How preparedness pays off

Evolution, costs, benefits and prospects of disaster risk management in Georgia

www.ifrc.org
Saving lives, changing minds.

International Federation
of Red Cross and Red Crescent Societies

The International Federation of Red Cross and Red Crescent Societies (IFRC) is the world's largest volunteer-based humanitarian network. Together with our 189 member National Red Cross and Red Crescent Societies worldwide, we reach 97 million people annually through long-term services and development programmes as well as 85 million people through disaster response and early recovery programmes. We act before, during and after disasters and health emergencies to meet the needs and improve the lives of vulnerable people. We do so with impartiality as to nationality, race, gender, religious beliefs, class and political opinions.

Guided by *Strategy 2020* – our collective plan of action to tackle the major humanitarian and development challenges of this decade – we are committed to 'saving lives and changing minds'.

Our strength lies in our volunteer network, our community-based expertise and our independence and neutrality. We work to improve humanitarian standards, as partners in development and in response to disasters. We persuade decision-makers to act at all times in the interests of vulnerable people.

The result: we enable healthy and safe communities, reduce vulnerabilities, strengthen resilience and foster a culture of peace around the world.

Cover photo: Patrick Bolte, Banyaneer

P.O. Box 303
CH-1211 Geneva 19
Switzerland
Telephone: +41 22 730 4222
Telefax: +41 22 733 0395
E-mail: secretariat@ifrc.org
Web site: www.ifrc.org

How preparedness pays off.
Evolution, costs, benefits and prospects of disaster risk management in Georgia

Table of contents

Abbreviations

AAL	Annual avoided losses
ADA	Austrian Development Agency
AHL	Avoided hazard losses
APR	Annual probability rate
AutRC	Austrian Red Cross
BCR	Benefit-cost ratio
CBA	Cost-benefit analysis
CCA	Climate change adaptation
CENN	Caucasus Environmental NGO Network
CHF	Swiss Franc
DP	Disaster preparedness
DREF	Disaster Relief Emergency Fund
DRC	Danish Red Cross
DRM	Disaster risk management
DRR	Disaster risk reduction
ECHO	European Commission for Humanitarian Aid and Civil Protection Office
EMA	Emergency Management Agency
EPR	Emergency Preparedness and Response
EWS	Early warning system
FEP	Family Emergency Preparedness
GDP	Gross Domestic Product
GEL	Georgian Lari
GRCS	Georgia Red Cross Society
HDI	Human Development Index
ICRC	International Committee of the Red Cross
IFRC	International Federation of Red Cross and Red Crescent Societies
NGO	Non-governmental organisation
OCHA	(UN) Office for the Coordination of Humanitarian Affairs
ODI	Overseas Development Institute
PPP	Purchasing power parity
RC/RC	Red Cross/Red Crescent
UNDP	United Nations Development Programme
USD	United States Dollar
VCA	Vulnerability and Capacity Assessment

Executive summary

Does disaster risk reduction actually pay off? If so, what are the benefits and underlying mechanisms? This cost-benefit analysis (CBA) finds that the USD 2.4 million of external support to the disaster risk management programme of Georgia Red Cross Society (GRCS), launched in 2010, has paid off extremely well: In the three surveyed areas, identified benefit-cost ratios range between 12.51 and 54.54.

The study identifies avoided hazard losses as the main benefit and analyses the various channels that lead to loss avoidance. It also notes significant organisational and governance co-benefits.

Several cost-benefit analyses have researched the ratio between costs for risk mitigation and benefits in terms of avoided losses. While showing positive benefit-cost ratios, it has been argued that such approaches fail to grasp the full value of DRR, as they do not reflect multiple developmental benefits.

This study aims to make amends, while also analysing the interplay between the factors that lead to loss avoidance. It confirms the underlying assumptions of many community-based DRR projects: that household and community preparedness as such is a potent factor to reduce hazard-related losses.

Country context

Located in the southern Caucasus and home to 3.7 million people, Georgia has achieved considerable economic and development progress since it re-emerged as an independent nation after the 1991 break-up of the Soviet Union. Yet, much of this progress has still to reach many rural parts of the country, where most make a living based on small-scale agriculture.

As a mountainous country located on a major fault line, Georgia is exposed to geophysical and hydro-meteorological hazards. While earthquakes pose the greatest risk to lives and livelihoods, other hazards are much more frequent - mudflows, landslides and floods in particular. Taken together, these hazards incurred 72.3% of recorded economic hazard losses between 1995 and 2010. Over the same period, overall recorded losses amounted to more than USD 1.8 billion - equivalent to 1.9% of its GDP over this timeframe, or USD 499 per citizen. Without proactive action, the impending effects of climate change are expected to make matters worse, leading to even greater hazard-related damages and losses.

Evolution of disaster risk management

Georgia Red Cross Society emerged from the Georgian branch of the Soviet National Society after the country's independence in 1991. Today it has a network of 37 branches that work on social, health and disaster management services. In the armed conflicts over Abkhazia and South Ossetia, it also played an important humanitarian role in collaboration with the International Committee of the Red Cross (ICRC).

GRCS began working on disaster risk reduction in 2010, when a consortium of Danish Red Cross, Icelandic Red Cross and IFRC launched an ECHO-funded regional DRR project in Georgia, Armenia and Azerbaijan. Focussing on the country's north-central regions of Racha and Imereti, support has been extended twice, and may be extended over a fourth project phase. From 2012 onwards, another regional project (Building Safe and Resilient Communities, BSRC) extended the coverage of DRR work to Georgia's eastern region of Khareti. Supported by Austrian Development Agency (ADA), Austrian Red Cross and Swiss Red Cross, the work here is being extended over a second phase. Furthermore, ICRC has been supporting four branches since 2013 through its Emergency Preparedness and Response (EPR) project.

Overall external support between 2010 and 2015 amounted to USD 2.4 million and also included resources from the Disaster Relief Emergency Fund (DREF).

The DRR program is strongly anchored at schools and promotes disaster preparedness of schools and households. It also led to the formation of GRCS disaster management teams, who closely collaborate with public emergency services. The program furthermore developed links to local governments, spurring governmental co-funding for GRCS activities and selected mitigation measures.

The proactive nature of the program is a rather novel direction, considering a national context that traditionally equates disaster risk management with relief and recovery.

Benefits and costs

The study findings confirm the cost-effectiveness of the DRR program. Assuming time horizons of fifteen years, adjustment of past financial figures by inflation and a discount rate of 5% for years beyond 2015, benefit-cost ratios were calculated for three surveyed areas. Identified ratios range from 12.51 (Sagarejo; supported over three years, no mitigation) to 20.60 (Ambrolauri; supported over four years, no mitigation) to 54.54 (Lagodekhi, supported over one year, effective mitigation). While the highest ratio is partially attributable to mitigation as well as excellent targeting (high level of hazard exposure), the study also shows that the promotion of household preparedness pays off. The combination of initial school-based combination and family emergency preparedness (FEP) training is particularly effective - 95% of households exposed to both 'streams' adopted home safety measures. On average, households adopting proactive steps expected a reduction of hazard losses that is significantly greater than amongst those who did not.

Impact

In the absence of available data that would have allowed longitudinal comparisons, BCRs were based on expected rather than materialised levels of avoided losses. As such, it was not yet possible to quantify actual impact. However, there is mounting anecdotal evidence that losses have already been avoided. The organisational co-benefits, quantified by using the number of volunteer hours as a proxy for the outcomes of volunteer work, are substantial. The number of volunteer hours has already increased almost eightfold. The total value of these benefits is found to be USD 8.8 million, using a conservative projection up until 2025. Eventual impact will partially depend on the extent to which local governments integrate DRR into public planning - recent trends in this regard give reason for cautious optimism.

Building further

The cost-effectiveness of DRR illustrated in this study, the high level of hazard losses across the country, and recent events that have triggered calls for more proactive disaster risk management provide an opportunity for GRCS to build further. The Society has the potential to become a more prominent actor, supporting efforts to modernise Georgia's disaster risk management structures and processes. To do so, it should retain and expand what already works well - school-centred programming, embedding of GRCS teams in emergency services networks, and the close collaboration with government actors.

At the same time, it should strive to address gaps. Issues include the need for better targeting (e.g. of households without school-aged children), the integration of early warning systems, and improved validation of proposed mitigation measures. At an organisational level, GRC should strive to build up capacities in communication and resource development to render the Society and its DRR program even more effective and sustainable. Improvements to monitoring and data management are advisable to enable better impact assessment and programming.

The main partners of GRCS should allocate some of their support to the reinforcement of these these cross-cutting capacities. Thus enabled and encouraged by past achievements, Georgia Red Cross Society has strong potential to further reinforce hazard resilience across the country.

Introduction

Imagine two scenarios. In the first, a flood kills one-hundred people and causes damages of USD ten million. In the second, a similar flood in a similar setting kills five people and causes USD one million of damage. The first community was unprepared, while the second had practiced evacuation, response, and been proactive in building dams and flood canals.

What would the news headlines look like? Most likely, the first would read something like "100 killed in flood." The second would likely read "five killed in flood" if this event made it into the news at all.

Although both 'stories' are newsworthy, another one may go unnoticed: "95 lives saved through flood preparedness." However, such a story would require thorough analysis and does not usually enter the fast-paced news cycle.

The two scenarios illustrate the dilemma that disaster risk reduction (DRR) faces: it usually lacks the counterfactual that can illustrate its success. At best, disaster risk reduction leads to 'non-events' - when hazards do not create widespread damages and losses, they receive much less attention.

By contrast, when hazards overwhelm local capacities to prepare, protect and respond - thus leading to disasters - they receive broad media coverage. In turn, local governments and organisations provide assistance, showing they care for affected constituents. In larger disasters, international assistance is quickly dispersed to provide relief and assist people in their recovery.

The missing counterfactual of DRR helps explain why the recognition of the concept's benefits, re-affirmed by the Sendai Framework for Disaster Risk Reduction[1], remains out of sync with actual funding practice.

On the one hand, DRR has long become the conceptual mainstream of disaster risk management (DRM), and there is convincing evidence of its effectiveness. The humanitarian zeitgeist has moved even further, emphasising the notion of community resilience - the ability to anticipate, reduce the impact of, cope with, and recover from the effects of adversity without compromising [...] long-term prospects (IFRC 2011:iv).

On the other hand, DRR's share of humanitarian assistance remains rather marginal despite a moderate increase over recent years (1.8% in 2009; Kellett and Sparks 2012:12). By default, the media cycle pays less attention to mere hazards than it does to full-fledged disasters - there is neither an obvious 'story' nor, by implication, the disaster-like generosity towards helping sustain and reinforce the structures that helped avoid a disastrous level of damages and losses in the first place.

In other words, the success of DRR (in terms of outcomes) tends to be a key challenge (in securing funding).

By comparing scenarios (DRR versus no DRR), cost-benefit analysis (CBA) can be a potent tool to illustrate the effectiveness of disaster risk reduction. The analysis in this report on DRR efforts in Georgia - that have been implemented since 2010 - adds to the growing body of literature on DRR cost-effectiveness.

Like a recent study of DRR in Tajikistan, its findings show that DRR pays off. Applying CBA, which is a common technique amongst economists to gauge the efficiency of investments, the two studies unearth findings that make a strong case to bring DRR funding in line with its conceptual recognition.

Whereas the Tajikistan study focussed on the benefits of mitigation (avoided losses and damages), this report makes an attempt to go further. While avoided losses remain central in the discussion of benefits, this report also discusses the various mechanisms behind loss avoidance, and puts more emphasis on the economic, organisational and governance co-benefits.

The report is arranged in five chapters. The first two describe Georgia's general background and disaster context *(chapter 1)* and analyse the evolution of the DRM efforts of Georgia Red Cross Society (GRCS) *(chapter 2)*.

The report goes on to explain the basics of CBA and the underlying methods and assumptions *(chapter 3)* before presenting its findings *(chapter 4)*. Based on a survey amongst target households, interviews and document review, it finds that disaster risk reduction is even more valuable than commonly acknowledged.

The study concludes with recommendations and an outlook concerning DRM structures and foci, future scenarios, a move towards resilience programming, and the future use of cost-benefit analyses *(chapter 5)*.

1. Like its preceding Hyogo Framework for Action, the Sendai Framework for Disaster Risk Reduction 2015-2030 urges for investments in DRR. *http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf*

1. Georgia and disasters

Warning: *A road sign in Ambrolauri warns of falling rocks from overhanging cliffs. As a mountainous country on a major fault line, Georgia is prone to a wide array of geophysical and hydro-meteorological hazards. Between 1995 and 2010, the country recorded economic hazard losses of USD 1,843.6 million - equivalent to 1.9% of its GDP over this period.*

Photo: P. Bolte, Banyaneer

In June 2015, a hippo from Tbilisi made local and international headlines. As sudden floods and mudflows inundated the city's zoo and adjoining parts of Georgia's capital, the hippo managed to escape and take a stroll around Tbilisi's Heroes' Square. The hippo was recaptured and survived. At least twenty people were less fortunate and lost their lives. Meanwhile, economic damages were estimated to be around USD 50 million.[2]

Six months later, there was little reminding the visitor of this flood (bare the closed zoo). Yet, the fact that a natural disaster could cause such damage right in the heart of the country caused a re-think, triggering calls for better and more proactive disaster risk management. Early warning systems are now being discussed - a novel step in a context where disaster risk management has largely been equated with relief and recovery. For a country that re-emerged as an independent nation in 1991 (following the collapse of the Soviet Union), this pattern is consistent with many other post-Soviet contexts. At the same time, the frequency and scale of disasters suffered in the recent past indicate that greater investments in proactive disaster risk management could bring sizeable benefits to Georgia's people and its economy.

