Climate results

The GIZ sourcebook for climate-specific monitoring in the context of international cooperation

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The hyperlinks used in the sourcebook are compiled in the hyperlinks bibliography.

Figures

In brief

Foreword

Climate change is one of the main threats to sustainable development in developing and emerging countries. To analyse and to deal with the causes and consequences of climate change, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) undertakes climate-relevant projects in the fields of reduction and adaptation, together with partners and on behalf of various public and private clients.

Continuous monitoring and evidence of the results achieved by our projects are central components of each of these projects. Until now there was no standardised approach or methodical support for evaluating and illustrating the climate results achieved by our projects and programs at a technical and methodical level.

As part of a GIZ Future Innovation policy "Environmental monitoring", the Water, Energy and Transport department and the Environment and Climate department have developed a sourcebook aimed at project planners and managers. Depending on the type of project or sector, this sourcebook presents standards and concrete assistance for monitoring and developing monitoring systems in reduction and adaptation projects.

The sourcebook is intended to act as a reference and aims to contribute to the calculation, standardised definition and illustration of climate results in climate-relevant projects. Due to the dynamics of international climate policy and the discussion about Measuring, Reporting and Verification (MRV), still ongoing at the time of going to press, this issue does not claim to be complete.

Rather it is intended to stimulate the continuing discussions on how to assess climate results. The project team is grateful for any further information or critical suggestions.

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Introduction

For whom?

This "GIZ Sourcebook on Climate Results" (hereinafter "sourcebook") is aimed at everyone who works on the planning, execution, monitoring or evaluation of environmental projects in the area of international cooperation. The focus is on tracing intended climate results at a project level.

Why?

International cooperation is accompanied by an increasing need for clients, partners and the general public to be informed in a more sophisticated manner about the results of climate and development policies than was previously necessary. Projects must therefore prove results using figures, data and facts. The following developments must be mentioned in this context:

1. **Increasing relevance of climate change related projects in international cooperation:** The fight against climate change and the adaptation to its consequences have become important priorities for international cooperation in recent years. Germany is one of the biggest donors of funds for climate protection in developing and emerging countries. Since 2005 the German government has more than doubled its commitment, and in 2009 it allocated approx. 1 billion Euros to climate protection (BMZ, 2011). In the area of climate, there is also an above-average amount of co-financing with other donors.

2. **Demand for monitoring standards and instruments for proving climate results:** In the 2010 Cancún climate negotiations, Annex I countries pledged to improve reporting of the support given to developing countries. In return, developing countries agreed to improve the reporting of reduction measures and their results, and to accept international advice in doing so. "Measuring, Reporting and Verification" (MRV, see Box 1) is not only becoming more important for developing countries in the field of reduction; opportunities to improve and standardise the approach are also being sought in the area of adaptation. To date, no one has succeeded in creating an international framework for this. Experiences from adaptation projects are therefore playing an important role.

3. **International discussion about the assessment of impacts:** Many projects contribute to the reduction of greenhouse gas emissions through changing framework conditions, transferring knowledge or other types of capacity development. Internationally and also within the Gesellschaft für Internationale Zusammenarbeit (GIZ), the possibilities and boundaries of an assessment and aggregation of these indirect climate results are currently being debated.

Objectives

The sourcebook is pursuing three objectives:

1. To precipitate a uniform **understanding of climate results and a standardisation** within all GIZ's environmental projects. This is against the background of different organisations using different terms and definitions. The sourcebook therefore recommends a categorisation of climate results that have already been acted on by the international climate initiative of the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU).

2. To provide projects with **support for monitoring climate results.** To this end, the sourcebook summarises the international discussion on monitoring climate results and as a conclusion provides step-by-step instructions for monitoring climate results in the areas of reduction and adaptation. It also presents cross-sector and sector-specific methods for monitoring climate results. Short descriptions and evaluations facilitate the selection of a suitable method.

3. To contribute to **recording impacts** of climate change related projects. The sourcebook presents different approaches to assessing the impact of GHG reduction projects.

Structure

The sourcebook is divided into three parts:
- Basic principles
- Results in climate protection projects
- Results in adaptation projects

The “Basic principles” section is the basis for all climate protection and adaptation projects. It explains GIZ’s understanding of the results-based monitoring, introduces the target areas for categorising climate results and explains the meaning of co-benefits for all climate change related projects.

The “Results in climate protection projects” section presents the “greenhouse gas reduction” and “mitigative capacity” target areas in chapters 1 and 2 and provides step-by-step instructions for monitoring results and an overview of methods used to record them. Chapter 3 goes into specifics of the forest sector. Finally, chapter 4 explains the possibility of estimating emission reductions that have been achieved by a project indirectly through capacity development. The corresponding methods are also presented here.

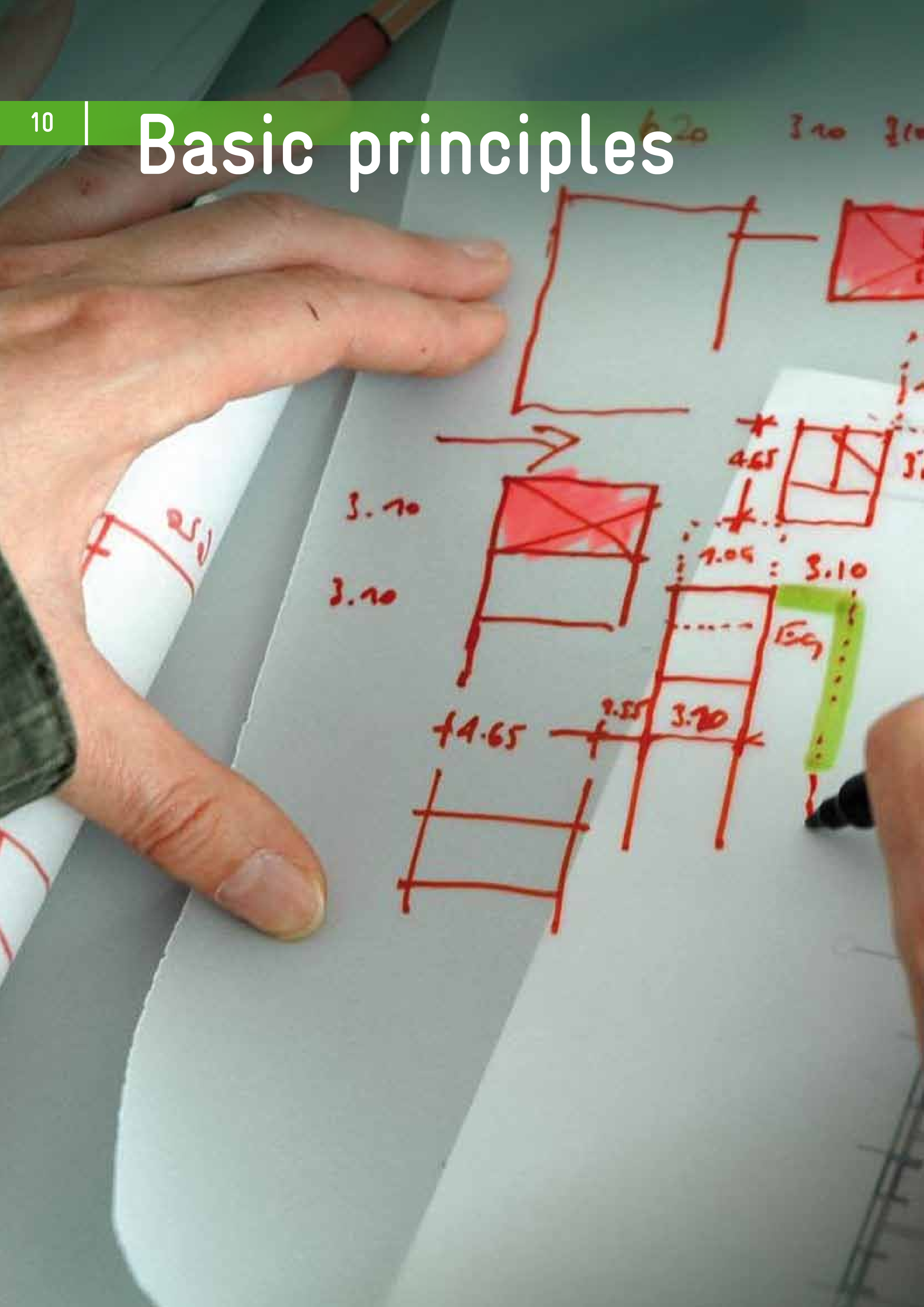
Box 1: Measurable, Reportable and Verifiable (MRV)

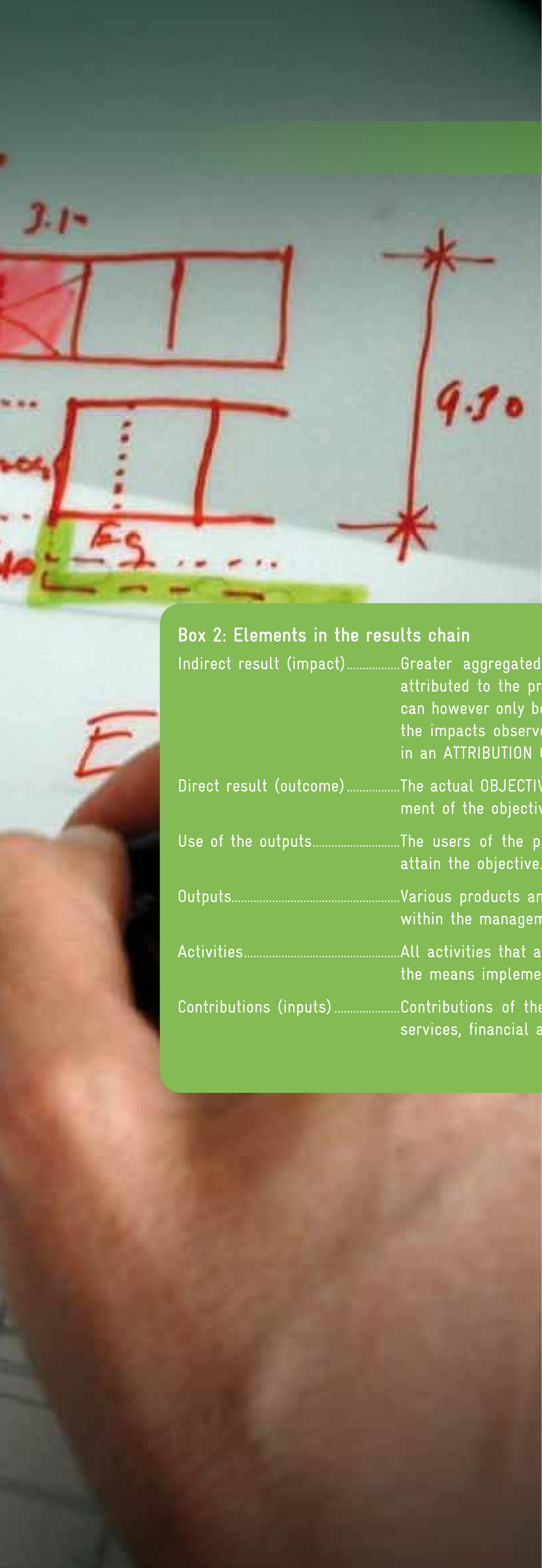
The term MRV was coined in the Bali Action Plan (2007) and stands for measurable, reportable and verifiable. Under any future international climate protection agreement, countries will be able to have their climate change mitigation achievements recognised only if they comply with these three criteria. This involves both verifiable implementation of measures and also the question of what the measures contribute to reducing emissions and therefore to climate change mitigation. This is a particularly stringent requirement for measures that receive support in the form of international financial transfers. The term MRV embraces an entire toolkit containing instruments for recording current emissions and potential for reduction, for planning and implementing measures, and for reporting the measures and their effect on emission reduction. The focus is not confined to direct, short-term reduction impacts. MRV also applies to more long-term activities that may have a lasting impact on global climate change mitigation.

Source: German International Climate Initiative programme office (2010)

The section “Results in adaptation projects” gives an overview of the international debate on the monitoring of adaptation projects, briefly goes into the target areas and then explains the most important aspects of the monitoring of adaptation projects with step-by-step instructions. To conclude, suitable methods are summarised in brief.

Basic principles





1. The GIZ results model

GIZ projects are result-oriented. This means that the success of the work is not only measured by the completion of activities and outputs generated. Instead the focus is far more on what kind of transformations have been achieved by the project.

The basic principle behind the results-based concept is a results chain whose elements (activities, outputs, uses of outputs, outcome and impact) have a causal connection. The individual elements are defined in Box 2. Figure 1 illustrates a results chain using the example of a project to promote renewable energy.

Box 2: Elements in the results chain

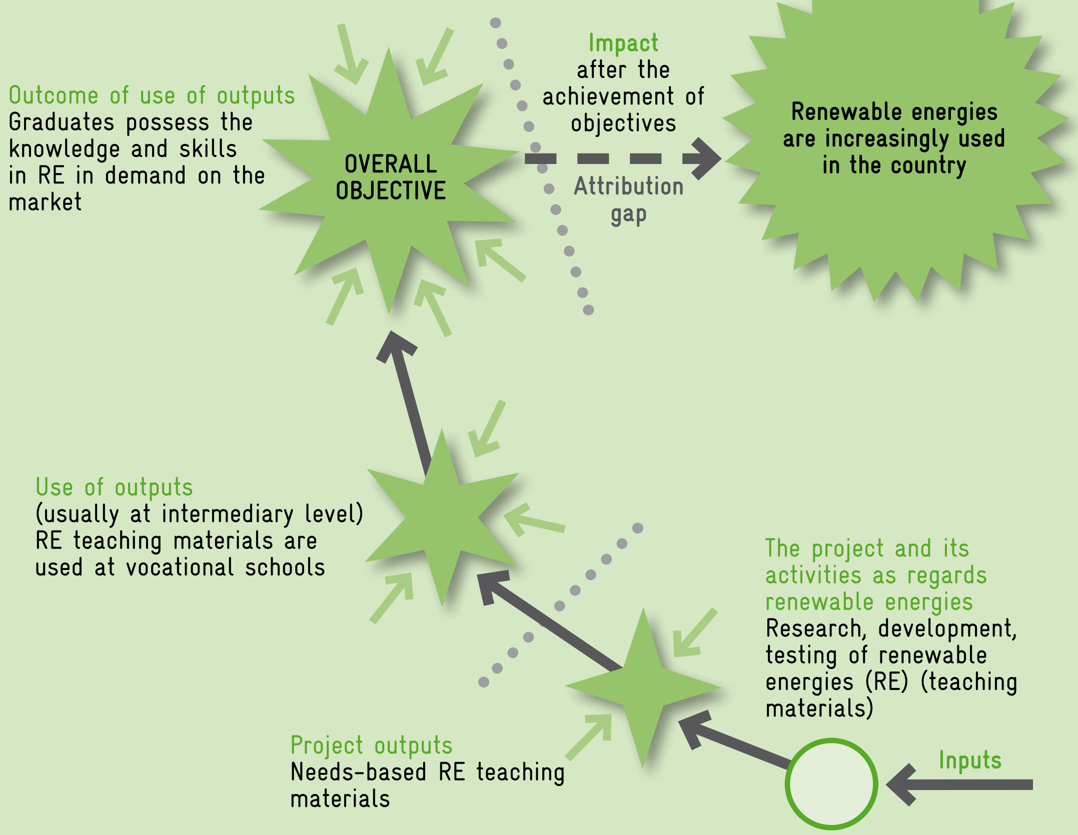
Indirect result (impact)	Greater aggregated developments and changes that can be plausibly attributed to the project. The contribution of the project to these results can however only be partially isolated or quantitatively recorded because the impacts observed are influenced by many other factors. This results in an ATTRIBUTION GAP.
Direct result (outcome)	The actual OBJECTIVE of the project or one of its components. The attainment of the objective can be clearly attributed to the project.
Use of the outputs	The users of the project outputs pass through a process of change to attain the objective.
Outputs	Various products and services for users, the provision of which still lies within the management responsibility of the project.
Activities	All activities that are performed within the framework of a project using the means implemented.
Contributions (inputs)	Contributions of the project, the partner and other donors (consultancy services, financial and material contributions, etc.).

Source: Own diagram according to GIZ (2008b)

The formulation of the results chain also indicates the scope of a project (system boundaries, represented by dotted lines in figure 1) and the attribution gap between what can be directly causally attributed to the project (activities to outcome) and the impact.

The focus on the results-based concept begins at GIZ with the formulation of a results chain during the preparation of projects, continues during the implementation, and concerns monitoring and evaluations and finally also the reporting.

Figure 1: GIZ results model using the example of an environmental project in the field of renewable energies (RE)



Own diagram according to GIZ (2008b)

Monitoring means systematically observing, analysing and assessing the project, its environment and the interaction between the two during the course of the project.

Results-oriented monitoring of projects has three objectives:

- The **management of the project:** Observing and assessing the project results and the changing environment in terms of the project objectives enables risks to be confronted early on and new opportunities to be exploited

- The internal and external **knowledge management** and support of the **learning process** for all those participating in the project and

- The **reporting** of project activities and results to clients and project partners.

The sourcebook highlights climate-specific aspects that have to be taken into account for results-based monitoring of climate change projects. As climate change projects do not fundamentally differ from other projects in the monitoring of project activities and outputs, the sourcebook places the focus on recording outcomes and impacts.

For results-based monitoring, the usual procedure in GIZ applies, which can be taken from the GIZ guideline "Results-based Monitoring: Guidelines for Technical Cooperation" (2008b).

Links & literaturee

GIZ (2008): "Results-based Monitoring:
Guidelines for Technical Cooperation"
Links from page 88 onward

2. Target areas of climate results

What are climate results?

The sourcebook focuses on the monitoring of "climate results". Climate results are changes that are achieved through a project in the area of climate protection and/or adaptation to the consequences of climate change. They must be established both at an outcome and impact level of the results chain shown above.

In the following pages an analytical framework is defined for the monitoring of climate results. Environmental projects can accordingly be categorised into four target areas concerning their outcomes. These are: 1) Greenhouse gas reduction (abbreviation: GHG reduction), 2) Mitigative capacity, 3) Adaptive measures and 4) Adaptive capacity. The structure of the sourcebook follows this categorisation. The target areas are also part of the International Climate Initiative of the Federal Ministry for Environment.

Target areas at the outcome level

The four target areas (see figure 2) differ from each other in:

1. Their overarching, long-term aim that is described as an **impact** (climate protection or adaptation to the consequences of climate change) and

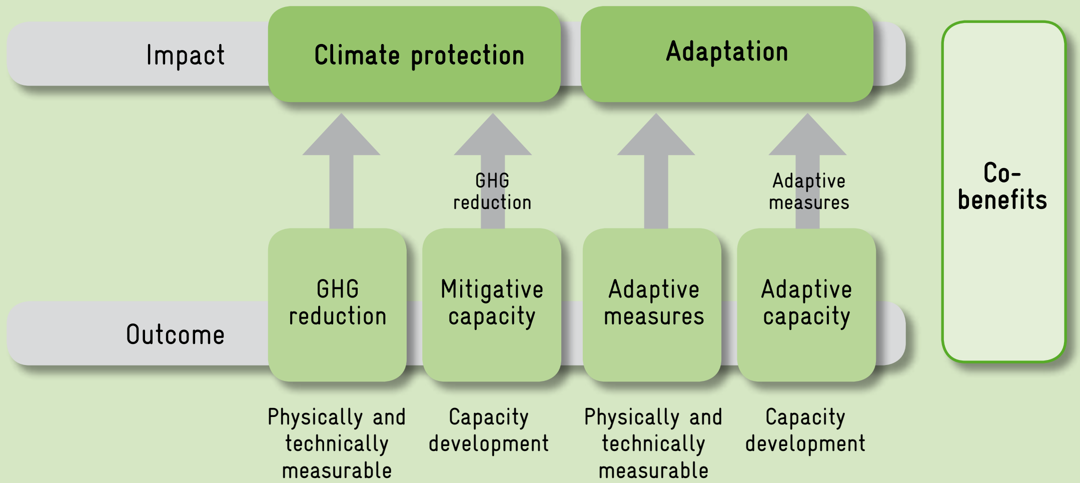
2. The **type of their outcome** (physically and technically measurable or capacity development).

Note:

In the international context and in English usage, the term climate protection implies both the reduction of greenhouse gases ("reduction" for short) and the increase in the capacity to adapt to the consequences of climate change ("adaptation" for short).

In this sourcebook, the term climate protection is used for the impacts of projects in the target areas of GHG reduction and mitigative capacity, to clearly indicate the attribution gap between the impact and outcome levels. The aim is to show the uncertainty/variance as to what is the real impact of the GHG reduction on climate protection.

Figure 2: Target areas of environmental projects



Source: Own diagram

1. Categorisation according to impacts

Climate change related projects always contribute to "climate protection" by reducing emissions or "adaptation to climate change". However, this contribution cannot always be directly causally attributed to the project and therefore is at the impact level. For example, in a project that can prove it has reduced GHG, there is also uncertainty concerning the question of what impact this GHG reduction actually has on climate protection. We cannot prove the fraction of an (avoided) change in temperature for which this GHG reduction is responsible. This uncertainty between the outcome which can still be attributed to the project and its long-term impact is described as the "attribution gap" and symbolised by arrows in figure 2.

2. Categorisation according to outcomes

Environmental projects can also be categorised depending on the type of their outcomes. Accordingly, environmental projects whose direct climate results are physically and technically measurable differ from climate change related projects whose outcomes focus on the development of capacity. Depending on the type of outcome, the contribution of a project to climate protection and adaptation (i.e. the long-term, impacts) must be proven in a different way.

The contribution of projects with physically and technically measurable results to climate protection or adaptation is directly traceable. Results such as "GHG reduction", measured in tonnes of CO_2 equivalents, or the construction of a barrage against flooding ("adaptive measure") can be plausibly connected directly with the impacts of climate protection or adaptation to climate change.

With projects that focus on capacity development as an outcome, the contribution to the impact of climate protection and adaptation on the other hand is harder to determine. If the mitigative capacity or adaptive capacity of a country increases, then the conditions for a country to attain a physical and technical GHG reduction or carry out adaptive measures itself have been created or improved (cf. figure 2). Only this will lead to climate protection or adaptation.

The experiences of GIZ and other implementing organisations demonstrate that projects which focus on capacity development at the outcome level are very important for the reduction of greenhouse gases and climate change and the adaptation to its consequences. These projects frequently lead to a greater GHG reduction or adaptation to climate change than projects with physically and technically measurable results (cf. e.g. UNDP, 2010). Therefore, projects which can produce

GHG reductions or adaptive measures as outcomes and projects which contribute indirectly to climate protection through GHG reduction or to an adaptation as a result of capacity development have the same value. The concepts of mitigative capacity and adaptive capacity are based on the IPCC reports and on GIZ's definition of capacity development (cf. Box 3).

In line with the categorisation presented according to "impacts" and "type of outcomes", there are four target areas which are explained in the following pages: GHG reduction, Mitigative Capacity, Adaptive Measures and Adaptive Capacity.

Box 3: GIZ's understanding of capacity development

GIZ understands capacity development to be the process by which people, organisations and society as a whole are put in the position of organising their own development sustainably and adapting themselves to changing framework conditions. In GIZ this capacity is often characterised as decision-making, responsibility and management skills, which is understood to involve in particular the effective merging of political will, interests, knowledge, values and financial resources according to individual development objectives and needs.

Capacity development must be supported by all the stakeholders involved and transformed into concrete actions. This requires ownership, i.e. significant identification and commitment of the participants concerning the desired changes.

The specific approach of GIZ to supporting capacity development is derived from the model for sustainable development. Development is understood to mean the permanent search, negotiation and teaching process of all participants which cannot be planned in detail in advance. GIZ's working procedure reflects this basic understanding of development. The basic principles are that the approach is holistic, as well as process- and value-based.

Source: GIZ (2007)

"GHG reduction" target area

A project is active in the "GHG reduction" target area if a physically and technically measurable GHG reduction (e.g. in tonnes of CO_2 equivalents) occurs as an outcome. It must be possible to causally and quantitatively attribute this GHG reduction to the project as an outcome. This is generally the case in technology-based projects, demonstration projects and pilot projects, and in investments that are carried out during the course of the project.

In the "GHG reduction" target area the impact is the reduction of climate change and therefore climate protection. The attribution gap between the outcome "GHG reduction" and the impact "climate protection" results from the fact that we can hardly assess what impact a GHG reduction obtained through a project has on the (avoided) increase in the average temperature of the earth and on the regional and local developments and consequences of climate change.

