Cost–benefit analysis of community-based disaster risk reduction

Red Cross Red Crescent lessons learned, recommendations and guidance

International Federation
of Red Cross and Red Crescent Societies

strategy2020

Strategy 2020 voices the collective determination of the International Federation of Red Cross and Red Crescent Societies (IFRC) to move forward in tackling the major challenges that confront humanity in the next decade. Informed by the needs and vulnerabilities of the diverse communities with whom we work, as well as the basic rights and freedoms to which all are entitled, this strategy seeks to benefit all who look to Red Cross Red Crescent to help to build a more humane, dignified, and peaceful world.

Over the next ten years, the collective focus of the IFRC will be on achieving the following strategic aims:

1. **Save lives, protect livelihoods, and strengthen recovery from disasters and crises**
2. **Enable healthy and safe living**
3. **Promote social inclusion and a culture of non-violence and peace**

International Federation of Red Cross
and Red Crescent Societies, Geneva, 2010

Cover photo: Community involvement
in river bank strengthening in Nepal.
Credit: Nepal Red Cross Society

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Summary

In recent decades there has been growing recognition that when it comes to effective disaster management, prevention is better than curNe[1]. Nevertheless, accessing sufficient resources to enable widespread community-based disaster risk reduction (DRR) continues to be a challenge. Meanwhile, funders are increasingly requiring proof that DRR is more cost-effective than disaster response (DR), so development and humanitarian players need to provide a strong evidence base.

Cost–benefit analysis (CBA) is a process that involves weighing expected project costs against the expected benefits in order to choose the most cost-effective option. It is increasingly being used in the world of DRR, both to design programmes and to demonstrate impact, but it has some limitations as an approach, and it is not always the best choice for these purposes. Through a series of case studies, this report emphasises the benefits of CBA while highlighting the need to use it appropriately, and the risk of practitioners who are insufficiently skilled producing results that appear robust but are actually invalid. CBA can be an appropriate option, but always within a wider emphasis on project planning and monitoring.

The need for evidence

Strategy 2020 highlights the IFRC commitment to strengthening community resilience, greater accountability and impact of programming. As part of this work we are scaling up community-based DRR, using a range of decision-support tools to target maximum impact and cost-effectiveness.

In response to the growing demand for evidence supporting effectiveness of DRR over DR, practitioners often quote that for every $1 invested in disaster risk reduction, $4 is saved in response[2]. Sometimes they increase the figure of $4 to $7. The figures sound promising, but they are usually misquoted. This is because they were originally calculated in studies performed on specific programmes. They are context specific, so their findings cannot be applied to other DRR projects.

In fact, there is no rule of thumb as to how much can be saved through DRR. As the case studies in this report show, some DRR activities may result in savings of tens of dollars for every $1 spent, while in others the implementation costs may outweigh the benefits they produce. (The benefit–cost ratios calculated in the case studies ranges from 0.7 to more than 25. Values above 1 indicate greater benefits than costs.)

The only certainty is that if DRR is properly designed and implemented, then it can certainly save more money than response could. And as a principle it should always save. However, those savings may take the form of lives, livelihoods, property or money. This raises the question of how to measure the savings.

1. Hagman, G. *Prevention Better Than Cure: Human and Environmental Disasters in the Third World*. Stockholm/Geneva: Swedish Red Cross, 1985.
2. See, for example, Multihazard Mitigation Council (MMC). *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*. Washington, D.C.: National Institute of Building Sciences, 2005.

Cost–benefit analysis: the answer?

Cost–benefit analysis (CBA) is a tool designed to measure the benefits produced by certain investments, based on economic methods. There is growing demand for CBA to be used to evaluate DRR projects. However, it is not the only option. Others include cost-efficiency analysis, multi-criteria analysis and simply improved project planning and monitoring.

The greatest added value of cost–benefit analysis lies not in the numerical results it produces but in the process by which it generates those results. In this process, stakeholders (including but not limited to community members, organisations and governmental bodies) come together to think about the financial implications of activities, and focus on outcomes (impacts) rather than outputs. They have to agree assumptions and reconcile perspectives through transparent dialogue that involves all stakeholders. This process can make an important contribution to effective programme design, and offers a way for everyone involved to contribute.

However, within DRR – including in the case studies in this report – CBA is mostly applied in such a way that it analyses financial values only, focusing on private rather than social costs. If one wants to really understand how DRR impacts on social and economic welfare, more long-term and complex assessment and monitoring are needed.

Using an economic measure to assess the impact of humanitarian projects means placing a monetary value on factors such as psychosocial well-being, or indeed on a life. There are ways of doing this: one approach used for health assessments is the disability-adjusted life year (DALY), which can be used to translate years of life lost and years of disability into income or financial losses. However, this approach is not widely accepted in the economic profession, and critics argue that it may actually be misleading. What is more, bearing in mind the Red Cross Red Crescent principles and values[3], a monetary value cannot be placed on a life or on psychosocial well-being.

Summing up

The greatest value of community-based DRR continues to be in supporting and empowering vulnerable communities. Because these are hard to quantify, CBA can capture only certain benefits of DRR projects. This means that CBA will always deliver an incomplete picture. So, as decision-makers will readily explain[4], it should never be used in isolation.

For this reason, CBA is most usefully viewed as one of a mix of qualitative and quantitative decision-support and monitoring tools that can help anticipate the holistic consequences of a proposed activity, alongside improved project planning and monitoring, to achieve maximum impact and cost-effectiveness. It is therefore neither realistic nor useful for the IFRC to perform CBA on all of its community-based DRR programming. Where it is used, it should be applied to specific programmes and contexts, and should be part of a wider move towards broader emphasis on improved project planning and monitoring to meet funding requirements, achieve maximum impact and ensure cost-effectiveness.