As will be shown in chapter two, the work of Georgia Red Cross Society (GRCS) over the past six years is a move into this direction. But before turning to GRCS, the country's general background *(part 1.1)* as well as its disaster history *(part 1.2)* shall be introduced to contextualise our analysis.

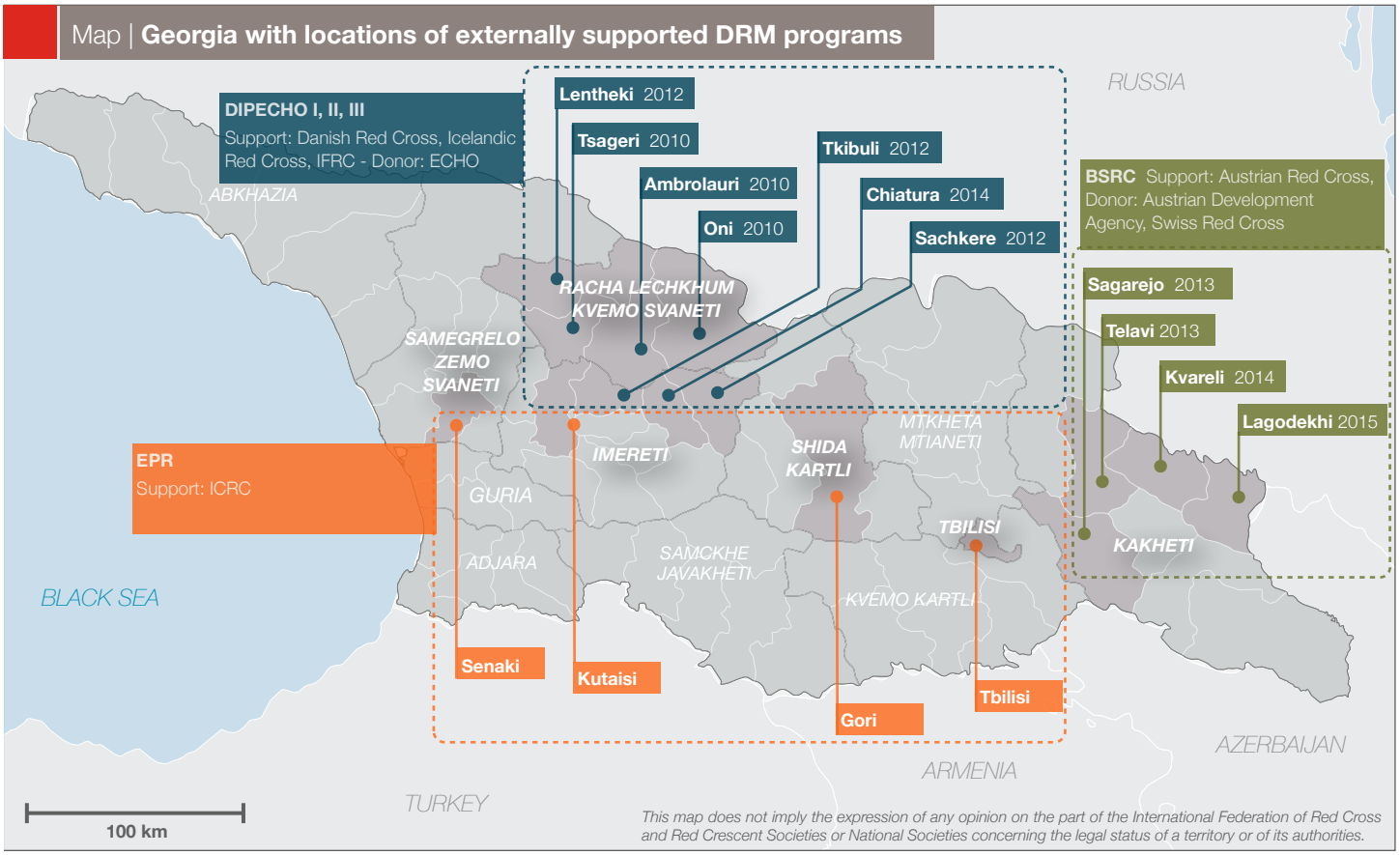
1.1 General country context

Located in the southern Caucasus, Georgia is home to 3.7 million people[3] and borders Turkey and Armenia to the south, Azerbaijan to the east, and Russia to the north *(see map overleaf)*. It has access to the Black Sea, although its coastline has been effectively halved when Georgia lost control over the region of Abkhazia as a result of the Russian-supported

2. Estimates on economic losses from the Tbilisi floods vary; this figure is a conservative estimate.

3. Georgia's population is frequently listed at 4.4 million - however, the 2014 census showed the population is actually significantly smaller, partially due to the fact that the areas of Abkhazia and South Ossetia are discounted.

Map | **Georgia with locations of externally supported DRM programs**



war in 1992-93. Another conflict in South Ossetia led to two wars (1991-92 and 2008) and resulted in the loss of control over some of Georgia's north-central territory. For strategic and economic reasons, Georgia pursues policies seeking close alignment with the European Union (EU), NATO and the United States. Although long-term goals of EU and NATO membership remain elusive, these policies facilitated considerable development assistance and economic liberalisation. Notably, the justice and law enforcement system has been overhauled and modernised with external support, putting the high crime rates of the mid-1990s to an end.

Georgia's economy has grown significantly over the past two decades, with GDP growth rates averaging at 5.4% over this period. But while the shiny new apartment towers in Tbilisi epitomise this growth, dilapidated office buildings, schools and homes in the countryside illustrate that progress has yet to reach many rural areas.[4] The GDP per capita is USD 7,160 (2013, World Bank - PPP), and Georgia has a Human Development Index (HDI) score of 0.754, roughly on par with Brazil.

1.2 Hazards and disasters

As a largely mountainous country in one of the most seismically active parts of the Alpine-Himalayan collision belt, Georgia is exposed to both geophysical and hydro-meteorological hazards. Strong earthquakes with magnitudes up to 7.0 and intensity of 9 on the Mercalli scale have occurred in the past, with an average recurrence period of 103 years (UNDP 2014:10). In 1991, a 7.0 earthquake in the Ratcha-Imereti region killed 100 people and affected 100,000 others. In 2002, an earthquake in Tbilisi killed six, affected 3,700, and caused economic losses of USD 350 million.

4. Two statistical data underscore the urban-rural divide that was easily visible during the study: More than 55% of the country's workforce is employed in agriculture (largely family-based farming) - yet, the sector contributed only around 10% to GDP (9.3% in 2013). Meanwhile, the city of Tbilisi contributes almost half (48.4%) to gross value added.

Hydro-meteorological hazards are much more frequent - in the period 1995-2010 there have been an average of 380 landslides, 134 mudflows, as well as 10 floods and 10 hailstorms per year. Available data show that mudflows and landslides together caused almost 60% of all hazard-related economic losses *(see figure 1)*.

The Georgia DRR Atlas, prepared by the Caucasus Environmental NGO Network and the University of Twente, provides an excellent overview of the country's hazards and risks (CENN 2010). The analysis of these Atlas data shows that Georgia recorded hazard-related losses of more than USD 1.8 billion between 1995 and 2010. This is equivalent to 1.9% of its gross domestic product during this time, or to USD 499 per citizen. On average, economic losses amounted to USD 115.2 million per year - 282 times the average amount the that GRCS partners have invested in disaster risk reduction per year.

With mudflows, landslides, floods and storms standing behind 80% of economic hazard losses, the greater variability in precipitation that is emerging as a manifestation of climate change is likely to make matters worse (UNDP 2014:10). Some interview partners felt certain that more frequent hailstorms and droughts are already due to climate change.

The fact that the number of hazard-related deaths is comparatively minor (178 people died in disasters between 1995 and 2015, compared to 564 in traffic accidents just in 2013) should not distract from the high cost of disasters to the country in general, and to the most vulnerable in particular. As field research in hazard-prone villages across Georgia illustrated, many households are disproportionally affected; some are inundated by flood waters every year. On average, surveyed households lost USD 1,117 in the single most severe event over the past decade. Given short return rates in these areas, hazards challenge the prosperity of these households. The destruction of perennial crops (e.g. wine) or irrigation systems can be particularly problematic, as they often leave small-scale farmers unable to recover (given lack of funds and insurance) and incur prolonged indirect losses.

While the Tbilisi floods of 2015 has brought the gaps in disaster risk management to national attention, the extent to which this will lead to more concerted efforts between the responsible agencies remains to be seen - and whether such efforts will reach the most vulnerable parts and citizens of the country. The efforts of GRCS, described in chapter 2, are a step into this direction.

Figure 1 | **Key disaster data** 1995-2010*

1,843.6 million
Total recorded economic losses 1995-2010, in USD

1.9%
Economic losses as share of GDP

115.2 million
Annual average losses, in USD

2,075 million
Probable maximum loss PML) from earthquakes, 100-year period

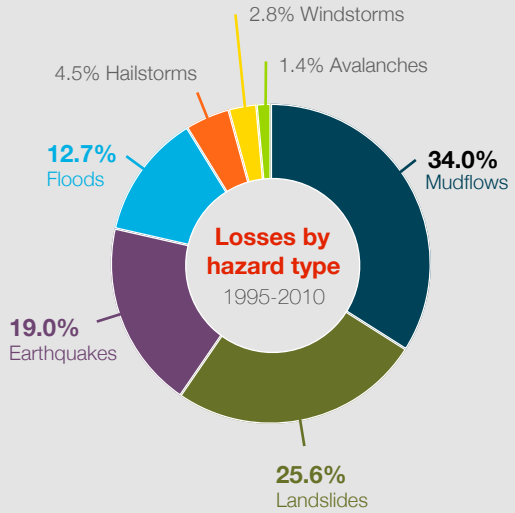


Fig. 1a | **Average annual hazard losses, in million USD**

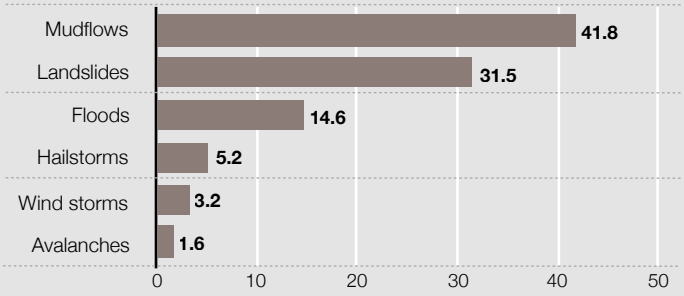
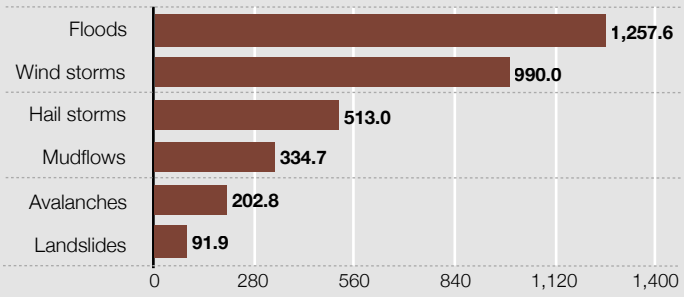


Fig. 1b | **Average annual hazard losses per event, in '000 USD**



* Data are based on the Georgia DRR Atlas (CENN 2010). Given the context of this study, economic losses related to droughts - although substantial - were not included in this illustration.

Note that figures 1a and 1b also exclude earthquake-related losses. See the DRR Atlas as well as interactive hazard maps at *www.drm.cenn.org*.

2. Managing disaster risk: evolution

Oni: *The local disaster management team presents itself in full gear. Teams like this one have been engaged in numerous emergencies, extending the capacity of the public emergency services. projects.*

Photo: Georgia Red Cross Society

2.1 Georgia Red Cross Society (GRCS): an introduction

Georgia Red Cross Society emerged from the Georgian branch of the Soviet National Society after the country's independence in 1991. Today it is one of the biggest civil society organisations in the country. It has a network of 37 branches that work on social, health and disaster management services. In the armed conflicts over Abkhazia and South Ossetia, it also played an important humanitarian role in collaboration with the International Committee of the Red Cross (ICRC).

2.2 Evolution of GRCS disaster risk management

Prior to 2010, GRCS had limited resources in disaster risk management, and work was mainly restricted to assistance in relief efforts. The Society started working on disaster risk reduction when a consortium of Danish Red Cross, Icelandic Red Cross and IFRC launched an ECHO-funded DRR project.

This "Regional Programme for Building Safer Local Communities in the South Caucasus"- usually referred to as 'Dipecho I', covered communities in Georgia as well as in neighbouring Armenia and Azerbaijan. In Georgia, the project targeted the municipalities of Ambrolauri, Oni and Tsageri in the north-central region of Racha. There have been two successive projects since ('Dipecho II and III'), during which coverage was extended Lentheki and then to the municipalities of Tkibuli, Sachkere, and Chiatura *(see map on p. 2)*. A proposal for a fourth project was submitted in December 2015; if accepted, this 'Dipecho IV' project would extend support up until mid-2017.