"Mitigative capacity" target area

A project is active in the "mitigative capacity" target area if it contributes, at the outcome level, to the capacity of a country to reduce greenhouse gases or protect or expand natural (carbon) sinks (definition according to Winkler et al., 2007, cited in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC). The projects therefore place the focus of their outcome on the capacity development of their partners. The increase in the mitigative capacity will lead to a GHG reduction through the partners, and therefore to climate protection as an impact. Mitigative capacity can be established through a whole range of varied measures which include not only the development of capacities at an individual level, but also at the level of organisations and societies, for example through strengthening a ministry for the environment or changing framework conditions by adopting an eco-tax.

In GIZ, the concept “mitigative capacity” includes the following capacities:

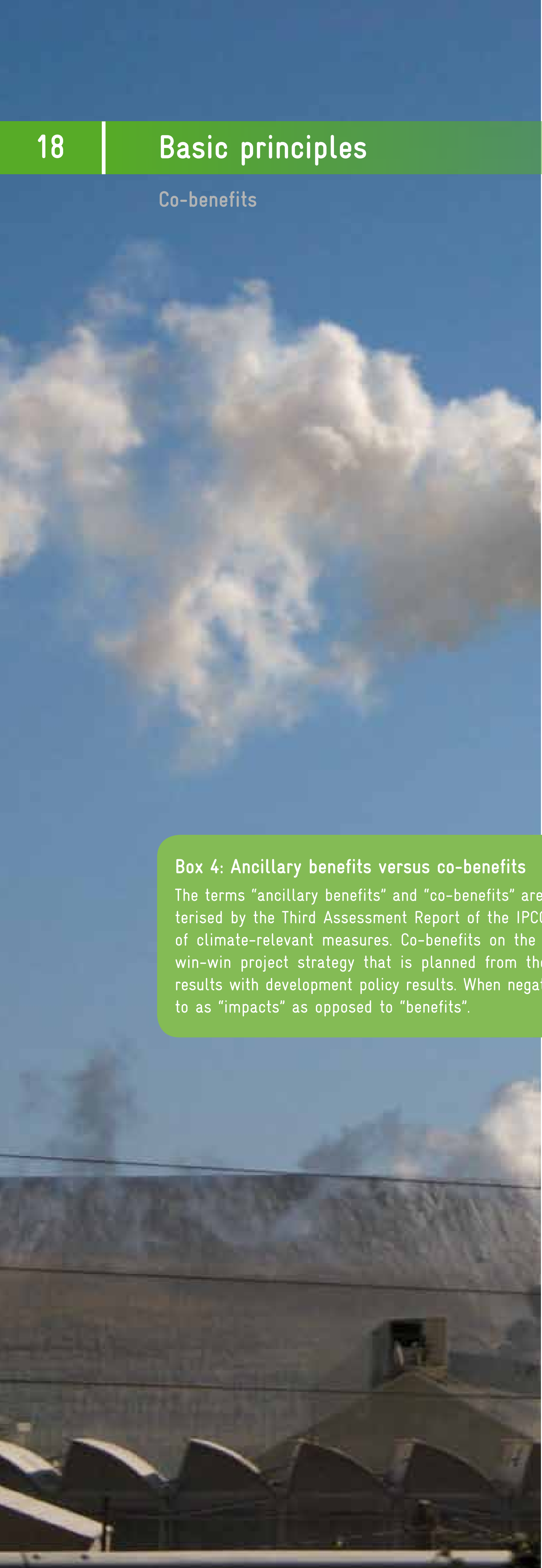
a) To reduce greenhouse gases independently, for example by adopting a law that promotes renewable energies or by offering a training course in the field of energy efficiency which leads to demonstrable and established skills in target groups. This corresponds to the narrow definition by Winkler et al. (2007).

b) To contribute to international climate negotiations (e.g. through establishing consensus concerning a negotiation strategy for international climate negotiations). This extension of the original definition by Winkler et al. (2007) is based on the broader definition of “mitigative capacity”, also cited in the IPCC Fourth Assessment Report, as the capacity to reduce the intensity of natural (and other) stress conditions to which a society is exposed (Rogner, H. / Zhou, D. et al., 2007).

c) To prove the emission reductions obtained through MRV (e.g. by developing a national MRV institution). This repeated extension of the aforementioned definitions accepts that MRV is necessary for GHG reductions to be recognised internationally. In turn, the international recognition enables developing countries to have access to financial, personnel and technical resources that are provided by industrialized countries for climate protection.

“Adaptive measures” target area

In the "adaptive measures" target area, projects provide measurable contributions at the outcome level to reduce the risks and effects of climate change, e.g. through the development of the water storage capacity for the agricultural sector in regions affected by climate-induced drought. These contributions (e.g. a dam) are generally physically and technically demonstrable. However, the contribution to adaptation can often only be deduced as a plausible figure, as it is based on assumptions about the local characteristics of climate change (e.g. expected frequency of storms). This target area is described as “adaptive strategies” in the BMU’s ICI projects.



"Adaptive capacity" target area
The "Adaptive capacity" target area includes all projects or project components which increase the capacity of the population or certain sections of the population to develop and implement adaptive measures themselves. The outcome therefore focuses on the development of capacities for adaptation to the consequences of climate change. Examples are the provision and systematisation of information about the consequences of climate change or the use of this information to develop risk management capacities.

3. Co-benefits

What are co-benefits?

Co-benefits are project results achieved in addition to climate results (cf. figure 2). They describe the contribution of the project to sustainable economic and social development and the improvement or conservation of the environmental quality. Co-benefits are mostly found at a regional or local level. Examples of co-benefits are increases in salaries, social security or the decrease of air pollutants.

Box 4: Ancillary benefits versus co-benefits

The terms "ancillary benefits" and "co-benefits" are often used simultaneously. Both terms were characterised by the Third Assessment Report of the IPCC. This cites ancillary benefits as being "side effects" of climate-relevant measures. Co-benefits on the other hand are seen as being an integral part of a win-win project strategy that is planned from the outset; measures should combine positive climate results with development policy results. When negative side effects are also considered, they are referred to as "impacts" as opposed to "benefits".

Source: Clean Air Initiative ACP (no date given), IPCC (2001)

Why are co-benefits important?

Co-benefits often tip the scales for the local partners when it comes to adopting the project, as these are direct, positive results that can be seen locally. Therefore co-benefits are vital for the acceptance and thus the success of projects. They should be especially considered in project planning, monitoring and reporting, and ideally operationalised with indicators. Qualitative or quantitative indicators can be chosen. A baseline should be established or at least estimated. It is also recommended that relevant stakeholders are involved in checking if co-benefits have been achieved.

How can co-benefits be measured?

In many methods used for monitoring GHG reduction projects, co-benefits are insufficiently considered. For example the Clean Development Mechanism (CDM) and the Verified Carbon Standard (VCS) do not give any specification on the type and intensity of public involvement. Neither do they expressly stipulate that a reduction project should achieve positive socio-economic contributions. Therefore (additional) standards should be used that integrate co-benefits sufficiently in the project planning and execution, as well as in the monitoring and assessment. The list of links at the end of the chapter contains a short description of suitable standards.

Co-benefits in adaptation projects

An adaptation project is therefore successful when economic, social and ecological objectives are achieved despite climate change. As a result, the difference between co-benefits and adaptive results is not always very clear. Adaptation projects should nevertheless list contributions to preserving or improving the living conditions of particularly vulnerable sections of the population, additional ecological results and other aspects which were not explicitly sought as project objectives.

Co-benefits / Safeguards in forest projects

The consideration of economic, social and ecological aspects is often crucial for long-term success in forest projects. This is reflected in the fact that, in the context of securing the economic, social and ecological acceptability of forest projects, we talk about "safeguards" and, when it comes to targeting additional positive results beyond the actual project, we talk of "co-benefits". The following should be considered:

- **Economic and social factors:** Indirect drivers of deforestation such as poverty or the lack of clear land use and ownership rights must be reduced via project activities specific to the target group. Potential negative effects from the implementation of REDD+ projects must also be investigated in light of their social results and if necessary avoided;
- **Ecological factors:** The preservation of ecosystems, their outputs and their biodiversity must be considered, so as to be able to guarantee local relevance and international acceptance of REDD+ projects.

Links & literature (from page 88 onward)

CDM Gold Standard (Gold Standard Foundation): Quality standard for CO_2 offsetting projects from the WWF and other environmental organisations

The CDM Gold Standard, which is awarded by the Swiss NGO Gold Standard Foundation, is an independent standard for projects under the CDM and joint implementation regime and for projects whose emission allowances are sold on the voluntary market. As well as the achievement of GHG reduction, the Gold Standard also checks the contribution of a project to sustainable development. Among other things, a good stakeholder process is required. Environmental and socio-economic co-benefits must also be considered.

United Nations Environment Programme (no date given): "CDM Sustainable Development Impacts"

Within the framework of the "Capacity Development for the Clean Development Mechanism" (CD4CDM) project, the United Nations Environment Programme (UNEP) has published the manual "CDM Sustainable Development Impacts" to connect CDM projects with sustainable development. Its contents include references to the operationalisation of sustainable development at project level, to the formulation of indicators and to the assessment and selection of co-benefits, including cost-benefit and multi-criteria analyses.

Social Carbon Standard (Ecologica Institute): Standard for CO_2 offsetting projects on the voluntary market

Social Carbon is a standard developed by a Brazilian NGO, Ecologica Institute, which the organisation uses to certify the economic, social and ecological sustainability of projects in the voluntary carbon offsetting market. The standard has been developed especially for projects with small communities and is therefore easily accessible. However the system is not transparent. The Social Carbon Standard is almost exclusively used in Brazil.

Japanese Ministry of the Environment (2002): "Manual for Quantitative Evaluation of the Co-Benefits Approach to Climate Change Projects"

The "Manual for Quantitative Evaluation of the Co-Benefits Approach to Climate Change Projects" by the Japanese Ministry of the Environment describes some methods and approaches for assessing co-benefits in detail. Co-benefits in the areas of air quality, water and waste are considered in particular. Corresponding examples, checklists and recommendations for co-benefit approaches can be found on its dedicated website.

Global Environmental Strategies (2009): "Mainstreaming Transport Co-Benefits Approach: A Guide to Evaluating Transport Projects"

The "Mainstreaming Transport Co-benefits Approach: A Guide to Evaluating Transport Projects" recommendation from the Institute for Global Environmental Strategies explains how to quantify co-benefits such as time savings, savings of operational costs, transport safety and improved environmental quality.

GAINS International Institute for Applied Systems Analysis (2008): "A Tool to Combat Air Pollution and Climate Change Simultaneously"

The "Tool to Combat Air Pollution and Climate Change Simultaneously" by GAINS provides detailed advice on assessing air purity and the co-benefits achieved as a result of it, such as improved health and healthy vegetation. Instructions for a cost-benefit analysis are also included.

Climate, Community & Biodiversity Standards (Climate, Community & Biodiversity Alliance): Standard for CO_2 offsetting projects on the voluntary market

In the forests sector, the Climate, Community & Biodiversity Standards (CCBS) are often used to assess co-benefits.

Plan Vivo Standard (Plan Vivo Foundation): System and standard for local agroforestry projects

The Plan Vivo Standard of the Scottish NGO Plan Vivo Foundation is primarily used for local agroforestry projects to assess the consequences on rural development. The system develops projects and programmes in the field of payments for ecosystem services.

Digression: Environmental and climate assessment

Does our work in partner countries have negative impacts on the environment and climate, or is there potential for positive contributions? And the reverse: Are the objectives of our programmes or projects threatened by climate change? Since 1 January 2011 these questions have had to be answered for all BMZ projects being launched or entering a new phase.

Environmental and climate assessment is carried out independently from the allocation of cross-sector classifications by the OECD (for more information on classifications see "The Classification System" guideline). While classifications serve the purpose of statistical investigation and are based on the objectives defined for the project, environmental and climate testing supports the content of a project concept. Only in the event of a modification to the project concept at objective level due to the in-depth assessment can environmental and climate assessment lead to a change in the classification (e.g. from UR-0 to UR-1, if corresponding measures are defined e.g. to promote ecological sustainability at indicator level).

Environmental and climate assessment is compulsory for all German implementing organisations and replaces the previous procedures. The aim is to systematically consider environmental and climate aspects from both the strategic and operational perspective.

How the implementing organisations develop the environmental and climate assessment concretely is their own responsibility. In GIZ the assessment procedure for projects has two stages:

1. Screening (mandatory)
The brief preliminary check is carried out by the contract manager in the form of a checklist. Time required: approx. 20-60 minutes.

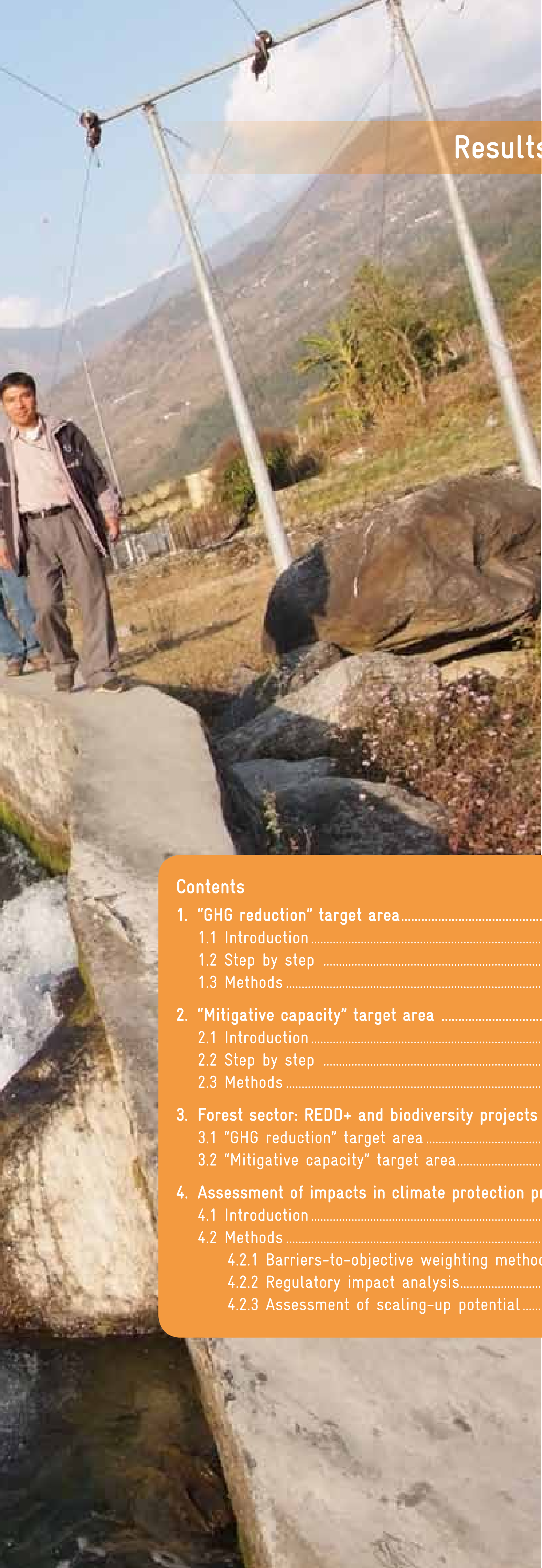
2. In-depth assessment (as needed)
If the screening comes to the conclusion that the project has a significant environmental and/or climate issue, more in-depth assessment is performed. This is part of the appraisal mission or the project progress review. Time required: approx. 1-5 days.

Further information:

GIZ intranet section Environmental and climate assessment, GIZ (2011c); Guideline "The classification system",

Source: GIZ (2011b), GIZ (2011c)

Results in climate protection projects



1. “GHG reduction” target area

1.1 Introduction

Projects in the “GHG reduction” target area contribute to climate protection (impact) through their outcome, which is physically and technically measurable. The outcome is a GHG reduction, operationalised through an indicator which generally states the GHG reduction to be reached in tonnes of CO_2 equivalents.

The “Step by step” section gives four steps for monitoring the results in any project of the “GHG reduction” target area. This sequence of steps also applies for forest projects in principle. Special characteristics of forest projects are dealt with in the 3rd chapter of the “Climate protection” section.

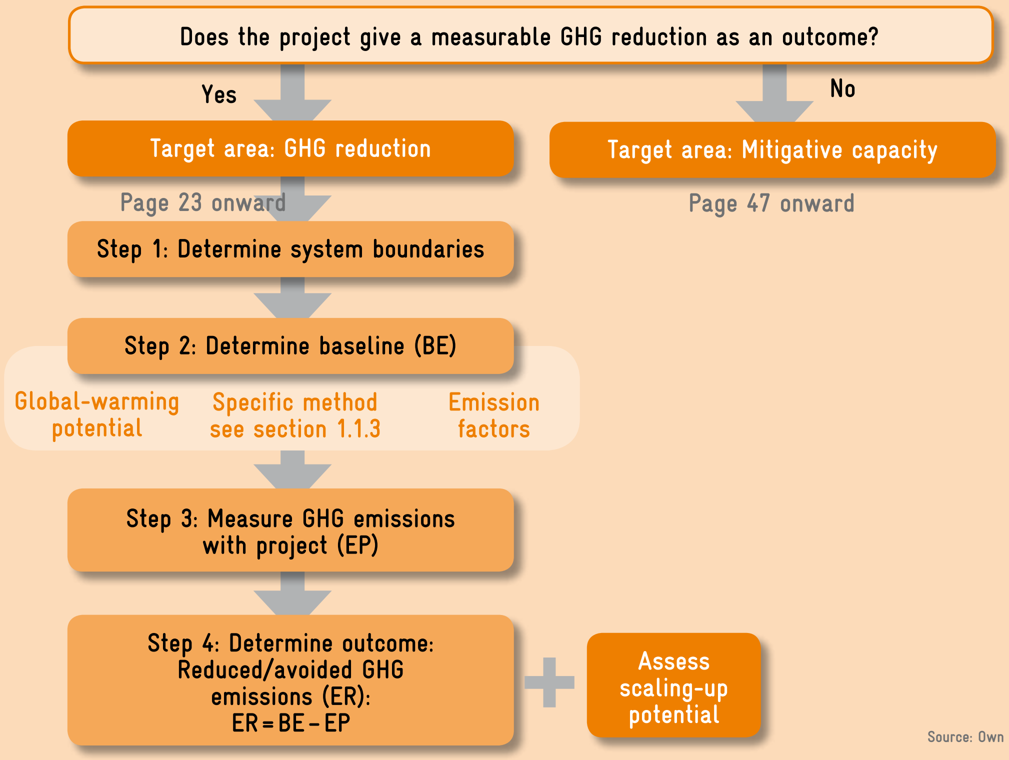
The “Methods” section presents cross-sector and sector-specific methods for assessing GHG reduction and for planning and carrying out projects in this target area. The selection is based on the screening of available methods and advice from GIZ employees and external experts. The method overview does not claim to be complete.

Contents

1.2 Step by step

This section provides cross-sector advice for projects in the "GHG reduction" target area. The points listed here should be considered by all projects that strive to reduce greenhouse gases as an outcome. Figure 3 leads you step-by-step through the most important aspects when assessing GHG reduction. The steps are explained below.

Figure 3: Step-by-step instructions for monitoring "GHG reduction"



Source: Own diagram

Box 5: Formula for calculating "GHG reduction"

To calculate the GHG reduction which is achieved as a direct result of a project the following equation is used:

ER = BE – EP [tonnes of CO_2 equivalents]

ER Reduced/avoided emissions

BE Baseline emissions

EP Emissions with project

Expressed in words: The GHG reduction achieved by reducing or avoiding emissions (i.e. the direct result) results from the baseline emissions minus the emissions measured with the project.

Source: Ecofys Germany (2009)

When calculating the individual components of the equation, the details of the procedure are as follows:

Step 1 Determine system boundaries

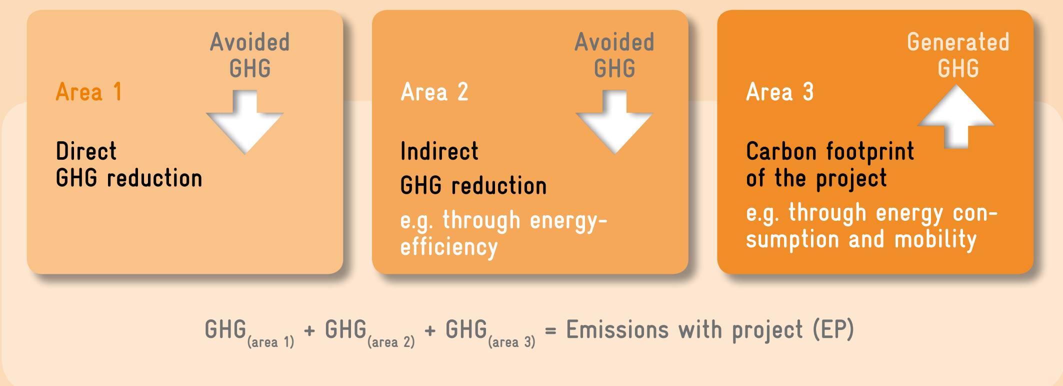
For GHG reduction to be measured, first the system boundaries must be defined. The system boundaries determine which type of GHG emission in which period should be taken into account in the measurements. The system boundaries have both a temporal and a spatial dimension. Each contract manager determines the system boundaries of their project themselves. Ideally this is in consultation with the partners and other donors.

Spatial system boundary: With the spatial system boundary, climate protection projects determine what type of GHG emissions they wish to consider. The types of GHG reduction can be split into the three areas: direct GHG reduction, indirect GHG reduction and the project's carbon footprint (cf. figure 4). Areas 1 and 2 are defined according to ISO 14064 (see Box 6).

Area 2 includes other avoided greenhouse gases. These accompany the project but are not vital for its implementation. These greenhouse gases can for example be avoided by using more energy-efficient machines or processes. Not all projects reduce indirect (according to ISO 14064) greenhouse gases.

The emissions-balance-sheet of a project can also include the amount of greenhouse gases caused by a project itself. This is area 3. The carbon footprint is calculated from emissions that are caused by the energy consumption, travelling of project employees and other participants. In comparison to the avoided emissions, the emissions caused by the project are relatively small and do not have a significant impact on the total balance sheet. The carbon footprint is easy to calculate and often interesting for the project's external communications.

Figure 4: Spatial system boundaries for climate protection projects according to ISO 14064



Source: Own diagram

Area 1 covers all the intended emissions that were directly avoided through the project (according to ISO 14064). In a wind farm, these are greenhouse gases that were not even caused in the first place due to the use of renewable energy sources as an alternative to fossil fuel (baseline scenario). In the case of the substitution of fluorinated gases with natural gas propellants in the production of insulating material, the resulting GHG reduction is taken into account in area 1.

When added up, the emissions avoided in areas 1 and 2 and the new emissions caused in area 3 give the emissions with project (EP) in the formula for calculating "GHG reduction".

Box 6: Direct and indirect GHG reduction according to ISO 14064

The sourcebook differentiates between GHG reduction at the level of direct results and GHG reduction that is attained as an indirect result through projects with the "mitigative capacity" target area. This should not be confused with the distinction between direct and indirect GHG reduction according to ISO 14064:

According to ISO 14064, direct GHG reduction is understood to be a reduction of greenhouse gas emissions that is under the direct control of a project (area 1). This includes all processes in which fossil fuels are burnt or fugitive emissions are produced. An example from a GIZ project to reduce direct emissions: "By selling an annual output of 4,320 tonnes of insulating material expanded with CO_2, direct emissions amounting to 1,600,000 tonnes of CO_2 equivalents will be definitively avoided up to the year 2020."