3. See www.ifrc.org/what/values/principles/index.asp.
4. See, for example, UNFCCC. *Synthesis Report on Efforts Undertaken to Assess the Costs and Benefits of Adaptation Options, and Views on Lessons Learned, Good Practices, Gaps and Needs*. Bonn: Secretariat of the United Nations Framework Convention on Climate Change, 2010.

1. Introduction

Sudanese men discuss the costs and benefits of community-based disaster risk reduction. Credit: Hisham Khogali/IFRC

In recent decades there has been growing awareness among humanitarians and development organisations that when it comes to effective disaster management, prevention – in this case, disaster risk reduction (DRR) – is better than cure – in this case, disaster response (DR). Nevertheless, accessing sufficient resources to support DRR, at a scale needed for sustainable global impact, continues to be a challenge. Many decision-makers are asking for proof of impact showing specifically that prevention is cheaper than cure.

Due to this demand, as well as a desire by practitioners to better measure the impacts of their work, the issue of cost–benefit analysis (CBA) has become a key topic for debate within the sector. There is a growing awareness of the benefits of CBA but also of its limitations as a means of providing the increasingly complex evidence that funders are demanding.

What is cost–benefit analysis?

CBA is an assessment tool used to determine the economic efficiency of a potential or already implemented activity. If the economic returns produced by the activity (benefits) are more than the amount spent to implement the activity (costs), then the activity is considered economically efficient – in other words, worthwhile.

CBA is used primarily during project design, to help compare activities and to identify the most economically beneficial. It can also be used as a post project evaluation tool, to understand whether a project has produced the expected benefits and returns. Often it is used simply for advocacy and communication, to show to partners and decision-makers that DRR is indeed worth the investment. Sometimes it is also used to help improve planned or ongoing programming.

CBA can be a highly effective decision-support tool. However, it is just one of many that can be used to help design projects and programmes, and should never be used in isolation. Over time its purpose has become blurred, and there is a growing expectation that CBA should always be carried out, even where it is not the best tool for the job or where practitioners do not have the required skills.

What are the alternatives?

CBA can be regarded as the most rigorous approach for comparing costs and benefits, yet it reaches its limitations quickly when benefits can or should not monetised, such as the value of life. There are a number of decision-support tools that can be used instead of, or alongside, CBA. Two key approaches are cost-efficiency analysis and multi-criteria analysis:

> **Cost-efficiency analysis** – This approach involves first setting a goal (for example, eliminating flood damage to 50 houses) and then devising activities to achieve that goal (for example, raising house plinths, moving houses or building a dyke). The team compares the options, and then identifies the most cost-efficient option for achieving its goal.

> **Multi-criteria analysis** – This approach involves considering several goals rather than just one. First, the team identifies goals – and trade-offs between them – and then weights the different goals to help select the best activity. For example, a programme may aim both to protect crops from floods and to provide the crops with irrigation. The activity chosen (dyke or retention pond) will depend on which goal is judged more important (flood protection verses irrigation).

These tools have both their merits and challenges. Cost-efficiency can provide a way around difficult and potentially contested benefit judgements: if the design is to save a certain number of lives at the lowest cost, there is no need to place a value on life. However, for cost-efficiency analysis a clear quantitative definition of goals has to be set from the beginning (which in integrated community-based DRR is often not feasible), and multiple goals cannot be considered.

Multi-criteria analysis is the most broad-based method, but when using a number of goals and attaching subjective weights to them, the analysis becomes complicated. Practitioners need to agree on the weights, solutions may not be found and it is hard to check the robustness of the results.

About this report

This report analyses the way CBA is used. It emphasises the benefits of this tool while highlighting the need to use it appropriately, and the risk of practitioners who are insufficiently skilled producing results that appear robust but are actually invalid. It consolidates the outcomes and lessons learned from a series of case studies, concluding that CBA can be valuable, but should be only performed in certain contexts, and when sufficient capacity is available.

A hanging footbridge between Barangays Pisanan and Indigan provides safe transportation during floods ensuring uninterrupted access to markets, health care and school. (Sibalom municipality, Antique province, Philippines).
Credit: Erik Olsson/IFRC

An older footbridge in a state of disrepair in the Philippines. Without investing in proper maintenance, the benefits of this footbridge can no longer be realized.
Credit: Erik Olsson/IFRC

A community working together to strengthen flood defenses in Ilam, Nepal.
Credit: Nepal Red Cross Society

2. Findings

To better understand the economic efficiency of community-based DRR, as well as the use of CBA for community-based DRR in the Red Cross Red Crescent context, the IFRC and some of its member National Societies implemented three case studies to test the effectiveness of the CBA approach to assess the value of three separate DRR programmes in Nepal, the Philippines and Sudan between 2008 and 2010.

This section presents the results of those three case studies. Each project was led by external consultants with the active participation of the National Societies. In all three cases, CBA experts were involved. In Nepal they led the study, while in the Philippines and Sudan they provided technical support and oversaw the proceedings.

The results of the case studies are reviewed in the context of some of the key decisions that had to be made during implementation. This includes why some key benefits, and therefore activities, had to be excluded from the analyses and how risk assessments were brought into the process. The numerical results are then reported with a description of how to interpret them.

Key challenges

In this section we consider two key issues – the problems of certain benefits being excluded from the analysis, and the difficulty of working with insufficient risk assessments – before going on to look at the results of the case studies. A range of further challenges are described in *Lessons learned*, page 13.