The project aimed to increase disaster response capacity through the formation of volunteer-based teams. Initially based around branches, the most recent Dipecho iteration included the added formation of nine 'satellite' teams in remote communities of Racha. Through links with emergency services, overall response capacity was to be raised. Another element of the project was the focus on school and households' disaster preparedness. Teachers were trained to teach DRR in their lessons - in turn, they encouraged children to discuss possible home safety measures with their families (e.g. preparation of a go-bag, relocation of affixing of furniture, addition of exits). Family Emergency Preparedness (FEP) training was conceived as a complementary approach. Furthermore, the project aimed to advocate governments towards mainstreaming of DRR into public planning. In some cases, mitigation measures were added, co-funded by the project and local governments.[5]

From 2012 onwards, another regional project (Building Safe and Resilient Communities, BSRC) extended the coverage of DRR work to Georgia's eastern region of Khareti. Supported by Austrian Development Agency (ADA), Austrian Red Cross and Swiss Red Cross, the work here is being extended over a second phase. The project largely iterated the approach of the Dipecho projects, but was more selective in the choice of target communities: some municipality-level support aside, most of the work focussed on a community (village/ suburb) rather than a wider area.[6] Although laid out over a three-year timeframe, the BSRC project staggered its support to branches - beginning with Sagarejo and Telavi in 2013, it expanded to Kvareli (2014) and Lagodekhi (2015) more recently.

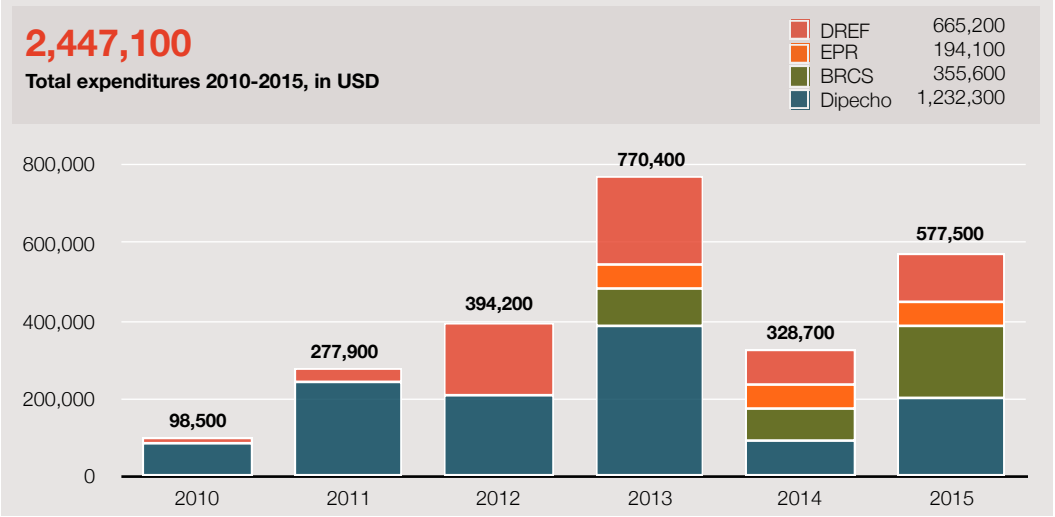
In 2013, ICRC added DRR support to some of the branches it had already been working with - Gori, Tbilisi, Kutaisi and Senaki. The Emergency Preparedness and Response (EPR) project took on the same approach found in other areas, albeit on a smaller scale.

Meanwhile, IFRC provided funding for relief and recovery after several emergencies (through DREF, the Disaster Relief Emergency Fund) - most recently after the Tbilisi floods.

In sum, external support to the GRCS DRM program amounted to more than USD 2.4 million between 2010 and 2015 *(see figure 2a)*.

On the national level, GRCS has emerged as a well-respected player in the disaster management arena. It takes part in national policy dialogues and assessments and collaborates with the Emergency Management Agency (EMA) as well as other agencies and ministries, UN organisations (UNDP, UNICEF) and non-governmental organisations. Recent legislative initiatives, such as the Civil Safety Law (2014) provide a basis for disaster risk management, paving the way for better overall coordination (See UNDP 2014).

Fig. 2a | **External support to disaster risk management**



5. See the respective project evaluations for further details - Rees-Gildea 2011 (Dipecho I, Rees-Gildea 2013 (Dipecho II) and Roots 2015 (Dipecho III).
6. See Roots 2015a for the evaluation of the BSRC project.

3. Analyzing costs and benefits

Gori: *GRCS volunteers and headquarters staff pose in front of the local branch. Gains in branch capacity are analysed as part of the benefits of the DRR projects.*

Photo: P. Bolte, Banyaneer

With more than USD 2.4 million invested in the disaster risk management program of Georgia Red Cross Society thus far, it is intriguing to ask about the benefits and their value. Yet, there is no easy answer or an overall benefit-cost ratio. The common phrase 'for every dollar invested, benefits of X dollars were identified' may be easily misconceived the ratio between *overall* benefits to *overall* program costs. However, very few studies can make such broad claims: this would not only require a comprehensive assessment, but also the ability to monetise *all* benefits. Yet, it is not always possible to express non-market benefits in money (e.g. the value of a saved life, the value of a greater sense of security). The present study therefore does not provide an overall value of the benefits created with the USD 2.4 million of investments.

Rather, and like most other cost-benefit analyses of disaster risk management (see Shreve and Kelman 2014; Chadburn et al. 2013), it analyses concrete benefits on a smaller scale (village, neighbourhood).

Most cost-benefit analyses related to DRR focus on avoided hazard losses that can be attributed to mitigation measures (e.g. dams, flood canals). While these studies illustrate generally positive benefit-cost ratios, there are at least two shortfalls: *first*, they do not analyse the benefits of greater disaster preparedness as such. The theory of change behind many DRR projects implies that a family who has learned and adopted proactive risk

measures encounters less losses - whether mitigation measures have been implemented in their community or not. But available literature sheds little light on the value of these savings - an issue that this study aims to address. *Another* shortfall of most studies is that they do not fully 'unlock the triple dividend' of DRR, as a recent paper by the Overseas Development Institute (see ODI 2015) put it. With most cost-benefit analyses highlighting avoided losses (the '*first dividend*'), the paper argues that the '*second dividend*' of development benefits (greater potential for economic investments in areas of reduced disaster risk) as well as the '*third dividend*' of social, economic and environmental co-benefits are overlooked. As a result, the identified benefit-cost ratios fail to take the full value of DRR into account. While the first dividend materialises only when disaster strikes, second and third dividends can emerge irrespective of actual disaster occurrence.

This study attempts to value some of these second and third dividends, and we will return to this issue shortly. But first, let us have a look at the basic concept of cost-benefit analysis.

3.1 Introducing cost-benefit analysis

Cost-benefit analysis (CBA) is a well-established tool amongst economists to help make decisions as to whether a proposed investment shall be pursued or not *(ex ante)*. In the development context, CBAs are also used to assess efficiency of past and present programmes *(ex post)*.

The basic idea is simple: Identify and quantify all expected and witnessed benefits (B) as well as all related costs (C) and then divide B/C to calculate the benefit-cost ratio (BCR). Generally, where the benefits exceed the costs (B > C and thus BCR >1.0), there is a positive benefit-cost ratio and thus a case for the suggested or implemented intervention.

Many OECD countries regularly conduct or require CBAs for their development assistance, including in the field of disaster risk management. The World Bank is seen as one of the "chief practitioners" of CBA - unless a BCR above 1.0 can be reasonably expected, funds will not be released (Mechler 2009:1).

What sounds simple in theory is more difficult in practice - and the CBA approach has several limitations: *First*, it generally looks at costs and benefits rather than at their distribution. To identify the distribution of benefits (e.g. who were the winners and the losers?), other qualitative methods need to be added. *Second*, CBAs face difficulties in assessing non-market impacts such as those on health and the environment. CBAs tend to overlook environmental externalities. *Third*, future benefits need to be discounted in relation to current benefits. But applying high discount rates, as it is often suggested in a development context, expresses a strong preference for the present while potentially shifting large burdens to future generations (Mechler 2008:6). A *final* limitation concerns time and scale: since a cost-benefit analysis involves estimates, the usefulness and robustness of a CBA generally decreases as time and scale increases (ibid:7).

Generally, cost-benefit analysis must be understood as an approximation rather than an expression of the exact economic value of a given investment. The limitations - in particular the difficulty in assessing non-market impact - place cost-benefit analyses of DRR in an uneasy position: avoiding loss of life and alleviating human suffering (also through relief) are arguably some of the most important benefits of effective disaster risk management.

Despite the limitations, a review of 25 CBA studies of DRR interventions shows that DRR pays off even when only considering avoided economic losses (Shreve and Kelman 2014). Showing a range of benefit cost-ratios from 1.3 to 1,800, the paper also dismantles the

much-quoted myth that every dollar invested into DRR yields seven dollars in benefits. CBA studies are always context-specific, and the identified benefit-cost ratios rely as much on the type and appropriateness of the intervention as they do on the studies' underpinning assumptions and parameters. In order to make benefit-cost ratios meaningful, it is therefore crucial to explain how they were calculated.

3.2 Calculating costs

Although overall costs for the different GRCS projects were readily available from GRCS, the *actual* attribution of cost shares to particular project locations was not feasible. Therefore, the study made use of assumptions as to how costs could be reasonably allocated. *Figure 3a* summarises the underlying procedure and attributed costs.

Having obtained financial data in Georgian Lari (GEL, *step 1*), amounts were converted into US Dollars, using average annual exchange rates for each respective year *(step 2)*. As all benefits and costs are expressed in current (2015) US Dollars, these original-year amounts were then converted, using cumulative US dollar inflation rates (*step 3*). Assuming that 75% of overall costs are attributable to field-level implementation, amounts were adjusted accordingly *(step 4)*.

The specific attribution to branches then depended on the length of support *(step 5)*: In the case of Dipecho I, BRCS and EPR projects, figures were simply divided by the number of branches each respective project had supported. For Dipecho II and III projects - each of which represented an expansion in the number of covered branches - it was assumed that the initial start-up costs in new branches equalled those costs under Dipecho I. These start-up costs were then subtracted from the Dipecho II/III costs, with the remainder being equally distributed amongst all other branches. *Finally*, the costs for the different phases were added up, generating the overall attributable amount.

The cost calculation is not without caveats. Although it is reasonable to assume that costs for three project phases are greater than for just one phase, there is a considerable level of uncertainty as to whether costs in Ambrolauri, Oni and Tsageri were really twice as high as in Chiatura, as the figures suggest. The attribution also does not take the different costs of

Figure 3a | **Attribution of program expenditures to GRCS branches**

1. Financial data from GRCS (GEL)

2. Conversion to USD for each year (annual average exchange rates)

3. Conversion to present USD (cumulative inflation rates)

4. General attribution to field implementation (75%)

5. Specific attribution to branches
- For the **BRCS, EPR** and **Dipecho I** projects, the figure as identified through earlier steps was divided by the number of supported branches
- For the **Dipecho II and III** projects, the first-phase figures (from Dipecho I) were taken for newly added branches. The remainder of the expenditures was then divided by the number of all other branches

Branch	Supported since	Programs	Attributed costs per period (2015 USD)			Attributed costs (2015 USD)
			First phase	Second phase	Third phase	
Ambrolauri	2010	DIPECHO I, II, III	94,277	67,401	22,675	**184,353**
Oni	2010	DIPECHO I, II, III	94,277	67,401	22,675	**184,353**
Tsageri	2010	DIPECHO I, II, III	94,277	67,401	22,675	**184,353**
Lentheki	2012	DIPECHO II, III	-	90,283	22,675	**112,958**
Tkibuli	2012	DIPECHO II, III	-	90,283	22,675	**112,958**
Sachkere	2012	DIPECHO II, III	-	90,283	22,675	**112,958**
Chiatura	2014	DIPECHO III	-	-	88,000	**88,000**
Sagarejo	2013	BSRC	68,161	-	-	**68,161**
Telavi	2013	BSRC	68,161	-	-	**68,161**
Kvareli	2014	BSRC	67,289	-	-	**67,289**
Lagodekhi	2015	BSRC	67,121	-	-	**67,121**
Gori	2013	EPR	37,025	-	-	**37,025**
Tbilisi	2013	EPR	37,025	-	-	**37,025**
Kutaisi	2013	EPR	37,025	-	-	**37,025**
Senaki	2013	EPR	37,025	-	-	**37,025**

mitigation measures into account. Furthermore, it is important to note that the costs do neither reflect the in-kind contributions from volunteers, nor the financial contributions from government partners (the latter are however incorporated in individual case studies).

