MRV

Measurement, Reporting, Verification

How To Set up National MRV Systems

Draft 4.2

The concepts expressed in this tool are those of the authors and do not necessarily represent the views of the German government, or the endorsement of any approach described herein.

Please open this tool in full screen mode in order to be able to click on the internal hyperlinks to additional information or accessible instruments

Imprint

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Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-0
F +49 61 96 79-1115

Contact
E climate@giz.de
I www.giz.de

GIZ Environment and Climate Change Division

Responsible
Sebastian Wienges, Sallie Lacy

Authors
Yvonne Pang, Glen Thistlethwaite, John Watterson, Shoko Okamura, James Harries, Adarsh Varma, Emily Le Cornu (all Ricardo-AEA)

Contributions by
Maya Valcheva, Tobias Hunzai, ICLEI - Local Governments for Sustainability

Please be aware that this version of the MRVTool is still under development and that some steps can only be finalized after the negotiations have made substantial progress. Hence, there might be issues in the tool which different governments have different views on.

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On behalf of
Federal Ministry
for Economic Cooperation
and Development

Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

International Partnership
on Mitigation and MRV

This tool as well as the training based on it is made accessible through the International Partnership on Mitigation and MRV which supports through a variety of measures the capacity building on MRV, NAMAs, and LEDS, including the design, pilot testing, and training of a series of tools as this MRV-Tool.

Launched by South Africa, Republic of Korea and Germany at the Petersberg Climate Dialogue in 2010, the Partnership encourages countries to step-up mitigation ambition and undertake transformational change.

More specifically the Partnership supports the design, set-up and effective implementation of:

- Low-Emission Development Strategies (LEDS)
- Nationally Appropriate Mitigation Actions (NAMAs)
- Measuring, Reporting and Verification (MRV) systems

The Partnership facilitates the exchange of best practice between climate negotiators, policymakers and practitioners from more than 40 developing, emerging and developed countries. This helps to share learning, build trust and inform the UNFCCC negotiations.
Visit us at: www.mitigationpartnership.net

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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How to Use this Tool?

The MRV-Tool is not designed to be read from start to finish. Instead, follow the path you want to take by clicking on the links, forward arrows and back arrows.

Here are some explanations to the basic maneuvers:

Navigation tools are found at the bottom of every slide. When you followed a link, you can always return following the ‚back to' button. If you click outside of any link, the program will take you to the next chronological slide.

You can reach the **Main Menu** and **Content** page from every slide by following the links at the middle bottom. Please note that you cannot directly return to the last slide you visited from them.

You can follow highlighted links as well as **Buttons** to gather more detailed information about the indicated topic. Some links will lead you to external websides.

It might prove helpful to experiment with the navigation for a minute before starting to use the content of the tool. You will see - It is quite easy to comprehend.

Content of the MRV Tool

MRV-Tool Objectives and Content

Along with the new obligations to MRV, come new challenges for raising **national-level, sub-national-level and sectoral-level capacities** for improving information. The MRV-Tool is supposed to help implementers set up and harness national MRV systems:

- To **improve the basis of information of countries and to monitor** their mitigation actions for national planning, implementation and coordination of individual mitigation activities of bottom-up actions and policies and top-down goals,
- To **comply** with common international UNFCCC reporting requirements to be able to track emissions and emissions reductions towards the global 2°C objective and to coordinate individual activities internationally (see example: Mexico's pledge and plan for implementation),
- To **be guided step-by-step through the process of developing a national MRV system**, and to **carry out** MRV in three principle areas of scope as required in the BUR guidelines:
  - Emissions/ National greenhouse gas inventories
  - NAMAs/ Mitigation actions
  - Support/ Finance, technology and capacity building needs and support received

The three principle areas in the MRV-Tool shall also reflect the different groups of people usually in charge of MRV in these three areas and the different responsible ministries in international cooperation.

Note*:* This Tool does not support the compilation of BURs or NCs but the development of national MRV systems to generate such reports. There are other tools under development providing guidance on how to collect data for BURs and NCs.
Note: This Tool has been designed to provide guidance and recommendations. The Implementation might not need to be as comprehensive as advised.