Excluded benefits

These three case studies set to understand and analyse the costs and benefits of multi-activity and multi-sectoral community-based DRR programmes. However, all three shared a key challenge for assessors, in that they all had important benefits that could not be included in the analysis, including:

- **Non-quantifiable benefits** – much Red Cross Red Crescent programming provides social support that cannot be measured numerically.
- **Non-monetisable benefits** – some benefits can be measured numerically, but it would be in contravention to Red Cross Red Crescent principles and values to place a monetary value on them.
- **Benefits that were too complex to monetise** – many benefits related to socio-economic well-being require complex and often theoretical economic concepts to quantify and monetise.
- **Lack of data** – generally, only limited pre-programme baseline data were available, and data from secondary sources were often incomplete or not at a household or community resolution.

Table 1, overlaf, provides some example of impacts and activities that could not be analysed due to these challenges.

Because of this, only certain activities were included in the case studies for the Philippines and Sudan. In Nepal, the full community-based DRR programme was analysed in more depth so that the economic efficiency of the overall programme could be better understood. However, this was at the expense of a more detailed understanding of the contributions of each individual activity, which would have been useful for improving programming and project design going forward. At the same time, this approach avoided the potential challenge of assigning specific or partial benefits to each individual activity.

Many of the activities analysed were of a physical or structural nature (such as the construction of a dyke or retention pond), while many of those that could not be analysed were non-structural. This was not intentional, but was due to the previously described constraints in measuring benefits. Again, the Nepal case study overcame this challenge by analysing the community-based DRR programme as a whole. It is possible to perform CBA on non-structural and software approaches, but structural approaches tend to be easier to analyse because their immediate benefits are more readily quantifiable.

Table 1. **Programme impacts and activities that could not be analysed**

Primary reason for non-inclusion	Examples of activities or impacts
Non-quantifiable benefits	Improved community coordination and cohesion
	Empowerment of women including women's centres
	Greater sense of security
Non-monetisable benefits	Lives saved (for example, by multi-purpose evacuation centres)
Too complex to monetise	Longer-term economic impacts
	Strengthened basic health care services
	Increased education – particularly for girls
Lack of data	Some small-scale physical mitigation works
	Strengthened disaster preparedness for response
	Increased water supply (sub-surface water dams, hand pumps, protected wells, distribution systems, etc.)

Risk assessments

In the absence of scientific information and sophisticated hazard modelling, the case studies used very basic risk assessments. In some study locations in the Philippines floods occur every year, so flood frequencies did not need to be considered. In the Sudan study location, droughts occur at a similar magnitude twice every five years (on average), so an annual drought frequency of 40 per cent was used.

In Nepal, stakeholders differentiated between normal yearly flooding and high-magnitude floods, which occur every five-to-ten years. The practitioners incorporated both these factors into the CBA by averaging their impacts over each year in the analysis period – for example, by spreading the impact of a flood that occurs only every ten years over ten years, to obtain its annual impact.

Results

Table 2 lists the results of the three case-study CBAs, reported as the benefit–cost ratio. (For an explanation of the benefit–cost ratio, see *Interpreting the results*, page 12.) The analysis periods were selected based on actual programme start dates, foreseen project life spans and data limitations.

The resulting benefit–cost ratios ranged from less than 1 to more than 25. Most results were substantially above 1.0, meaning that the community-based DRR programmes and activities can be considered economically efficient, or worth it.

Table 2. **Results of the case-study CBAs**

Country	Location	Activities	Analysis period	Benefit–cost ratio
Nepal	Ilam District	Integrated structural, non-structural and livelihood activities to strengthen overall resilience, including riverbank strengthening, constructing evacuation shelters, community organisation, first-aid training and providing income-generation funds.	2006–2021	19
Philippines	Barangays Pis-anan and Indig-an, Sibalom, Antique Province	Building a hanging footbridge for safe transportation during floods increasing access to market, health care and school	2004–2018	24
	Barangays Poblacion 1&2, Burgos, Surigao Del Norte Province	Building a sea wall to protect houses and crops from storm surges	2000–2019	5
	Barangay Roxas, San Isidro, Surigao Del Norte Province	Building a dyke to protect houses, crops and livestock from river flooding	2000–2014	0.7
Sudan	Al Maneer, Derudeib, Red Sea State	Constructing terraces to capture run-off for farming	2005–2015	>25
	Lashob, Red Sea State	Building earth dams and embankments to capture run-off for farming	2005–2015	2.4
	Hamisiet, Red Sea State	Developing a communal garden for dependable produce, increasing household income	2004–2014	>25
	Delai, Red Sea State	Building a *hafir* (retention pond) to provide water for people and livestock	2005–2020	2.7

For activities with benefit–cost ratios of just over or below 1.0, poor performance could be attributed to some of the benefits not being properly captured, as discussed earlier. However, it could also indicate that the original project design was not optimal and lacked sufficient consideration for maximising impacts and cost-effectiveness. This is exactly the sort of situation in which CBA can make a useful contribution to decision-making and design support.

Interpreting the results

There are three main figures used to report the results of a CBA:

> **The net present value** – the difference between the sum of all the costs and the sum of all benefits over the lifetime of the project, in today's (present) values. (For an explanation of present values, see *Analysing with present values*, page 18.)

> **The benefit–cost ratio** – the sum of all benefits divided by the sum of all costs – again, in today's values.

> **The internal rate of return** – the return on the costs, reported as an interest rate – in other words, if the money spent on costs were invested somewhere else, such as the stock market, the interest rate that would be needed to match the benefits of the project.

None of the three parameters listed above provides information on the data and the assumptions used in the calculations. For this reason, they should never be viewed in isolation, without an understanding of how they were produced. Recognising the assumptions and uncertainties involved in CBA, the supposed accuracy of the resulting numbers tends to be misleading. If a benefit–cost ratio is marginally above 1 (say, 1.05), it cannot be concluded that the project is worth it. So, CBA results should only be considered in orders of magnitude rather than exact figures.