3.3 Calculating benefits

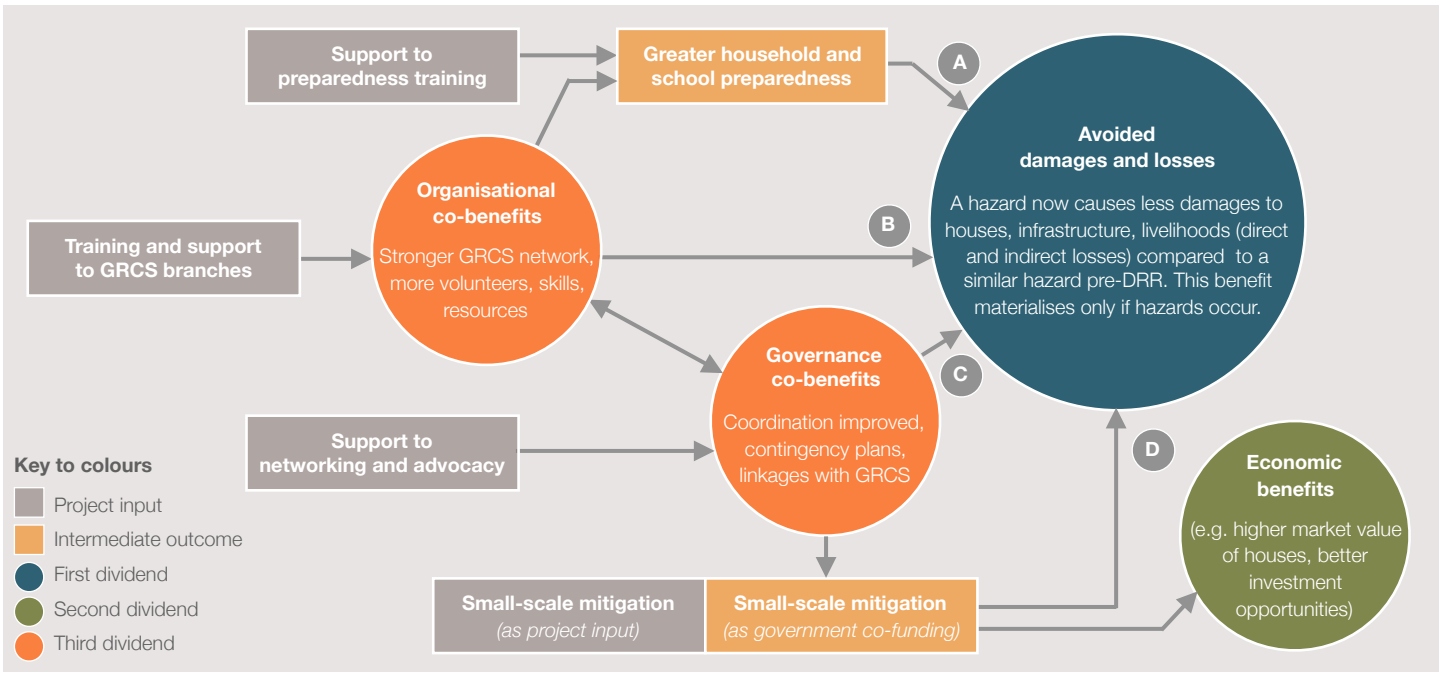
The analysis involves four main steps of *identifying*, *quantifying*, and *monetising* benefits, and then *extrapolating* them over a reasonable timeframe representing the expected durability of the benefit in question.

Conceptually, **avoided damages and losses (first dividend)** are the key benefit and ultimate goal of DRR. Hazard losses can be immediate (direct) or accumulate over subsequent years (indirect). For instance, when a vineyard is destroyed, the immediate losses may represent only a fraction of the lost income over subsequent years. In all visited villages, reduced damages were identified as a benefit - either because less losses have been incurred in recent hazards, or because this can be reasonably expected in future events. In order to quantify and monetise this loss reduction, a survey was carried out in three target areas of Ambrolauri, Sagarejo, and Lagodekhi. Questions elicited the losses during recent pre-intervention disasters as well as whether, and by how much, respondents expected the level of losses and damages to change. The difference between pre- and post-intervention losses was taken to represent losses avoided per hazard event *(avoided hazard losses, AHL)*.

In a next step, *annual probability rates (APR)* were identified: based on the disaster history of each area, the likelihood of a similar hazard recurring in a given year was established. Multiplying AHL with APR led to *annual avoided losses (AAL)*. These AAL values were then applied for each year of a given timeframe, accounting for inflation up to 2014 and a discount rate of 5% for all years beyond 2015. The sum of these annually-adjusted AAL values for the given time frame represents the total avoided losses.

But avoided losses are not the whole story. There are two more aspects worth considering. *First*, other benefits were identified that are in line with what ODI calls second and third dividends. *Second*, there is an interplay between these benefits as well as with intermediate project outcomes, as illustrated in *figure 3b* below.

Figure 3b | **Co-benefits and mechanisms to avoided losses**



The first aspect concerns the observation that DRR investments bring about benefits irrespective of whether (or how often) a hazard occurs. The **second dividend** includes economic gains. Villagers in a severely flood-prone part of Lagodekhi, for instance, were confident that the value of their properties would increase once the flood canal supported by GRCS was complete. Distressed by annual flooding, several families had sold their houses at 10-20% of average market value, escaping to a more secure environment. In the villagers' expectation, prices would 'normalise' and also enable investing in what would be a more secure setting.

While these economic gains may be specific to mitigation and could not be fully quantified, the analysis of **third dividends** adds further insights to the value of DRR.

Organisational co-benefits are most obvious amongst them: the GRCS branches that now drive disaster risk reduction did not exist at all, were dormant or at least less active before being supported through the projects. These co-benefits are described in detail in the next chapter. Aside from avoided losses, these organisational gains are the only benefits that could be incorporated into the calculation of benefit-cost ratios (BCR). To do this, we made use of volunteer hours as a proxy, applying the same technique as in a previous IFRC study ('The value of volunteers', IFRC 2011b). Technically, the hours that volunteers spend for the Red Cross are an input, or a cost. However, from the viewpoint of a donor, these additional volunteers and the hours they spend are seen as a benefit of the financial investment. Thus, we treat these volunteer hours as an - albeit imperfect - proxy of organisational co-benefits.

We gathered volunteer data for the year before the start of project support (X) as well as for 2015. Calculating the difference between overall volunteer hours in year X and in 2015, and then multiplying this figure by the median hourly wage[7] led to the value of these gains in 2015 alone. This figure was then adjusted for all prior years (assuming linear growth, and taking inflation into account), and extrapolated for ten years into the future (applying a high discount rate of 15%).[8] The sum for all years over this timeframe represents the overall quantifiable organisational co-benefit.

As *figure 3c* shows, other benefits of DRR were identified - however, none of these could be incorporated into the calculation of benefit-cost ratios.

7. The 2014 median hourly wage was GEL 4.19 (USD 1.86) - this figure was taken to monetise volunteer hours.

8. The short timeframe and high discount rate was selected to reflect the uncertainty of future engagement of volunteers. These parameters assume a high drop-out rate and must be seen as a conservative estimate.

Figure 3c | **Included and excluded benefits of DRR**

Potential benefit	Locally applicable?	Could the benefit be...			
		...quantified?	...monetised?	...extrapolated?	...included in BCR?
First dividend					
Avoided economic losses	Yes	Yes	Yes	Yes	Yes
Avoided injuries, loss of life	Yes	No			
Second dividend					
Greater sense of security	Yes	Partially	No		
Greater economic opportunities	Partially	Partially	No		
Third dividend					
Organisational co-benefits (GRCS)	Yes	Yes	Yes	Yes	Yes
Governance co-benefits	Yes	Partially	Partially	No	
Social co-benefits	Yes	No			
Environmental co-benefits	No				

a) Although avoided loss of life and injuries is conceivable, no relevant data were available amongst the survey sample.
b) The expected reduction of hazard-related losses as identified could be seen as a proxy for a greater sense of security - yet, it is not possible to quantify or monetise this gain as such.
c) Only applies to contexts with mitigation measures.
d) Organisational co-benefits were assessed by proxy, taking additional volunteer hours as a measure.
e) Governance co-benefits were partially assessed: this included the added value of linkages between the government and GRCS.
f) There are some social co-benefits (social services of GRCS) - yet, the effect on community organisation/cohesion is limited and could not be quantified.

Figure 3d | **What may contribute to avoided losses?**

	Factor	Type	Potential role in reducing hazard losses
A.	**Household preparedness**	Intermediate outcome	• Households who have been reached via school children, family preparedness training, or both, may take concrete measures to make their house and property safer - thus encountering reduced losses if affected by a hazard. • Households who have not been reached may receive similar information indirectly - spurring proactive steps and reduced losses. • Schools may encounter reduced losses as teachers and students have learnt how to evacuate and apply other steps.
B.	**Organisational co-benefits**	Co-benefit	• GRCS branches have more volunteers, many of which have been trained in disaster response. GRCS teams closely collaborate with emergency services and thus extend overall response capacity. This can lead to broader and more rapid action, thus reducing losses incurred by some hazards (especially fires). • This collaboration could be even more beneficial if integrated with early warning/evacuation regimes, thus avoiding losses more broadly.
C.	**Governance co-benefits**	Co-benefit	• Through training and awareness-raising, government agencies may have been led to improve contingency planning, to mainstream risk reduction into planning, and to support measures that mitigate disaster risk.
D.	**Small-scale mitigation**	Intermediate outcome and/or project input	• Mitigation measures may have reduced sensitivity and/or exposure to hazards, thus reducing hazard losses and damages. • Mitigation can be seen either as a project input (if solely funded and implemented by the project) or as an intermediate outcome (if co-funded by local governments).

The various co-benefits however have to be kept in mind when discussing our earlier question: what mechanisms at at play when damages and losses are avoided? As pointed out before, conventional CBA studies link avoided losses to mitigation measures *(point D in figure 3b)*.

In principle, the organisational co-benefits *(point B)*, governance co-benefits *(point C)*, and the intermediate outcome of household preparedness *(point A)* may be seen as playing compounding roles. *Figure 3d* above lists hypotheses for potential mechanisms that were tested in the study.

Organisational and governance co-benefits may play a role both in avoiding hazard losses (underpinning the first dividend) while also representing added value as such (even in the absence of disasters). This dual role needs to be kept in mind to prevent double-counting benefits. We will return to this aspect in chapter 4.

Before turning to the findings, it is important to consider the limitations of this study. GRCS staff has been extremely supportive in compiling required data and supporting field research. But despite their efforts, data availability remained limited: neither do local government agencies have a systematic approach to collecting and reporting data on hazard losses and damages, nor did any of the GRCS projects conduct baseline surveys that could shed more light on exposure, risk attitudes and past hazard losses. GRCS would benefit from gaining skills in adequate data collection (e.g. sampling).

The survey was conducted with the support of GRCS volunteers; it is based on a confidence level of 90% and an effective margin of error of 6.56. It should be noted however that the level of precision for disaggregated results is lower, and that data on household losses (and expected reductions) rely on the estimates of respondents.

4. Findings: how DRR pays off

Lagodekhi: *On the western fringe of the town lies Shroma village. The six-hundred households here are affected by flooding at least once per year - a 1.7 km flood canal is now expected to reduce losses significantly.*

Photo: P. Bolte, Banyaneer

Having described the process and the assumptions underpinning this cost-benefit analysis, let us turn to the findings. The chapter begins with the survey results, following the path from training to preparedness and on to avoided losses *(part 4.1)*; it proceeds with the analysis of organisational co-benefits *(4.2)*. The three subsequent parts *(4.3-4.5)* then present the case studies of Ambrolauri, Sagarejo and Lagodekhi, respective benefit-cost ratios, and other identified benefits. The chapter concludes with a summary and findings from other locations visited for this study *(4.6)*.

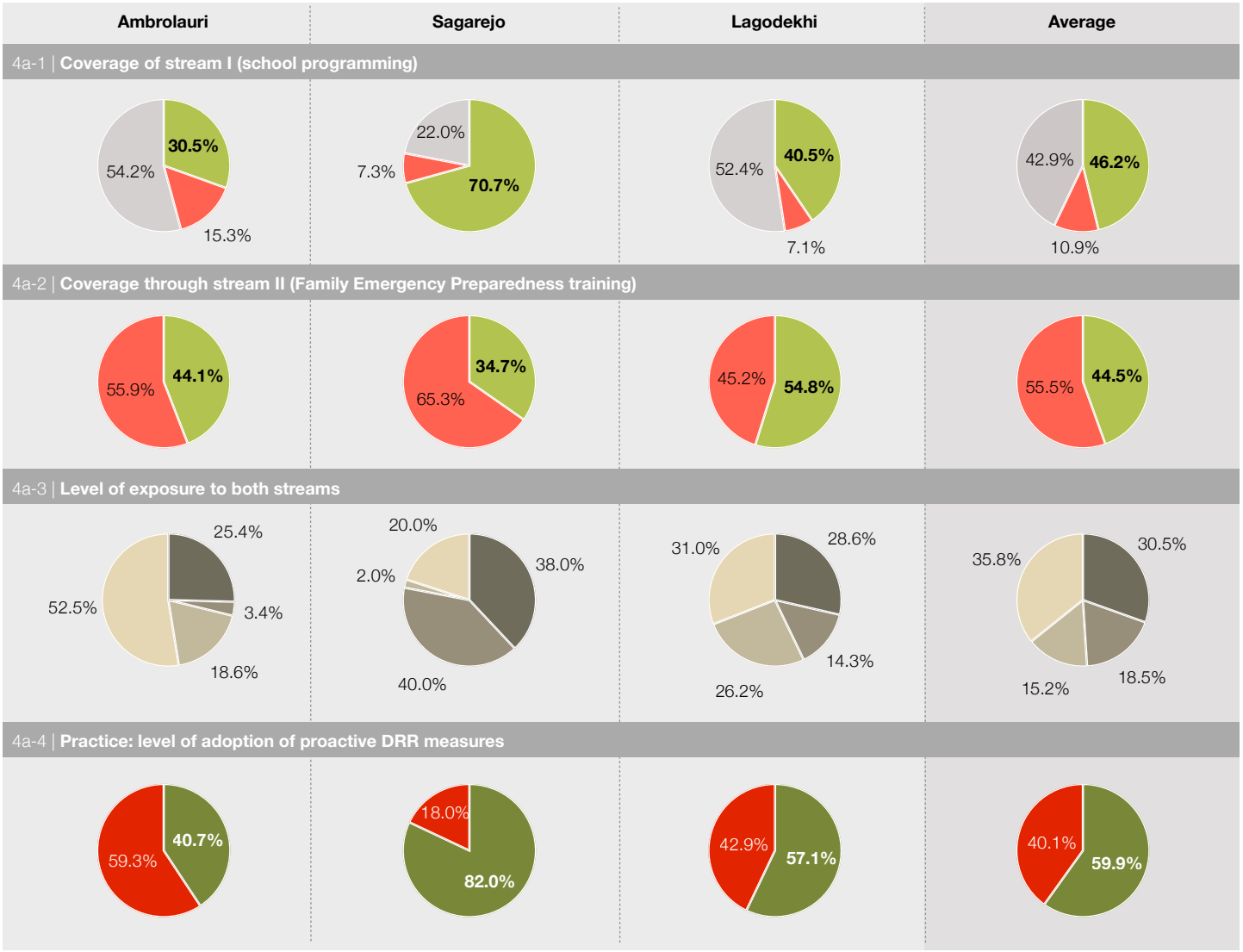
4.1 Survey results: from training to preparedness to loss avoidance

The theory of change behind the DRR projects assumes that greater *knowledge* of disaster preparedness leads to changed *attitudes* to risk and adjusted *practices*, thus increasing actual preparedness levels and reducing hazard-incurred damages and losses. This assumed efficacy, and the implied treatment of all target area residents as beneficiaries (direct or indirect), shall be tested at the outset.

