and costs for other activities such as workshops, training etc.

DATA CONSTRAINTS AND UNCERTAINTY

Data limitations can pose a substantial challenge, especially where there is not the capacity or resource to conduct primary data collection. Even where data can be collected, there are often significant levels of uncertainty over the data gathered (e.g. bias in responses, long recollection times, conflicting/inconsistent information among those surveyed). Oxfam America found that the CBA process was hindered by a real lack of data, specifically in relation to agricultural interventions, where a host of factors impact crop yields, and therefore there can be significant uncertainty around the impacts of improvements (2010). This problem could be addressed at least in part through strengthened M&E systems. Further, while CBA is underpinned by some common principles, due to data constraints and other limiting factors, it is not applied systematically at a community level, making it difficult to compare across studies and draw broader lessons around successful interventions. There are differing perceptions on how valid the CBA process is at a community level, given these data limitations.

A clear understanding of risk is central to conducting CBA. Yet it is very difficult to estimate the probability of hazard occurrence and associated impacts, particularly when the analysis is taking place at a community level. CBA, at its core, is about risk assessment, and hence uncertainty is inherent in the process, especially at a community level and in the face of climate change. Ideally, a CBA is built upon probabilistic risk modelling, where the probability of a hazard occurring is estimated for a range of hazard magnitudes. The impacts (and associated reduction in impacts that come about with risk reduction) are then weighted by the probability of an event happening. These points create a loss-frequency curve. In practice, however, data is often very limited, particularly at a local level, and it is only possible to map two or three hazard/impact probabilities. A recommendation emerging from the Practical Action study in Nepal was to obtain and record information on past disaster frequencies and associated damages as part of the baseline vulnerability assessment given gaps in official statistics at the local level (2011). This would support the assessment of the impact reduction from future climate-related disasters (as part of a pre-project CBA).

Climate change adds another level of complexity to probabilistic risk modelling. The probability of hazards is altering due to climate change, and hence loss-frequency curves will also shift, changing the outcomes of any cost benefit analysis. Significant efforts are being made to downscale projections on climate change impacts from more global models to country, region, and

locale-specific models, but this requires significant amounts of data, and even then, results are highly uncertain. In addition to a certain degree of unpredictability of future human behaviour and natural variations, the downscaling of global projections is itself an imprecise science. Hence it becomes very difficult at a community level to estimate whether a one-in-ten year flood is likely to become a one-in-eight year flood, or a one-in-five year flood, and indeed, how quickly these changes will take place. The Risk to Resilience India study used a risk-analytic modelling approach, and found that ultimately this was a very resource- and time-intensive approach, which generated findings that were highly uncertain in any case. The study authors suggest that sensitivity testing for a range of probable climate scenarios could have generated equally reliable findings but more efficiently (2008). Instead of addressing the costs and benefits of adaptation in an inductive fashion (e.g. downscaling regional economic models), the more recent Care International study followed a deductive bottom-up approach (2012).

METHODOLOGICAL CONSTRAINTS

Comparing results from CBAs is a key challenge. This is because the studies have significant differences in terms of assumptions, time horizons and impacts included (e.g. environmental, social and health/loss of life). This means that a simple comparison between ratios is often misleading, and according to one source: *'the devil lies in the detail of the approaches' manifold variations'* (LSE 2011). Similarly, it can be difficult attributing the findings directly to the intervention itself without consideration of external factors and other activities that could influence the results. In fact, the SROI approach (see *Box 2*) specifically recommends that SROI ratios are *not* compared across different activities, as the emphasis on stakeholder involvement results in diverse sets of indicators (Arvidson *et al.* 2010). Along similar lines, *transparency* over findings and calculations is critical to allow for effective comparisons between studies.

The valuation of non-monetary benefits is a significant constraint in applying CBA. Community interventions result in a host of benefits that cannot be quantified – but which are often central to the work being undertaken – for example social and environmental benefits. This applies equally to 'disbenefits' – i.e. the social and environmental costs that can also result from interventions. A focus on quantitative aspects of programme design sits more comfortably with large infrastructure projects. By contrast, CBDRM, by its very nature, is typically focused on a mix of hard and soft measures, largely implemented by NGOs/CBOs. Hence the focus on quantitative is not as natural, and the benefits are often inherently difficult to measure and quantify. Decision-making must, however, take into account the full range of impacts. The danger with CBA is that a project with a high level of monetary benefits will be selected over a project that may be equally beneficial but not so easily quantified. This issue becomes particularly critical in areas such as slow onset disasters, where it can be very difficult to identify both monetary and non-monetary benefits of breaking cycles of poverty brought on by successive droughts, or in the case of ecosystem-based approaches, where environmental benefits are a key priority. The Care International study in Kenya has made progress in attempting to incorporate these non-monetary benefits by developing a model which also includes social impacts (e.g. gender equality), and ecological impacts (e.g. ecosystem services) and their interactions, following a 'triple bottom line' approach (2012).