Most often (including in this report), CBA results are reported as the benefit–cost ratio. A benefit–cost ratio greater than 1.0 indicates economic efficiency (the benefits are greater than costs, so the activity is worth it). However, the benefit–cost ratio can be somewhat misleading, because good investments can range from 1 to infinity, while bad investments can only range between 0 and 1.

If a project costs $1 million but produces $5 million in benefits, the benefit–cost ratio is 5. But if these figures were reversed, with $5 million in costs and $1 million in benefits, the benefit–cost ratio would be 0.2. In terms of perception, 5 is much further from the good performance threshold (of 1) than 0.2. But in terms of CBA, 0.2 is as just as poor a score of economic efficiency as 5 is a good one.

One way to avoid this issue is through the net present value. The high-performing project described in the previous paragraph would have a net present value of $4 million ($5 million minus $1 million), while the poor-performing project would have a net present value of $-4 million.

For more information about interpreting the results, see Section 3, Considerations for analysis.

Lessons learned

All three case studies produced lessons and recommendations for community-based DRR that were specific to the context and activities of the programme they focused on. This report highlights lessons learned for performing CBA in the Red Cross Red Crescent context, but some general cost and benefit-related outcomes are valid for all community-based DRR programming.

A key finding was that long-term engagement – primarily through regular maintenance – can substantially increase the economic efficiency of community-based DRR. Once up-front investments have been completed, regular maintenance can ensure continuous and long-term benefits. During these times, small maintenance costs can produce large benefits, offsetting high initial costs. Depending on the programme, maintenance should target both hardware (in other words, maintaining structures) and software (refresher training). Maximising impacts and benefits through continued support generally requires long-term donor commitment and government support or participation.

Specific lessons, relating specifically to performing CBA, were as follows:

1. Designing the analysis

The key lessons here were in relation to assessing the impact of individual activities as opposed to a whole-programme assessment, the difficulty in assessing both increased resilience and reduction in losses, and the challenges in setting boundaries of analysis.

Individual activities versus the full programme

Even if the ultimate goal is to better understand the overall economic efficiency of a community-based DRR programme, gathering information about the costs and benefits of individual but potentially linked activities within the programme will better help guide and improve programme design. However, it can be quite difficult to assign specific benefits to individual activities. Even assigning costs to individual activities can be challenging – particularly for overhead costs such as staff time, which are sometimes poorly recorded.

Carrying out a full-programme CBA does avoid the challenges of assigning costs and benefits to individual activities. But then information on how to improve the impact and efficiency of certain activities is not generated, limiting the CBA's use for decision support – which is a primary objective of performing CBA in the first place.

Increased resilience versus fewer losses

Integrated community-based DRR programmes often aim to reduce disaster losses as well as to strengthen resilience. Analysing a mix of such benefits requires a structured approach, as some benefits represent decreases in losses while others reflect positive changes in household production and/or income. It must also be considered that reductions in losses are generally realized only if a hazard occurs, so likely not every year, while increases in production and/or income can be realized every year, potentially varying depending on the hazard conditions.

Boundaries of analysis

It can be difficult to define the boundaries of a CBA, depending on the reach of the activities being analysed. For example, flood mitigation measures protecting one community may be shifting negative impacts downstream to another community that is not part of the programme. The CBA results for the programme may therefore be very positive if the CBA analyses only the target community – but this will miss the bigger picture. So, practitioners must acknowledge potential negative impacts of programming and incorporate these into the analysis.

2. Data challenges

Specific challenges in this area arise when compiling data, and in considering the applicability of data within changing contexts.

Primary data

The data needed for a thorough CBA often do not exist, are difficult to obtain or are unreliable. The primary source of data should be the target communities themselves, but people tend to find it difficult to remember quantitative information from previous years. In fact, many people have difficulty in even quantifying 'current' information – particularly when dealing with socio-economic and disaster issues. This means that the quality of data from communities can be variable and difficult to verify.

Secondary data

Data that do not come directly from communities (for example, from a National Society branch office, government or partner organisation) can be difficult to collect. Particularly in the case of long-running programmes, high staff turnover and poor archiving systems often result in past documentation becoming lost or untraceable. Sometimes old reports become illegible due to weathering, and in any case paper documentation needs to be digitised, which can be a very tedious job. Meanwhile, government agencies (national and local) are sometimes unwilling to share data for a variety of reasons.

Often, secondary data that are available are at an inappropriate scale – for example, sub-national socioeconomic indicators do not provide community and household details. Both primary and secondary data rarely capture important informal processes such as the costs of social and kinship obligations and baselines of nomadic peoples.

Data applicability in changing times

Even if solid data of past experiences are available, their use for estimating future processes is challenged by a constantly changing world. This is particularly true when analysing community-based DRR for weather-related risks, in light of climate change. Even though operations and maintenance costs are generally not large, and can usually be well predicted into the future, sometimes unexpected and larger support costs do arise.

3. Risk and vulnerability

Lessons in this area of work include the importance of recognising social impact, and the need to take into account natural hazards and uncertainty.

Value of social impacts

As reviewed in the case study results, the fact that many important impacts (especially social benefits) are difficult or impossible to quantify is a major limitation of CBA for use in the Red Cross Red Crescent context. It is clear that CBA can only provide partial decision support for vulnerability-focused programming, as it fails to capture key qualitative outcomes and analysis.