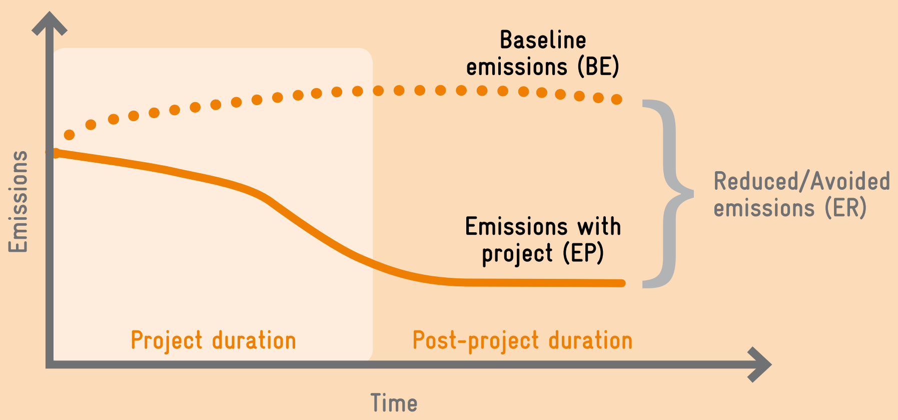
According to ISO 14064, indirect GHG reduction covers all greenhouse gas emissions that are generated through the use of grid-bound energy (area 2). An example from a GIZ project to reduce indirect emissions: "By reducing the energy consumption for operating a production plant for foam insulating material, 30% less electrical energy is required, which corresponds to 5,000 tonnes of CO_2 equivalents up to 2020."

Source: ISO 14064-1:2006

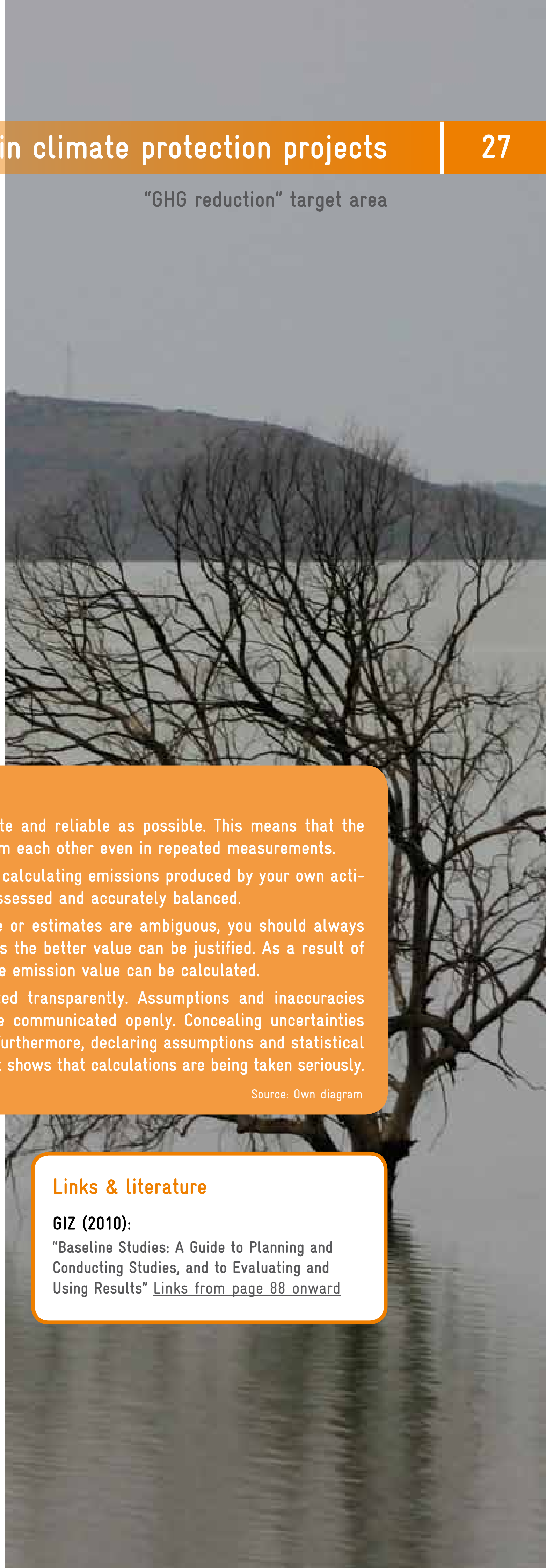
Temporal system boundary: The temporal system boundary determines the period in which emissions that are avoided or produced by the project should be assessed. The temporal system boundary can include the project duration and/or the life cycle of the new product or the running period/utilisation period of the newly installed plant. An example of the life cycle of a product as a temporal system boundary is the GIZ project "Proklima", which promotes the production of insulating foam with environmentally-friendly foaming agents. The measurement of the greenhouse gases saved includes the total product life cycle, i.e. the sum of avoided GHGs that would have otherwise been generated during the production, the 50-year life cycle and the disposal period. The method is briefly presented in section 1.3 "Methods".

Figure 5 illustrates the separate designation of GHG reduction during the project and GHG reduction that is achieved after the project has ended. Individual organisations (inc. GEF, 2008) distinguish between those emissions that are reduced during the project and the post-project reduction of GHGs through financing mechanisms that continue to function after the project has ended and therefore enable new projects and measures that in turn result in GHG reductions.

Figure 5: Temporal system boundaries for climate protection projects



Source: Own diagram



Stap 2 Determine the baseline (BE)

The baseline is defined as the hypothetical situation without the project. It answers the question "What would happen if..." Thus this hypothetical situation can either contain the status at the start of the project, the expected status without the project ("business as usual") or a combination of the two. The baseline acts as a reference value, through which the targeted changes are made visible and measurable.

In the "GHG reduction" target area, the baseline emissions (BE) are the emissions that are expected without the project during the given period. The baseline is therefore based on an analysis of the current political, economic, social, general and sectoral situation as well as growth and development trends, having regard to various technologies (combination of both baseline assessments). Before the project starts, a preliminary baseline can already be created with estimated or inexact data, if accurate data can only be collected once the project has begun.

Box 7: Four principles for good baselines

1. Accuracy: The measurement should be as accurate and reliable as possible. This means that the measurements should not significantly deviate from each other even in repeated measurements.
2. Appropriate scope (see System boundaries): When calculating emissions produced by your own activities, all relevant emissions sources should be assessed and accurately balanced.
3. Conservative calculation: When the data available or estimates are ambiguous, you should always take the worst value as your starting point, unless the better value can be justified. As a result of the many influencing factors, often only a probable emission value can be calculated.
4. Transparency: The calculation should be presented transparently. Assumptions and inaccuracies concerning measurements should in particular be communicated openly. Concealing uncertainties does not in any way mean that they do not exist. Furthermore, declaring assumptions and statistical uncertainties must not be seen as a weakness, as it shows that calculations are being taken seriously.

Source: Own diagram

Due to the dynamic context in which projects happen, the baseline can develop in other ways than expected. This is called a "baseline shift". The possibility of a baseline shift should be considered during the course of the project and if necessary the baseline should be re-calculated.

General foundations for creating baselines are given in the GIZ guideline "Baseline Survey" (2010a).

Links & literature

GIZ (2010):
"Baseline Studies: A Guide to Planning and Conducting Studies, and to Evaluating and Using Results" Links from page 88 onward

When baselines are produced, the following are required or should be taken into consideration:

1. A suitable method (see section 1.3 "Methods")

2. Country and sector-specific, climate-relevant data: We recommend using the following sources:

Links & literature (page 88 onward)

UNFCCC:
Greenhouse Gas Inventory Data on the homepage

UNFCCC:
"Project Design Documents" from CDM projects

International Energy Agency:
Statistics according to country or energy product

UN Statistics Division:
Country-specific environmental and energy statistics

World Resources Institute:
The Climate Analysis Indicators Tool Link provides data and graphics that can be created independently (registration necessary)

3. Global-warming potential

Greenhouse gases differ in how long they remain in the atmosphere and therefore in their climate impact. So as to be able to still compare the gases with each other, they are replaced with the reference gas CO_2 for a reference period of 100 years in the atmosphere and calculated in what is known as CO_2 equivalents. The global-warming potential of methane (CH4) for example is 21. This means that 21 molecules of CO_2 have the same impact on the climate as one molecule of CH_4.

Links & literature

IPCC (2006): The Physical Science Basis
The data from the publication "The Physical Science Basis" by the Working Group I in the Fourth Assessment Report of the IPCC should be used to convert greenhouse gases into CO_2 equivalents. Links from page 88 onward

4. Emission factors

Emission factors give the emissions per fuel unit in CO_2 equivalent. In doing so, the emission factor describes the ratio of the mass of CO_2 emissions (in kilogrammes or tonnes) to the fuel mass (in kilogrammes or tonnes). To facilitate calculations, fuels are also given in units of volume. In the transport sector they are applied to the type of transportation and distance. As a result, there are emission factors for various fossil fuels like gas, petrol and diesel, for the country or provider-specific fuel mix in the field of electricity, and in the transport sector.

Links & literature (page 88 onward)

General

UNFCCC:
Country-specific emission factors are given in part in the "Project Design Documents" from CDM projects

National Atmospheric Emissions Inventory:
Comprehensive database

Fossil fuels

World Resources Institute Greenhouse Gas Initiative (registration necessary)

Electricity

Institute for Global Environmental Strategies:
List of various grid emission factors

Transport

Deutsche Bahn MobilCheck in collaboration with the IFEU 2010:
Distance calculator for rail traffic in Germany

Atmosfair:
Distance calculator for international flights

World Resources Institute Greenhouse Gas Initiative:
Overview of the worldwide emission factors of the transport sector (registration necessary)

Step 3 **Calculate emissions with project (EP)**

The emissions with project (EP) represent the actual greenhouse gas emissions that are produced with the project. They are therefore opposed to the baseline emissions which are reflected in the hypothetical situation without the project.

The emissions with the project are calculated from the sum of the greenhouse gases from the areas 1, 2 and 3 previously determined (see figure 4). In the calculation, only the areas that were selected in step 1 when determining the system boundaries should be taken into account.

Generally emissions with the project are calculated per year and then added up for the project duration or for a defined number of years in the post-project duration (see figure 5).

Step 4 **Calculate avoided or reduced greenhouse gases (ER)**

Once the baseline emissions (BE) and the emissions with the project (EP) have been determined and given in the same units (e.g. tonnes of CO_2 equivalents), they are used to calculate the reduced or avoided emissions (ER). For this, using the formula ER=BE-EP, the emissions with the project are subtracted from the baseline emissions (see figure 5).

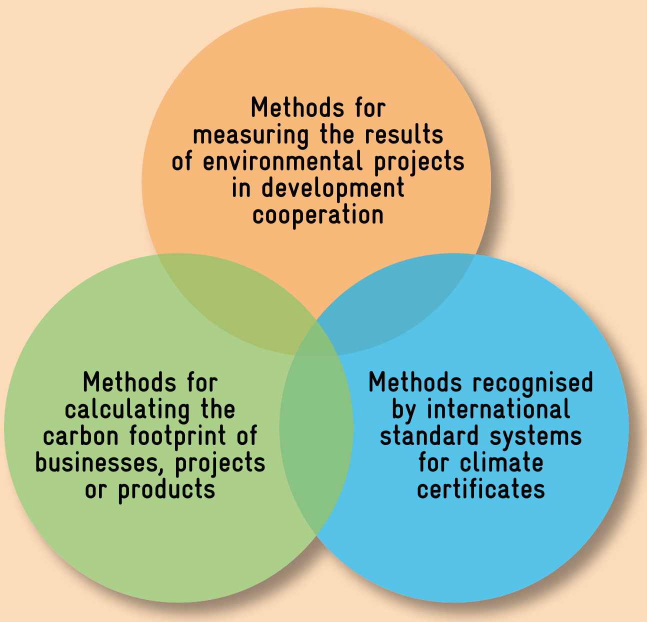
+ Assess scaling-up potential

The scaling-up potential of a project can also be assessed. This is explained in the "Climate protection" section in Chapter 4 "Assessment of impacts of climate projects".

1.3 Methods

The following chapter presents sector-specific and cross-sector methods which can be used to calculate greenhouse gas emissions. In their respective objectives, the methods can be divided into three different areas, which however are not always very clearly defined (see figure 6).

Figure 6: Method objectives for projects in the "GHG reduction" target area



Source: Own diagram

"GHG reduction" target area

The methods for measuring the results of environmental projects in development cooperation aim to illustrate the efficiency of climate protection projects that are the subject of international collaboration. The methods presented primarily serve to measure avoided emissions.

The methods recognised by international standard systems for climate certificates are also useful to calculate avoided greenhouse gas emissions. However, they are characterised by the fact that the calculated avoided GHG emissions are to be sold in the form of certificates on the compulsory or voluntary carbon market. The methods are therefore recognised by the climate secretariat (compulsory carbon market) or by internationally accepted organisations (voluntary carbon market).

The methods for calculating the carbon footprint of businesses, projects or products aim to calculate the existing or expected emissions of companies, projects or products with what is known as the carbon footprint.

In the following pages a selection of methods is briefly presented according to the aforementioned categorisation and according to sectors. The selection does not claim to be complete.

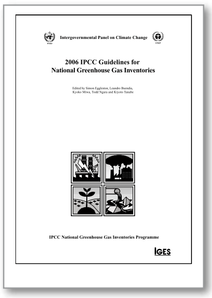
Overview: Methods in the "GHG reduction" target area according to sectors (Links from page 88 onward)

1.3.1 Methods for measuring the results of environmental projects in development cooperation

All sectors

IPCC Guidelines for National Greenhouse Gas Inventories – IPCC, 2006

Areas of application:	Quantification of GHG reduction in all sectors.
Brief description:	The guidelines give instructions on how to estimate man-made generated GHG emissions at a national level in a structured manner. Volume 1 describes the basic steps for developing data studies in the field of GHGs. Volumes 2-5 contain specific requirements and procedures for the following sectors: energy, industrial processes and the use of products, agriculture and forestry as well as other land use and waste.
Evaluation:	The IPCC Guidelines for National Greenhouse Gas Inventories are actually intended for estimating GHG reduction at a national level, but also give very good cross-sector advice and standards and a good overview of sector-specific methods. As the IPCC sets the standards internationally, these methods are extremely suitable for use as guidelines for individual calculations.
Further information:	IPCC Guidelines for National Greenhouse Gas Inventories



All sectors

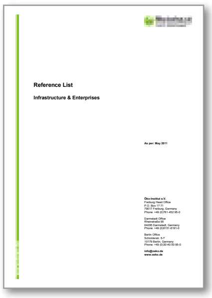
The GHG Protocol for Project Accounting – Greenhouse Gas Protocol Initiative (2005)

Areas of application:	Quantification of GHG reduction in all sectors.
Brief description:	The protocol provides a good overview of concepts and principles of GHG measurement and of the background and political discussions around the topic. The main section presents clear requirements for accounting, monitoring and reporting. These are then explained in detail and provided with concrete step-by-step recommendations. The protocol helps, among other things, when selecting and calculating a meaningful baseline (for example static vs. dynamic baseline approach), determining and analysing primary or secondary effects (intended and unintended GHG effects), the baseline estimate period, additionality, barriers to implementation, uncertainties and legal provisions and the performance of an investment analysis for calculating the net benefit of the project. The Greenhouse Gas Protocol Initiative supplies the separate Corporate Standard for quantifying emissions that are caused by organisations or companies.
Evaluation:	The protocol is particularly suitable for background information before sector-specific guidelines (e.g. waste calculator) are used. It is also very helpful as a practical recommendation for projects that are referred to in the protocol as examples, as it shows concrete procedures for assessing the GHG reduction.
Example:	The protocol handles in detail GHG reduction in the cement sector, with a project-specific baseline and GHG reduction with improved efficiency for a compressor station with a standard performance baseline. The determination of the baseline, consideration of additionality and restriction for projects are also represented using the following aspects as an example: renewable energies: installation of a wind farm; energy efficiency: replacement of light fixtures; transport: switch of fuel in buses to bio-gas; industry: switch of fuel in electricity production; afforestation projects; forest management projects; agriculture: changing tillage practices; waste management: use of landfill gas.
Further information:	• The GHG Protocol for Project Accounting • A variety of sector-specific calculation tools are provided on the GHG Protocol Initiative website, generally Excel-based (e.g. for cement, steel, aluminium). • Moreover cross-sector tools are available, e.g. on the subject of transport, electricity or cooling technology • GHG Protocol Corporate Standard

Waste management

Tool for Calculating Greenhouse Gases in Solid Waste Management – Institute for Energy and Environmental Research (IFEU) with sponsorship from BMZ, KfW and GIZ

Areas of application:	Estimate of GHG emissions from measures in the field of waste management before the performance of the measure. An estimate is only possible without detailed baseline data if the standard values are entered.
Brief description:	The method follows the life cycle assessment method approach. Different waste management strategies are compared with each other and the GHG emissions of different recycling rates and the GHG emissions from the accumulation at landfill sites are assessed over their entire life cycle („from cradle to grave") and compared with each other. The total GHG emissions are expressed in CO_2 equivalents, including all future GHG emissions, which e.g. are still produced by accumulation at a landfill site.
Evaluation:	The tool is suitable for providing quantitative information about GHG reductions for various waste management strategies which allows political decision-makers to assess these strategies in the early planning stage. The Excel tool is easy to use and can quickly simulate different strategies. The focus is not on the exact determination of the GHG emissions, but rather the comparison between different waste management strategies and their estimated influence on GHG emissions. The detailed appendix, with standard values which can be used if data has not yet been collected locally, is very helpful.
Further information:	• English: Download Tool, Manual and Example • German: Download Tool und Manual, Download Tool, Manual and Example • Contact person: Sandra Spies (sandra.spies@giz.de)



Biomass for power production

Manual for calculating the greenhouse gas emissions according to the Biomass Electricity Sustainability Regulation (BioSt-NachV) - GIZ in cooperation with the Institut für Energie- und Umweltforschung Heidelberg (Institute for Energy and Environmental Research) (IFEU, 2009)

Areas of application:	Detecting greenhouse gas emissions along bio-energy added value chains and calculating GHG reduction potential of biofuels in comparison to fossil fuels.
Brief description:	The manual substantiates the guidelines of the BioSt-NachV (methodology of the Renewable Energy Directive of the EU) and contains • technical guidance for the recognition of certification systems by the relevant authorities; • concretely formulated instructions for calculating a greenhouse gas balance using precisely measured values, as well as taking into account the partial standard values of economic operators. Data, which is gathered to calculate the actual data, is to be understood by 'precisely measured data' (i.e. on-site measurement or from literature sources).
Examples:	A calculation of the GHG emissions by economic operators takes place on the stakeholder levels: cultivation of biomass, oil mill operators and refinery operators..
Evaluation:	The manual offers step by step instructions for calculating the GHG emissions of liquid biomass.
Further information:	IFEU homepage on sustainable biomass
GIZ contact person:	Martina Gaebler (martina.gaebler@giz.de)
IFEU contact person:	Horst Fehrenbach (horst.fehrenbach@ifeu.de)

Biofuel

BioGRACE – Align biofuel GHG emission calculations in Europe

Areas of application:	All biofuel projects which wish to calculate emissions reductions.
Brief description:	The aim of BioGrace is the harmonization of biofuels in the European Union. The website offers information on relevant political developments. The calculation methods and instruments for biofuels are the central topics. There is also information on technical workshops.
Further information:	BioGrace-Homepage

Energy supply with modern energy services

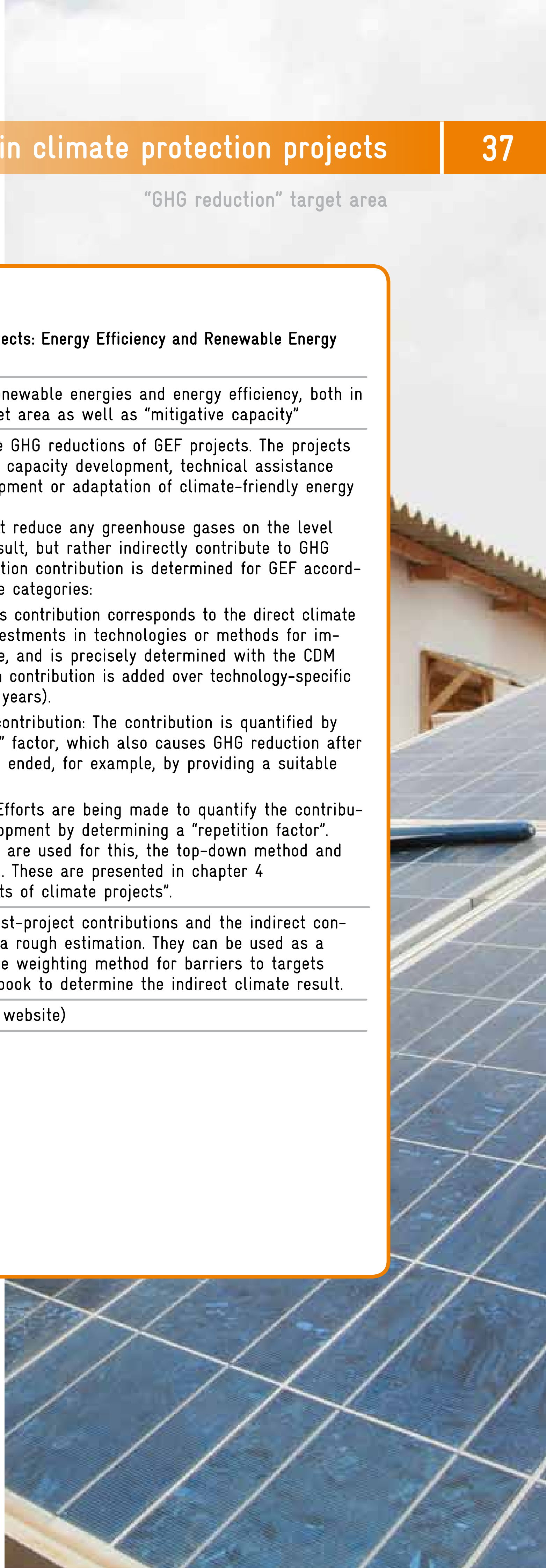
Monitoring of projects of the Energising Development Programmes (EnDev) – GIZ (First phase 2005-2009 and second phase 2009-2014)

Areas of application:	Monitoring the results in household energy projects and rural electrification projects (power supply or energy-efficient stoves)
Brief description:	The Energising Development project (EnDev) is part of a common initiative of the Netherlands and Germany, with the aim of sustainably improving the supply of modern energy services to poorer households, social institutions and SMEs in selected developing countries. The EnDev monitoring method is focused on uniformly measuring the degree to which targets are achieved in all 18 partner countries. Firstly, this includes creating an exact baseline of the current energy supply situation in the relevant project area. Monitoring data is collected at target group level, corresponding to the structure of the partner as much as possible. This is then forwarded to the EnDev office, which controls the quality. The data is then put into a standardised Excel spreadsheet, which includes information on the available technologies in the individual regions, as well as on the number of people or households supplied with energy. Qualitative data is held in the EnDev-Wiki (a platform in the style of Wikipedia), as well as contributions on the impact, lessons learnt, and general information and processes. Monitoring takes place twice a year. EnDev puts great value on precise and reliable data in monitoring. The degree of sustainability of the energy supply achieved is considered using an adjustment factor, as well as a possible addition of households who may have had access to electricity without EnDev, or who already had it.
Evaluation:	The handout on monitoring very precisely describes the methods and procedures for monitoring, and has tables of examples. The strict EnDev monitoring requires the creation of a very specific baseline for determining the contribution of projects of this type. It is therefore extremely suitable as a basis for assessing the direct climate results of household energy projects and rural electrification projects. The example of small-scale hydropower use in Indonesia in the handout on the CaPP climate calculator shows how you can use the data already collected in EnDev to assess the GHG reduction, without collecting more data.
Further information:	• Manual: Guidebook for monitoring of Projects implemented under the Energising Development Programme • Handout on building a Management Cockpit: Technical support for result-oriented monitoring • EnDev-Wiki (registration required)
GIZ contact person:	Robert Heine (robert.heine@giz.de)

Renewable energy and energy efficiency

Accounting for Greenhouse Gas Emissions in Energy-Related Projects - Applying an Emission Calculating Tool to Technical Assistance, part B climate calculator (CaPP) – GIZ (2008)

Areas of application:	Part B: Quantification of the GHG reduction achieved by the project in the renewable energy and energy efficiency sectors. Part A describes the quantification of emissions, which are caused by the project (see section 1.3.3, "Methods for calculating the carbon footprint of businesses, projects or products").
Brief description:	In part B, there is a differentiation between the direct contributions to GHG reduction and indirect contributions to GHG reductions. Direct contributions include the climate calculator contributions in the "GHG reduction" target area, which is the GHG reduction as an outcome of a project. Indirect contributions include GHG reduction on the impact level, which is achieved by an increase in the mitigative capacity, by scaling up or by financing systems. The handout presents a practical conceptional procedure for creating the baseline and for quantifying the GHG reduction in eleven selected GIZ projects in the area of energy efficiency and renewable energies (see examples). This is based on CDM methods.
Examples:	1. Renewable power generation – on grid and off grid • Small-scale hydropower in Indonesia and the Solomon Islands • Wind farm in Jordan • Photovoltaic systems in Mexico • Use of biogas and biomass in the palm-oil industry in Thailand • Wind farm and small-scale hydropower in the Caribbean 2. Renewable energy use in households • Solar thermal systems in Mexico • Photovoltaic solar home system in Bolivia • Energy efficiency • Energy efficiency in residential buildings in China • Optimisation of coal power stations in China • Energy efficiency in the agricultural industry in Thailand
Evaluation:	The examples offer very concrete instructions for quantifying GHG reductions. The methods have been applied in the framework of on-site field studies. The Excel tools and the overview of emission factors are very helpful in concrete use.
Further information:	Manual
GIZ contact person:	Anja Wucke (anja.wucke@giz.de)