The projects applied two principal 'streams' to disseminate DRR knowledge amongst the wider communities - school-based programming and Family Emergency Preparedness (FEP) training.

In terms of school-based programming, the survey shows that out of the households who have school-aged children (57.1%), a remarkable share of 80.8% discussed disaster preparedness with their children. The result confirms the high effectiveness of school children as agents for change found by other studies. Out of the overall target population, almost half (46.2%) received DRR messages through this stream *(see figure 4a)*.

Figure 4a | **Transmitting knowledge to practice**

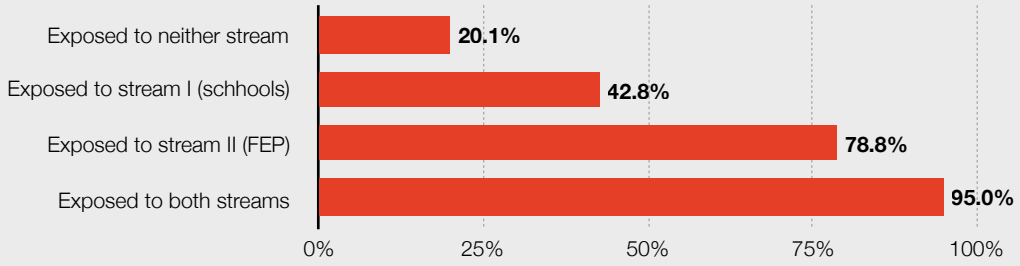


Meanwhile, an average of 44.5% of households took part in FEP training. Across the three surveyed areas, results show that respondents are divided in three almost equal shares: those who were reached through both streams (30.5%), through one stream (33.7%), and through neither of the two streams (35.8%).

The projects reached households also through other channels, as the broad awareness of GRCS DM teams indicates (on average, 77.8% know these teams). These channels include community mobilisation (52.2% took part in DRR activities) and indirect dissemination - that is, when trained households pass on key messages to their friends and neighbours.

Yet, direct coverage through the two main streams matters most: as the comparison between the three areas shows, the translation of DRR knowledge obtained through one or both of the streams appears to correlate with actual adoption of proactive disaster preparedness measures. Indeed, dose-response analysis *(see figure 4b overleaf)* confirms this, showing that almost all respondents (95.0%) exposed to both streams translated knowledge into practice. The fact that 20.1% of those exposed to neither stream is evidence of alternative channels at play; however, this rather low rate serves as a reminder that future DRR projects may seek to upscale efforts in reaching households not easily addressed through the two main streams (e.g. elderly people), and to offer an additional targeted stream for these groups.

Figure 4b | **Adoption of proactive measures for different exposure levels**



The extrapolation of survey data to the wider target population suggests that more than 2,000 households across the three sampled areas took proactive measures *(see figure 4c)*.

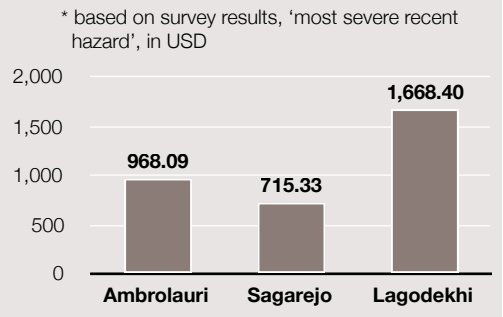
Figure 4c | **Effective coverage**

Location	Number of households		
	...in target area	...reached through any stream	...who took proactive measures
Ambrolauri	2,750	1,303	**1,119**
Sagarejo	811	649	**665**
Lagodekhi	619	397	**427**

What difference does this make in terms of hazard losses? To answer this question, we asked respondents (a) about damages they had encountered in what they deemed the most severe disaster in recent years, (b) about the extent to which the level of damages would differ if a similar hazard affected them now, and (c) what role the DRR project had played in this change (if any). We then compared their responses with their 'action status' - whether they had taken proactive measures or not.

Almost all respondent households (95.0%) were affected by a disaster over recent years. Respondents in Ambrolauri used either the 1991 earthquake or recent floods as their benchmark; those in Sagarejo and Lagodekhi referred almost exclusively to recent floods. Nobody reported deaths or injuries, but almost all highlighted considerable economic losses. Damages to fields or gardens (53.3%%), houses (52.4%) and their contents (42.5%) were most frequently cited, followed by losses of livestock (25.9%). Asked to value their losses by item, house damages and loss of contents by far outweighed agricultural losses. Although the estimates are in line with qualitative interview results, it is almost certain that respondents did not take indirect agricultural losses into account.[9]

Figure 4d | **Hazard losses***



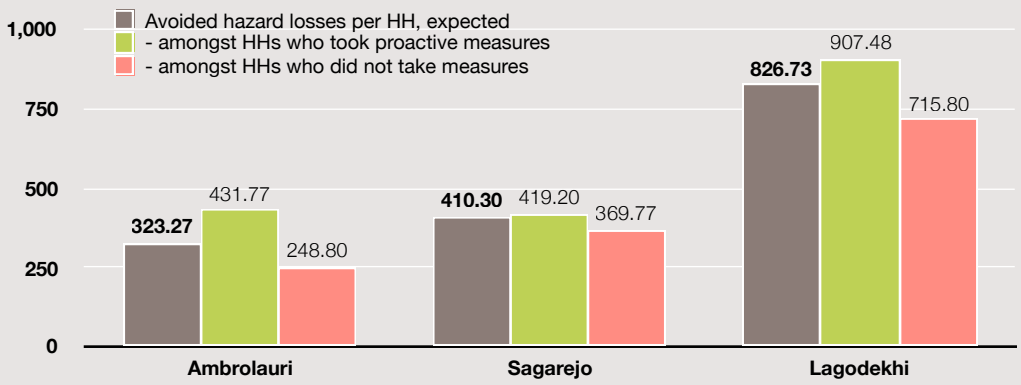
Overall losses are thus likely to err on the conservative side *(see figure 4d)*. Note that the figures are per hazard event in Ambrolauri and Sagarejo, and per year in Lagodekhi (which experiences more than one flood each year).

Our next question concerned the expected variation in losses between the 'baseline' hazard and a comparable (hypothetical) hazard in the near future. Almost all households (95.2%) expected a reduction of losses, with the remainder predicting no change. On average, respondents forecasted a reduction of hazard losses by 44.5%. Critically, almost all respondents saw this loss reduction as a result of the GRCS projects - 40.5% attributed a major role and 51.6% the sole role to the recent DRR interventions.

Crucially, our analysis showed that households who applied proactive measures expected a greater reduction in losses than those who did not: while the first group envisaged a reduc-

9. The first of three case studies in the recent CBA study on Tajikistan is an example of the scale of indirect losses: With reduced income over six years following the destruction of apple and peach plantations as well as vineyards, overall agricultural losses in the village of Sharizabz exceeded all other losses combined (damaged houses, infrastructure).

Figure 4e | **Damage and loss reduction by household, in USD**



tion by 52.5%, the second group estimated a reduction by just 40.5%. In *figure 4e*, we show what this expected reduction of losses translates to in terms saved US dollars. It implies that the difference in expected losses between the two groups (USD 140.28 on average) represents a value that can be attributed to households taking proactive steps.

Overall, avoided losses are attributed to **five factors:**

- **A.1 Household preparedness - proactive measures:** Households taking concrete action appear to suffer less losses. Taking the difference in loss reduction as guidance, around *USD 183* can be attributed to households being proactive in Ambrolauri, *USD 49* in Sagarejo, and *USD 188* in Lagodekhi.
- **A.2 Household preparedness - greater knowledge:** Interview results further suggest that households being more knowledgable enables them to act differently immediately before, during and after a hazard - for instance, if farmers take their livestock out of flood-prone areas if heavy rain is expected or bring valuable items to upper house levels. The relative role on avoided losses is assumed to be *high* but can not be specifically quantified.
- **B. Improved disaster preparedness/response capacity** at the community level. The existence of GRCS disaster management teams as an extension to public emergency services means that preparing for and responding to disasters is more effective. For instance, fires can be fought more rapidly. The relative role is seen as *moderate*; the main benefit of this aspect concerns not so much avoided losses but a greater sense of security (people get help when already affected).
- **C. Improved governance:** with local governments having learned and taken on policies and plans (e.g. concerning contingency), some losses may be avoided. In the studied areas, the main benefit of this aspect concerns a greater sense of security as well as the sustainability of project outcomes; the relative role on avoided losses in the given context is seen at the lower end.
- **D. Mitigation:** The fact that avoided losses per household are expected to be higher than those in Ambrolauri and Sagarejo put together is due to the construction of a drainage canal in Lagodekhi's Shroma village, as well as a much higher level of hazard losses. Out of the three areas, Lagodekhi was the only case with effective small-scale mitigation measures.[10] It is reasonable to expect that around half of the avoided losses (about USD 400) are attributable to this mitigation work.

The analysis does not allow for a specific distribution of the five factors (to what extent did each factor contribute to loss avoidance), with the cautious exception of factors A.1 and D.

Meanwhile, extrapolation from the survey sample to the wider population provides a good indication of expected avoided losses per hazard (or per year in Lagodekhi) due to the GRCS DRR projects *(see figure 4f)*. We will return to these figures when calculating the benefit-cost ratios for the three areas - but first, let us have a look at the other key benefit: volunteers.

10. Project implementation in Sagarejo did not include mitigation measures. Meanwhile, the two measures in Ambrolauri were mitigation mainly by name: the road stabilisation measure and the small sewage system set up in two villages benefited just a very small share of Ambrolauri's population, and the effect towards loss avoidance is found to be marginal at best.

Figure 4f | **The benefit of avoided damages and losses, in USD**

Location	Avoided hazard damages and losses (per hazard/*per year)		
	... by households who took proactive measures	... by other households	...combined
Ambrolauri	483,259	405,731	**888,989**
Sagarejo	278,768	53,986	**332,754**
Lagodekhi*	387,571	133,434	**525,004**

4.2 Organisational co-benefits: the value of a stronger Red Cross

There can be no doubt that the GRCS branches supported by the DRR projects are now stronger than than they once were. Across all visited branches, interview partners made this observation, pointing to more volunteers (who are also more active and better trained), better linkages to and support from local governments, better resourcing and extended services. [11] In fact, several of the branches did not exist at the outset.

The total number of volunteers at the fifteen project-supported branches increased more than four-fold, and the number of volunteer hours eight-fold. The additional hours that volunteers have already dedicated to the Red Cross equal 75.2 years - or slightly more than the entire life of an average Georgian. Given close integration with schools and governments, high levels of dedication and team spirit, this gain in capacity is seen as largely sustainable, at least over the medium term.

So what is the value of these gains? As described in chapter 3, we took the number of additional volunteer hours - monetised at the median 2014 hourly wage - as a proxy to value organisational co-benefits. Using this technique, the additional hours spent over recent years are valued at almost USD 2.7 million - more than the overall program costs of USD 2.4 million *(see figure 4g below)*.

11. Seven of the fifteen branches supported by DRR projects were visited for this study. They included Ambrolauri, Oni and Tkibuli (Dipecho/Danish Red Cross-supported), Sagarejo, Kvareli and Lagodekhi (supported by ADA/Austrian Red Cross), and Gori (supported by ICRC through the EPR project).