CBA does not traditionally account for **distributional impacts.** The distribution of benefits from risk reduction is very important from a development perspective, with many projects focusing on the most vulnerable, including women, children, and people who are elderly and/or disabled. The work done to date on CBA at a community level has consistently emphasised the need to ensure that the quantitative analysis sits within a wider qualitative framework. As such, distributional aspects can be discussed and included in a more qualitative fashion. The SOPAC Navua study used a methodology that explicitly demonstrated distributional impacts between households, businesses and government (Holland 2008). The study used a survey to investigate impacts of hazards and reduction in impacts associated with risk reduction measures in each of these groups. The study also allocated costs of risk reduction measures according to who would

pay for them. The study estimated CBA figures specific to each of these groups – according to who pays and who receives the benefit, and as such it presents a very interesting case for addressing distributional aspects across a society as a whole. An alternative approach to addressing the equity aspect is to give weights to different costs and benefits according to who receives the benefits and bears the cost (although this is a subjective process). Conversely, the more popular approach is to present the distributional impacts of adaptation options alongside the aggregate costs and benefits (UNFCCC 2011).

Gender-sensitive analysis is limited. The case studies show that very little consideration has been given to identifying the costs and benefits of DRR interventions specifically for women, although data collection was reported to employ separate focus groups with women in a handful of studies (e.g. Oxfam America 2010). Only one study takes gender differences through to analysis and uses women-only focus groups (employing a willingness-to-pay technique) to help valuate gender equality (Care International 2012). However, no gender-sensitive CBAs (including separate CBAs conducted for women and men to account for gender impacts) were carried out in any of the case studies reviewed.

6 GAP ANALYSIS

INTRODUCTION

This section highlights the findings of a high-level gap analysis on the 23 studies reviewed as part of this report. The analysis does not seek to be comprehensive; there are certain to be other relevant studies that were not identified during the literature review. However, this report and the gap analysis below give an initial flavour of where effort has been focused to date, key trends and remaining gaps.

GAP ANALYSIS+

Geographical scope

	Number of studies	Countries
Africa	9	Kenya (2); Sudan; Malawi; the Gambia (2); Burkina Faso; Chad; Niger; Mauritania; Ethiopia
Asia	10	India (3); Nepal (4); Pakistan; the Philippines; Bangladesh
Pacific	3	Samoa; Fiji; SPREP
Middle East	0	N/A
South and Central America	2	El Salvador

- Majority of studies are in Asia, followed by Africa.
- Few studies in South and Central America.
- No studies in the Middle East.

Temporal scope

	Number of studies in 2009 and before	Number of studies in 2010 and after	Total
Backward-looking	6	8	13
Forward-looking	4	4	8
Both	1		1

- More studies are backward-looking.
- Increasingly, CBA is being used as a 'forecasting' tool to identify the most appropriate interventions.

Type of hazard

	Number of studies in 2009 and before	Number of studies in 2010 and after	Total
Flood	9	2	11
Drought	1	5	6
Mix of hazards	1	4	5

- Overwhelming focus on floods and a total absence of geophysical hazards.
- More needed on slow onset disasters (e.g. drought), although these have increasingly been the subject of recent studies, and on multi-hazard contexts.

7 LESSONS LEARNED

INTRODUCTION

This section looks at some of the key lessons learned from the CBA studies, both in relation to applying CBA at a community level and to the types of activities that are cost-effective for addressing disaster and climate risk. These are reviewed in terms of:

- the benefits of CBA for CBDRM;
- methodological issues;
- the most cost-effective interventions.

LESSONS LEARNED

The benefits of CBA for CBDRM

The literature suggests that the CBA process can be **useful at a community level**. Many of the studies concluded that the CBA process was useful and intuitive, and this was confirmed during consultation. CBA at a community level yields findings that are helpful for evaluation purposes as well as making forward-looking planning decisions. These findings have been used effectively for advocacy and for demonstrating the value of CBDRM to donors and government. The CBA process itself can support social accountability. Communities typically reported that they found the process allowed them to engage with issues affecting their community in a more concrete way.