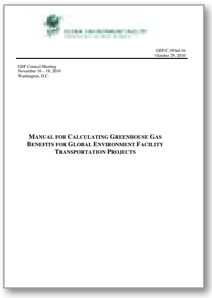


"GHG reduction" target area

Renewable energy and energy efficiency

Manual for Calculating the GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects – Global Environment Facility (GEF, 2008)

Areas of application:	Projects for promoting renewable energies and energy efficiency, both in the "GHG reduction" target area as well as "mitigative capacity"
Brief description:	The method examines the GHG reductions of GEF projects. The projects can work in the areas of capacity development, technical assistance and advice in the development or adaptation of climate-friendly energy policies. Many GEF projects do not reduce any greenhouse gases on the level of their direct project result, but rather indirectly contribute to GHG reduction. The GHG reduction contribution is determined for GEF according to the following three categories: a) Direct contribution: This contribution corresponds to the direct climate result by concrete investments in technologies or methods for improving the energy use, and is precisely determined with the CDM methods. The reduction contribution is added over technology-specific time periods (7 to 20 years). b) Direct "Post Project" contribution: The contribution is quantified by setting up a "turnover" factor, which also causes GHG reduction after the actual project has ended, for example, by providing a suitable financing mechanism. c) Indirect contribution: Efforts are being made to quantify the contribution of capacity development by determining a "repetition factor". Two different methods are used for this, the top-down method and the bottom-up method. These are presented in chapter 4 "Assessment of impacts of climate projects".
Evaluation:	The methods of direct post-project contributions and the indirect contributions only facilitate a rough estimation. They can be used as a comparison method to the weighting method for barriers to targets suggested in this sourcebook to determine the indirect climate result.
Further information:	Link to the manual (GEF website)


MANUAL FOR CALCULATING GREENHOUSE GAS BENEFITS FOR GLOBAL ENVIRONMENT FACILITY TRANSPORTATION PROJECTS

Fluorinated greenhouse gases (F gases)

Calculation of GHG Emissions Reduction: Methodology and Baseline and Ex-ante Calculation – GIZ PROKLIMA (2009)

Areas of application:	Determining the baseline and monitoring of F-gas projects by quantifying the F-gas emissions.
Brief description:	The handout explains a general structure, which applies to all baseline and monitoring methods of GIZ projects, which belong to the PROKLIMA programme. The emissions are calculated for three stations of the life cycle of the product (temporal system limits): production, operation and disposal. In accordance with ISO 14064, there is a differentiation here between direct emissions of F-gases (refrigerants and propellants) and indirect emissions from power production (spatial system limits). The results of the three stations are then used for the baseline and the project activities. The status at the start of the project is set as the baseline scenario and remains unchanged during the calculation period. A static baseline is selected, since a dynamic approach is considered as too complex for these projects. As in the formula given above, the GHG reduction level achieved is then calculated from the difference between baseline emissions and project emissions. Firstly, the handout describes the methods and then the quantitative determination of the baseline and the ex-ante calculation of the future GHG reductions using a concrete example. The necessity and the scope of monitoring are then discussed.
Evaluation:	The handout gives very precise instructions for F-gas projects, which assess all direct and indirect emission reductions over the whole life-time of the products as their GHG reduction contribution.
Examples:	Propellants in the construction sector, China Energy efficient refrigerants in supermarkets in South Africa
Further information:	On request In addition, both VCS (still in the review process) and the methods of the UNFCCC/CDM offer suitable calculation methods..
GIZ contact person:	Bernhard Siegele (bernhard.siegele@giz.de)

Agriculture

Cool Farm Tool – University of Aberdeen, on behalf of Unilever / Sustainable Food Lab (2011)

Areas of application:

- Determining a baseline by calculating GHG emissions
- Determining emission hotspots and reduction potentials
- Quantifying GHG emissions at any time during the project

Brief description:

The Cool Farm tool is a tool for calculating GHG emissions in agriculture with a focus on the production area. Emissions from cultivation practices, field energy, transport, and first processing steps are considered, as well as the sequestration potential of the lots.

Parameters can be adapted to the location. Global use of various agricultural products is therefore possible. GHG emissions can be calculated at any stage of the progress of the project by changing the parameters.

The tool can be used for determining a quantitative baseline. Possible saving potential can also be determined in this way.

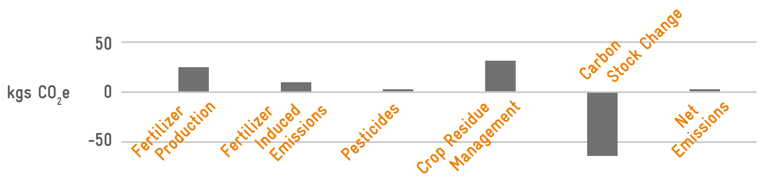
The tool is a component of the "Cool Farming Options" project, run by Unilever, the Sustainable Food Laboratory and the University of Aberdeen. GIZ is participating in a development partnership for climate change adaptation and reduction in the Kenyan coffee sector (Sangana PPP) as a sponsor in the development of a coffee-specific Cool Farm Tool.

Evaluation:

The Excel-based tool is an instrument for quantitative calculation of GHG emissions in agriculture. The results are shown as numbers and graphs. The tool allows location-specific parameters (climate, soil, pH-value etc.) to be integrated, and is therefore suitable for global use.

Example:

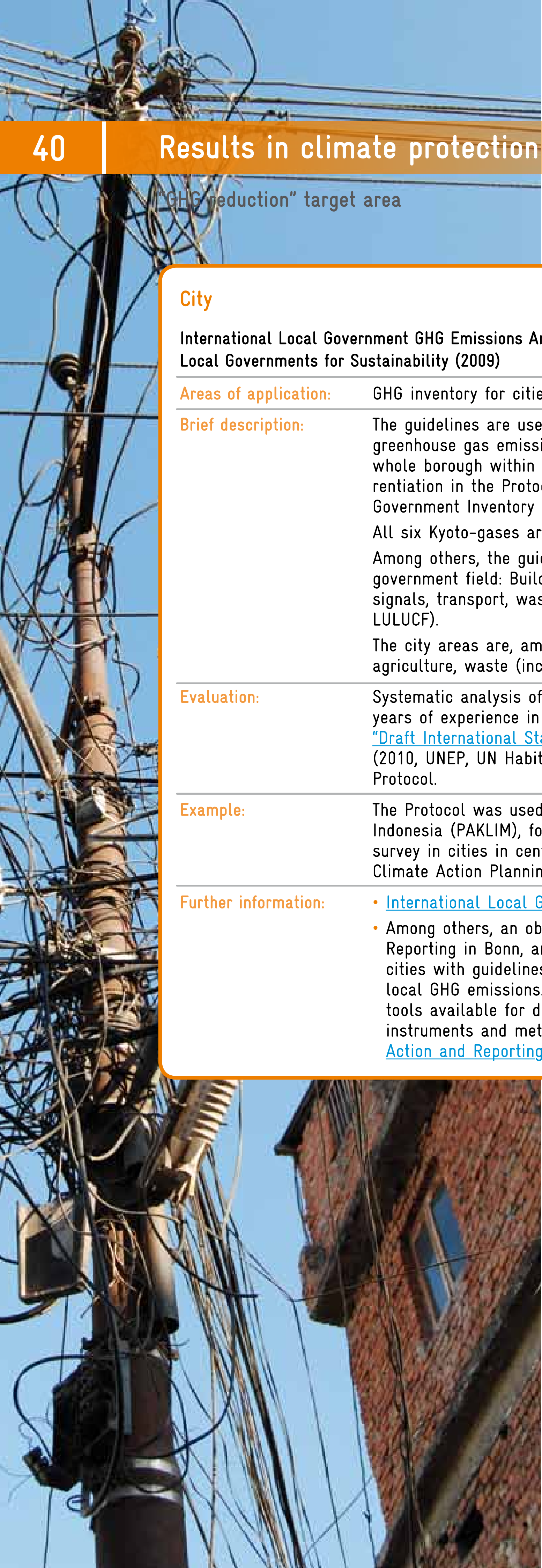
A climate module for the 4C Code of Conduct, a voluntary coffee standard, is being developed within Sangana PPP. The Cool Farm Tool is tested with a Kenyan coffee cooperative for monitoring the result of this climate module. Coffee-specific parameters are used here. The first research with this instrument calculates 2.02 kilograms of CO_2 equivalents per kilogram of coffee cherries, broken down as follows:



Further information:

- Download Cool Farm Tool
- Information on the 4C Coffee Association homepage

GIZ contact person: Sophie Grunze (sophie.grunze@giz.de)



"GHG reduction" target area

City

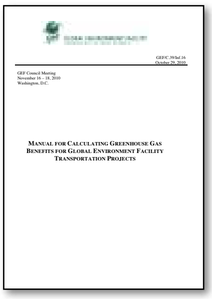
International Local Government GHG Emissions Analysis Protocol – ICLEI: Local Governments for Sustainability (2009)

Areas of application:	GHG inventory for cities and communities
Brief description:	The guidelines are used to support communities when quantifying the greenhouse gas emissions from internal activities and activities of the whole borough within their geopolitical borders (here is the first differentiation in the Protocol: Organisational vs. Geopolitical Boundary = Government Inventory vs. Community Analysis). All six Kyoto-gases are analysed here. Among others, the guideline includes the following components in the government field: Buildings and installations, street lighting and traffic signals, transport, waste (diffuse emissions, industrial processes, LULUCF). The city areas are, among others: Housing, business, industry, transport, agriculture, waste (including industry, LULUCF).
Evaluation:	Systematic analysis of all sectors, which is based on the ICLEI's many years of experience in developing city inventories around the world. "Draft International Standard for Determining GHG Emissions for Cities" (2010, UNEP, UN Habitat and the World Bank) refers to the ICLEI Protocol.
Example:	The Protocol was used within the city components of a GIZ project I Indonesia (PAKLIM), for establishing a GHG inventory and the baseline survey in cities in central and eastern Java, using the Integrated Climate Action Planning (ICA) method, which was developed with ICLEI.
Further information:	• International Local Government GHG Emissions Analysis Protocol • Among others, an objective of the Center for Local Climate Action and Reporting in Bonn, an initiative by ICLEI and UNEP, is to support cities with guidelines for the standards and instruments for recording local GHG emissions. The Center also offers a comparison of different tools available for determining a GHG inventory, and refers to further instruments and methods. Presentation; Bonn Center for Local Climate Action and Reporting (link still under construction).

Transport

Manual for Calculating Greenhouse Gas Benefits for GEF Transportation Projects – Institute for Transportation and Development Policy, for the Scientific and Technical Advisory Panel of the GEF (2010)

Areas of application:	Planning transport projects with emission reduction and estimating GHG reduction
Brief description:	After an overview of the general GEF methods, their hypotheses and requirements of the data, the manual addresses the lifetime of investments, baseline scenarios and emission factors. The focus is then assessing the GHG reduction to be achieved by the project in the fields of efficiency and eco-driving, local traffic and rail traffic, non-motorised transport, management of the demand for travel, support by employers and regional transport initiatives. Information is also given on surveying local co-benefits of transport projects. GEF differentiates between outcomes, emission reductions, which occur due to a financial mechanism after the end of the project, and impacts, among which GEF particularly includes scaling-up.
Evaluation:	The handout is clearly laid out, well structured and gives concrete information and instructions. In the recommended method for estimating the impact by scaling-up, there is of course the risk of overestimating the impact. The methods are presented in chapter 4, "Assessment of impacts in climate protection projects".
Further information:	Manual for Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects


GEF/C.39/Inf.16
October 29, 2010

GEF Council Meeting
November 16 – 18, 2010
Washington, D.C.

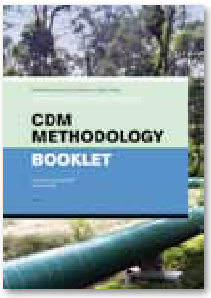
MANUAL FOR CALCULATING GREENHOUSE GAS BENEFITS FOR GLOBAL ENVIRONMENT FACILITY TRANSPORTATION PROJECTS

1.3.2 Methods recognised by international standard systems for climate certificates

Methods of the Clean Development Mechanism

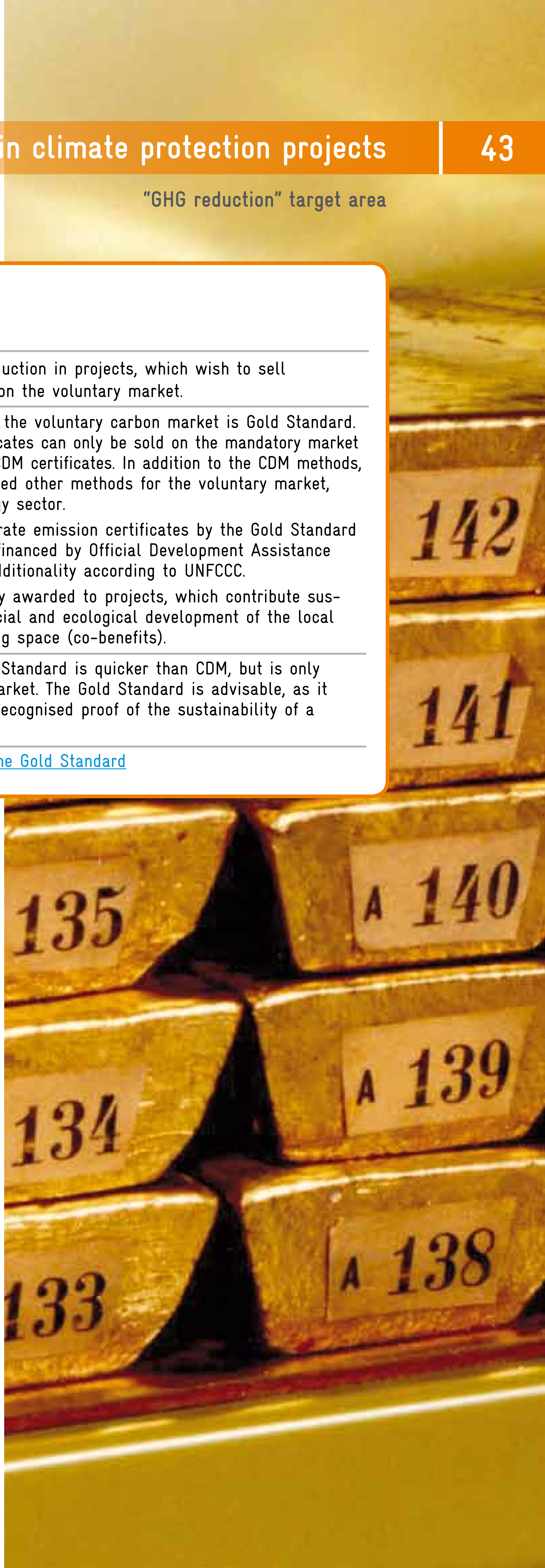
CDM Methodology Booklet – UNFCCC (2010)

Areas of application:	Quantification of GHG reduction in projects, which wish to sell certificates on the mandatory carbon market
Brief description:	In order to generate certificates for the mandatory carbon market, projects must use one of the methods recognised by the Clean Development Mechanism (CDM). The methods can also be used for projects, which wish to sell certificates on the voluntary market. The Methodology Booklet published in November 2010 gives a one-page overview of all currently recognised CDM methods. The methods are categorised by sector and type of GHG reduction, as well as by the technology or measure implemented. The methods cover large and small CDM projects and forest projects.
Evaluation:	The methods are very clearly explained, and the booklet is very well arranged and user-friendly. It gives a good overview and should therefore be consulted. However, the methods are often very detailed, which requires too much time and expense for projects which do not wish to generate certificates. Certification by CDM involves a long bureaucratic process.
Further information:	CDM Methodology Booklet



Gold Standard methods

Gold Standard Methodologies – The Gold Standard	
Areas of application:	Quantification of GHG reduction in projects, which wish to sell certificates, particularly on the voluntary market.
Brief description:	A recognised certifier on the voluntary carbon market is Gold Standard. However, emission certificates can only be sold on the mandatory market in combination with the CDM certificates. In addition to the CDM methods, Gold Standard also granted other methods for the voluntary market, particularly for the energy sector. Projects wishing to generate emission certificates by the Gold Standard are not permitted to be financed by Official Development Assistance (ODA) and must prove additionality according to UNFCCC. The Gold Standard is only awarded to projects, which contribute sustainably to economic, social and ecological development of the local population and their living space (co-benefits).
Evaluation:	Certification by the Gold Standard is quicker than CDM, but is only valid on the voluntary market. The Gold Standard is advisable, as it gives an internationally recognised proof of the sustainability of a GHG reduction project.
Further information:	Methods recognised by the Gold Standard



1.3.3 Methods for calculating the carbon footprint of businesses, projects or products

Calculating GHG emissions of companies and organisations

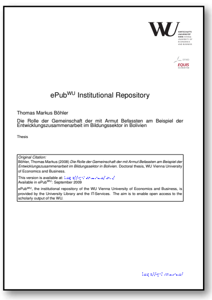
ISO 14064-1: 2006 – Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals, and the GHG Protocol Corporate Accounting and Reporting Standard – Greenhouse Gas Protocol Initiative (2004)

Areas of application:	Quantification of emissions caused by organisations or businesses
Brief description:	ISO 14064-1 sets principles and standards for quantifying GHG reduction on an organisational level, "Corporate Carbon Footprinting". The user can apply the standards for developing a case-specific method. The GHG Protocol Corporate Accounting and Reporting Standard shows ways for practical implementation of the ISO 14064-1. It can also be used for evaluating reduction potential in a business or project.
Evaluation:	Whilst ISO 14064-1 is widespread and accepted, it must be further developed by the user himself. The GHG Protocol is the standard guideline for recording emissions on a business level, with the additional benefit of its pragmatic approach, practical use, and experiences of many stakeholders.
Further information:	• ISO 14064-1 • GHG Protocol Corporate Standard • GIZ complies with the "Accounting principles and guidelines for eco-audits of financial services providers with a uniform system of accounts" of the Verein für Umweltmanagement in Banken, Sparkassen und Versicherungen e.V. (VfU). These are suitable for service industries.

Carbon Footprint of GIZ country or programme offices

Internal environment management in GIZ offices, manual – GIZ and Centro de Alianzas para el Desarollo (2009)

Areas of application:	Among other things, the manual describes the country offices or programme offices of GIZ. This is a component of eco-audits, which are established as components of operational environmental management.
Brief description:	On the one hand, the manual suggests data analysis for surveying environmental impacts, and on the other, methodical questioning and a Good Housekeeping Tour. Data regarding the energy use of the office and the mobility (commuter travel, business trip travel) of employees is used to determine the carbon footprint. The technical foundations are the PREMA environmental management system stipulated by the German Federal Ministry of Economic Cooperation and Development (BMZ) and developed by GIZ, as well as the methodical accounting principles of the Verein für Umweltmanagement in Banken, Sparkassen und Versicherungen (VfU), which were supplemented by new findings of the Federal Environment Agency (UBA). For calculating carbon dioxide emissions, GIZ uses the emission calculator "Atmosfair", and for calculating the often complex baselines the organization refers to data from the UN Climate Change Secretariat (UNFCCC) wherever possible.
Evaluation:	The manual is clearly and simply written, and contains tables and explanations of the background of individual environmental aspects, as well as many practical measures for reducing negative environmental impacts. It is very user-friendly, with many 'best practice' examples and suggestions for data management.
Example:	Several international GIZ offices (e.g. China, Kyrgyzstan) have already analysed their carbon footprint, as well as other environmental aspects, using the manual. In addition, it was also used for the environmental audit of the Mekong River Commission.
Further information:	On request: • The Environmental Management Manual for GIZ Offices is available in German, English, Spanish and French. • Collection of Eco-Audits of the GIZ Country Offices • Mekong River Commission Environmental Audit 2010
GIZ contact person	Roger Wolf (roger.wolf@giz.de)



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Die Rolle der Gemeinschaft der mit Armut Befassten am Beispiel der Entwicklungszusammenarbeit im Bildungssektor in Bolivien

Thesis

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Carbon footprint of a project

Accounting for Greenhouse Gas Emissions in Energy-Related Projects - Applying an Emission Calculating Tool to Technical Assistance, part A, climate calculator (CaPP) – GIZ (2008)

Areas of application:	Calculating the emissions caused by a project itself
Brief description:	Part A of the manual gives instructions for calculating the emissions which a project causes itself. It also provides a climate calculator in the form of an Excel spreadsheet, in which the emissions from transport and energy use can be calculated. A selection can be made between a detailed method of calculation or a rough estimation. The emission factors necessary for conversion into CO_2 equivalents are also given in another Excel spreadsheet.
Evaluation:	The instructions are kept short, but all relevant information is given. It is therefore extremely suitable for people who already have experience in the carbon footprint area.
Example:	The project emissions were recorded in the small-scale hydropower plant project in Indonesia.
Further information:	Manual
GIZ contact person	Anja Wucke (anja.wucke@giz.de)

Calculating product emissions: Product Carbon Footprint (PCF)

Product Accounting and Reporting Standard – World Resources Institute (2011)

Areas of application:	Quantifying emissions, which develop as a result of the production, use and disposal of a product
Brief description:	The carbon footprint of products contains both the emissions which are caused in production of a product, as well as those which are due to use and disposal. Two international standards are currently being developed: an ISO standard, as well as a product standard of the GHG Protocol, which is to be published in 2011. There are also various standards on a national or business level. Among others, these are the PAS 2050 (Publicly Available Specification) of the British Standardisation Institute and the Japanese PCF standard. The French Government is currently developing a standard, which is to be published in 2011.
Further information:	• An ISO standard (ISO/CD 14067) is currently being developed. • GHG Protocol Product Standard is to be published in 2011.

2. "Mitigative capacity" target area

2.1 Introduction

Projects which increase the capability of their partners to reduce greenhouse gases themselves, to contribute to international climate negotiations, or to be able to prove the emissions reductions achieved using MRV are classified in the "Mitigative capacity" target area. The following briefly addresses the close links between mitigative capacity and sustainable development, and the attribution gap between mitigative capacity and the emission reduction which is actually achieved. The following sections present step-by-step instructions for monitoring climate results in the "mitigative capacity" target area, and discuss methods for measuring mitigative capacity.