Natural hazards

The occurrence and intensity of a natural hazard in a given year is generally unpredictable. To incorporate this in CBA, practitioners must use a risk-based approach to calculate the annual average disaster losses, based on past and predicted hazard frequencies and intensities. In other words, the CBA calculates an average disaster impact per year by averaging the likelihood of a range of possible disasters.

However, in many settings it can be difficult to obtain scientific information on hazard frequency and magnitude – how often a hazard such as a flood can be expected, and how large it might be. Even with such information, assumptions will probably be needed on the impacts each magnitude of hazard will have. At most, communities and local organisations may be able to supply information on the past impacts of disasters yearly, bi-yearly and perhaps every five-to-ten years.

To assign probabilities to hazards of different magnitudes and their impacts, practitioners need to triangulate all this information and perhaps, depending on what details are available, to make assumptions. For weather-related disasters, they also need to take into account changing frequencies and intensities due to climate change.

Uncertainty

CBA is part of a risk-management process, so uncertainty is inherent. One of the objectives of risk management is to weigh up all the factors contributing to uncertainty (hazard frequency and magnitude, climate change, natural adaptation, and so on) and make the best possible decision in the face of uncertainty, using a range of qualitative and quantitative tools.

Depending on the context and data environment of the analysis, there comes a point when the compounding of uncertainties and assumptions becomes so great that practitioners can no longer perform the CBA with confidence. But it is difficult to judge when this is, and stakeholders may disagree about whether or not to proceed.

4. Process versus results

Learning within this topic included the importance of innovative thinking, and consensus building, as elements of the CBA approach.

Innovative thinking

The numerical results that arise from a CBA are far less valuable than the process of carrying it out. By requiring practitioners to think about the financial implications of activities and focus on outcomes (impacts) rather than outputs, the CBA process can offer fresh insights that can improve programming.

CBA forces practitioners to consider relevant issues in a way that may be different from traditional approaches. Whether this involves thought processes on socioeconomic impacts or insights into hazard frequency, it can act as a catalyst for new perspectives, deeper understanding and potentially innovative solutions.

Consensus building

If CBA is to be carried out effectively, assumptions must be agreed and perspectives reconciled through open dialogue, involving all stakeholders. This process plays a valuable role in designing programmes that meet demands and can be supported by everyone involved.

5. Capacity to perform CBA

The main lessons within this area were the importance of sufficient technical skills to perform CBA effectively, and the need more generally for strong planning, monitoring and evaluation skills.

Technical skills

National Society staff and community members had mixed feelings about the manageability of the CBA process – particularly in terms of quantifying disaster and community-based DRR impacts. Some found it more intuitive than they expected, while others found it challenging. This could partly reflect the differing approaches taken by the supporting technical experts – particularly in their ability to demystify technical language.

Technical analysis such as CBA requires a sound understanding of the economic principles on which it is built, as well as certain mathematical and computing skills. At the same time, CBA is not an off-the-shelf product that can be implemented following a guide. As such, most National Society staff would need training in order to perform CBA properly, and many National Societies would need CBA mentors to help ensure proper implementation.

Planning, monitoring, and evaluation skills

A National Society must have strong skills in monitoring and evaluation before it even considers performing a CBA. Where a CBA is planned, adequate time and human resources must be allocated if the process is to be successful. Because the particular value of the approach is in the process itself, there is little point rushing it.

6. Integrating in existing processes

Learning in this area included the need to integrate CBA into processes such as vulnerability and capacity assessment (VCA) and baseline setting.

Vulnerability and capacity assessment

CBA adds a more quantitative approach to existing Red Cross Red Crescent qualitative decision-support tools. As such, it can be adapted to operate in line with existing processes, such as VCA and monitoring and evaluation. If it were added to VCA, practitioners would simply need to add additional lines of questioning to the existing process of gathering quantitative data on outcomes and impacts in the field.

Baselines

Unless solid baselines have been put in place at the start of the programme, post-programme CBA requires baselines to be reconstructed retrospectively. This is generally difficult, and will affect the quality of the CBA.

In addition to the specific lessons highlighted above, the following lessons were gleaned from studies of CBA for community-based disaster risk reduction performed outside of the Red Cross Red Crescent. One key source of information are the nine working papers of the ProVention Consortium and DFID-supported *Risk to Resilience Project*[5], some of which are referenced directly in this document.

7. The importance of identifying inequity

Because the Red Cross Red Crescent targets the most vulnerable, and adheres to the principle of impartiality, programming decisions must take into consideration potential challenges in fair and targeted support. However, CBA generally treats the beneficiaries of a project as a homogenous group, whether this comprises a single community, all communities in a region, or an entire country. This means that it tends not to account for differences in the distribution of costs and benefits. If within a targeted community certain people benefit – or are perceived as benefiting – less than others, CBA will not capture this quantitatively[6].

8. The need for comparative disaster-loss data

CBA for community-based DRR presents a further challenge in that the main benefit of community-based DRR is a reduction of disaster losses, which can be very difficult to measure. If community-based DRR is completely successful, then there are no disaster losses. So, there is a need for information or assumptions about the disaster losses that would have occurred had the community-based DRR not been implemented. Often, these type of baseline data do not exist or – due to changing disaster patterns driven by such processes as climate change – past experiences cannot be considered relevant for current and future conditions.

5. See www.proventionconsortium.org/?pageid=37&publicationid=158#158
6. Moench, M. and the Risk to Resilience Study Team. *Understanding the Costs and Benefits of Disaster Risk Reduction under Changing Climatic Conditions*. 'From Risk to Resilience' working paper no. 9. Kathmandu, Nepal: ISET-Nepal/ProVention, 2008.