The process introduces **another layer of evaluation**, encouraging a more robust analysis of benefits, as well as fostering a greater focus on outcomes as opposed to outputs. Furthermore, CBA encourages an open discussion that promotes consensus-building, innovative thinking and transparency, and can help to bridge discussions between government and CBOs. In fact, a key finding is that the process is often more beneficial than the 'product' (the final analytical result), because it forces organizations to clarify and test the assumptions they make between an intervention and the desired outcome, as well as opening up a transparent dialogue.

More recently, CBA is being used to enable donors and governments to see **the value of DRR and CCA projects**. Demonstrating the value of DRR/CCA through quantitative methodologies such as CBA could allow donors to see the true value of these interventions. CBA is increasingly being used to demonstrate the benefits of preparedness activities, especially in disaster-prone or poor communities, for both protecting development investments and avoiding costly post-disaster aid. These CBA studies are increasingly important in an environment of competing financial demands driving the need to maximize investment and ensure that DRR and CCA are *economically efficient* and *effective.*

CBA is potentially more powerful as a **forward-looking planning and decision support tool** to assist in channelling scarce resources into activities with the highest net benefits.

Unexpected findings have added value to decision-making. The studies reviewed have not only confirmed some anticipated outcomes, but have also generated some surprises and hence have added value to the overall decision-making process. For example, the CBA study undertaken by Oxfam in El Salvador in 2010 demonstrated that the use of silos and storage practices to protect crops were not actually cost-effective, in large part because of cultural barriers to collective storage that dictated the need (and expense) of household silos. Hence a suite of other options are being investigated and prioritized that can reap greater gains for beneficiaries. Similarly, in the Gambia, Oxfam found that the costs of some interventions (e.g. animal vaccinations) surprisingly outweigh the benefits particularly if the project suffers from implementation problems (2011).

Methodological lessons

There is a need for **more systematic and organised recording** of project inputs and observed outputs and outcomes. Good baseline data collection, as part of a wider M&E system, would support this. Many M&E systems already aim to collect information that is relevant to CBA and could be updated with minimal additions to ensure that data collection is systematic for such evaluations. Improving data on costs and benefits is essential and will improve quality of financial data attributable by year and location/community.

It is important that **sufficient time has elapsed** for all impacts to emerge. A recommendation emerging from the IFRC Bangladesh study is to allow sufficient time after the conclusion of the main programme activities before implementing a CBA to incorporate impacts that take time to emerge (although not so long that beneficiaries are unable to reconstruct the 'without' scenario) (2012). A further recommendation emerging from the Practical Action Nepal study is to conduct a follow-up study in the same project site in a number of years to examine the longer-run impacts of the measures initiated by the project.

Most cost-effective interventions

There are some interesting and unexpected lessons emerging from the CBA studies with respect to those interventions that are most cost-effective; these findings have direct relevance to NGOs, governments and donors alike.

A focus on interventions that bring wider development gains is generally going to be more cost-effective. This is particularly relevant in the face of uncertainty. In areas where the frequency and magnitude of hazard occurrence is less known, activities that focus only on CBDRM are more likely to have a negative return. By contrast, if these activities also bring wider development gains, they are more likely to be cost-effective. For example, in the Tearfund study in India, boats were provided for evacuation purposes, but were also rented out by villages to neighbouring communities for fishing outside of flood times, generating an important source of income for the community that was then used for community development projects (Venton 2004). Indeed many of the interventions assessed for CBA deliver both disaster and development benefits – evacuation shelters are used at other times for community meetings; provision of raised water wells are not only beneficial in floods but provide sufficient clean water year-round; and training and community organising for evacuation often results in community groups that advocate for themselves on a whole range of issues. This finding strongly supports the current discussions around 'no-regrets' development approaches and integrating/mainstreaming DRR/CCA within wider development plans.

Soft/non-structural measures are often more cost-effective and robust in relation to uncertainties than hard/structural measures. Firstly, soft measures generally cost less (less capital intensive) but can be highly effective. For instance, in El Salvador, Oxfam found that training on evacuation was highly effective and resulted in significant savings as families evacuate livestock

in good time (2009). Second, even where the ratio of benefits to costs is similar across soft and hard measures, the absolute cost for softer measures tends to be much smaller. For example, the Maldives study highlighted in *Box 5* found that non-structural measures yielded similar ratios to structural measures, but the total spend was far less. Further, structural measures tend to be 'threshold dependent' – designed to withstand a specific magnitude of hazard. As a result, returns from soft measures may be more robust in the context of uncertainty over changing conditions. The Samoa case study also came to a similar conclusion: finding that softer measures such as improved flood forecasting were more cost-effective than more structural measures such as floodwalls (Woodruff 2008).