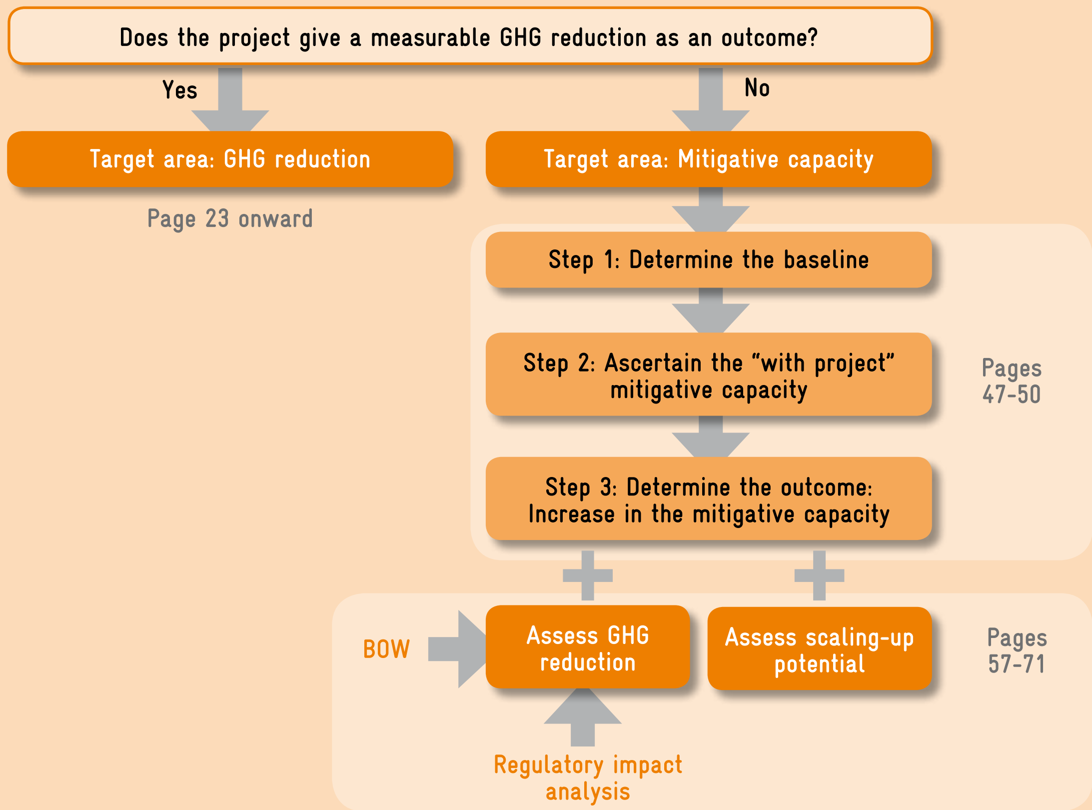
Mitigative capacity and sustainable development

For GIZ, the concept of mitigative capacity is closely linked to sustainable development. Firstly, this is justified by the fact that the economic opportunities and social conditions are the basis of the mitigative capacity of a country. Secondly, the development path chosen by a country is just as important for reducing the extent of climate change as the climate policy is itself. Therefore, GIZ sees mitigative capacity as an important connection between the selection of a development path and avoiding or reducing emissions. Thirdly, it is just as attractive for developing countries to invest in GHG reduction if this also contributes to the development of the country. This is due to the opportunity costs, which a country is confronted with when it makes this decision. Even if the avoidance costs themselves are low, there is often no incentive to carry out GHG reduction measures, since the money is instead spent on developing the country, for example by providing better healthcare or promoting employment. It is therefore necessary to link development policy targets with climate objectives in a project. The fourth IPCC Assessment Report also repeatedly refers to the concept that "mitigative capacity" must be understood in the wider context of sustainable development (IPCC, 2007; see also Munasinghe / Swart, 2005).

From mitigative capacity to emission reduction
"Mitigative capacity" expresses the extent to which pre-requisites for reducing emissions exist in a country. Whether this actually happens also depends on many different factors, such as avoidance costs, political will, or the perception of risks (see Winkler et al., 2007). Projects in this target area might aim at training energy experts in the selection and use of renewable energy technologies or energy efficiency measures, but the result depends on whether these experts will pass on their knowledge to others. Another example is to change the market conditions, e.g. by introducing economic instruments, such as an eco-tax. Assumptions are also made in this case as to the preferences and resources and therefore a changed consumer behaviour, which often can only be checked once the project has ended. It is therefore essentially important for projects which contribute to increasing the mitigative capacity of a country to make these assumptions explicitly clear, and to always cast a critical eye over them during the project.

Projects which aim to increase the mitigative capacity on the outcome level cannot prove GHG reduction in tonnes of CO_2 equivalents. In fact, the contribution of a project of this type for reducing greenhouse gas emissions can only be estimated. More information on this is given in chapter 4 "Estimation of impacts in climate protection projects".

Figure 7: Step-by-step instructions for monitoring: "Mitigative capacity"



Source: Own diagram

2.2 Step by step

The following briefly explains which steps should be taken into account when assessing the results in the "mitigative capacity" target area.

Step 1 Determining the baseline

The baseline describes the hypothetical situation without the project. It answers the question "What would happen if..." The hypothetical situation can either signify the status before the start of the project, the hypothetical development without the project, or a combination of both. The baseline is used as a reference point for calculating results, and is necessary for providing values for the indicators in project planning, for results-based monitoring and control and for a meaningful result measurement. The hypothetical development without the project can be constructed using control groups. The foundations for creating general baselines are given in the GIZ manual "Baseline Studies".

> **Links & literature**
>
> **GIZ (2010):**
> GIZ (2010): "Baseline studies: A Guide to Planning and Conducting Studies, and to Evaluating and Using Results" Links from page 88 onward

Step 2 Ascertaining the "with project" mitigative capacity

The "with project" mitigative capacity corresponds to the actual situation. As a rule, it is ascertained using the same methods as the baseline, or it is based on the same source of secondary data. This is the only way in which the baseline and the actual situation can be compared.

Step 3 Determining the outcome: Mitigative capacity

The outcome, which is the "Increased Mitigative Capacity", is determined by comparing the baseline and the actual "with project" situation. Depending on the aim of the project, this comparison can be expressed qualitatively or quantitatively. If possible, the comparison with monitoring should take place over the course of the project at specified times. However, in all cases it should take place at the end of the project in order to establish the degree of achievement of the outcome.

Assessing the impact

Increased mitigative capacity mostly leads to actual GHG reduction, which can be expressed in tonnes of CO_2 equivalents. However, it is ultimately only possible to estimate the extent of the contribution of a project to a physically and technically measurable GHG reduction. Chapter 4 "Estimation of impacts in climate protection projects" suggests two methods approved by GIZ for this.

+ Assessing the scaling-up potential

The scaling-up potential of a project can also be assessed. This is explained in the "Climate protection projects" section in Chapter 4.

2.3 Methods

General

The methods which GIZ uses in planning, implementation and project management, as well as in monitoring and measuring the results of projects with a focus on capacity development are cross-sectoral. Only the contents, which are processed with these methods, result from the respective specialist discipline.

The methods which should be used in the "mitigative capacity" target area are generally developed in GIZ to be multi-sectoral. The publicly available manuals on results-oriented monitoring (2008b) and baseline studies (GIZ, 2010a) are helpful tools.

Capacity Assessment

The "Capacity Assessment" method which is currently being developed by GIZ (publication mid-2012) is presented in the following. In the future, it is to support strategy planning in GIZ projects by handling practical topics relating to implementation. The information gained in the Capacity Assessment can also be used for formulating a baseline and for monitoring.

What is a Capacity Assessment?
A Capacity Assessment is a consultation process, which should make the GIZ projects aimed at Capacity Development more effective. The consultation process is based on a political-economic analysis, as well as implementation-oriented strategy advice. A Capacity Assessment is therefore a basis for a successful Capacity Development Strategy. It always has practical grounds, or comes from a concrete, implementation-related problem, which can include practical challenges, problems or prospects. The Capacity Assessment gathers concrete, implementation-oriented recommendations for this problem. The focal point of the recommendations is a Capacity Development Strategy adapted to the political, economic and social context of the project – including practical suggestions for adaptation of the results logic and indicators, and suggestions for suitable baseline studies.

Why is a Capacity Assessment needed in climate protection projects?
A Capacity Assessment can answer the question "What contributes to an increase in the mitigative capacity?" in a context-specific manner. It should be applied before the start or at the start of a project to exploit all possible potential. In this way, questions relating to the importance of the theme "climate change" in the partner country, the relevant stakeholders and their interaction patterns, veto players and reasons for possibly hostile behaviour towards climate-related measures, can be answered. Building on a deep understanding of interests, regulatory and incentive systems, as well as power structures in societies, strategic options for Capacity Development can then be identified. It is also important in conflicts of interest to create win-win situations by closely linking climate-related measures and sustainable development, as the partners identify with these objectives.

The support of Capacity Assessment when formulating the baseline is important in the context of climate projects. This is necessary in projects for increasing mitigative capacity, in order to prove results of Capacity Development strategies as increased climate-specific capacities on the level of individuals, organisations and communities, and therefore prove the success of the project.

When can a Capacity Assessment be carried out?
Capacity Assessments can be carried out in all project phases. In the planning phase, they are used for comprehensive strategic conception of a new development measure. In the implementation phase, strategic options are developed together with the partner, and a Capacity Development Strategy is agreed with practical measures. In addition, baseline data is generated for setting up a results-oriented monitoring system. In the completion phase, the findings of a Capacity Assessment can be used for the systematic description of the changes achieved in the partner system.

3. Forest sector: REDD+ and biodiversity projects

This chapter of the sourcebook outlines specific aspects of monitoring and measuring the results of projects which include carbon sinks, particularly of forests and other eco-systems such as wetlands. These activities often connect climate and biodiversity protection.

3.1 "GHG reduction" target area

If a forest project is active in the "GHG reduction" target area, it achieves a provable reduction of greenhouse gas emissions as an outcome. This must be substantiated with three verifications:

1. Additionality: Corresponding reduction measures would not have been implemented without the project;
2. Performance: The emission of GHGs has actually been reduced;
3. Prevention of leakage/non-permanence: The emissions were not displaced either in terms of time or location.

1. Additionality

As a pre-requisite for the recognition of a REDD+ project, it must be shown that the project leads to emission reductions, which would not have occurred without the project. As soon as the project measures differ from the "business as usual" scenario, they are considered to be additional. The criterion of additionality is mostly checked through the difference between the project emissions and the baseline.

The exact criteria of additionality are described in the respective methodology or the standard used by the project. It is advisable to use the following methods as a basis:

Links & literature

UNFCCC (2008):
CDM tool for demonstrating and assessing additionality Links from page 88 onward

Verified Carbon Standard (VCS):
Methods for demonstrating additionality
Links from page 88 onward

2. Performance

The actual GHG reduction is measured by comparison with a baseline, which has already been ascertained at the start of a project, and which quantifies the likely development for the two following scenarios in the project area:

1. The development of GHG emissions (CO_2 equivalents in tonnes) without the project (reference scenario) and
2. The development of GHG emissions (CO_2 equivalents in tonnes) with the project (project scenario)

3. Preventing leakage / non-permanence

Spatial displacement (leakage) of emissions from deforestation and forest degradation should be checked in neighbouring (comparative) regions during the project, and their risk should be reduced by preventive measures.

Promising measures for avoiding or at least reducing leakage must be able to reduce the drivers of deforestation. For example, this could be done by introducing alternative forest cultivation practices, (agroforestry, sustainable management of forests, etc.), which offer an alternative to the current destructive land-use practices.

All projects must also consider how the risk of non-permanence can be checked, and how this risk can be reduced by preventive measures. In a similar way to the reduction of leakage, careful analyses of the deforestation drivers and the incentives to be devised are essential in order to be able to ensure the permanence of emission reductions.

Checking and risk reduction can be made possible, for example, by the obligation to make a project open to external checks in the long term through certification. Establishing participative and transparent monitoring systems as well as measures for ensuring the financial and organisational sustainability of the project stakeholders are also important. The checking and implementation of measures to avoid leakage and non-permanence should be based on existing standards such as the Verified Carbon Standard (VCS).

Links & literature (page 88 onward)

Methods

General:

Oro Verde/Global Nature Fund (2011): "Investing in forest carbon projects: Guidelines for companies and private investors"
The manual is recommended as introductory reading for climate projects in the forestry sector, which goes beyond the content of the sourcebook, but deals with all important aspects clearly and concisely.

IPCC (2003): "Good Practice Guidance for Land Use, Land-Use Change and Forestry (LULUCF)"
This very detailed manual is to be used as a basic document on which all methodology used should be based on.

GOFC-GOLD (2010): "Sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals caused by deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation"
A very user-friendly manual, which builds on the IPCC guidelines and is supplemented, among other things, by practical examples.

A combination of standards is recommended for certification:

Verified Carbon Standard (VCS): Quality standard for CO_2 offsetting projects of the voluntary market
The VCS was founded by The Climate Group, the International Trading Association and the World Economic Forum in 2005, with the aim of making the voluntary market for emission trading certificates more transparent and standardised. Its focus is on calculating GHG reduction in projects in the forestry and agricultural sectors. The VCS has become one of the leading standards for REDD+ projects.

Climate, Community and Biodiversity Standard (CCBS): Sustainability standard for CO_2 offsetting projects on the voluntary market of the Climate, Community & Biodiversity Alliance
The CCBS was developed by the Climate, Community and Biodiversity (CCB) Alliance, an association of research institutes, businesses and NGOs in 2003. The CCBS is suitable for the development and co-certification of land-based GHG reduction projects. The objective is to identify or plan projects, which simultaneously aim to reduce climate change, support local populations and conserve biodiversity. However, the CCBS alone is not suitable for generating emissions certificates, since it does not quantify the GHG reduction. Consequently, the CCBS is mostly combined with the VCS Standard in REDD+ projects, in order to be able to prove the positive influence on the local population, biodiversity and climate..

Example: Climate-tolerant rehabilitation of degraded landscapes in Georgia

Commissioned by: German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Period: 2008–2011

The Dedoplistskaro district, which is characterised by fertile agricultural land and spacious grazing land, is situated in south-east Georgia. Forests still only cover 1.3% of the surface. Climatological analyses showed that the district is one of the regions of the country which are most affected by drought. The average drought period increased to 60 days (an increase of 22%) in the period from 1980 to 2007, compared to the first measurements from 1952 to 1979 with an average of 49 dry days. According to climate change predictions, the average air temperature in Dedoplistskaro will increase by 4.6° C to 15.4° C by 2100 (cf. Ministry of Environment Protection and Natural Resources of Georgia, UNDP (2009)).

Direct result and monitoring: As an outcome, the aim of the project is to rehabilitate degraded landscapes in east Georgia by reforestation, in order to reduce the advancing climate change, which especially affects the local semi-arid regions. Together with the local government of Dedoplistskaro, whose lead institution is the Environmental Ministry in Tbilisi, degraded arid and semi-arid steppe landscapes were rehabilitated in the context of climate change. The project supports the national climate-protection strategy (cf. Ministry of Environment Protection and Natural Resources of Georgia, UNDP (2009)).

Based on the "Good Practice Guidance for Land Use, Land-Use Change and Forestry (LULUCF)" of the IPCC, a baseline of zero is set for the monitoring of linked CO_2 emissions, since no carbon is saved by plants in the sparse areas. In order to determine the carbon content in planted areas, both the above-ground and below-ground biomasses were estimated, and the soil was systematically sampled. Projections of the future CO_2 storage by the project end and by the year 2020 were carried out through the felling of reference trees and the evaluation of trunk analyses. Prevented emissions are projected at about 13 tonnes of CO_2 per hectare by the project end, and they are even calculated at 66 tonnes of CO_2 per hectare by 2020 (see figure 8).

Figure 8: REDD+ using Georgia as an example: Direct climate results

In tonnes of CO_2/hectare	Baseline	Projection by the project end	Projection by 2020	Emissions reduction actually achieved after 2 years of the project
Biomass	0	3,2	33	1,6
Soil	0	9,9	33	6,6
TOTAL	0	13,1	66	8,2

Activities, outputs: Between spring 2009 and autumn 2010, around 130 hectares of model plantations were reforested on degraded grazing land and windbreaks. The deciduous trees selected for this are adapted to the dry and warm climate of the region.

Co-Benefits: Reforestations on degraded areas bring further ecological advantages with them. They make an important contribution to the protection against wind erosion of the neighbouring agricultural areas, to humus accumulation and therefore to an increase in biodiversity and soil quality. With this, the increase of agricultural profits as well as attenuation of climate extremes (increasing summer drought) comes along. First and foremost, the provision of non-wood products such as acacia honey, nuts and fruits, as well as firewood, adds to the social advantages for the local population. Also, after a period of about 20 to 30 years, the use of wood can create extra jobs and sources of income.

Outlook: Mitigation projects such as reforestations must be considered in the long term. Even a projection up to 2020 is too short-term, as the culmination of the wood growth has not yet been reached at this point. In contrast to technical projects such as biogas plants, which according to CDM can allow a crediting period of 10 to 21 years max, CO_2 reduction first occurs in the course of the tree growth with its biomass accumulation, which is reflected in a crediting period of the CDM of 30 to 60 years. For a projection up to 2040, there is a CO_2 reduction of around 162 tonnes of CO_2 per hectare for the biomass and 99 tonnes of CO_2 per hectare in the soil.

Source: Belinda Freiheit

3.2 "Mitigative capacity" target area

REDD+ is currently still in the development phase. In this so-called "Readiness" phase, developing and emerging countries should be put in the position where they can successfully participate in a challenging REDD+ offsetting mechanism through capacity development. In this context, the majority of REDD+ projects focus on the "mitigative capacity" target area, the REDD+ Readiness.

Readiness measures can work in three areas:

1. At the level of institutional and legal advice (political),
2. Creation of reasonable offsetting mechanisms for changing the management of forests (incentive systems) and
3. Reliable proof of performance (technical).

Therefore, projects which create or improve institutional framework conditions (Governance) on a national, regional and local scale, or projects, which build, sample and distribute methodical capacities and knowledge of novel implementation aspects of REDD+, are counted among those increasing mitigative capacity. For example, this includes building monitoring systems for proving measurable, reportable and verifiable results (MRV), creating and integrating national strategies for preservation of forests, as well as innovative methods for national and local distribution of financial incentives for REDD+.

Factors for the success of a REDD+ project

According to the above-named areas for Readiness measures, a selection of factors are listed, which contribute to the success of a REDD+ project in a traceable manner. When drawing up a project proposal, the listing can help you to consider the focus of the project as well as the choice of indicators in a structured way.

Political

- Fixing or strengthening REDD+ in national policies
- Creating a set of rules (strategy, legal framework, mainstreaming REDD+ in other strategies etc.) and obligations
- Support of participative consultation processes from the beginning of the planning phase
- Capacity building at all levels
- Defining and demanding competences and responsibility of all involved parties
- Involvement of civil society and/or the private sector
- Consideration and support of marginalised groups
- Fighting corruption
- Integration into regional/international strategies and processes

Incentive systems

- Analysis of the drivers of deforestation
- Analysis of the alternatives, which could be offered to the drivers
- Analysis and testing of alternative national financing options for REDD+
- Definition of institutional structures for managing funds
- Definition and establishment of clear criteria for distribution and use of funds (e.g. project financing, subsidies, funds, direct individual compensation payments, etc.)
- Creating transparency (e.g. information portal on the Internet)
- Capacity Building in other cultivation practices
- Investment in the creation of new local markets and restructuring cultivation systems
- Research (e.g. on traditional cultivation forms, use of natural plant types, management of municipal forests, agroforestry systems, as well as market analyses etc.)

Technical

- Implementation and planning of forest and biomass inventories
- Method development and training in the Carbon Accounting field
- Determining and implementing reference level and monitoring methods for REDD+
- Method development, implementation and training in the area of biodiversity monitoring or monitoring of socio-economic effects of REDD+ projects
- Conception and design of MRV systems according to IPPC standards - in the data collection, data processing, reporting (interpretation) and documentation components
- Capacity Building on all levels

4. Assessment of impacts in climate protection projects

4.1 Introduction

How many GHG emissions are actually cut by climate protection projects? This question is particularly difficult to answer if the climate protection project is operating and obtains its outcome in the "mitigative capacity" target area. The contribution to climate protection (which is concrete GHG reduction, expressed in tonnes of CO_2 equivalents from a project in the “mitigative capacity” target area) can then only be estimated. Two methods are given below for this and for estimating the climate result by scaling up. Three principles must always be considered when estimating GHG reductions (see Box 8).

Box 8: Three principles for estimating GHG reduction as an impact

1. Separation of GHG reduction on an outcome and impact level:

   GHG reduction on the impact level can be plausibly attributed to the project and roughly estimated. The estimation of this GHG reduction, or the contribution of the project to a measurable GHG reduction is based on assumptions and subjective expert opinions, and its validity is therefore uncertain. Estimation is far more inexact than a quantitatively provable measurement of GHG reduction, which is achieved as an outcome of the project. For this reason, directly measured reductions and estimated reductions must always be defined separately from one another. When estimating GHG reductions, it is essential that there is a plausible and comprehensible representation and report of how you “got to the number”. Methodical weaknesses in the estimation of GHG reductions are to be transparently shown for third parties.
2. Conservative estimation: The estimation of the GHG reduction, which is reached as an impact of the project, should be set conservatively so that it can be seen as reliable despite the uncertainties.
3. Transparency: Estimations of the impact of projects for increasing the mitigative capacity can help to set priorities for investment in climate-friendly measures. However, this also has the risk that organisations knowingly overestimate the reduction potential of their measures. In this context, it is even more important that the methodical approaches are always recorded and presented transparently, so that third parties can always understand how the quantitatively presented reduction contributions occurred on an impact level.

Source: Own diagram

4.2 Methods

Up to now, there are only very few approaches for assessing the GHG reduction contributions of projects, which contribute to increasing the mitigative capacity on the outcome level. Two methods are given below, which target exactly that: the estimated determination of the GHG reduction potential in projects of the “mitigative capacity” target area. Both methods have been developed and piloted in projects which GIZ is carrying out on behalf of the BMZ or BMU.

They are the
- barriers-to-objective weighting method (BOW), and
- the regulatory impact analysis method.

The extension of measures to other regions, sectors or a larger target group ("scaling up") can also be interpreted by the partner, other donors or a follow-up project as an impact. Subsequently, two methods suggested by the Global Environment Facility (GEF) are therefore given for estimating the scaling-up potential.

4.2.1 Barriers-to-objective weighting method (BOW)

What is the barriers-to-objective weighting method?
The barriers-to-objective weighting method (BOW) is a method developed by GIZ for estimating the GHG reduction (in tonnes of CO_2 equivalents) which is achieved by projects that have an increase in the mitigative capacity of a country as an intended outcome. The BOW assumes that a range of barriers prevent the implementation of certain climate protection measures. One or several of these barriers should be eliminated in the context of outputs achieved by the project. The elimination of the barriers is the outcome of the project. Once the obstructive barriers no longer exist, the climate protection measures can be implemented; this amounts to a prevention of GHG emissions and therefore to an impact of the project. The BOW intends that experts weight the barriers according to their relevance. The contribution of the project to the implementation of a certain climate protection measure and thus the contribution to GHG reduction is estimated by weighting the importance of all barriers that obstruct the implementation of the climate protection measure.

Evaluation
The BOW shows an important expansion of the current equipment for measuring results in climate-related projects, of which the focus is on enabling a country to reduce GHG emissions independently. Up to now, there has not been another method which undertakes such a detailed and systematic assessment of GHG reduction which is achieved by increasing the mitigative capacity. Since the BOW is substantially based on the value judgement of experts, the estimation is inevitably a rough one, and in particular would not be completely reproduced if it was redetermined. If the determination takes place before the impact is achieved (in CO_2 equivalent tonnes), the assessment also only refers to a potential GHG reduction, which is defined as the "objective" in the BOW. The method is currently being checked and developed further.

When can the BOW be applied?
The method can always be applied, if there is a clear cause-result relationship between the outcome of the project (Increase of the mitigative capacity) and a GHG reduction which can be estimated or measured as an impact of the project. The project must therefore address and actually eliminate the barriers which hinder the implementation of certain measures for reducing GHGs. The method can be applied at any point during a project, or before a project starts or at its end.