Figure 4g | **The value of volunteers**

Branch	Supported since	Number of volunteers		Volunteer hours			Valuation (USD)		
		Baseline [a]	2015	Baseline [a]	2015	Difference	Present [b]	Timeframe	Projected [c]
Ambrolauri	2010	0	106	0	49,920	49,920	**331,313**	2010-2025	**797,062**
Oni	2010	0	70	0	16,900	16,900	**112,163**	2010-2025	**269,839**
Tsageri	2010	0	70	0	24,570	24,570	**163,068**	2010-2025	**392,304**
Lentheki	2012	0	90	0	21,840	21,840	**102,439**	2012-2025	**306,205**
Tkibuli	2012	0	210	0	112,320	112,320	**526,832**	2012-2025	**1,574,768**
Sachkere	2012	60	105	4,160	45,760	41,600	**195,123**	2012-2025	**583,247**
Chiatura	2014	0	234	0	133,536	133,536	**372,964**	2014-2025	**1,618,844**
Sagarejo	2013	50	150	2,080	11,050	8,970	**40,324**	2013-2025	**124,014**
Telavi	2013	28	105	1,976	13,260	11,284	**50,572**	2013-2025	**155,851**
Kvareli	2014	60	187	6,864	40,248	33,384	**93,241**	2014-2025	**404,711**
Lagodekhi	2015	40	100	8,320	52,000	43,680	**81,196**	2015-2025	**488,727**
Gori	2013	140	95	13,520	28,080	14,560	**54,411**	2013-2025	**190,254**
Tbilisi	2013	230	1,500	39,520	140,400	100,880	**376,988**	2013-2025	**1,318,190**
Kutaisi	2013	100	190	12,480	42,640	30,160	**112,708**	2013-2025	**394,098**
Senaki	2013	35	140	6,760	21,840	15,080	**56,354**	2013-2025	**197,049**
		743	3,352	95,680	754,364	658,684	**2,682,194**		**8,837,775**

a) The baseline represents the number of volunteers/hours in the year prior to the start of the respective DRR projects. Data were gathered retrospectively.

b) This figure is the value of all additional hours that volunteers have spent up to the end of 2015. It is based on assumed linear growth in volunteer hours and expressed in 2015 USD (inflation-adjusted).

c) This figure is the value of additional hours that volunteers will have spent between the start of the projects and 2025. It includes value of hours already spent as well as those in future years. This projection is based on a discount rate of 15% - a rate that reflects the usual 5% discount of other benefits, as well as an assumed drop-out of volunteers of 10% per year. Actual development of volunteer hours may however vary.

Since volunteer engagement does not cease in 2015, we extrapolated this value over the timeframe from respective project starts up until 2025 - ten years into the future. Applying a high discount rate of 15% (representing the usual rate of 5% and an assumed annual volunteer drop-out of 10%), we calculated the organisational co-benefit to be more than USD 8.8 million across the fifteen branches.

Four qualifications are worth noting: *First*, it should be reiterated that although this volunteer input is technically a cost, we take it as a proxy for all the work performed by stronger GRCS branches. After all, the figure shows the extended leverage of donor investments. *Second*, there is considerable uncertainly over the appropriate timeframe and discount rates. The selected parameters imply that volunteer hours will amount to only 25% of current levels by 2025 (and then drop to 0%, as the timeframe is not further extended). Levels and lifespan of volunteer dedication may well be higher - however, it is preferable to err on the side of caution in order to not over-state benefits. *Third*, it must be mentioned that some branches were also supported through other projects - the implied mechanism of DRR project support being causal behind more volunteer hours thus has some limitations (other factors may also be at play).

Finally, let us take up our earlier point on the dual role of organisational co-benefits: they represent both a benefit in their own right *('third dividend')* as well as a contributing factor to avoided losses *('first dividend')*. Their latter role is analytically problematic: on the one hand, volunteer hours are counted as a proxy for all the benefits created by these volunteers - including benefits towards greater disaster preparedness and better response. On the other hand, the volunteer-generated benefits related to disaster risk management are already counted as one of the mechanisms behind avoided losses. Simply adding up avoided losses and organisational co-benefits would thus imply partial double-counting.

Without evidence on the specific proportion of avoided losses that can be reasonably attributed to volunteers, we decided to count half of organisational co-benefits in the calculation of benefit-cost ratios: 50% of organisational co-benefits are counted as a third dividend, while the other 50% are subsumed under the previously identified value of avoided damages and losses. The share is inevitably arbitrary, but certainly preferable to over-stating overall benefits.

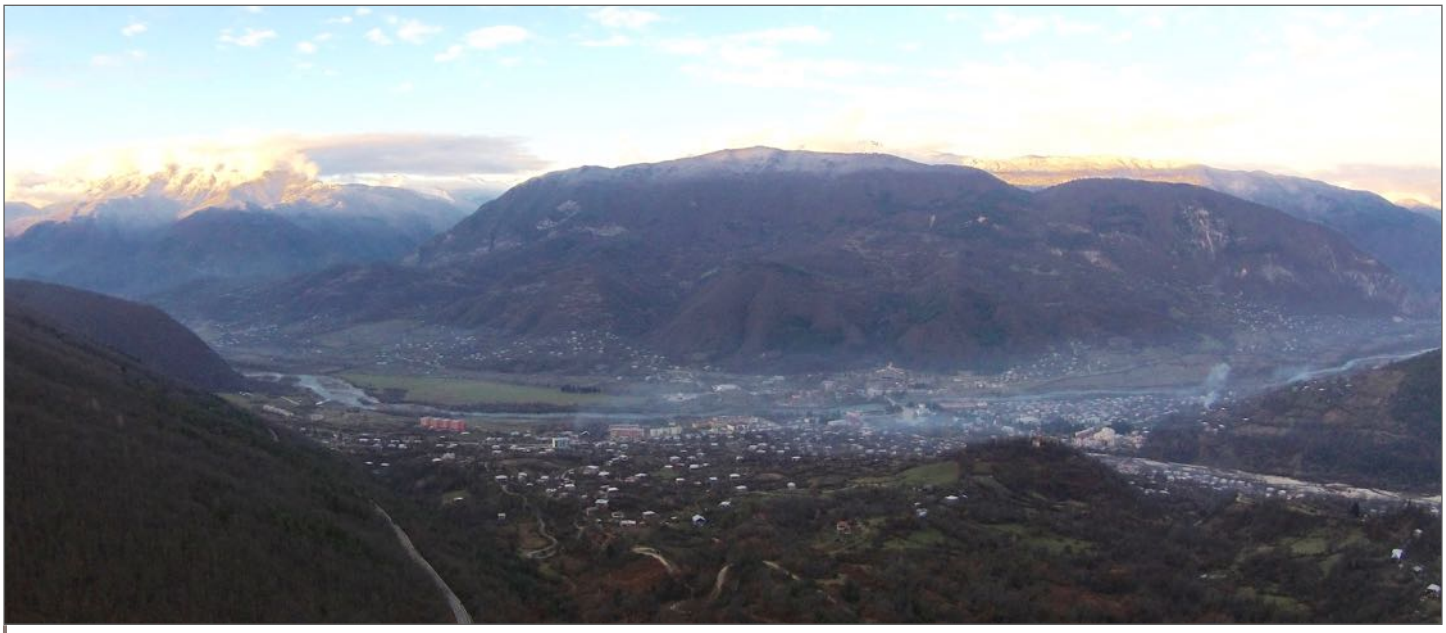
Having quantified and monetised two main benefits of the GRCS DRR projects - avoided losses and organisational co-benefits - let us now turn to the concrete cases and specific benefit-cost ratios - in Ambrolauri, Sagarejo and Lagodekhi.

4.3 Case study 1: Ambrolauri | Racha

Located on the banks of the Rioni river, Ambrolauri is a small mountain valley town that also serves as the capital of Ambrolauri municipality and of Racha region. The town and the 18 villages that make up the municipality are home to 2,750 households. Most people make their living as farmers.

Much of the town was devastated by a magnitude 7.0 earthquake in 1991 - an event that remains vivid in the memories of those old enough to remember. The area features steep slopes and large expanses of uphill forest, while fields and villages are interspersed along rivers. As such, Ambrolauri frequently faces landslides, floods, mudflows and fires. A major flood in 2014 affected 5 of the 18 villages and destroyed fields, roads and bridges.

Ambrolauri was amongst the first GRCS branches supported by one of the DRR projects. Under the first DIPECHO project - launched in 2010 - GRCS established a 20-strong disaster response team and began promoting disaster preparedness through schools. In subsequent phases, it added three 'satellite' teams in remote villages, and expanded coverage of schools throughout the whole municipality.



Ambrolauri: *The capital of Racha region lies in the Rioni river valley - key hazards are earthquakes, floods, mudflows and landslides.*

Photo: P. Bolte, Banyaneer

For the head of the Ambrolauri GRCS branch, the three consecutive DIPECHO projects have facilitated progress in several areas. Whereas the branch had been dormant prior to project support, it now has more than 100 volunteers (44 of whom are trained members of the DM teams). The volunteers work in collaboration with the region's emergency service, and the branch has supported the enactment of the Municipality Response Plan. The collaboration with schools not only serves to promote disaster preparedness amongst the communities - it is also a channel to recruit new volunteers. Asked to rate the disaster preparedness level of her branch over the past ten years, the coordinator gave 2 (out of 10 points) for 2005, 5 points for 2010, and 8 points for 2015. To obtain the highest possible rating, the branch would need more rescue equipment and should deliver more mitigation measures to particularly hazard-prone villages.

So far, mitigation is not the key strength of the project: in one village, gabions were installed to stabilise a minor access road; in another, a sewerage system was set up to benefit 35 households. Both measures addressed gaps in public infrastructure - yet, their effect towards loss avoidance and risk reduction is seen as negligible.[12]

By contrast, the fact that GRCS now has trained volunteers is seen as much more beneficial: working closely with the regional emergency service, they effectively extend their capacity at no cost.[13] Adding 100 volunteers to the region's 140 firefighters almost doubles the human resources, and the fact that volunteers have helped fight several forest fires, provide initial assessments and act as first responders has been appreciated. Based on the success of this collaboration, one of the emergency service coordinators said that more volunteers were now needed, suggesting two additional volunteer teams in remote areas.

Figure 4h | **Ambrolauri costs and benefits**

Benefit-cost ratio 1	**22.6**	**Timeframe**	2011-2025 (15 years, avoided losses)
Benefit-cost ratio 2	20.43	**Discount rate applied**	• 5% (losses and damages) • 15% (organizational co-benefits)
Attributed costs	**USD 184,353**		
Total quantifiable benefits	**USD 4,165,572**	**Other parameters**	• Avoided hazard losses (AHL): USD 748,330 • Annual probability rate: 33% • Annual avoided losses (AAL): USD 293,366
a) Avoided losses and damages	USD 3,767,041		
b) Organisational co-benefits	USD 398,531		

12. The recent Dipecho III evaluation report discusses the sewerage system in more detail - see Roots 2015a:16.

13. The cost of extending the number of firefighters in Racha by 100 (instead of volunteers) would cost the government USD 266,190 per year (taking the average monthly salary of a firefighter (GEL 500) as a measure).

GRCS and the emergency service has also conducted several simulations and built good communication networks. Their work focuses on better *reactive* disaster management rather than *proactive* measures. This clearly has a value on its own, but unless impending damage can be prevented (e.g. if a house fire is extinguished before the whole house is burnt)[14], the role towards loss reduction is limited.

By far the most important benefit of the three consecutive Dipecho projects concerns household preparedness. Using schools as channels to spread key DRR messages, GRCS efforts achieved great coverage and effect. As the household survey showed, 47.5% of households in Ambrolauri were reached through their school-aged children and/or through FEP training.

As a result of this dissemination, four out of ten households in Ambrolauri implemented home safety measures (e.g. affixing furniture to the wall, preparing 'Go Bags', or installing additional doors). An eighth-grader recalls: "It was a great experience and a lot of fun! Our family changed the location of beds and added screws to furniture. [...] Our teacher was excellent and came to see the changes we made."

While the expected average reduction of hazard losses per household is the lowest amongst the three surveyed communities (USD 323), two observations stand out: *first*, GRCS achieved broad coverage (targeting an entire municipality rather than just a village/ neighbourhood. *Second*, the proportional variation between households who implemented home safety measures (USD 432; 44.6%) and those who did not (USD 249, 25.7%) is the biggest amongst the surveyed areas.

These results illustrate the level of consolidation achieved over the past six years, and suggest that more than USD 3.7 million *(see figure 4h)* of losses will have been avoided by 2025. Only counting these avoided losses on the benefit side of the CBA equation leads to a benefit-cost ratio of 20.43 (BCR 2). When organisational co-benefits are added, **the benefit-cost ratio (BCR1) is identified as 22.60.**

This rate is considerably high given the practical absence of mitigation measures - it shows that preparedness as such pays off. At the same time, two **qualifications** need to be mentioned: *first*, the loss reduction relies on expected (rather than materialised) losses. A more robust longitudinal comparison was not feasible given the absence of a baseline. *Second*, several other benefits were identified that could not be quantified or monetised (e.g. school preparedness, some aspects of improved governance). The 'true' BCR value may thus be higher than the one identified.

14. An actual case of avoided losses concerns a major forest fire in 2015. All volunteers were mobilised in this event, and firefighters said that it would not have been possible to contain the flames as quickly without the volunteers. Unfortunately, it was not possible to gather the required data to monetise this benefit.

4.4 Case study 2: Sagarejo | Kakheti

Our second case study takes us to Sagarejo, a semi-urban municipality of 12,400 people located 70 kilometres east of Tbilisi. The Red Cross branch here was one of the first branches supported through the BSRC project. Since 2012, when the project was launched, the number of volunteers has tripled from 50 to 150 - "we now have so many people that we need more space", commented the branch coordinator. Asked to rate the branch capacity on a scale from 1 to 10, she assigned 6 points for 2012 and 8.5 for 2015. Back then, there had been few links to the government, the branch was little known and had little ability to attract volunteers. By contrast, the branch now works together with government and emergency services on a frequent basis.

Sagarejo: *the aerial view shows Tvaltkhevi river in the centre and the project's target area to the right. A school (in the background) has been a hub for activities. With the river banks poorly maintained, the area is affected by flooding about every five years.*

Photo: P. Bolte, Banyaneer

Figure 4i | **Sagarejo costs and benefits**

Benefit-cost ratio 1		**12.51**	**Timeframe**	2013-2027 (15 years, avoided losses)
Benefit-cost ratio 2		11.61	**Discount rate applied**	• 5% (losses and damages) • 15% (organizational co-benefits)
Attributed costs	**USD**	**68,161**		
Total quantifiable benefits	**USD**	**853,247**	**Other parameters**	• Avoided hazard losses (AHL): USD 332,754 • Annual probability rate: 20% • Annual avoided losses (AAL): USD 66,551
a) Avoided losses and damages	USD	791,240		
b) Organisational co-benefits	USD	62,007		

Emergency service staff confirmed this trend, highlighting the GRCS role in simulations and awareness-raising. Volunteers are seen as extremely motivated and well-organised, and many of them spend more than six hours per week for the Red Cross.