The design of both soft and hard measures for risk reduction should be **fit-for-purpose to ensure returns**. The Risk to Resilience Pakistan study found that, contrary to intuition and previous experience, the Early Warning System (EWS) was not cost-effective, because it had been over-designed for its purpose (2008). This finding also accentuates that there is no one-size-fits-all approach; even an EWS can be cost-ineffective if it is not tailored to local circumstances.

Box 5: Building resilience in the Maldives

A CBA of three islands in the Maldives was conducted in 2009 to determine the effectiveness of creating 'safer islands' using mostly hard resilience measures to protect selected islands from the risk of sea level rise, flooding and tsunami. Two of the islands were under consideration for development as safer islands, whereas one of the islands had already been significantly modified following near complete destruction from the 2004 tsunami. A number of scenarios were considered, including a full suite of safe island measures (for instance construction of safe harbours, building of sea walls), a selected suite of measures, and a limited protection scenario.

The findings from the CBA were mixed, with a range of positives and negatives. Furthermore, the findings were very specific to island characteristics. In particular, the analysis for Thinadhoo Island was more positive because: 1) Thinadhoo has a predicted lower intensity for a tsunami and therefore a standard suite of risk management measures affords more protection; and 2) much of Thinadhoo's infrastructure is located away from high-intensity zones and therefore easier and less costly to protect.

Furthermore, the study found that soft resilience measures may, in fact, be a more successful and sustainable option for the Maldives. The greatest threat to the Maldives is sea level rise, which is slow onset (unlike other hazards such as flash flooding), and can be monitored (unlike earthquakes). Hence the Maldives can use time to its advantage to look into alternative protection options, allow for development of new technology, and lower cost innovation, while also allowing the natural adaptation processes of the islands to work to their full advantage. Man-made interventions may in fact hinder the ability of islands to respond naturally, and thus while providing some protection in the short term, may contribute to a lack of longer-term resilience. In addition, many of the more frequent hazard events, such as rainfall flooding, are not reported in the past – they have largely come about as a result of poor development practices on the islands, and hence could be rectified through lower-cost measures such as revising and enforcing land use planning.

Source: Cabot Venton *et al.* 2010.

CBDRM programming needs to **understand impacts throughout the whole system**, even if activities are only undertaken in a subset of communities. Benefits accrued from activities are not valid if risk is simply displaced. For instance, in Nepal, the British Red Cross (BRC) and the NRC found that mitigation works in the river were having significant benefits for the communities in that section of the river, protecting crops and houses from annual floods (2008). However, there was concern that the displacement of the water from one set of villages could possibly be increasing the flow of water in other villages, and hence simply displacing the impacts of flood-

ing. While the NRC could not operate across the whole river basin, the study findings highlighted the need to take a more holistic approach into consideration. This is a key weakness in many community-based approaches – they generally miss system-level vulnerabilities and/or benefits.

There is a need to link CBA to the **broader policy context**. For example, the Tearfund study in Malawi found that although effective and well-targeted local programmes can deliver significant benefits for a specific community, additional progress towards greater food security requires a supportive policy framework and coordination (2008). It is important therefore to embed the assessment of adaptation/DRR options into broader planning processes and create vehicles or processes to ensure results are integrated into national, sub-national or sectoral policies. CBA at a community level will not provide all of the answers, but rather needs to inform wider assessments at all levels. For example, DFID now uses 'value for money' as a metric across all of its programming decisions, both for implementation (forward-looking) as well as assessments (backward-looking), and the findings are used to support investments. In due course, the use of CBA should provide evidence that governments and donors alike can use to justify scaling up of investments and the need for policy and institutions to reinforce them.