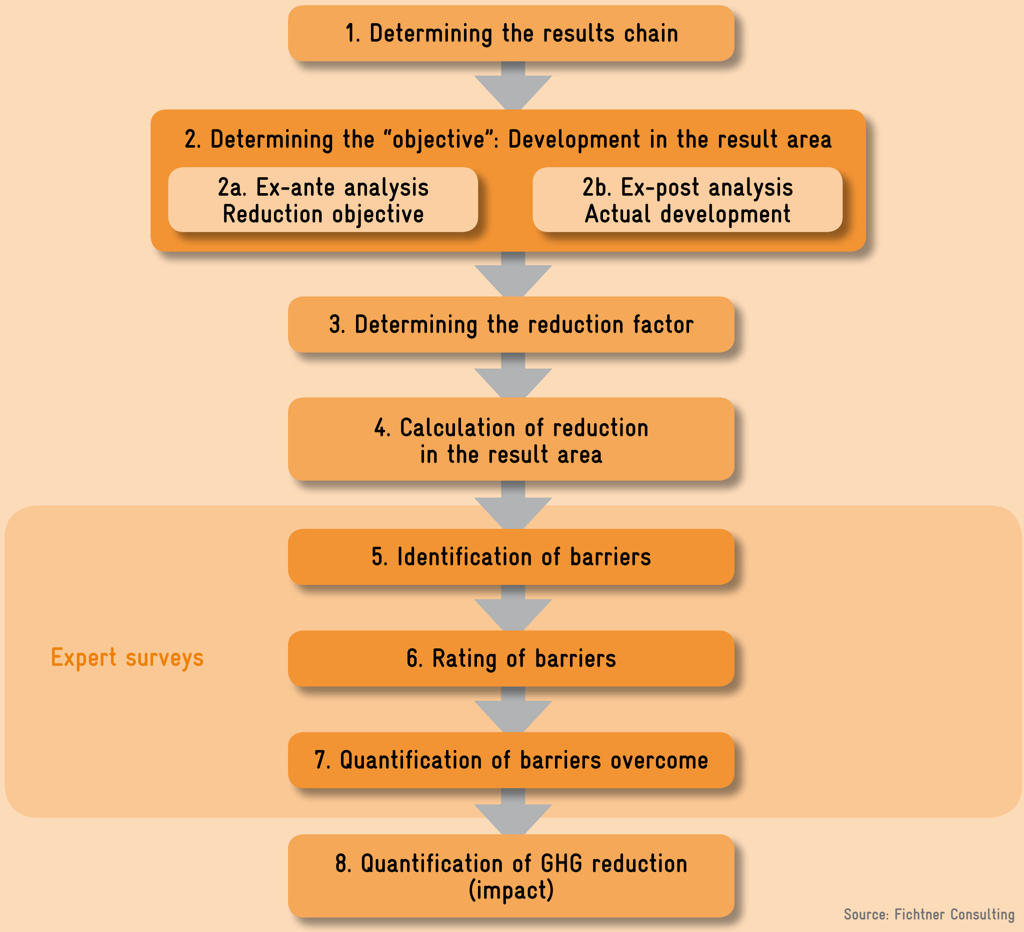
How much effort is needed to apply the BOW?
The effort required for implementing the method depends on the complexity of the results chain, data records and the availability of experts for questioning. An approximate planning effort of 40 hours can be calculated (see Figure 9).

Figure 9: Labour input for the application of the BOW

Work-steps	1	2	3	4	5	6	7	8	Total
Input in hours	4	4	4	1	4	16	4	1	38

Source: Fichtner Consulting

Figure 10: Procedure for the barriers-to-objective weighting method (BOW)



Source: Fichtner Consulting

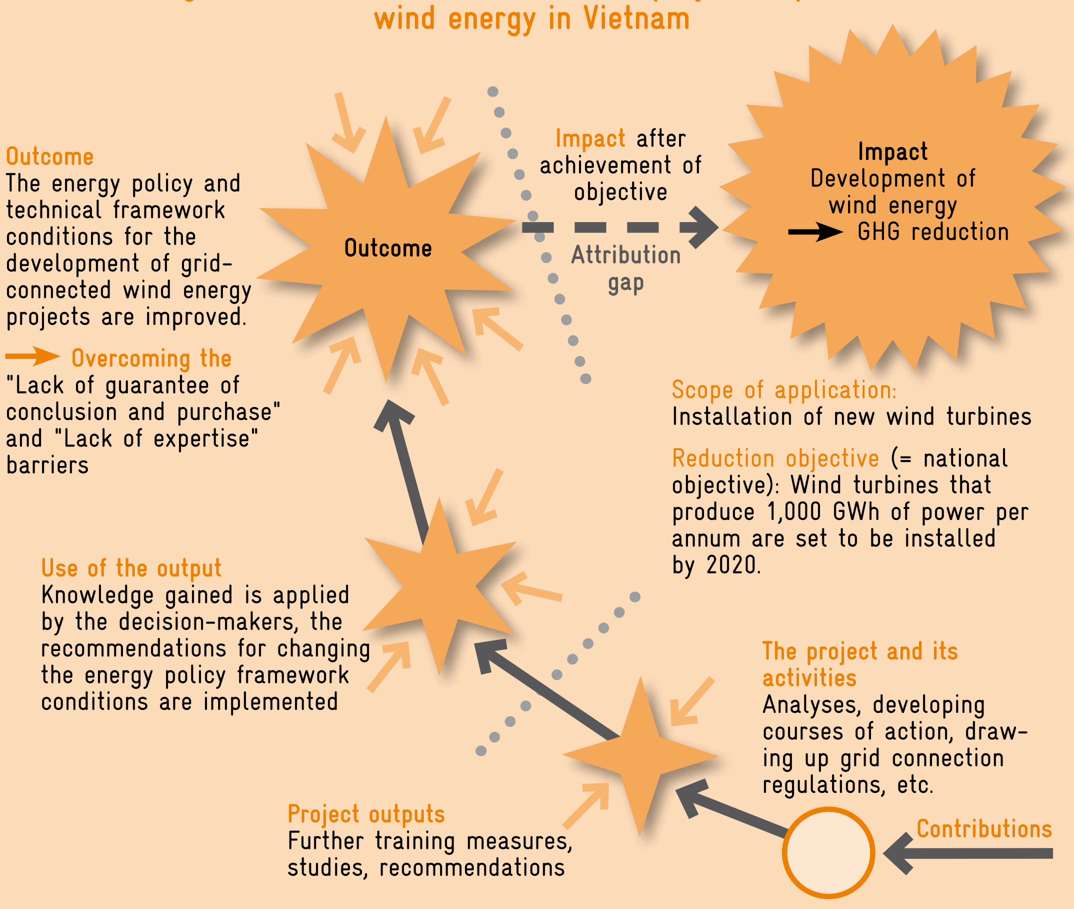
Step by step: How can the BOW be applied?
Figure 10 shows the different steps of the BOW for identifying the GHG reduction, which is intended as an impact of the project. They are explained below, theoretically and by means of a GIZ project for improving the energy policy framework conditions for wind power in Vietnam.

Step 1 Determining the results chain

The results chain shows the accepted cause-effect relationships between the activities, the output achieved as part of the project, the use of these outputs, the produced outcomes that are used to overcome the barriers, and the impacts achieved in this way. The logic of assigning the achieved output, the outcome in the form of an increase of mitigative capacity and the impact (GHG reduction in tonnes of CO_2 equivalents) thus becomes clear. The exact analysis of the result logic of the project facilitates the identification of competing results chains. It also facilitates a structured discussion of barriers in the context of the surveying experts (see steps 5-7).

Wind energy project in Vietnam
The BOW was developed as part of the project "Establishment of a Legal Framework and Improvement of Technical Capacities for Grid - connected Wind Power Development in Vietnam", which GIZ carried out on behalf of the BMU. Figure 11 shows the results chain of the project. The barriers are overcome by the outcome.

Figure 11: Results chain for the GIZ project to promote wind energy in Vietnam



Own diagram according to GIZ Z (2008b)

Step 2 Identifying the "objective": Development within the scope of application

This step identifies and determines the "objective" of the BOW, i.e. the GHG reduction, to which the project (partly) contributes at the level of its impacts. The development within the scope of application at which the project is aimed is also ascertained. The scope of application is the area in which the project develops its impacts (GHG reduction). Alternative procedures may apply depending on when the BOW is applied. If it is carried out before the intended impact is achieved (ex ante), objective values are used to determine the possible GHG reduction within the scope of application (step 2a). If this is determined after the intended GHG reduction has been reached (in full), the actual development within the scope of application can be determined (step 2b).

Step 2a: Ex ante analysis: Reduction objective
The reduction objective is a national or regional objective within the corresponding scope of application. A reduction objective is established for the scope of application based on documents. The objective to be established here is not necessarily congruent with one objective or the objective of the project. It can even be more comprehensive so that only a partial contribution to reaching the objective is expected from the project. For example, the target can be set to increase the share of renewable energies in the power supply of a partner country from currently 5% to 20% by a certain date. Another example is a regional or national objective for a specific surface area of reforested woodland. Objectives should be based on documents of partner organisations or governments and explicit reference is usually made to them at the planning stage of a project. Alternatively, objectives can also be taken from the national UNFCCC reports, provided they cover the scope of application. If there are no quantitative objectives for the scope of application, these must be drawn up preferably together with the project partners. The objectives should be ambitious but realistic. The period in which the objectives need to be reached must be taken into account. The periods to be selected should be long enough for the project to achieve its impacts. Typically, periods between 10 and 15 years are selected.

As a result of this step, a quantitative objective exists in a physical unit that describes the overall sought-after development within the scope of application.

Step 2b: Ex post analysis: Actual development
The analysis is carried out once the impact has been achieved within the scope of application. This means the actual development can be used for further analysis. A sufficiently long period must also be applied in this case so that the impacts can develop. A period of at least five years after the project ends seems to be sufficient. If there are only shorter monitoring periods available, the monitored development can be projected over an appropriate period. For example, the quantity of power from wind energy which has been generated from the new, additional wind turbines since the outcomes were achieved can be presented in megawatt hours per annum. This quantity can then be forecast for a longer period based on the expected development of the electricity market in the following years. This must however be indicated.

This step produces a value in a physical unit that describes the overall monitored (or forecast, based on the initial monitoring values) development within the scope of application.

Wind energy project in Vietnam
The project aims to install new wind turbines through its intended outcomes (“Improving energy policy framework conditions for renewable energies through the implementation of a funding mechanism"). These will be the impacts, the GHG reduction potential of which can be calculated based on the likely development within the scope of application and the reduction factor (step 3).

Since the impacts of the project have not yet been reached, an ex-ante analysis needs to be carried out. Step 2a of the method comes into play to determine the objective values. According to the master plan from 2009, Vietnam set itself the objective to install wind turbines with a capacity of 500 megawatts (MW) by 2020. Thus the reduction objective is calculated by multiplying the newly installed total capacity (500 MW) by the expected average full load hours (h) of 2,000.

*Total capacity * Full load hours = 500 MW * 2000h/a*
Reduction objective = 1.000.000 MWh/a = 1.000 GWh/a (gigawatt hours per annum)

Step 3 Determining the reduction factor
In this step, the corresponding reduction factor is worked out. This details how the impact (as identified in step 2) can be specifically interpreted as GHG reduction. It is offset against the objective determined in step 2 (step 2a) or the actual development (step 2b) and must therefore be compatible with the units used there. This step produces a factor, which provides the GHG reduction in tonnes of CO_2 equivalents per “unit” of impact. The overall GHG effect should take into account as many relevant GHGs as possible, i.e. the factor should be given in tonnes of CO_2 equivalents per annum. It often corresponds to an emission factor and should preferably be taken from the literature. If climate protection projects for the project country in the project type, which corresponds to the intended impact, have been submitted to the UNFCCC (particularly CDM projects), the emission factor documented in the Project Design Document (and stored on the Internet) is provided as the reduction factor. If there are no values specifically for the region or country concerned, international standard values must be used. If these are not available, then the assessment of experts can be used as a substitute.

Wind energy project in Vietnam
According to the local Institute of Energy, the reduction factor for power generation from wind energy is 875 tonnes of CO_2 equivalent per gigawatt hour. This means that for every gigawatt hour of power generated from wind energy, 875 tonnes of CO_2 equivalents can be prevented.

Step 4 Calculating the maximum GHG reduction within the scope of application

In this step, the GHG reduction is calculated within the scope of application. Theoretically, it represents the maximum GHG reduction that can be assigned to the project as an impact. In practice however, the indirect GHG reduction actually caused by the project will be lower. The GHG reduction within the scope of application is the product of the reduction objective estimated by the ex-ante analyses (step 2a) or alternatively the actual development within the scope measured by the ex-post analysis (step 2b) and the reduction factor (step 3):

Reduction within the scope of application =
*Reduction objective * Reduction factor or*
reduction within the scope of application =
*actual development within the scope of application * Reduction factor*

The result is an annual quantity of prevented GHGs in tonnes of CO_2 equivalents (t CO_2/a).

Wind energy project in Vietnam
By multiplying the values from steps 2 and 3, the following calculation results:

Reduction within the scope of application =
*Reduction objective * Reduction factor*
*875.000 tCO_2eq/a = 1000 GWh * 875 tCO_2eq /GWh/a*

The maximum GHG reduction within the scope of application of the installation of new wind turbines in Vietnam corresponds to a CO_2 reduction of 875,000 tonnes of CO_2 equivalents per annum.

Step 5 Determining the barriers

Barriers are defined as obstacles or restrictions that hinder or even prevent the achievement of the intended impacts of the project. "Mitigative capacity" target area projects contribute to the removal of barriers so as to support the partner country in the achievement of GHG reduction. When the results chain is being determined (step 1), the first barriers can already be recognised. The aim of this step is to work out which ones are the main barriers. The following approach is recommended:

- **Document analysis:** national development plans for the corresponding sector often broach the issues of existing challenges to the achievement of national, regional or local objectives. In addition, reports from other donors, the private sector or the sciences provide important information on the obstacles in the respective climate area of the project.
- **Interviews or informal meetings with experts:** the identification of barriers can be dealt with in the expert interview or it can be carried out at the preparation stage during informal meetings with representatives from the relevant climate area, the project order managers or the project partners (see Box 9).

Examples for barriers to a project concerning the consolidation of renewable energies for power generation:

- Lack of grid access
- Subsidies for conventional energy carriers
- Planning law not adapted
- Lack of trained personnel
- Lack of information

Barriers are often dependent on other barriers, i.e. the removal of one barrier means that the barriers it is dependent upon also need to be overcome. The aim of this step is to identify barriers that are as independent from other barriers as possible. A barrier can also be a subset of another higher-ranking barrier. In this case, either the higher-ranking barrier is to be referred to on its own or the barrier(s) described in individual aspects of the higher-ranking barrier must be referred to in the event that the total number of barriers does not exceed seven. If necessary, lower-ranking barriers must be combined in order to limit the total number of major barriers to a maximum of five to seven.

The result of this step is a list of five to seven barriers that are as independent from one another as possible and which considerably hinder the intended impact of the project. This list should be complete, i.e. it should cover all of the major barriers that are an obstacle to achieving the intended impacts.

Wind energy project in Vietnam
The ambitious objective of the national development plans – to expand wind energy by 500 megawatts by 2020 – is hindered by the following barriers, according to experts and investors:

1. Lack of guarantee of connection and purchase of the energy generated by renewable energies
2. The dependence of technical components on imports
3. Insufficient access to data about wind energy potential
4. Lack of expertise for the planning and management processes
5. Insufficient infrastructure

The project supports the partner ministry in reaching the national energy policy objectives and works on overcoming the "Lack of guarantee of connection and purchase of the energy generated by renewable energies" (1) and "Lack of expertise" (4) barriers.

Step 6 Rating the barriers

In this step, the meaning/significance of the barriers identified in step 5 is rated. The more a barrier hinders the achievement of the intended impacts, the higher their significance is during the assessment. The relative significance is rated, i.e. which of the barriers are more important compared with the others and which are not so important. The significance of the barriers is determined through a survey by experts (see Box 9). There are two different methods: a **simultaneous assessment** or **pairwise comparison**.

Independently of the method selected, the assessment can present the problem of barriers that make it impossible to achieve the impacts. If the intended impact is a GHG reduction through the production of electricity from wind energy, then the lack of technical connection conditions for the wind turbines to the power grid is a barrier, which must be overcome so that a GHG reduction can be achieved. This cannot however be fully expressed in a weighting. In any case, such barriers should be rated as paramount in their significance in comparison with other barriers.

Box 9: Interviews with experts in the barriers to objectives weighting method

Steps 5 to 7 will be carried out with the help of interviews with experts as a supplement to the document analysis. The interviews are intended to provide information that does not appear in the literature (triangulation). The subsequent comparison of information and data, which has been obtained through different methods, serves as an important tool for validating the results.

It is recommended that the experts' survey is carried out as a series of structured interviews, i.e. going through a pre-prepared survey together with the experts as part of an interview in person or over the phone.

The interviews should be carried out with at least 5 experts from the fields of politics, the economy and science. The more experts that can be surveyed, the more comprehensive and precise the assessment of the barriers and the results of the project will be. The experts should be familiar with the scope of application and preferably also have experience of the project.

The experts' survey covers the areas of barrier determination, rating of barrier significance and quantification of the project contribution to overcoming the barriers. It should really be restricted to one interview per expert. If it is not possible to determine the barriers as extensively as possible before carrying out the survey, the survey will have to be carried out in two stages. The first stage of the survey would involve a short interview with a general discussion on the barriers to the implementation of objectives within the scope of application and the second stage of the interview would involve a rating of the full list of determined barriers and a discussion involving any further questions.

If the survey reveals huge differences among the experts regarding the significance of the barriers and/or the significance of the project, it might be necessary to repeat the survey as part of a Delphi procedure regarding these aspects, starting by asking the experts about the results of the first round of the survey. This step can also be carried out over the phone or by e-mail. The result will then be calculated based on the average of all answers.

Source: Fichtner Consulting

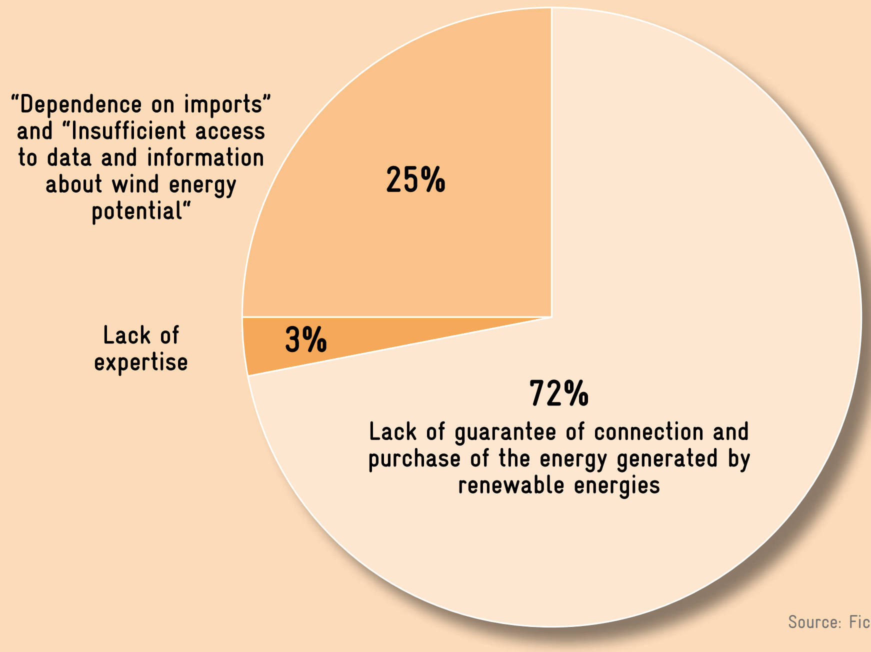
The result of this step is that all barriers, as specified in the preceding step 5, are weighted with a Ki factor in their significance, where the total of the weighting factors must equal 1.

The following describes the simultaneous rating and the pairwise comparison for the experts' survey regarding the significance of the barriers.

Method: Simultaneous rating
For the simultaneous rating, the experts will be asked to give a total score out of 100 to each individual barrier according to the barrier's significance. The total ratings of all barriers will equal 100. The ratings of the individual experts will then be summarised as averages. If the ratings of the experts deviate significantly from one another, the experts should be asked for their rating again after they have been consulted about the results of the first round of the survey in the form of average values (Delphi survey). The significance of the barriers is then worked out based on the average of the ratings from the second survey round.

Wind energy project in Vietnam
The rating has been obtained through an experts' survey, where they rated the significance of the barriers simultaneously by giving the individual barriers a score of up to 100. The experts consider the "Lack of guarantee of connection and purchase of the energy generated by renewable energies" to be the most significant barrier to the installation of wind turbines. They assume that 72% of the capacities of wind turbines installed in the future will need to overcome this barrier (Figure 12). The "Dependence on imports" and "Insufficient access to data and information about wind energy potential" factors are weighted 25% in total. "Lack of expertise" receives a rating of 3%. "Insufficient infrastructure" (0%) is, based on the results of the interviews, not a reason to explain why wind energy could not be established in Vietnam before now. The BOW is currently being tested again on the wind energy project in Vietnam, using the pairwise comparison method (see below).

Figure 12: Expert rating of the different barriers that hinder the development of wind energy in Vietnam



Source: Fichtner Consulting

Method: Pairwise comparison
A simultaneous quantitative weighting of the significance of barriers can be difficult in practice. The problem with this method concerns the cardinality, i.e. the difficulty of estimating the distances and conditions of all combinations of the existing decision options. Often the overall amount given is perceived as fictitious. In addition, the test persons tend to concentrate too heavily on fully assigning the points. This can mean that the image of the relevant individual preference structure falls into the background while the test person tries to find the mathematically correct total amount needed to produce the score allocation (Simon, 2009:158).

These problems can be avoided by carrying out a **pairwise** comparison as part of an Analytic Hierarchy Process. Through a pairwise comparison, the barriers are compared with one another qualitatively. A ranking scale is used for this, which simplifies the assessment so that only a comparative rating needs to be provided (e.g. “equivalent”, “more significant”, etc.). The qualitative comparison leads to a quantitative rating, as shown in figure 13. These quantitative ratings are entered into a matrix which shows the respective barriers in the first column and row (figure 14). This produces a rating matrix in which all comparison pairs are allocated a quantitative rating.

To evaluate the matrix, the column totals are calculated in a first standardisation step and the individual matrix elements are divided by the corresponding column total (result: standardised matrix V). The required weighting vector (the eigenvector of the weighting matrix) is provided when the standardised row total is divided by the number of rows (= number of barriers). The individual elements of the weighting vector represent the order of significance of the barriers to the objective. For this, it must be remembered that this is still a ranking scale that is limited in its informative value. However, the values and their ratios can be viewed as adequate for a barrier weighting rating.

A further advantage of the pairwise comparison lies in the possibility of checking the **experts' ratings for consistency.** Ideally the information provided by the experts should be consistent within itself (if A is twice

Figure 13: Pairwise comparison of barriers

Comparison of barrier (1st column) with barrier (1st row)	Explanation	Rating
Wholly insignificant	This is the greatest possible difference in significance between two barriers.	0,2
A great deal more insignificant	The much lower significance of a barrier has proven to be clear in practice.	0,25
A lot more insignificant	Experience and assessment indicate a much lower significance of a barrier in comparison with another one.	0,33
More insignificant	Experience and assessment indicate a lower significance of a barrier in comparison with another one.	0,5
Equivalent	Two barriers have the same weighting in their inhibitive impact.	1
More significant	Experience and assessment indicate a higher significance of a barrier in comparison with another one.	2
A lot more significant	Experience and assessment indicate a much higher significance of a barrier in comparison with another one.	3
A great deal more significant	The much higher significance of a barrier has proven to be clear in practice.	4
Wholly significant	This is the greatest possible difference in significance between two barriers	5

Source: Adapted according to Thomas L. Saaty: Decision Making for Leaders – The Analytic Hierarchy Process for Decisions in a Complex World. 3rd edition. Pittsburgh 2001

Figure 14: Example matrix of a pairwise comparison of the significance of barriers

Number of barriers identified	Rating matrix							Standardised matrix V								Weighting vector W
Compare: / zu:	Barrier A	Barrier B	Barrier C	Barrier D	Barrier E	Barrier F	Barrier G	Barrier A	Barrier B	Barrier C	Barrier D	Barrier E	Barrier F	Barrier G	Row total	Weighting factor wi
Barrier A:	1	0,2	5	2				0,15	0,1	0,4	0,2				0,92	0,23
Barrier B:	5	1	4	5				0,75	0,61	0,3	0,6				2,27	0,57
Barrier C:	0,2	0,25	1	0,5				0,03	0,15	0,08	0,1				0,32	0,08
Barrier D:	0,5	0,2	2	1				0,07	0,12	0,17	0,12				0,48	0,12
Barrier E:																
Barrier F:																
Barrier G:																
Column total	6,7	1,7	12,0	8,5												1,00

Only the values in red have been filled out. In this case, four barriers were compared, where for example Barrier B was rated as entirely more significant than Barriers A and D and a great deal more significant than Barrier C. After the conversion using the standardised matrix V, the weighting factors of the relative significance of the barriers are produced in the last column (in blue).

Source: Fichtner Consulting

Figure 15: Random Consistency Index

n	1	2	3	4	5	6	7	8	9	10
R.I.	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49

as significant as B and B is three times as significant as C, A should be six times as significant as C). Due to the limited human capacity to make judgements, deviations are common but the inconsistencies that occur are often tolerable. In order to ensure the level of consistency is adequate, the consistency index (CI) can be calculated based on the experts' ratings:

$$K.I. = \frac{\frac{1}{n} * \sum_{i=1}^{n} \frac{(V*W)_i}{w_i} - n}{n-1}$$

V = standardised matrix (see figure 14)
W = Weighting vector (see figure 14)
n = no. of barriers
wi = weighting factor of barrier i

The consistency index (C.I.) calculated in this way is compared with the Random Consistency Index (R.I.) as per figure 15. In order for the consistency level to be adequate, the C.I./R.I. ratio must be ≤ 0.1 (which is called the Consistency Ratio). If the consistency requirement has not been met, the survey is of no value and a repeat or review of the expert ratings is necessary.