A well-organised community working together to manage impacts during flooding in Mahotary, Nepal.
Credit: Nepal Red Cross Society

3. The relationship between costs and benefits

As we have seen, CBA can be a complex process. This section highlights two necessary areas of understanding – converting past and future values to the present, and recognising the changing dynamics between costs and benefits over time (including what this means for project planning).

Analysing with present values

CBA is performed using cost and benefit values today, in the present. Past and future costs and benefits are shifted to present values through a discount rate. All the CBA results in this report utilised a discount rate of 10 per cent. This parameter – also called the social discount rate – is used to reflect the preference for living and consuming today versus doing so in the future. The higher the discount rate, the stronger the preference is for spending today.

The logic behind discounting is best described through an example: an apple today is worth more than the same apple tomorrow because today's apple can be sold, the money invested, and from this additional income generated tomorrow. Since we think and plan in the present, we consider that tomorrow's values result from a smaller investment today. (CBA should also consider inflation, which in a developing country setting can be quite high. However, inflation is treated separately from discounting.)

In CBA, the discount rate is applied every year, meaning that with each year, looking into the future, the reduction of future values to the present is greater. Someone with a 0 per cent discount rate feels that $100 any time in the future is also worth $100 to him or her today. However, someone with a 10 per cent discount rate feels that $100 in five years time is worth only $62 to him or her today, and that $100 in ten years time is worth only $39 today. When quantified like this, such value judgements can have large impacts on the outcomes of a CBA.

Applying high discount rates (of 5–15 per cent) is standard practice for CBAs of development projects. But, by assuming a strong preference for the present, this can shift large burdens to future generations, as the assumptions may not be valid when impacts are large-scale and irreversible. For example, some leading economists have suggested that in analysing the economics of climate change, very low discount rates (of less than 1 per cent) should be used.

The easiest way around the moral and political debate of selecting a discount rate is to perform a sensitivity analysis. In other words, the CBA should be performed many times, using a different discount rate (of, for example, between 0 and 20 per cent) each time. If in all cases the overall outcome is the same (consistently either worth it or not worth it), then the results can be considered relatively robust. However, if the outcome varies depending on the discount rate, then further stakeholder discussion and analysis will be needed to support decision-making.

Cost and benefit interactions over time

When considering evaluation, it is important to understand the relationship between costs and benefits. While CBA often comes across as a somewhat theoretical tool, the idea of comparing costs and benefits over time is in fact very pragmatic, and is something everyone does in their daily lives, even for the smallest of decisions. The fact that CBA supports real-world decision-making can be demonstrated most effectively through a hypothetical example.

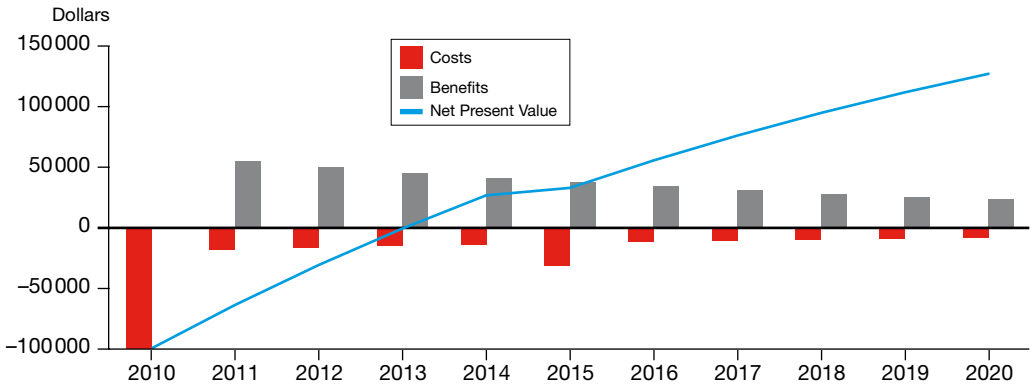
Imagine a community-based DRR programme that runs for ten years – in this case, from 2010 to 2020. During this decade, the National Society invests by paying the following costs:

> initial investment in 2010 of $100,000
> operations and maintenance costs of $20,000 every year thereafter
> an additional cost of $30,000 for refresher training in 2015.

Benefits for the target community start the year after initial implementation (2011) and amount to $60,000 each year.

The practitioners have performed the analysis, and the results are shown below in the present value based on a 10 per cent discount rate (meaning that future costs and benefits are reduced to reflect their value today), following the process, and the assumptions behind it, described in *Discounting the future?* (see page xx). In this example it is important to see how much this changes the values. For example, although the benefits are $60,000 every year, their present values today are substantially lower. The further one looks into the future, the more the present value decreases.

Figure 1. **Costs and benefits of a community-based DRR programme over ten years**



As we saw in *Interpreting the results* (page 12), the net present value is the difference between the cumulative benefits and costs. If the net present value is above 0, then the project is considered economically efficient. This corresponds to the benefit–cost ratio being above 1.0. Here, the final net present value, as calculated for the ten-year project lifespan in 2020, is $127,000, which for this example corresponds to a benefit–cost ratio of 1.53.

Figure 1 clearly shows the lesson learned that long-term engagement – primarily through regular maintenance – can substantially increase the economic efficiency of community-based DRR. Often initial costs (as shown for 2010) are quite large. But over time, as benefits are reaped every year, they offset these costs. Even though some operations and maintenance costs are needed every year, they deliver comparatively large benefits.

With each passing year the net present value increases, eventually changing from negative to positive after three years (by 2013). So, if the operation and maintenance of this project were stopped in 2013, then the final net present value would be negative, meaning that it would not be economically efficient. Again, it is clear that long-term support is needed not only for greatest impacts, but also to ensure economic efficiency.