Longer-term support can reap significant benefits. In several of the case studies, CBAs were assessed for both the short term and the longer term. A lot of NGO and donor programming in communities typically runs for one to three years. CBA demonstrates that returns can often be doubled if a small amount of support (for instance refresher training or maintenance on physical works) is provided over the longer term. For example, the BRC study in Nepal found that benefits could be doubled for a minimal amount of support in maintaining first aid kits, water wells and check dams over 10 years as opposed to the standard project lifetime of three years (2008). The longer the benefits can be realised, the greater the return on investment. Further, in a separate study in the Gambia, it was identified that many of the proposed activities could be sustained, in part through ongoing training and in particular by 'training the trainers' to minimize costs and to ensure benefits accrued and were replicated (Oxfam America 2011). In summary, the findings demonstrated the importance of considering both short- and long-term adaptation options in the broader development and planning context and of identifying a holistic adaptation portfolio (UNFCCC 2011).

8 KEY MESSAGES AND RECOMMENDATIONS

INTRODUCTION

The application of CBA at a community level is clearly adding value to our understanding of the effectiveness of efforts to reduce climate and disaster risk. As suggested by the CBA study findings described in the previous sections, the case studies have added a new dimension to our understanding of the types of interventions that are cost-effective, in some instances confirming suppositions, and in others presenting unexpected findings. The *process* is also proving valuable in helping partners to think through interventions in terms of outcomes, rather than outputs. This section summarizes the key messages emerging from this study; outlines recommendations for filling gaps in our understanding; and identifies recommendations for taking the agenda forward.

KEY MESSAGES

For DRM and CCA interventions

The studies show that no one size fits all – interventions need to be tailored to the community context.

- **Decision-making** with respect to channelling funds and scaling up need to be based on context-specific CBAs. We can draw common lessons on the different kinds of costs associated with different interventions and technologies, but the benefit that these will yield very much depends on what the communities need – in one community, access to livestock markets to get good prices may be the key to unlocking a high level of benefit, whereas in another veterinary services may be key. Both may have a strong economic argument, but 'what' to invest in depends first on the community profile.

If we want to deliver value for money at scale, our attention needs to refocus from 'what' to 'how.'

- The debate around this question has tended to focus on 'what' types of interventions can be scaled up as opposed to 'how' to design and implement a programme of work. There is a real risk that if we draw wider conclusions from CBA – e.g. hand pumps are almost universally high value-for-money interventions – this does not allow space for qualitative factors. It may be that a peace and security measure is significantly more valuable but gets missed off the radar because it delivers benefits that are not easily monetized. Or it may be that water pumps are high priority, but completely miss the mark because a less directly quantifiable measure such as the creation of a water user group is missing. The need for an integrated resilience approach cannot be understated.

  In theory, most resilience-building measures are value for money (other than those that are over-designed or hard structural measures, as outlined above). However, *in practice,* there are many examples of resilience measures that fail to deliver benefits to communities. This leads to the conclusion that maximising gains for every dollar spent ultimately depends on

how you design a programme of work, rather than *which* interventions you choose to implement.

CBDRM interventions should be designed to deliver value for money by focusing on key characteristics of the intervention process rather than just the intervention itself.

The studies suggest that the following characteristics of CBDRM interventions are important:

- Interventions should be designed **in consultation with communities** to ensure buy-in and longevity. Too many interventions fail because they were not introduced as a participatory process, not because the intervention itself is poor value for money.

- Interventions should be designed **as part of a holistic and integrated approach**. There is a lot of discussion around the lack of transformational change in communities, despite well-intentioned and thought-out interventions. A largely sectoral focus on interventions results in activities that are undermined by other factors not considered. So, for example, water infrastructure may fail if it does not account for issues around conflict or gender. The resilience agenda is helping to re-invigorate a more holistic and integrated approach to how we design interventions.

- Interventions should be designed **to be part of a pathway**. We frequently look for solutions, rather than understanding pathways of change. This is where a 'theory of change' approach can greatly facilitate value for money – where do we want to get to and how do we facilitate the process to get there? Many interventions do not deliver value for money in practice because they focus, for example, on humanitarian response, or development response, but fail to see the pathway between the two. Similarly, a long-term understanding and commitment is often lacking, and yet ensuring benefits over a longer timeframe greatly enhances value for money.

RECOMMENDATIONS

For filling gaps in our understanding

The gap analysis highlighted a number of gaps in our understanding in terms of the use of CBA in a community DRM context. The following recommendations are suggested for addressing these.

- Build the body of evidence on the use of CBAs for **assessing CBDRM in new geographic areas**. The gap analysis of the studies made available for this research found that the majority of studies identified to date have taken place in Asia, some in Africa and very few in Central and South America and the Middle East.