Step 7 Evaluation of how the barriers have been overcome

This step will assess the percentage that the project contributes to overcoming the identified barriers. Experts will be surveyed for this. It must be taken into account that efforts may be being made externally to the project to overcome the barriers. If actions are being taken by other donors or national representatives with the same intended outcome, their respective contribution to overcoming the barriers must be taken into account during the experts' survey. These actions of other representatives may take place at the same time as the current project or may even have been completed beforehand. In the latter case, the project would then be based on the earlier results. Links like this should be identified before the interviews with the experts, if possible, and discussed with the experts.

The ratings of the individual experts will then be summarised as averages. If the ratings of the experts deviate significantly from one another, the experts should be asked for their rating again after they have been consulted about the results from the first round of the survey in the form of average values (Delphi survey). The significance of the barriers is then worked out based on the average of the ratings from the second survey round.

For each barrier identified in step 5 there is a Zi percentage figure, which shows how much the project contributes to overcoming the individual barriers.

Wind energy project in Vietnam

As the project does not address the "Dependence of technical components on imports", "Insufficient access to data about wind energy potential" and "Insufficient infrastructure" barriers, overcoming coefficients of Z=0 will be assumed here. The experts surveyed are not conclusive when it comes to the percentage that the project contributed to overcoming the individual barriers. The project contribution to overcoming barriers has therefore been estimated as follows by the consultant as an alternative.

There are no further international collaboration projects for overcoming the "Lack of guarantee of connection and purchase of the energy generated by renewable energies" and "Lack of expertise" barriers within the scope of application for wind energy. In this respect, the whole subject of overcoming barriers can be attached to this part of the GIZ project. But the activities of the national representatives outside of the GIZ project are also of great importance. This is why a percentage of 50% has been assigned to the national representatives outside of the GIZ project to represent their contribution to overcoming the barriers. 50% remains with the GIZ project. Therefore the contribution to overcoming the barriers to the GIZ for both the "Lack of guarantee of connection and purchase of the energy generated by renewable energies" barrier and the "Lack of expertise" barrier is Z=0.5.

Step 8 Quantitative GHG reduction (impact)

In conclusion, the GHG reduction, which is intended to be the impact of the project, can be calculated as follows using the factors already determined:

Indirect GHG reduction =
Reduction within the scope of application $* \sum_{i=1}^{n} K_i * Z_i$

n: Number of barriers

Ki: Significance rating of barrier i (see step 6)

Zi: Contribution of collaboration project to overcoming barrier i

The GHG reduction rating is given in tonnes of CO_2 equivalents

Wind energy project in Vietnam

Since the coefficient Z is the same for all barriers, the following calculation is produced for the quantification of the GHG reduction at the level of impacts:

Indirect GHG reduction =

$$875.000 \text{ t } CO_2eq/a * 0{,}5 * (0{,}72+0{,}03) = 328.125 \text{ t } CO_2eq/a$$

The GIZ project will therefore achieve a reduction in emissions of 328,125 tonnes of CO_2 equivalents per annum from 2020. This corresponds to 37.5% of the maximum GHG reduction that can be achieved within the scope of the "Installation of new wind turbines" in Vietnam.

Since wind turbines are being built steadily as of 2010, the full output and the maximum GHG reduction of 875,000 tonnes of CO_2 equivalents will first be achieved in 2020.

Before 2020, the number of GHGs will of course be reduced by the wind turbines already built. An estimate will have to be given here for how quickly the installation of turbines will progress. For the sake of simplicity, a linear build-up is adopted, which is expressed by the factor 0.5 (see figure 16).

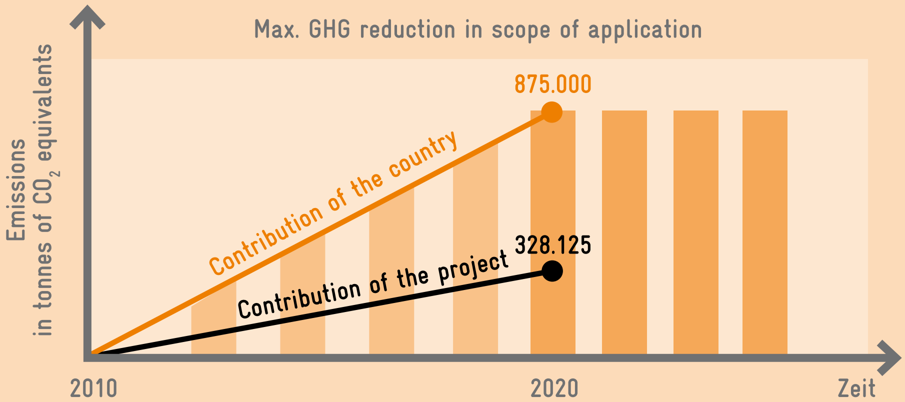
If the contributions over the ten years between 2010 and 2020 are added together, this would produce a GHG reduction of 1,640,625 tonnes of CO_2 equivalents, according to the calculation below.

$$328.125 \text{ t}CO_2eq/a * 10a * 0{,}5 = 1.640.625 \text{ t}CO_2eq$$

Closing comments

The recommended method represents an important extension to the assessment of the results from climate protection projects and is innovative. It can be used to assess the reduction impact through consultancy services for the first time. The attribution gap between outcome and impact can be partially decreased or skipped over using the BOW. The methodology is appropriate, however exhibits some critical points. The BOW is essentially based on a range of subjectively affected assumptions by experts that can strongly impact on the result. Moreover, there is the limitation that the estimated emission reductions are of a different nature to the measurable or calculable emission reductions

Figure 16: Greenhouse gases avoided as a result of the GIZ wind energy project in Vietnam



Source: Own diagram

from predominantly technology-based projects. When reporting about the two reduction results, there is the danger that this difference will not be transparently and sufficiently indicated. That is why emission reductions from outcomes and impacts may not be added up. Estimated reductions may also not be used to measure the efficiency of projects. Critical aspects of additionality, accountability and aggregation concerning the reduction results attained in a project must be clearly highlighted for third parties in the report.

4.2.2 Regulatory Impact Assessment (RIA)

Regulatory Impact Assessments (RIA) allow an ex-ante estimate of emission reductions through policy advice and capacity development. They are drawn up in view of the possible positive or negative results of political regulations on society and the economy, but also to demonstrate alternatives or opportunities for improvement (e.g. in the quality of the regulation).

In the same vein as methods to assess the physically and technically measurable GHG reduction, regulatory impact assessments use a baseline for the estimate which clarifies how the current situation would develop without the regulation under discussion ("no change scenario"). Then various conceivable political options are explained and the effects assessed as net changes in comparison with the baseline. Within the framework of a regulatory impact assessment, it is possible to focus on ecological and climate-specific effects. GHG reduction potential is ascertained through the effects on the use of fossil energy sources.

Key questions

The following key questions serve as an orientation for climate results (according to the European Commission, 2009):

- Do the scenarios have an effect on GHG (specifically CO_2) emissions into the atmosphere?
- Do the scenarios have an effect on emissions of substances that damage the ozone?

Estimation model

The regulatory impact assessments are conducted using various models. These models estimate the interconnection between the change in the law/introduction of a law and the possible economic, ecological and social consequences (Böhringer/Löschel, 2006).

Different models are suited to the estimating of GHG reductions and each has advantages and disadvantages depending on its application. For more precise information on the individual models, refer to the websites of the Joint Research Centre of the European Commission and the Community for Energy Environment & Development (COMMEND). The following pages will present the Computable General Equilibrium model (CGE model) which was tested on GIZ projects and the Long range Energy Alternatives Planning System (LEAP) in more detail.

Links & literature (page 88 onward)

General:

European Comission Joint Research Centre:
Impact Assessment Tools, Supporting Impact Assessment in the European Commission

Special methods:

European Comission Joint Research Centre:
Computable General Equilibrium (CGE)

European Comission Joint Research Centre:
Sector-specific models

European Comission Joint Research Centre:
Macroeconometric models

European Comission Joint Research Centre:
Environmental impact assessment models

Stockholm Environment Institute:
Long range Energy Alternatives Planning System (LEAP)

The Computable General Equilibrium model (CGE model)

Fields of application of the CGE model
Computable General Equilibrium models (CGE models) are economic models that use real economic data to simulate how a national economy reacts to political changes, changes in technology or other external factors. Using this standard economic method we can analyse how possible policy impacts simultaneously affect the entire national economy, as opposed to just individual (economic) sectors or actors. The method can be applied to estimate the consequences of:

- Eco-political instruments (e.g. eco-tax or emission certificates)
- Fiscal instruments (e.g. structural adjustments, tax reforms)
- Commercial laws (e.g. liberalisation of trade)

Necessary data/experts

- Social Accounting Matrix (SAM) from statistical institutes or economic research institutes
- A CGE model and an expert with experience in CGE modelling (in emerging countries it could also be a national expert with experience in modelling)

Costs
Insofar as all data (SAM) is available and an international expert must be hired for the modelling, the costs amount to approx. 20,000 to 30,000 Euros.

Assumptions
CGE models are based on neoclassical assumptions that consumers maximise utility, producers minimise costs (maximise profit) and all economic actors make rational decisions. According to the general equilibrium theory, it is assumed that adjusting the prices in such a way to achieve equilibrium results in complete market clearing. Extended CGE models can however also include market failure and possible environmental damage in the modelling. Further assumptions are incomplete factor substitution, incomplete substitutability of national and imported goods in the demand and complete inter-sector capital and labour mobility (all labour can work in all sectors).

Theory
To model GHG reduction potential, the CGE model should allow various energy sources to be technically substituted in production. This means that the model allows the energy inputs required for production to be replaced by an increased use of labour and/or capital, to a certain extent. If energy prices increase due to political intervention, the producers can deal with the increased prices (in part) by increasingly using capital and labour and thereby increase lower-energy production techniques.

However the price change does not just affect production, it also influences the demand and thereby the amount of used energy sources. If we compare the used amounts and the connected emissions with and without implementation of tax (simulation), the possible potential savings is obtained.

The systems of equations for a CGE model reflect both the flow of goods and services as well as the cash flow of an economic cycle in a national economy. Extended CGE models can however also include the public sector and the banking sector.

In addition to the system of equations, CGE models also require a consistent database. Generally CGE models are based on what is known as a Social Accounting Matrix (SAM). A social accounting matrix is an input-output matrix which reproduces the production structures, the goods structure of domestic demand and of international trade, the distribution of income, public spending, taxes and transfer payments of the national economy concerned. In principle it is an extension of the national overall account and represents all economic transactions which flow within a national economy between the economic actors (production sector, household sector, government sector and rest of the world) in the form of a matrix. It is therefore a snap-shot of the national economy concerned in a certain year.

Example 2: Consumption tax in China

In cooperation with GIZ's Environmental Policy Programme, the China Council for International Cooperation on Environment and Development (CCICED) has conducted a regulatory impact assessment on the introduction of a consumption tax on carbon emissions (carbon tax) in China. Also in this case the CGE model was used for a quantitative analysis. The database was a Social Accounting Matrix from 2005. Five different tax rates were simulated (from 20 to 100 Yuan per tonne of CO_2). At 20 Yuan per tonne of CO_2, emission reductions were calculated at 2.03% for 2010, 1.85% for 2011 and 1.63% for 2012. For the tax rate of 100 Yuan per tonne of CO_2, emission reductions were predicted to be 3.12% for 2010, 5.94% for 2011 and 5.86% for 2012.

Example 1: Eco-tax in Vietnam

To analyse the possible economic, social and ecological consequences of an eco-tax being introduced in Vietnam, the GIZ Macroeconomic Reform programme supported the local Tax Policy Department with the regulatory impact assessment. As in the European Union, in Vietnam this is regulated by law.

The regulatory impact assessment was simulated using a CGE model. Computable General Equilibrium models (CGEs) are a standard economic method to estimate possible policy impacts, as explained above. The CGE modelling carried out was in this case based on Vietnam's Social Accounting Matrix (SAM). The parameters of the CGE model are calibrated such that it reproduces the SAM (2007) in the balance without the eco-tax. In the case of Vietnam, the CGE modelling covers a total of 33 production sectors, 33 goods and raw materials groups, 9 primary production factors (labour, capital, land, natural resources, etc.) and 20 household groups (4 classes in 5 income quintiles).

The CGE modelling selected for estimating the consequences of the eco-tax contains both ecological tax parameters and the possibility of technically substituting different energy sources in production. The model therefore allows energy to be replaced by an increased use of labour and/or capital, to a certain extent. If energy prices increase due to the introduction of the eco-tax, the producers can deal with the increased energy prices in part by increasingly using capital and labour and thereby increase lower-energy production techniques while minimising costs. The increase in prices accordingly leads to substitution effects for intermediate goods and in the final consumption and as a consequence reduces the demand and the connected use of fossil energy sources.

To estimate the possible GHG reductions, the real values of the use of fossil energy sources (coal, motor fuel and natural gas) using their energy content from 2007 are first converted into terajoules and then into the connected CO_2 emissions. In the next step, these emissions are extrapolated along the most recent economic growth curve of 7.3% up to 2012 (business-as-usual scenario). The emission reductions can now be established by comparing the percentage reduction in consumption calculated using the model (which occurs through the processes explained above) with the extrapolated emission values for the year 2012. According to the simulation results, in Vietnam the potential savings are between 2.3% and 7.5% depending on the eco-tax rate introduced. This corresponds to 3 - 9 million tonnes of CO_2.

Long range Energy Alternatives Planning System (LEAP)
A software programme that is often used and freely available for developing countries is the LEAP system developed by the American "Stockholm Environment Institute". It allows energy policy scenarios to be analysed across all sectors. Past scenarios can be analysed, or future scenarios can be designed. A regional analysis is also possible.

4.2.3 Assessment of scaling-up potential

The extension of measures to other regions, sectors or a larger target group, i.e. a "scaling up" can be interpreted by the partner, other donors or a follow-up project as an impact of a project. The scaling-up potential must be kept in mind and planned from the outset. Here the GIZ guide "Scaling Up in Development Cooperation" is a useful support.

"It is the development goal of GTZ and its clients to achieve a broad impact"
(GIZ: "Scaling Up", 2010)

The Global Environment Facility (GEF), an international mechanism for financing environmental protection projects in developing countries which has 179 member states and whose projects are mainly run by the World Bank, the United Nations Development and Environment Programmes, uses two procedures to estimate the scaling up potential: The bottom-up approach and the top-down approach. However, neither of the two methods has been empirically examined. One advantage of the methods is their easy application. One disadvantage is the danger of simplification and certain arbitrariness in the evaluation of the scaling-up potential. The estimation is very imprecise and can suggest a reduction potential that might not necessarily be exploited. The methods can nonetheless be used to estimate the scaling-up potential if the three principles for estimating GHG reduction as an impact are taken into account (separation of GHG reduction at an outcome level and GHG reduction at an impact level, conservative estimation, transparency).

Bottom-up approach
The GEF's bottom-up approach comprises an estimate of the scaling-up potential of pilot projects and demonstration plants by experts. The bottom-up approach assumes that equal investments enable an equal reduction potential. It can only be used if the project whose scaling-up potential is to be assessed can physically and technically prove GHG reduction as its outcome. In this case the GHG reduction targeted is multiplied by a replication factor. The replication factor is based on four factors: market potential for a replication, quality of the project, activities that require a replication and local co-benefits.

Top-down approach
The GEF's top-down approach assumes that a project increases the mitigative capacity of a country, by changing framework conditions, eliminating barriers, building capacity or promoting certain environmentally-friendly measures or behaviours. It is therefore assumed that potentially the entire market that is affected by such a project could be transformed. The top-down approach therefore provides a market study which is used to assess how many areas could be transformed within 10 years. The top-down approach also requires the reduction potential of individual measures that could be conducted with an increase in mitigative capacity to be known. This potential is then projected by the market study over 10 years from the end of the project and also multiplied by a causality factor. This causality factor is important due to a changeable baseline: it may be that certain environmentally-friendly measures would also have been carried out without the project. Therefore the causality factor roughly estimates the size of the project's contribution to the measures.

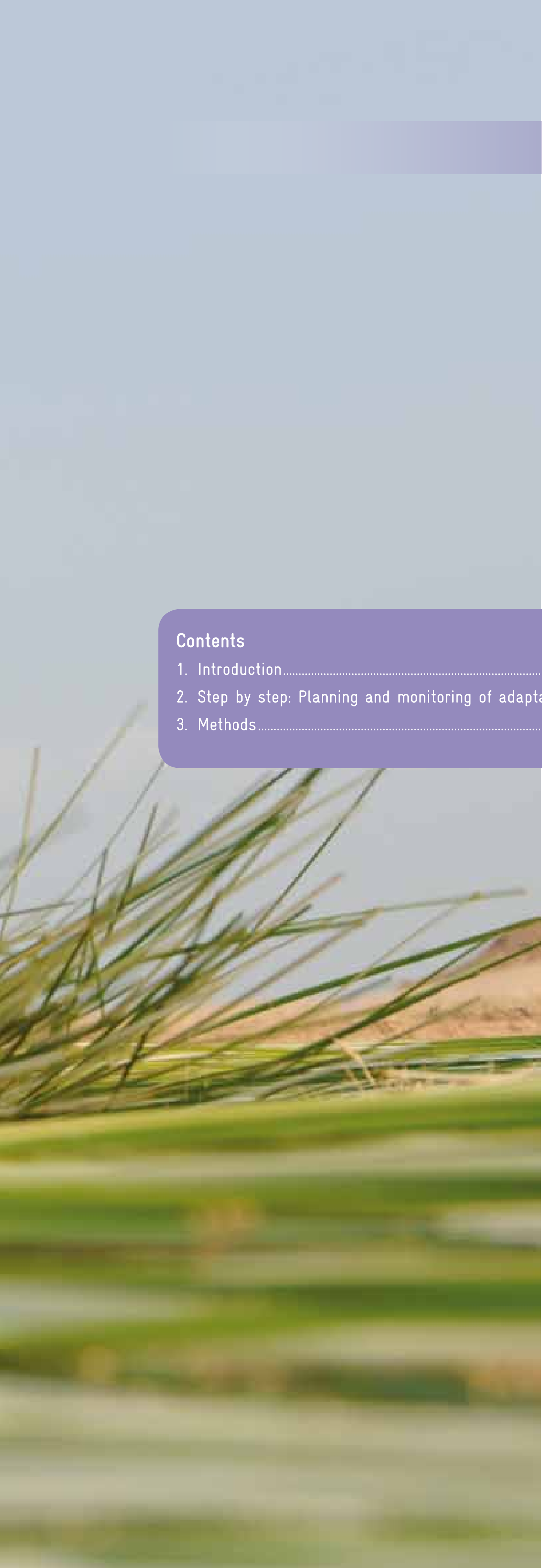
Links & literature (page 88 onward)

GIZ (2010):
"Scaling-Up in Development Cooperation"

GEF (2008):
"Manual for calculating GHG benefits of GEF projects: energy efficiency and renewable energy projects"

GEF (2010):
"Manual for calculating greenhouse gas benefits for global environment facility transportation projects"

Results in adaptation projects



1. Introduction

The subject "Adaptation to the consequences of climate change" has gained significantly in importance in recent years. Although there is an increasing number of findings, it continues to be a relevant issue. Many questions are still unsolved and debated internationally. This is also important given the increasing financial support. Indeed, almost all institutions for international collaboration and the climate funds are committing themselves to promoting improved monitoring of results. Currently in many places, results frameworks and requirements for monitoring and evaluating are being developed in the field of adaptation.

Contents

For all that, "adaptation" is hard to measure because, unlike climate protection through GHG reduction, there are no tangible, universal indicators (such as reduction in tonnes of CO_2 equivalents). Rather it is becoming apparent that the approaches for monitoring adaptation do not fundamentally differ from the approaches in other fields of development cooperation. However this makes it even harder to prove the relevance of a project for adaptation. Results-based monitoring primarily relies on a clever formulation of indicators that accommodate the characteristics of adaptation and on the continuous checking of assumptions.

The following sections respond to the current position of the international debate on this subject and to the characteristics and challenges faced, and suggest approaches to solving the problems. The second chapter contains step-by-step instructions for results-based planning and monitoring of adaptation projects.

Current state of the international debate

The international debate on monitoring and evaluating adaptation projects is based on the one hand on the aid effectiveness agenda and, on the other hand, on issues of additionality concerning adaptive and climate protection measures. Between adaptation to climate change and development there are diverse interrelationships. Climate change endangers development, but in many cases development also contributes to the increase in adaptive capacity. A considerable proportion of adaptation financing comes from development cooperation and should therefore contribute to the achievement of the Millennium Development Goals (MDGs) and is based on general principles of aid effectiveness such as managing for results. In the UN climate negotiations, the issue of reporting concerning support and the climate results targeted is central in view of the high financial pledges. For the subject adaptation, in parallel to the MRV approach in the area of reduction, a new way must be found to guarantee reporting and effectiveness.

However the additionality aspect does not just play a role at the level of international climate policy, it also raises practical issues at a project level: What is an adaptation project and what is not? What is new or different? How does this affect the formulation of objectives and indicators and the results monitoring of a project?

In studies based on research and practice (e.g. WRI/GIZ, 2011; OECD, 2011; Frankhauser et al., 2010), a certain convergence of approaches for monitoring and evaluating emerges; most institutes recommend an approach based on individual cases that considers the context at hand and corresponding indicators. Some comprehensive reference points are generally accepted in this. These are in part formulated as standard indicators or categories of indicators/adaptation contributions. Some approaches (e.g. the approach presented below by WRI/GIZ, 2011) attempt to categorise adaptation results. Others attempt to find standardised or universal indicators for adaptation at a higher, aggregated level (particularly “Saved Health, Saved Wealth, Saved Environment”; Stadelmann et al., 2011) or to produce a type of checklist of available adaptation procedures that could reflect the position of a country, sector or industry concerning adaptation (OECD, 2011).

Particular characteristics and challenges

Compared with monitoring results in the area of reduction or conventional development measures, the monitoring of adaptive measures involves the following particular characteristics and challenges:

- **Uncertainty of climate predictions:** Adaptive measures are planned in the context of uncertain climate predictions due to climate variability. As a result, extremely relevant framework conditions change or additional information comes to light through improved climate data and predictions during the course of the project. In turn this can impact on (a) the project design and (b) the baseline study. Changing baselines make monitoring harder.

- **Long time frame:** Short-term results (reaction to current climate variability and sensitivity) and long-term results (preparation for climate changes in the future) must be measured. The latter are hard to conceive in the development policy project context however, as they only occur after a comparatively long interval.

- **Heavily dependent on context:** As adaptation can be organised in a number of different ways under various conditions, particularly concerning climate changes and vulnerabilities in a region, hardly any universally applicable indicators can be defined. It is also difficult to draw comparisons between adaptation results in different regions and projects.

- **Interdependencies of projects:** There are complex interconnections to “conventional development measures” which hinder their delimitations.

- **Counterfactual analyses:** There is a need for counterfactual analyses. When assessing the effectiveness of adaptation, we need to make a comparison with “what could have happened”. For example: How would the same climate change have affected society and the ecosystem without the adaptive measures implemented? These counterfactual analyses are strongly based on suppositions.

Box 10: Adaptation to climate change – what does it involve?

In the extended IPCC DEFINITION, adaptation covers the climate change measures with which the sensitivity of natural and man-made systems to actual or expected effects is to be reduced or with which damage that has already occurred is to be remedied or reduced.

Adaptation generally begins with strategic considerations, whereby these considerations themselves could represent an adaptive measure. Usually sensitivity analyses (vulnerability analyses) which are based on available climate information and climate modelling are performed first at country or regional level for the DEVELOPMENT OF A STRATEGY. Here the conscious handling of uncertainty is central, as climate modelling can at best state probabilities of the occurrence of certain scenarios but can never provide definite predictions. Regions and sectors are prioritised according to their relative future sensitivity to the impacts of climate change. It is clear that adaptation is not first and foremost an environmental issue, but rather affects a variety of sectors. The development of strategy generally also leads to recommendations for the further development of policies, for changes to legal foundations and for extensions to planning systems so as to establish appropriate framework conditions for the successful implementation of adaptive measures.