The realities shown in this hypothetical example point to the need for proper decision-support tools such as CBA to be used in project planning. For example, it could be that a proposed project would only start producing overall benefits (positive net present value) after seven years, but that current plans are to limit the project duration to just five years. CBA would show this to be a poor plan, and would provide evidence for a longer project duration. Similarly, CBA would provide a further argument for longer-term donor and local partner support.

Yet this is a very simple theoretical example where all costs and benefits have been idealised. In real applications the analysis would be more complex, and would require certain technical capacity in the implementing National Society.

As we have seen, the relationship between costs and benefits can change over time, and assumptions on values today verses in the future can have a major impact on the results of a CBA. These can be complex concepts that require not only a strong understanding by practitioners, but also agreement by stakeholders.

4. Recommendations and guidance

Community volunteer Maximino Virtudazo leans against the sea wall protecting his community from storm surges. (Barangay Poblacion, Burgos municipality, Surigao Del Norte province, Philippines).
Credit: Erik Olsson/IFRC

A primary recommendation emerging from the case studies in Nepal, Philippines and Sudan is that CBA should not be applied across the board to all Red Cross Red Crescent community-based DRR programming. An attempt to do so would neither be feasible nor useful. Instead, community-based DRR programmes should be selected for CBA based on their implementation timeframes, availability of data and, most importantly, the relevance and applicability of CBA to support future programming decisions within the specific country or regional context. If it is determined that a CBA will indeed be productive, then this should be done following the recommendations and guidance below (grouped by theme).

The case studies also resulted in two specific CBA action recommendations:

> In each community to be analysed, practitioners should spend at least one day focussed specifically on data collection.

> The team performing data collection in the field should consist of two or more interviewers.

When and why to perform a CBA for community-based DRR

The primary goal of CBA should be to support decision-making in designing future programming, or in improving an existing programme. Performing a CBA simply to understand whether a past community-based DRR programme has been economically efficient is of little value – except, perhaps, for political and advocacy purposes. So, it is important to keep in mind that CBA was originally developed as a pre-implementation design and targeting-support tool. During the design phases of community-based DRR, it may also be worth considering alternative quantitative decision-support tools (see *What are the alternatives?*, page 6).

While CBA can be very useful for designing programmes, it should not be used simply as an optimisation tool in order to select for implementation the activity with the highest benefit–cost ratio. The very process of identifying and agreeing costs and benefits can produce great insights to help improve programme design.

The most obvious and transparent means of evaluating the impact of community-based DRR is to assess how activities have affected real disaster experiences. So, ideally, all community-based DRR programmes should include provision in their budgets and monitoring and evaluation plans to collect and analyse specific data if a disaster occurs in the target communities during or after community-based DRR has been implemented.

Performing qualitative impact analysis and a quantitative CBA simultaneously can be mutually enforcing, but it is likely to be very challenging. It is recommended that CBAs are performed separately from impact evaluations – at least in terms of field visits – but of course, as mentioned, the outputs (and assumptions) cannot be viewed in isolation.

Integrating CBA into existing processes

As CBA provides only a limited perspective, it should never be used in isolation, but should be part of a wider assessment process that includes[7]:

- stakeholder participation, enabling a common understanding of risk and the potential strategies to reduce it
- detailed participatory analysis of the factors contributing to vulnerability
- quantitative and qualitative methods for evaluating the impacts of disasters and climate change
- processes for data collection and analysis that are qualitative and quantitative, transparent, inclusive and that clearly identify commonly agreed assumptions on which the analysis is based.

CBA should be incorporated from the outset of a programme. Integrating it with needs assessment, VCA, design and monitoring, and evaluation processes from the scoping and design phase of a potential programme will improve accuracy and reliability. This is particularly true when developing appropriate indicators and collecting data for the pre-programme baseline.

7. Moench, M., Ahmed, S., Mustafa, D., Khan, F., Mechler, R., Kull, D., Dixit, A., Opitz-Stapleton, S. and the Risk to Resilience Study Team. *Moving from Concepts to Practice: A Process and Methodology Summary for Identifying Effective Avenues for Risk Management Under Changing Climatic Conditions*. 'From Risk to Resilience' working paper no. 8. Kathmandu, Nepal: ISET-Nepal/ProVention, 2008.

VCA, in particular, provides a good entry point for collecting baseline and monitoring data, as well as for gleaning community views on potential costs and benefits. What is more, the impact-driven and quantitative thinking needed for CBA can be leveraged through VCA to enable communities to gain potentially non-traditional perspectives of their own vulnerability, and to develop innovative approaches to community-based DRR.

Managing data limitations and uncertainty

Any process (including CBA) will have methodological limitations, so it is vital to ensure that any weakness or data gaps in the assessment are identified, fully documented and addressed appropriately.

Practitioners must consolidate and triangulate all data collected from primary and secondary sources in order to achieve the most robust and reliable data set possible. When data are of questionable accuracy, it is important to use the most conservative values – in other words, those leading to the worst CBA outcome. For example, if a cost is unclear then the highest cost should be used, while if a benefit is unclear then the lowest benefit should be used. This contributes to greater confidence in the overall results.

These sorts of data assumptions must be clearly recorded, and indeed the CBA must be transparent on all assumptions so that all stakeholders can gauge for themselves how reliable the findings are for decision-making. Assumptions must be openly stated and clearly presented, so that they can be challenged and tested.

Sensitivity analysis is useful to circumvent controversy and disagreement about assumptions. In addition to testing different values of parameters such as the discount rate, estimated costs and benefits should be increased and decreased by different amounts (25 per cent, 50 per cent, and so on). If different – and even extreme – combinations of parameters, increased or decreased costs and benefits always result in similar CBA outcomes (worth it versus not worth it), then the results can be considered robust.