- Build the body of evidence on the use of CBAs for **assessing gender outcomes.** CBA is not designed to address distributional differences – for example, benefits to men and women are valued in the same way, and hence not differentiated in a traditional CBA approach. However, a critical factor in the design of DRR/CCA is often the promotion of women and children's rights and outcomes. So, for example, women typically bear the burden of gathering water for the household each day, and any water intervention that shortens this journey can bring about significant benefits for women specifically. Only one study as previously discussed attempted to value the gender equity of the intervention (Care International 2012). Differentiating these impacts in CBA will be an important factor in the interpretation of findings.

- Increase our understanding of the use of CBA for **slow onset disasters.** When first drafting this report in 2009, most of the case study work focused on rapid onset disasters, notably flooding. More recently, the trend has changed and an increasing body of evidence has begun to develop on slow onset or protracted crises. It is recommended that more effort be focused in areas where CBA is more complex, such as conflict, slow onset disasters and cyclical/cumulative impacts, DRR in recovery operations, and multi-hazard contexts.

- Develop our understanding of how CBA can support **investment in early response and resilience-building**. Recent work has begun to address the significant savings that can be made by avoiding the humanitarian consequences of inaction (see *Box 3* on the DFID TEERR report). This avoided loss can be significant and would benefit from further evidence to support the case for protecting development investments and avoiding costly post-disaster aid.

- **Initiate more forward-looking studies.** The gap analysis suggests that most CBA has been used in backward-looking assessments of interventions that have already been undertaken. However, more recently the CBA process has proved very helpful in a smaller body of forward-looking assessments, where CBA is used as part of a process to identify and evaluate a short list of interventions in a set of communities. Further work in this area would be beneficial.

- Further research to address **non-monetary benefits.** Given that many of the qualitative impacts addressed by DRR/CCA are central to good development, further work is required to:
  - identify ways that these non-monetary benefits can be quantified, drawing from literature in other areas of practice, such as environmental protection, for example, where some of these issues have been quantified using more complex techniques; and

  - develop procedures for assessing and ranking both qualitative and quantitative impacts for decision-making (such as risk assessment matrices) to ensure that non-monetary benefits are explicitly included in the process. This recommendation is particularly relevant in the context of an increased focus on ecosystem-based approaches**,** where soft measures and environmental approaches play a central role.

For moving forward

A number of specific recommendations emerged from the CBA studies and consultation. These support a process that builds on the work done to date and are applicable to the full range of stakeholders implementing and financing community-based work, including NGOs/CBOs, government and donors.

Develop a consistent CBA methodology and procedure for data collection.

This will help to ensure that findings from a range of studies across agencies and regions are comparable thereby creating a body of evidence that will help to inform policy choices at national and international levels. SROI specifically recommends that findings are not compared and the point is a fair one, as each CBA needs to be internally coherent, tailored to each context and use relevant assumptions. However, there are also areas where rules of thumb can be standardized to facilitate comparison.

- A potential starting point is **the integration into M&E and VCA procedures of data needs** relevant to CBA. Most M&E systems already collect baseline data that is relevant to a CBA, and require only a small amount of modification to collect relevant data that can be used for further analysis. This will help to institutionalize CBA and ensure that it is implemented in

the context of a strong M&E/VCA platform. Strong M&E/CBA will improve the transparency and accountability of activities, and the integration of CBA into M&E systems can help to drive more quantitative and efficiency-driven monitoring.

- **The development of standardized guidance and tools to support consistency,** designed to sit alongside existing processes such as VCA. Existing toolkits (e.g. Oxfam America) provide a good starting point.

Investigate the use of CBA in other areas of development practice.

For example the health/HIV communities where demonstrated cost-effectiveness has been used to great effect to advocate for further investment.

- **Document lessons and/or methodological approaches** that can be transferred across. As an example, the use of 'Knowledge, Attitude, Practice and Behaviour' Surveys (KAPB) in the health sector could provide some useful lessons and methodologies for collecting data.

Establish a CBA website/blog where practitioners can upload case studies, document methodological approaches and raise technical questions with a community of CBA practitioners.

This could also facilitate greater exchange of practice among the NGO, government and donor communities, identifying ways to work together, thematically and geographically.

- **Linkages should be created** between CBA and other relevant bodies of work, for example, 'Views from the Frontline' and other projects of the Global Network of Civil Society Organisations (CSOs) for DRR, as well as the growing body of work on M&E for resilience.

- **Regional communities of practice** should be developed providing evidence on context-specific interventions, providing guidance on the intervention process itself and for sharing relevant data.

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