The INCORPORATION OF RESULTS IN DECISION-MAKING follows the development of strategy, such as regional and sectoral strategies and plans. In individual cases this can go as far as extensive reorganisation. More commonly however, firstly, packages of measures are concretised for the regions or sectors which e.g. were prioritised in the course of a national strategy formation. Against the background of increasing uncertainty and climate variability, risk management measures often take up a key position. In this step, the central decision is made as to what proportion of measures are to be implemented through mainstreaming within the framework of ongoing initiatives that do not concern adaptation to climate change, and what proportion are to be carried out as part of targeted adaptation initiatives. Naturally the latter include such measures that respond rather to very specific effects of climate change.

The CONCRETE TECHNIQUES which are used to implement the chosen package of measures, for example in water resource management or in agriculture, are often not new. In the context of climate change they are however frequently used in a different way, intensified or adapted. An example might be the introduction of tested water retention systems in regions in which water shortages are expected in the future. Here generally a mixture of innovation and good practice is acceptable. Not all measures are of a technical nature. For instance weather insurance that offers policies especially for small farmers is playing an increasingly important role.

The MONITORING of the success of capacity development, the implementation of strategies and plans and the results of adaptive measures form the final step.

Source: Own diagram

Approaches to solving problems

Literature particularly recommends the following approaches to solving problems for the aforementioned adaptation-specific challenges concerning monitoring and evaluating:

- Use of scenarios which depict a plausible range for possible future developments, flexible planning and formulation and regular checking of assumptions concerning uncertain climate predictions;
- Setting and checking of milestones;
- Use of a dynamic baseline (inclusion of expected climate change in the future);
- Counterfactual analyses have shortcomings but are necessary;
- Use opportunistic results indicators (e.g. two consecutive, similar extreme events before and after project intervention);
- Collect and analyse statistical series over long time periods;
- Formulate indicators alongside the results chain (from use of output to impact);
- Combination of quantitative and qualitative indicators;
- Use vulnerability indicators.

Target areas

Just like climate protection projects, adaptation projects can also be attributed to the target areas presented in the "Basic principles" section. However the target areas cannot be entirely accurately separated from each other and, in a project run by the World Resources Institute (WRI) on behalf of GIZ/BMU (2011), are extended with an additional area. To date there is still no generally recognised categorisation.

Adaptive measures

Adaptive measures aim to reduce identified risks or vulnerabilities as an outcome. With the exception of the borderline case of financial mechanisms (e.g. weather risk insurance policies) they are physically and technically measurable. Examples of adaptive measures are technical infrastructure, such as the construction of flood retention basins or dykes, and "green" measures such as the creation of flood plains to protect against flooding.

Adaptive capacity

The concept of "adaptive capacity" refers to the Third and Fourth IPCC Assessment Reports (2001; 2007) which use the term. The increase in adaptive capacity means the development or improvement of necessary capacities to solve problems in order to prepare for climate change and deal with climate variability. Examples of capacity development are the support of climate projections and vulnerability analyses, regeneration aimed at target groups and communication of climate information and advice about its use or advice on the preparation of adaptive strategies.

Preservation of development objectives

The World Resources Institute acts on the assumption of an additional target area that involves development successes in spite of climate change. As indicated in the introduction, in the end this is the final objective of every adaptation project and can therefore be interpreted as an impact. In this case standard indicators such as "Saved Wealth, Saved Health, Saved Environment" can be used (Perspectives on behalf of GIZ, 2011). At a pilot level or in larger and longer projects, outcomes can also be formulated at this level. In any case, the corresponding measures are implemented in the various sectors of the "current development measures".

Links & literature (page 88 onward)

GIZ (2011):
Adaptation to Climate Change. New findings, methods and solutions. Eschborn.

Frankhauser, S. et.al. (2010):
Adaptation investments: a resource allocation framework. London.

International Initiative for Impact Evaluation (2010):
Impact Evaluation and Interventions to Address Climate Change: A Scoping Study.

Kasparek, Max (2011):
GIZ's climate-relevant portfolio. Adaptation and mitigation. Reference date 31/12/2011. Eschborn.

OECD (2011):
Monitoring and evaluation for adaptation: lessons from development co-operation agencies. Draft paper. Paris.

Perspectives Climate Change (2011):
Monitoring the adaptive effect of GIZ's natural resource management and adaptation projects. Analysis of the GIZ project portfolio in Asia, Latin America and the Caribbean. Hamburg.

Stadelmann, Martin et al. (2011):
Universal metrics to compare the effectiveness of climate change adaptation projects. Zurich.

World Resources Institute (2011):
Making adaptation count: concepts and options for Monitoring and evaluation of climate change adaptation. Eschborn. (On behalf of the GIZ)

2. Step by step

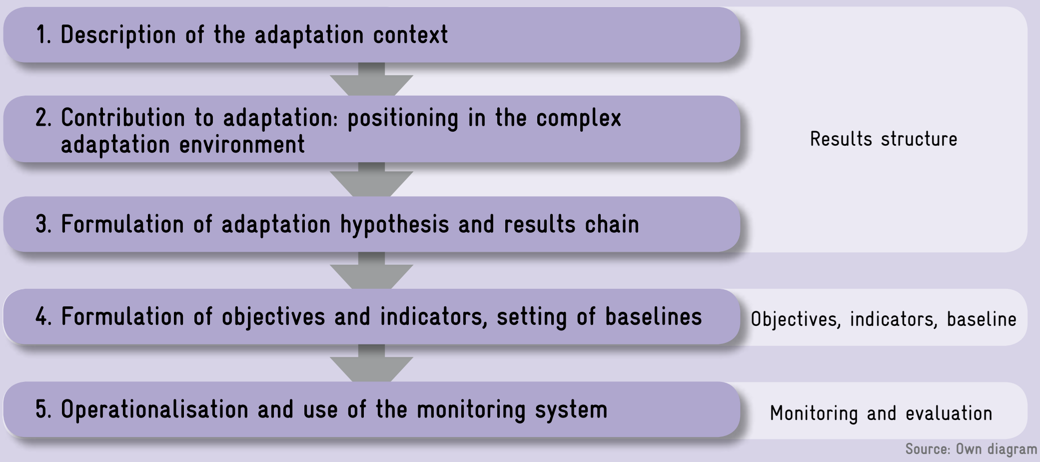
Procedure in five steps
Based on the work of the World Resources Institute, five steps can be shown from the conception of a results structure to the founding and use of a system for monitoring and evaluating adaptation projects (see figure 17). The individual steps are explained below.

Links & literature

ci:grasp:
Database system for climatic factors
Links from page 88 onward

UNFCCC:
Countries' national reports .
Links from page 88 onward

Figure 17: Step-by-step instructions for monitoring: "Adaptive measures" and "Adaptive capacity"



Source: Own diagram

Step 1 Description of the adaptation context

The description of the adaptation context sets the framework for the project and also for the monitoring and evaluation system. It involves determining project-relevant climate factors on the one hand and non-climate factors on the other. The climatic factors can be compiled using documentation existing in the country and internationally (e.g. database systems like ci:grasp or countries' national reports from UNFCCC), as well as participatory discussions with stakeholders. They include information from vulnerability studies, impact analyses and estimates of the adaptive capacity. Observed and expected climate variability and changes, affected regions, economic activities or social groups and finally possible and observed effects and vulnerabilities are all identified. The Climate Proofing for Development GIZ tool or climate testing (detailed testing of the adaptation) can be consulted for practical support. Scenarios are required and permitted as a basis for the estimation of future risks and effects. If available, observational data can be used, particularly at local level.

Step 2 Contribution to adaptation: Positioning in the complex adaptation environment

The next step involves the plausible deduction of adaptation contributions and thereby their positioning in the complex adaptation environment. In this step, the measures are classified according to the target areas presented above and the additional third area.

Step 3 Formulation of the adaptation hypothesis and results chain

The adaptation hypothesis is formulated on this basis. The adaptation hypothesis makes it clear to which climate change effects and vulnerabilities a project refers, and which transformations are sought. It thus establishes a connection between the adaptation context with its threatening or already existing climatic changes, and the planned measures, services and above all, the outcome of the project. Monitoring in the adaptation context then continually checks whether and how certain activities and capacities for preparation contribute to climate change, and whether core risks are addressed effectively. Adaptation hypotheses and assumptions must be changed accordingly when the framework conditions are changed.

Step 4 Formulation of objectives and indicators, setting baselines

Objectives and indicators are formulated and baselines are set on the basis of the first three steps.

In contrast to reduction, an indicator (such as "GHG reduction in tonnes of CO_2 equivalents") does not exist for adaptation. In order to make contributions or results of adaptation measurable and provable, measures are to be assigned to the expected effects of climate change or vulnerabilities in the respective context. The estimations of vulnerability or climate results, often qualitative, which are carried out in step 1, form the basis for this. Indicators are now formulated in step 4.

Formulation of indicators

In principle, indicators should be formulated along the results chain, from the activities level to the results level. Until now, a general tendency to use process indicators has been noticed. With an increasing knowledge of adaptation results, projects should increasingly formulate results indicators (e.g. vulnerability indicators or universal indicators such as Saved Wealth and Saved Health). The indicator set should also consist of a mix of categorical, quantitative and qualitative indicators. Qualitative indicators can be measured well using scales. In particular, the following variables and central questions are to be taken into particular consideration when deciding on indicators:

- **Time frame of the planned project:** Is the monitoring of the selected indicators realistic in the available time frame? Are the planned results short-term, mid-term or long-term? Shorter time frames could lead to an increased number of process indicators being used, which would be justified in this case.

- **Data availability or effort for collecting data:** What costs are linked to collecting data? Which techniques are necessary, and which are available within the framework of the project?

- **Relevance for adaptation to climate change:** Can the selected indicators be attributed directly or indirectly to the effects of climate change? Which assumptions are used here?

Example indicators according to target area

The formulation of the objective and indicators takes place congruent to steps 1-3. The indicators are therefore also to be attributed to both of the target areas. Example indicators are also found in the existing Results Frameworks of various adaptation funds.

- **Adaptation measures:** Water retention systems in regions with increasing water shortages; Degree of diversification of income in regions which are increasingly affected by extreme events;

- **Adaptation capacity:** Existence and quality of coordination and mainstreaming processes, availability and analysis capabilities of climate information, risk management capacities for handling increasing climate variability, early warning systems for weather extremes or also for communicable diseases;

Income stability, particularly of vulnerable population groups, or sectoral growth rates in sectors particularly affected by climate change, are examples of indicators for the "Safeguarding development targets" area suggested by the World Resource Institute.

The formulations of objectives and indicators, as well as the selection and setting of baselines, have an influence on the monitoring system, as well as the monitoring and evaluating procedures. Therefore, even at this stage, it is advisable to think ahead about some technical questions.

Step 5 Operationalisation and use of the monitoring system

This step is similar to the “conventional development project”, since most adaptation projects do not differ significantly from this (cf. OECD, 2011). However, considerable new aspects in the adaptation context are, for example, that assumptions should be made explicitly along the results chain, and very regularly checked and adapted if necessary. The organisation of the adaptation measure depends on the assumptions made about different forward-looking factors (climatic, ecological, political), and partly on higher uncertainty, which can directly affect the objective level. This means that it is essential to continually check whether the original strategy is still valid. When indicators are checked, the important aspects should be more precisely considered again: Are indicators formulated for all levels of the results chain? Are there indicators, which extend beyond the attribution gaps, and are their achievements and measurements still realistic? The question should regularly be asked whether certain results (e.g. extreme precipitation with severe floods as a result) could be practically used as opportunistic result indicators. Questions about the initial situation data are to be clarified in particular at the start of data collection.

Finally, when the results are used, it should be taken into consideration that there is still a great need for learning and exchange in the adaptation area. Interesting monitoring and evaluation results should also definitely be passed on at national and international levels.

Essential sources of verification/measuring of indicators are according to the target areas:

Adaptation measures

Repeatedly conducted analyses of vulnerability, risk or climate results. However, in projects with short durations and smaller measures, the analysis effort is only justified in a few cases. Analyses of this type are also not sensitive enough to show changes over a short period and on a large scale.

Adaptation capacity

Surveys (e.g. standard of knowledge and equipment in institutions), analyses of documents (e.g. legislation) and Capacity Assessment (see chapter 3, “Results in climate protection projects” section).

3. Methods

Monitoring and evaluation of adaptation projects on a portfolio level

SCCF/LDCF Adaptation Monitoring and Assessment Tool (AMAT) – Global Environment Facility (GEF)

Areas of application:	Monitoring and evaluation of adaptation to climate change at portfolio level
Brief description:	The tool was developed for the Special Climate Change Fund (SCCF) and the Least Developed Country Fund (LDCF) of the GEF for use by the implementing organisations. It is used for measuring the extent to which the objectives of the fund have been achieved at portfolio level. For the three overlapping objectives of the two funds (reducing vulnerability, increasing adaptation capacity, promoting technology transfer for adaptation), standard indicators are formed on a results level (outcome) and service level (output). The tool is available as an Excel tool. The indicators are clearly defined, and a measurement is given in each case, for which the baseline and measurement value are queried half way through the project and at the end. The measurements are either given with the unit (e.g. %, hectare) or as ordinally scaled answers. The tool was introduced in 2010 as a pilot application for the LDCF and SCCF. Application experiences are therefore still not available until a project is completed.
Evaluation:	The tool provides useful examples and scales of indicators for adaptation. The scales mostly avoid the use of measurements, but rather break down the different concepts into qualitative questions. However, it appears that the sensitivity of the indicators is not always given.
Example:	The number of adaptation measures, their quality and effectiveness are queried as an indicator for the intended result "Adaptation measures are integrated into regular development measures". Concrete definitions are given for quality and effectiveness, which are used as a measurement "for each activity indicate which ones include budget allocation objectives" (possible value: yes/no), and "for each activity indicate to what extent objectives set out in plans have been met" (possible values: not significant/significant).
Further information:	SCCF/LDCF Adaptation Monitoring and Assessment Tool (AMAT)

Monitoring and evaluation of adaptation projects

Project Level Results Framework and Baseline Guideline Document – Adaptation Fund Board (2011)

Areas of application:	The document should be used by the implementing organisations when monitoring the projects of the adaptation fund. However, it also provides an annotated representation of a Results Framework with an explanation of possible methods and indicators which can be used in other projects.
Brief description:	The document describes the Results Framework of the adaptation fund, explains selected standard indicators, and suggests methods for measuring. For the overall objective of the fund (essentially the less results-oriented objective "Covering the costs of necessary adaptation measures"), expected results are formulated, which are recorded with indicators on the results level (outcome) and the service level (output). Detailed definitions of all attributes used, justifications of the indicator selection and information on measuring (information as to how the indicator is to be measured (measurement, partly in several steps), degree of difficulty, frequency and timing of measuring, information on data collection, measuring equipment or methods required) are given for all of the indicators. In addition, there is information on interpretation of data and results, on the strengths and weaknesses of all indicators, an example and relevant literature. The document highlights the close connection between monitoring and knowledge management.
Evaluation:	The document offers useful examples of indicators and their derivations from literature (or coverage by international statistic programs). The information on practical measuring, including the effort required for measuring, is also helpful. In parts, however, the quality of the suggested indicators and the reliability of the information on the methods are rather poor.
Example:	"Stabilisation or improvement of the ecosystem services and natural assets under stress related to climate change or climate variability" is given as an indicator for the "increase of the resistance of ecosystems to stress related to climate change or climate variability". The attributes are substantiated: e.g. description of possible ecosystem services, types of natural assets, definition of "improvement" (e.g. recovery of degraded land areas); information on measuring (in ha, in number of types), evaluation of difficulty; information on the measuring time (general; oriented more towards the project length than towards the specific indicator); information on methods of data collection (studies, GIS etc.).
Further information:	Project Level Results Framework and Baseline Guideline Document

Monitoring and evaluation of adaptation projects

Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects, Guidance Note 8 „Monitoring and Evaluation of Adaptation Activities" The World Bank (no date given)

Areas of application:	This guideline helps in the creation of a system for the monitoring and evaluation of adaptation projects in the agricultural sector and in the management of natural resources. It identifies necessary core aspects of a system for monitoring and evaluation, offers support in the selection of adaptation-specific indicators, and gives information on the practical implementation of a system for monitoring and evaluation.
Brief description:	These instructions describe the specific challenges which exist in planning and implementing the adaptation projects. The relation to the general development objectives is then established, and target areas are derived from adaptation measures. Success indicators for mapping changes of Adaptive Capacity and Resilience of the observed system are divided into two categories: Process and long-term effect indicators. Process indicators measure the extent to which individual project activities contribute to achieving the objectives. On the other hand, long-term effect indicators record the long-term effect of project activities and also the change in the Adaptive Capacity and Resilience areas. Detailed examples are named for indicators of this type. In addition, in Part C of the guideline, best-practice experiences are given with reference to baseline creation, data collection, time of the evaluation of a project and recommendations for scaling up "Lessons Learnt".
Evaluation:	The Guidance Note gives a good first overview and concrete examples for indicators along the results chain, as well as data for baselines. It provides an assessment of the question "when are results evaluations useful?"
Example:	In the paper, links to different adaptation projects are listed for the areas of agriculture and management of natural resources, as well as for other areas. The paper also provides a literature list, references with detailed indicator tables, as well as a toolkit for monitoring and evaluation in the area of agricultural water management.
Further information:	World Bank Guidance Note No 8

Glossary

Adaptation to the consequences of climate change
In the extended IPCC definition adaptation covers the climate change measures with which the sensitivity of natural and man-made systems to actual or expected effects is to be reduced or with which damage that has already occurred is to be remedied or reduced.

Adaptive capacity
Is the capacity of the population or certain population groups to develop and implement their own adaptive measures. Capacity development aims to promote or increase this capacity.

Adaptive measures
Direct contributions to reducing the risks and effects of climate change, e.g. development of the water storage capacity in regions affected by climate-induced drought.

Additionality
GHG emissions, which are saved due to project activities within the framework of a reduction project (e.g. CDM or REDD+), in addition to those reductions which would have been achieved without the project. In connection with adaptation, there are practical questions behind the term, such as: "What is and what is not an adaptation project? What is new or different?"

Attribution gap
The attribution gap is the difference between the outcomes and impacts. It demonstrates that the impact cannot be entirely demonstrably attributed to the outcome as many other factors also influence it.

Baseline
The baseline is defined as the hypothetical situation without the project. Thus this situation can either contain the status at the start of the project, the expected status without the project ("business as usual") or a combination of both. The baseline acts as a reference value, to make targeted changes visible and measurable.

Capacity development
Capacity development equips people, organisations and society with the ability to develop their economy sustainably. This includes identifying development problems, developing strategies for resolving problems and then successfully implementing them.

CO_2 equivalents
To be able to compare the greenhouse effect of the various GHGs (see Global-warming potential, GWP), their greenhouse effect is converted into that of CO_2 (GWP of CO_2 = 1) and given in the unit "CO_2 equivalent".

Co-Benefits
Contributions of the project to sustainable economic and social development and the improvement or conservation of the environmental quality, in addition to climate results. They are mostly found at a regional and local level (e.g. reduction of air pollutants, decrease in pollutants in soil and water, protection of the biodiversity, increase in salaries, social security).

Direct GHG reduction according to ISO 14064
This comprises all GHG emissions which fall under the direct control of the project, including all processes in which fossil fuels are burnt or fugitive emissions are produced. An example for reducing direct emissions: "By selling an annual output of 4,320 tonnes of insulating material expanded with CO_2, direct emissions amounting to 1.6 million tonnes of CO_2 equivalents will be definitively avoided up to 2020." It is about GHG emissions which are generated directly at the place of production and within the project.

Emissions factor
An emissions factor describes the relationship of the mass of CO_2 emissions to the mass or volume of the fuel. Example: The emissions factor of diesel is 0.002676. If 1,000 litres of diesel is burnt there will be 2,676 tonnes of CO_2 emissions.

Environmental result
Result/effect caused by the project with climate issues in the field of reduction/adaptation.

Global warming potential (GWP)
A factor which expresses the climate impact of different GHGs by relating the extrapolation of a reference period of 100 years in the atmosphere to the reference gas CO_2. The radiation effect of a GHG applied to its mass is given in comparison with the radiation effect of the same mass of CO_2.

Impacts
The impacts of a development measure are those emissions which can no longer be directly (causally/quantitatively) attributed to the project. The impact depends on the contributions of many factors, whose share of the overall changes can indeed be plausibly shown, but can no longer necessarily be isolated or quantitatively recorded.

Indirect GHG reduction according to ISO 14064
This includes all GHG emissions that are generated through the use of grid-bound energy. An example of the reduction: "By reducing the energy consumption for the operation of a production plant for XPS foam, 30% less electrical energy is required, which corresponds to 5,000 tonnes of CO_2 equivalents up to 2020."

International Climate Initiative (ICI)
A programme created by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety with the objectives of developing the existing potential for reducing emissions economically and promoting innovative models for climate protection. Specifically, the BMU promotes climate protection measures that boost a climate-friendly economy. The International Climate Initiative also supports measures to adapt to climate change and to protect climate-relevant biodiversity in developing and emerging countries. GIZ is running various projects within the framework of the ICI. The programme is financed by the proceeds from the sale of emissions trading certificates.

Mitigative capacity
Is the capacity to reduce GHG emissions at individual, organisational and societal levels or to protect or extend natural (carbon) sinks and to render the results measurable, reportable and verifiable. Capacity development aims to promote or increase this capacity.

Monitoring
General: Continuous or periodic checking of processes
Results-based monitoring: This focuses on the results and achievement of objectives of a development measure. Therefore, it is not only activities (outputs) that count; changes brought about are observed as well. This type of monitoring also provides partners and target groups the opportunity to assess the quality of the outputs. The main focus of the monitoring is on the use of the outputs and the ensuing outcome of the development measure. The changes observed are therefore causally attributed to the outputs of the measure. The additional ensuing impact is also regularly observed, although it can only be connected to the measurable results via plausibility conclusions. It is therefore difficult to attribute the changes to the contribution of one single development measure.

Outcomes
The outcomes of a development measure are those emissions which can still be causally and quantitatively attributed to the project.

Reduction
Drop in GHG emissions within a reference time period.

System boundaries in GHG measurements
These define the spatial and temporal area in which data to measure GHG emissions are collected.

System boundaries in the results logic
Boundaries of the sphere of influence of a project within which ensuing results can still be causally attributed to said project.

Target areas of environmental projects
The target areas of environmental projects describe the objective of the project at the level of its outcomes. There are four distinct target areas: GHG reduction, increase of the mitigative capacity, adaptive measures and increase of the adaptive capacity. They are attributed to the climate results climate protection and adaptation.

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List of abbreviations

BMU .... Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BMZ .... German Federal Ministry for Economic Cooperation and Development
CCICED .... Council for International Cooperation on Environment and Development
CD4CDM .... Capacity Development for the Clean Development Mechanism
CDM .... Clean Development Mechanism
CGE .... Computable General Equilibrium
CO_2 .... Carbon dioxide
RE .... Renewable energies
EnDev .... Energising Development
EU .... European Union
F Gas .... Fluorinated greenhouse gas
GEF .... Global Environment Facility
GIZ .... Gesellschaft für Internationale Zusammenarbeit
GTZ .... Gesellschaft für Technische Zusammenarbeit
IEA .... International Energy Agency
IFEU .... Institut für Energie- und Umweltforschung Heidelberg (Institute for Energy and Environmental Research)
ICI .... (BMU's) International Climate Initiative
IPCC .... Intergovernmental Panel on Climate Change
ISO .... International Standards Organisation
KfW .... Kreditanstalt für Wiederaufbau (Reconstruction Loan Corporation)
LEAP .... Long range Energy Alternatives Planning System
LULUCF .... Land Use, Land-Use Change and Forestry
MRV .... Measuring, Reporting and Verification
PCF .... Product Carbon Footprint
PPP .... Public Private Partnership
REDD+ .... Reducing Emissions from Deforestation and Forest Degradation
SAM .... Social Accounting Matrix
GHG .... Greenhouse gas(es)
UBA .... Umweltbundesamt (Federal Environment Agency)
UN .... United Nations
UNDP .... United Nations Development Program
UNEP .... United Nations Environmental Program
UNFCCC .... United Nations Framework Convention on Climate Change
VCS .... Verified Carbon Standard
VfU .... Verein für Umweltmanagement in Banken, Sparkassen und Versicherungen
WBCSD .... World Business Council for Sustainable Development
WRI .... World Resources Institute
BOW .... Barriers-to-objective weighting method

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