In terms of disaster risk reduction, the branch targeted an area around one of the town's four schools, comprising around 4,200 people in 811 households *(pictured overleaf)*. Located on a slope and adjacent to the Tvaltkhevi river,[15] the community here is affected by floods about every five years - almost nine in ten households have incurred economic losses as a result. Promoting disaster preparedness, the branch applied the same dual-track approach as in Ambrolauri, albeit on a smaller scale.

This focus proved effective, and the branch now seeks to expand to other hazard-prone parts of the municipality. Out of the three surveyed areas, Sagarejo stands out as having the highest shares of target households reached through the two main streams of dissemination (80%), and of those adopting proactive measures (82%). The variance in losses between the two groups (having applied proactive measures or not) however is rather minor (USD 49), and may be due to the fact that the biggest issue (the poor state of the flood canal) could not be addressed.

Despite the consolidated and well-targeted achievements, the overall reduction of hazard losses is therefore less impressive than elsewhere, standing at USD 791,200 up until 2027 *(see figure 4i)*. Only counting these avoided losses on the benefit side of the CBA equation leads to a benefit-cost ratio of 11.61 (BCR 2). When organisational co-benefits are added, **a benefit-cost ratio (BCR1) of 12.53 is identified.**

4.5 Case study 3: Lagodekhi | Kakheti

The third case study takes us further east, close to the border with Azerbaijan. Lagodekhi is a town of 7,000 people that also serves as the capital to Lagodekhi municipality (population: 55,000). Nestled at the foot of the Greater Caucasus mountains, the town lies in the heart of the Georgian wine industry. With 80% of houses located along the banks of Gabale river, much of the town is frequently flooded. The Deputy Governor recalls major floods from 2008 and 2015 - in the latter case, half of the town was under water after fifty minutes of rain and hail. IFRC released DREF funds; the overall recovery took three months and included the repair of 247 house roofs. Damages and losses were much higher and included many destroyed vineyards. The government now plans to make hazard insurance for fields mandatory and says it will cover 60% of insurance premiums.

The BSRC project started covering Lagodekhi only in early 2015, and despite the short time and three disasters since, work was nearing completion that is expected to make a big difference to the 620 households of Shroma, the suburb selected as the project's main target area *(see picture on p. 13)*. In addition to the training and formation of DM teams, FEP

15. The dykes along the river are covered with small rocks and not reinforced by concrete or trees - it is easy to see that they would be quickly damaged by the typically high flow velocities. Reinforcing the dams was correctly deemed beyond the scope of the BSRC project. As a mitigation measure, corrective work had been considered to protect a water reservoir (see also Roots 2015) - however, these plans were not yet further pursued.

Figure 4j | **Lagodekhi costs and benefits**

Benefit-cost ratio 1	**54.54**	**Timeframe**	2016-2030 (15 years, avoided losses)
Benefit-cost ratio 2	52.2	**Discount rate applied**	• 5% (losses and damages) • 15% (organizational co-benefits)
Attributed costs	**USD 104,387**		
Total quantifiable benefits	**USD 5,693,733**	**Other parameters**	• Avoided hazard losses (AHL): USD 525,004 • Annual probability rate: 100% • Annual avoided losses (AAL): USD 525,004
a) Avoided losses and damages	USD 5,449,370		
b) Organisational co-benefits	USD 244,363		

training and school-based programming, the decision was made to construct a 1.7 kilometre drainage canal. During the Vulnerability and Capacity Assessment (VCA), many people had been sceptical, recalls the branch coordinator - there had been many earlier assessments but no action. However, by the time of our field visit, construction of the canal was about to be completed. With the impetus of GRCS, the government had agreed to co-fund the canal, which is expected to reduce the damages incurred by several floods each year.

With the high frequency of floods in the suburb, it is unsurprising that losses and damages are exceptionally high - valued at USD 1,668 per year and household. Survey respondents estimated a reduction of losses by USD 827 on average - USD 907 amongst those who took proactive steps and USD 716 amongst those who did not. While the well-targeted mitigation must be seen as a major reason for loss reduction, the variance between the two groups indicates that household preparedness plays a compounding role. GRCS reached 69% of Shroma residents through the two dissemination streams; 57% of respondents here say they implemented household safety measures.

The expected reduction of hazard losses and damages translates to more than USD 5.4 million over 15 years *(see figure 4j)*. Counting attributed project expenditures as well as the government contribution to canal construction on the cost side, this leads to a benefit-cost ratio of 52.20 (BCR 2). When organisational co-benefits[16] are added, **a benefit-cost ratio (BCR1) of 54.54 is identified.** The fact that this ratio is by far the highest amongst the three surveyed areas is due to a combination of sound targeting (high frequency of hazards) and the integration of effective mitigation.

4.6 Other branches and summary

Four additional branches were visited for this study: Oni and Tkibuli (DIPECHO/Danish Red Cross-supported), Gori (EPR/ICRC-supported) and Kvareli (ADA/Austrian Red Cross-supported). Although time and data constraints prevented the calculation of respective benefit-cost ratios for these locations, they added to the overall picture of project effectiveness. The following observations were made:

- **Schools as anchors:** All visited branches worked through schools - both to enhance the disaster preparedness of the schools themselves and to reach the wider community. Survey results and interviews with school staff[17] show that this approach has been hugely successful, given high coverage amongst wider school communities as well as very high conversion rates (applying knowledge by adopting household safety measures). Schools bring an additional benefit as a channel for volunteer recruitment, and form a good foundation for sustainable learning outcomes.
- **Targeting and coverage:** There is an obvious difference between the three projects: The ICRC-supported project covered rather general capacity-building towards disaster

16. While the short implementation span means that organisational capacity gains are yet to be consolidated, there are encouraging signs: The number of volunteers at the branch has grown from 40 to 100, and volunteers have been motivated by the work they did in the three recent disasters. The successful canal project is also seen as an important motivator. Close links to the government and a highly dedicated principal at Shroma's school add to a positive outlook. The local branch coordinator rates the capacity up from 5 to 8 (on a scale from 1 to 10).

17. Principals, teachers and/or students were interviewed in Gori, Ambrolauri, Oni, Kvareli, Sagarejo, and Lagodekhi.

- preparedness. The Dipecho and ADA-funded projects are significantly more complex (covering household, community and school preparedness as well as advocacy, networking and mitigation) and better funded. Dipecho projects cover a larger area, whereas targeting is more selective in the BSRC project - favouring the village-level over the municipality. This allows for more attention to detail and more thorough planning, while restricting (at least its initial) reach in terms of beneficiary numbers.
- **Household preparedness:** Improved levels of households' disaster preparedness are a one of the key project outcomes. As presented earlier, a significant share of avoided hazard losses can be attributed to households taking on what they have learned. The different targeting of the Dipecho and BSRC projects has implications in this regard: In Ambrolauri, about half (47.5%) of the municipal population has been reached over six years, whereas proportional reach was much higher in Sagarejo (80.0% of the target suburb after four years) and in Lagodekhi (64.2% after less than a year). The proportional uptake of proactive measures corresponds to this pattern, being higher in BSRC-supported areas (82% in Sagarejo and 57.1% in Lagodekhi) than in Dipecho-supported Ambrolauri (40.7%)
- **Organisational co-benefits:** Volunteers in project-supported branches now commit eight times more time to the Red Cross than they did before. Beyond plain numbers, the level of dedication was palpable in all visited branches. As several interviewees described, DRR gave branches a concrete purpose, which in turn attracted more volunteers. Organisational gains are seen as both a 'third dividend' and as a contributing factor to avoided losses ('first dividend').
- **Governance co-benefits**: The stronger links of GRCS branches with local governments, emergency services and schools were a consistent theme across branch visits. Through networking and advocacy, governments improved DRM planning and policies, upscaled or began investing in mitigation, and gained an effective extension of their response capacity (e.g. with volunteers supporting firefighters). Contingency planning and disaster simulations are expected to enhance the effectiveness of future disaster response operations. In terms of proactive disaster risk management, advocacy efforts on behalf of GRCS could be upscaled, promoting investments in further mitigation (e.g. reinforcing the flood canal in Sagarejo) and in early warning systems where feasible (Kvareli, Lagodekhi).[18]
- **Sustainability**: The investments in DRR are seen as largely sustainable over the medium term, an observation reflected in the selected timeframes that underpin the benefit-cost ratios (fifteen years since support started for avoided losses and ten years from 2015 for organisational co-benefits). Branches are now embedded in local networks; many are co-funded by local governments (support to staff or other overhead costs).
- **Mitigation:** In the context of the GRCS DRR projects, mitigation is a double-edged sword: on the one hand, it can lead to substantial loss avoidance and be highly cost-effective, as the case of Lagodekhi shows.[19] On the other hand, mitigation requires thorough planning and binds valuable resources. Where VCAs show possible mitigation measures, technical advice should be sought on the cost-effectiveness of various possible designs. Where opportunities for effective mitigation can not be identified, it is advisable to use project resources on broader or deeper preparedness coverage instead. Where options for effective mitigation can be identified but are beyond the project scope, it is also advisable to focus on advocacy - leading governments to invest in mitigation instead.

18. In Kvareli (Khareti region), the Polish NGO Civitas supported the set-up of an early warning system. However, this has never been used in practice nor tested. Interviewed government staff said they were reluctant to test the sirens, fearing it would create a panic amongst the community. The case is not just an opportunity for closer engagement with GRCS (who could explain the system to the community), but also a possible pilot that other governments may wish to study and replicate. Meanwhile, geophysical mapping and flow simulations have been prepared by Civitas - a valuable first step in creating an EWS. UNDP has also supported similar preparations for Racha region.

19. Another case of highly effective mitigation was identified in Tsageri: Following the construction of a 500-meter long flood canal in 2013 (co-funded by Dipecho and the local government, 30 households who each had suffered flood-induced losses of USD 1,330 every year have not seen any losses since the canal was completed. Counting only these avoided losses, divided by construction costs leads to a BCR of 17.70 over fifteen years (up to 2028).

Tkibuli: *A student's picture prepared for a drawing competition needs no translation - keeping rivers, creeks and drainages clean can help reduce flood risk.*

Photo: P. Bolte, Banyaneer

5. Outlook and recommendations

Back in 2010, disaster risk reduction played a minor role for Georgia Red Cross Society. When Danish Red Cross first proposed a DRR project, "we were not clear what it could mean for our Society", reflects the GRCS Secretary-General. Six years on, disaster risk management in general and DRR in particular play central roles for GRCS. Through the various projects, the organisational capacity of the 15 supported branches has dramatically increased. Branches are embedded in local networks with government agencies and schools. Most local governments co-fund activities and overheads, while DM-trained GRCS volunteers extend the response capacity of emergency services. Notably, the promotion of household preparedness and other outcomes are found benefitting communities in terms of avoided hazard losses. Although this study cannot express an overall benefit-cost ratio, it is beyond doubt that total benefits outweigh total costs several times.[20]

Given its increased capacity, expertise, recognition and linkages on the one hand, and continued external funding [21] as well as the public interest in DRR (raised by the Tbilisi floods) on the other, Georgia Red Cross now has a window of opportunity to build further. To do so, it should build on identified success factors (described in part 5.1) while addressing identified gaps (part 5.2). Meanwhile, cost-benefit analysis could become a useful tool for planning and monitoring - in Georgia and elsewhere (part 5.3).

5.1 Building on success factors

Through interviews with GRCS staff and volunteers, partners and stakeholders, several success factors have been identified that should be retained in future efforts to consolidate and widen the benefits of disaster risk reduction:

Sagarejo: *GRCS volunteers and firefighters bring an 'injured' person to safety. Simulations like this one are exercises for collaboration and also help raise awareness of risk and response in the communities.*

Photo: Georgia Red Cross Society

20. In fact, the sum of identified benefits in this study (avoided losses in the three surveyed branches plus organisational co-benefits in all branches - totalling USD 18.14 million - outweigh the total project costs of USD 2.44 million 7.14 times.This figure does neither account for avoided losses in branches not surveyed, nor for other benefits that could not be quantified.

21. A second three-year phase of the BSRC project is already underway, while a proposal for a further DIPECHO has been submitted.

- **Schools as anchors.** This study confirmed the powerful role of students as agents of change, leading to discussions with parents on DRR, participation in FEP training, and the adoption of home safety measures. In turn, these were expected to lead to greater avoidance of hazard losses. School-based programming has further benefits on school preparedness and on volunteer recruitment. Branches should consolidate teachers' skills (regular refresher training) and aim to extend the scope, adding one school (and adjacent communities) at a time.
- **Piloting of DRR in the most hazard-prone communities**: the comparison of targeting approaches between DIPECHO and BSRC projects indicates that the latter may be more effective (if sequentially upscaled). Rather than attempting to cover large areas at once, it appears preferable to focus on a particularly hazard-prone 'pilot' community first, learn from experience, and then upscale efforts to more communities. As much as possible, this upscaling process should be driven by local branches and maximise use of local resources. External partners could facilitate this growth through incentives. [22]
- **Embedding GRCS teams in emergency service networks**: The links between GRCS and public emergency services have been mutually beneficial and should be carefully maintained. Public awareness has been raised through joint simulations, and the collaboration has led to more effective response in numerous real-life emergencies. At the same time, it is crucial for volunteers to leave some tasks to better equipped and trained firefighters: the reported case of one volunteer entering a burning house illustrates concerns over personal safety of volunteers
- **Close links with governments and advocacy:** Developing and nurturing close links to government agencies is essential for effective and sustainable project outcomes. Despite multiple challenges (staff turnover in departments, as well as a wide array of relevant agencies), the DRR projects have been successful to foster close links - that in turn enabled government co-funding for many activities. These links provide a good foundation for qualitative and quantitative improvements over coming years.