In some cases, data availability and uncertainties may make it impossible to perform a quantitative CBA. An alternative option could be to simply collect, compare and discuss different stakeholders' views on whether or not a specific project would be beneficial, in a qualitative form of CBA[8].

8. Dixit, A., Pokhrel, A., Moench, M. and the Risk to Resilience Study Team. *Costs and Benefits of Flood Mitigation in the Lower Bagmati Basin: Case of Nepal Tarai and North Bihar*, 'From Risk to Resilience' working paper no. 5. Kathmandu, Nepal: ISET-Nepal/ProVention, 2008.

Ensuring sufficient capacity

If CBA is to be integrated into broader quantitative effectiveness or impact evaluation processes, as suggested, then it is important to assess the capacity of the National Society to perform such evaluations. Practitioners conducting CBA should have a solid understanding of key principles and good practices for conducting effectiveness or impact evaluations – preferably as part of an established monitoring and evaluation system. If this capacity is lacking, then it is unwise to attempt a CBA.

Often, longer-term programming is composed of multiple and overlapping projects in the same communities, sometimes supported or even implemented by different partner organisations. Without systematic and consistent monitoring and reporting, it can be challenging to capture the data required for a CBA. Here, again, if CBA is to be effective then a strong backbone of monitoring and evaluation is needed.

If a CBA does go ahead, all National Society and other personnel involved should receive training. Depending on the extent to which the training is integrated into existing processes, it may be combined or integrated with training activities in areas such as impact evaluation and VCA. Additionally, an internal or external technical adviser should be made available to support data collection and analysis. CBA champions could be identified and trained to provide support to other staff.

A farmer in Hamisiet, Red Sea State, Sudan, tends to a communal garden. Credit: Hisham Khogali/IFRC

5. Conclusions

This seawall in Barangay Poblacion, Burgos municipality, Surigao Del Norte province, Philippines, protects houses and crops from storm surges. Credit: Daniel Kull/IFRC

It is often claimed that disaster risk reduction costs less than the savings it provides in disaster losses and response, making it economically efficient. Cost–benefit analysis (CBA) is increasingly being used to prove this, as well as to better plan and guide programming.

Based on the experiences of the IFRC, as well as other organisations, it is clear that community-based DRR can be economically efficient or financially worthwhile as long as is properly designed and implemented. Community-based DRR should certainly save – whether that saving is of money, lives or livelihoods. The key is to maximise impact and cost-efficiency with the help of a mix of decision-support tools – both qualitative and quantitative.

As a process, CBA can be a very useful means of better planning and understanding community-based DRR, focusing on outcomes represented through benefits, and maximising the impacts of limited resources. Where it is carried out, all stakeholders should be involved in the process – particularly in terms of participating in a transparent process to agree the many assumptions that are often needed.

However, CBA can be challenging to perform effectively due to lack of technical capacity, insufficient data and the need to assess disaster losses that would have occurred had community-based DRR not been implemented. Further, many of the main benefits of Red Cross Red Crescent community-based DRR programming – such as saving lives and instilling a sense of security – cannot, or should not, be represented through monetary values.

The view of the IFRC is that we should not try to perform CBA on all of our community-based DRR programming, but instead should apply it to select programmes, in certain contexts. The priority should be first to increase skills and capacities in basic monitoring and evaluation. Only once these are solid, it may be worth considering CBA as the appropriate option.

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A hafir *(retention pond) providing water for people and livestock in Delai, Red Sea State, Sudan. Credit: Hisham Khogali/IFRC*

Notes

Earth dam to capture run-off for irrigation in Lashob, Red Sea State, Sudan. Credit: Hisham Khogali/IFRC

A dyke in Barangay Roxas, San Isidro District municipality, Surigao Del Norte province, Philippines, protects houses, crops and livestock from river flooding. Credit: Daniel Kull/IFRC

The Fundamental Principles of the International Red Cross and Red Crescent Movement

Humanity

The International Red Cross and Red Crescent Movement, born of a desire to bring assistance without discrimination to the wounded on the battlefield, endeavours, in its international and national capacity, to prevent and alleviate human suffering wherever it may be found. Its purpose is to protect life and health and to ensure respect for the human being. It promotes mutual understanding, friendship, cooperation and lasting peace amongst all peoples.

Impartiality

It makes no discrimination as to nationality, race, religious beliefs, class or political opinions. It endeavours to relieve the suffering of individuals, being guided solely by their needs, and to give priority to the most urgent cases of distress.

Neutrality

In order to enjoy the confidence of all, the Movement may not take sides in hostilities or engage at any time in controversies of a political, racial, religious or ideological nature.

Independence

The Movement is independent. The National Societies, while auxiliaries in the humanitarian services of their governments and subject to the laws of their respective countries, must always maintain their autonomy so that they may be able at all times to act in accordance with the principles of the Movement.

Voluntary service

It is a voluntary relief movement not prompted in any manner by desire for gain.

Unity

There can be only one Red Cross or Red Crescent Society in any one country. It must be open to all. It must carry on its humanitarian work throughout its territory.

Universality

The International Red Cross and Red Crescent Movement, in which all societies have equal status and share equal responsibilities and duties in helping each other, is worldwide.

Cost–benefit analysis of community-based disaster risk reduction

Red Cross Red Crescent lessons learned, recommendations and guidance

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The International Federation of Red Cross and Red Crescent Societies promotes the humanitarian activities of National Societies among vulnerable people.

By coordinating international disaster relief and encouraging development support it seeks to prevent and alleviate human suffering.

The International Federation, the National Societies and the International Committee of the Red Cross together constitute the International Red Cross and Red Crescent Movement.

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