5.2 Addressing gaps

Building further must not be misconceived as simple upscaling of the current work on DRR. GRCS would be well advised to also address the gaps identified in this study as well as the recent project evaluations, in order to render the outcomes of its DRR programming even more effective and sustainable. Five key issues require attention.

First, the current approach does not reach all community members. With much of the work centred on schools, households without school-aged children (elderly persons in particular) are less likely to be reached, and thus to adopt home safety measures. **A targeted stream for older residents shall be added** to the current outline. This could be combined with the social centres that already exist in several branches, and thus be part of closer integration between the various branch services.

Second, GRCS should **explore options to integrate early warning systems (EWS)** into its programming. Positive experiences in nearby Armenia could guide such development. EWS can be costly but extremely beneficial.[23] In Kvareli, GRCS can support the use of the existing EWS; in Lagodekhi and Racha, some of the groundwork is being done with UNDP support. GRCS could also play a role in the development of a possible EWS for Tbilisi, and should advocate for more EWS elsewhere.

Third, future **proposals for mitigation need to be validated**. Mitigation efforts take up valuable time and resources (despite government co-funding) of each project. If planned and targeted well, benefits of mitigation justify this input, as seen in Lagodekhi and Tsageri. However, unless there are evident opportunities for effective mitigation, projects would be better off allocating resources to broader coverage of school and household preparedness.

22. Rather than writing coverage expansions into project logframes, project partners could apply more flexible approaches, such as matching funds (project support is granted once branches have obtained local funds) and performance- or proposal-based small grants.

23. A recent UN report highlights the need for early warning systems in the country (UNDP 2014:60). An earlier IFRC study 'Early Warning, Early Action' provides general guidance (See IFRC 2008).

Fourth, GRCS should **consider investing in communication and resource development.** Efforts to elicit co-funding from government have been laudable and fruitful, contributing to a sense of ownership and facilitating sustainability of outcomes. Yet, by far the largest share of GRCS DRR work remains funded by external donors. In order to fully sustain and expand DRR programming (as well as other GRCS services), the National Society should improve its capacity to communicate achievements and raise funds. Opportunities include corporate partnerships, multi-tier memberships, and high-profile fundraising events or campaigns. Developing such capacities will come at a cost but should be seen as a priority for the long-term viability of an even stronger National Society.

Finally, the Society's **capacities in monitoring and data management should be reinforced.** None of the projects included baseline surveys thorough enough to render them useful for a longitudinal comparison (which enables the robust attribution of project impact). Basic capacities in survey design, sampling, data collection and analysis should be developed as soon as possible - i.e. before the BSRC and the possible Dipecho IV project get into full swing (to enable more robust impact and/or cost-benefit analysis). More broadly, indicators and overall monitoring regimes should be validated to ensure they measure outcomes (and not merely outputs) appropriately.

5.3 Cost-benefit analyses and the dilemma of disaster risk reduction

Cost-benefit analysis can help advance disaster risk reduction in several ways. *First*, CBAs can be applied to help identify the most suitable and effective mitigation designs. Holding proposed measures under a CBA and technical lens before they are implemented can help maximise cost-effectiveness at the outset. Reflecting on the experience of the projects, the two mitigation measures in Ambrolauri may not have passed the CBA test - thereby freeing up resources for other activities. In nearby Oni, a CBA could have led to a more effective location of a minor drainage canal.[24]

Second, CBAs can be used to advance advocacy with government agencies: presenting 'hard data' that is part of the modus operandi in public planning may help government agencies realise the full benefits of DRR, and thus facilitate greater investments in mitigation and general preparedness. The results of this CBA may reinforce such interest if shared amongst relevant circles.[25] *Third*, CBAs can be integrated into evaluations, thereby adding to the validation of project effectiveness. Such evaluations would be particularly useful if they could rely on adequate baseline surveys and monitoring along the lines of SMART indicators.[26]

These three roles require some basic knowledge in the CBA technique. Rather than relying on external consultants, IFRC or other RC/RC Movement partners may be interested in preparing a brief manual and/or application that would guide local staff (and evaluators) through the CBA process.

On a broader level, the role of cost-benefit analysis could be greatly improved to demonstrate the effectiveness of disaster risk reduction. Most CBA studies focus on the connection between mitigation and avoided losses only. While this study highlighted additional benefits as well as various mechanisms underlying loss avoidance, it also encountered several challenges, including limited data availability as well as the fact that it had to rely on prospective *(ex ante)* rather than materialised *(ex post)* loss avoidance.

To demonstrate the effectiveness more robustly, a more systematic ex post approach would be preferable. Rather than conducting country-based CBA studies, it may be worth considering global or regional studies based on initial screening of suitable case studies. Such research could prove useful not just for global advocacy efforts. More importantly, it could further investigate the variables contributing to loss avoidance - and thereby facilitate even more targeted and effective disaster risk reduction.

24. It is likely that the drainage canal constructed in one of Oni's villages would have been significantly more cost-effective if extended further uphill. A CBA would likely have demonstrated that benefits would have increased much more significantly than the additional cost of such an extension.

25. According to CENN's executive director, the cost-benefit analysis of DRR that the environmental NGO had commissioned in 2008 is a powerful case in point, as the Environmental Management Agency began investing in mitigation, better understanding full potential of such measures.

26. SMART stands for the key attributes of sound indicators: They should be specific, measurable, achievable, relevant and time-bound.

6. Conclusion

Gori: *A graffiti in front of the local branch illustrates the dedication of its volunteers. Branches supported by the various DRR projects now have more, and more active volunteers - a good basis that GRCS can build on.*

Photo: P. Bolte, Banyaneer

Let us return to the 'missing counterfactual' - the dilemma of disaster risk reduction mentioned in the introduction. The analysis in this report has illustrated the benefits of DRR: target communities would likely encounter far greater hazard-induced losses, had they not been supported by GRCS over recent years.

The study furthermore showed that it is not just mitigation that leads to loss avoidance: other factors are at play too: greater disaster preparedness as such pays off. Meanwhile, DRR yields other benefits irrespective of whether and when a hazard strikes: although not all of these aspects could be quantified, it is evident that organisational and governance co-benefits are significant. Furthermore, in places with effective mitigation, economic advantages such as increased values of real estate have been observed.

Like in all cost-benefit analyses, the values expressed in this study must be understood as approximations. Nonetheless, there can be little doubt that the investments of USD 2.4 million into Georgia Red Cross Society's DRM efforts have been extremely cost-effective. Overall benefits quantified by this study stand at USD 18.14 million over the respective timeframes - more than seven times the overall investment. Benefit-cost ratios in the three surveyed areas range between 12.51 and 54.54. Even if survey respondents over-estimated loss avoidance by some margin, benefit-cost ratios would remain high.

As such, the report findings represent an unequivocal call for further action. As encouraging as the results the DRR projects are, the losses they are likely to avoid are a very small fraction of what could potentially be avoided across the country. Considering that officially recorded losses over the 15 years between 1995 and 2010 (USD 1,843 million)

exceed the overall benefits identified in this study by more than 100 times, that the equivalent for the next 15 years will be much higher (considering significant rates of economic growth), and that climate change is likely to exacerbate losses, the possible savings to Georgia's economy and its people could be enormous.

Georgia Red Cross Society is unlikely to play the main role in achieving these savings - the national and local governments will need to be the key force in this process. But it can and should strive to be a strong supportive actor. To that end, careful but continuous coverage expansion, as well as consolidation of its achievements, should be accompanied by enhanced communication, fundraising, and advocacy.

Provided that GRCS is willing to take DRR to the next level and become a more prominent national actor, RC/RC Movement partners present in Georgia - IFRC, ICRC, Danish Red Cross and Austrian Red Cross - should direct some of their support over the next years to the reinforcement of the necessary organisational underpinnings. A gradual phase-down of external support should be scheduled to encourage greater financial independence of the National Society and its DRR program.

On the global and regional level, IFRC and other RC/RC Movement partners may seek to systematise studies of DRR cost-effectiveness, and promote the integration of the CBA lens into their programming. Standardised screening for suitable case studies that show actual rather than expected loss avoidance would be an important step to better address the missing counterfactual of DRR.

After all, it appears that many actors in Georgia and elsewhere are yet to fully comprehend the extent to which preparedness pays off. It is not just on humanitarian grounds but on economic ones too that proactive modes of risk management are preferable to reactive ones. Relief and recovery are rather expensive ways to *replace* losses instead of *avoiding (or reducing)* them. Undoubtedly, both the reactive and the proactive modes of disaster risk management have a role to play now and in future. But as this study shows, the more is invested in the latter, the better.

Appendix: Literature

CENN (2008): *Unnatural disasters.*

CENN (2010): *Georgia DRR Atlas*. Tbilisi: Caucasus Environmental NGO Network.

Chadburn, O., Anderson, C, Venton, C.C. and Selby, S. (2013): *Applying cost benefit analysis at a community level. A review of its use for community based climate and disaster risk management*. Oxfam Research Report, June 2013.

Danish Red Cross (2014): *Sustainability study. Georgia Red Cross Society, Armenian Red Cross Society.*

Danish Red Cross (2014a): *Branch development model. Review. March 17th-24th, 2014.*

IFRC (2008): *Early warning, early action.*
http://www.ifrc.org/Global/Publications/disasters/ew-ea-2008.pdf

IFRC (2011): *Breaking the waves. Impact analysis of coastal afforestation for disaster risk reduction in Viet Nam.*
http://www.preventionweb.net/files/globalplatform/entry_bg_paper~mangroveimpactreportfinallowapril2011.pdf

IFRC (2011a): *Characteristics of a Safe and Resilient Community. Community Based Disaster Risk Reduction Study.* *http://www.ifrc.org/PageFiles/96986/Final_Characteristics_Report.pdf*

IFRC (2011b): *The value of volunteers. Imagine how many needs would go unanswered without volunteers.* *http://www.ifrc.org/Global/Publications/volunteers/IFRC-Value%20of%20Volunteers%20Report-EN-LR.pdf*

IFRC (2012): *The long road to resilience. Impact and cost-benefit analysis of community-based disaster risk reduction in Bangladesh.*
http://www.ifrc.org/Global/Publications/disasters/reducing_risks/Long-road-to-resilience.pdf

Kellett, J. and D. Sparks (2012): *The Disaster Risk Reduction. Spending where it should count.*
http://www.globalhumanitarianassistance.org/wp-content/uploads/2012/03/GHA-Disaster-Risk-Report.pdf

Mechler, R. and The Risk to Resilience Study Team, (2008): *The Cost-Benefit Analysis Methodology*, From Risk to Resilience Working Paper No. 1, eds. Moench, M., Caspari, E. & A. Pokhrel, ISET, ISET-Nepal and ProVention, Kathmandu, Nepal.
http://www.preventionweb.net/english/professional/publications/v.php?id=8088

Mechler, R., Czajkowski.J., Kunreuther, H., Michel-Kerjan, E., Botzen, W., Keating, A., McQuistan, C., Cooper, C., O'Donnell, I. (2014): *Making communities more flood resilient: The role of cost benefit analysis and other decision-making tools in disaster risk reduction.* Zurich Flood Resilience Alliance. *http://opim.wharton.upenn.edu/risk/library/ZAlliance-decisiontools-WP.pdf*

ODI (2015): *Unlocking the 'triple dividend' of resilience. Why investing in disaster risk management pays off. Interim policy note*. London: ODI, GFDRR, World Bank.
https://www.gfdrr.org/sites/default/files/publication/unlocking_triple_dividend_resilience.pdf

Rees-Gildea, P. (2011): *Regional programme for building safer local communities in the South Caucasus. An evaluation - August 2011.*

Rees-Gildea, P. (2013): Final evaluation of the *regional programme for building safer local communities in the South Caucasus - DRR II.*

Roots, R. (2015): *Independent evaluation of the project "Building Safe and Resilient Communities in the South Caucasus" (ADA contract number 1980-11/2012)*. Final report.

Roots, R. (2015a): *Independent evaluation of the regional programme for Building Resilient Local Communities in Georgia and Armenia*. Version 3.

Shreve, C.M. and Kelman, I. (2014): Does mitigation save? Reviewing cost-benefit analyses of disaster risk reduction; *International Journal of Disaster Risk Reduction*, Vol.10, p. 213-235. *http://www.sciencedirect.com/science/article/pii/S2212420914000661*

UNDP (2014): *Georgia. Disaster risk reduction capacity assessment report. Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI).*

UNISDR (2009): *Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI). Risk Assessment for Central Asia and Caucasus Desk Study Review.*
http://www.unisdr.org/files/11641_CentralAsiaCaucasusDRManagementInit.pdf

White, B.A. and Rorick, M.(2010): *Cost-benefit analysis for community-based disaster risk reduction in Kailali, Nepal.* Lalitpur: Mercy Corps Nepal.
https://www.mercycorps.org/sites/default/files/mc-cba_report-final-2010-2.pdf

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, co-operation 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.

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.

www.ifrc.org
Saving lives, changing minds.

International Federation
of Red Cross and Red Crescent Societies