GIZ MRV - Training

In order to support countries process towards the design and implementation of a robust MRV System, the GIZ MRV training, brings together 25-40 participants from governmental agencies and national monitoring experts, donor organizations and academia in a proven three-day workshop.

Objectives

- Provide expertise on the background and objectives of MRV Systems,
- Introduce concepts of MRV System implementation,
- To gather an overview over existing structures and MRV mechanisms in place in the country to develop a next step assessment.

Methodology

The tools utilised in the workshop include the GIZ MRV Tool, as well as the GIZ Stocktaking Tool. National and international experts are invited to hold presentations throughout the workshop in combination with group exercises and plenary discussions.

The workshop builds on the specific countries current situation on developing mitigation actions and MRV systems in place. Consolidated background information folders are used to serve as a platform for the participants to identify knowledge and capacity gaps, as well as the institutional arrangements in place, in order to move towards a robust national MRV System. Split into working groups, the participants will choose the sector closest to their competency.

For more information on the training, please contact: Sven Egbers sven.egbers@giz.de

Intro I: The Need for GHG Mitigation

- The major challenge of international climate policy is to reduce GHG emissions to a level consistent with the **2°C objective**
- Having a "likely" chance of meeting this objective requires global emissions to peak before 2020 and have emission levels in 2020 around 44 GtCO2e, steeply declining thereafter
- This requires bold mitigation action by developed and developing countries
- McKinsey estimated global GHG emissions of 70 Gigatonnes CO2e per year in 2030,
  - of which 38 Gt. CO2 could be abated cost-efficiently
  - **67% of this GHG abatement potential is located in developing countries**
- Many developing countries have begun tackling the challenge of rising emissions by developing and implementing Nationally Appropriate Mitigation Actions (NAMAs), and informing UNFCCC about their mitigation actions through pledges.

Intro II: The Political Design of GHG Mitigation

- While the UN negotiations proceed to establishing a **global mitigation architecture**, the national level – with international support according to needs and ambition - must already act on **developing and implementing the building blocks of this mitigation architecture**.

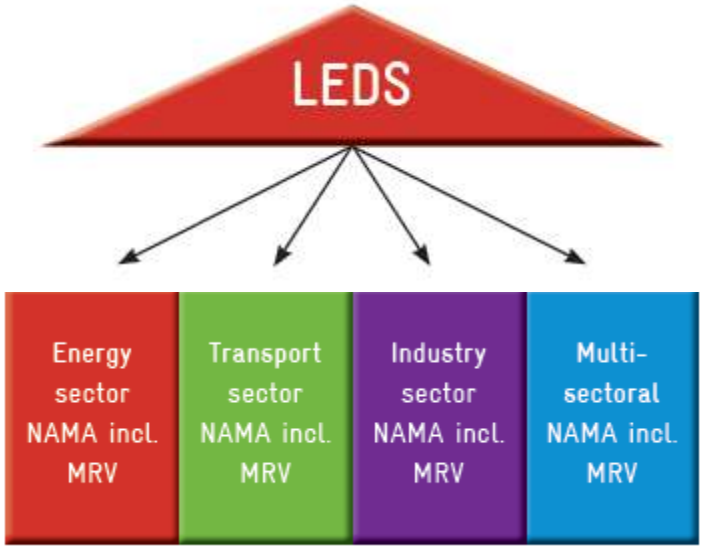
- The challenge is to consider the **global requirements** for achieving the 2°C objective while at the same time continuing **national development priorities**. This translates into the implementation of national long-term policies and strategies for sustainable development, while reducing GHG emissions and seizing opportunities for green growth.

- Comprehensive national and regional models for such low carbon and sustainable development are yet to be developed.

Intro III: LEDS, NAMA, MRV Architecture

Low-Emission Development Strategies (LEDS) are national long-term strategies for reducing emissions while promoting sustainable development. They provide an overall framework for the development of Nationally Appropriate Mitigation Actions (NAMAs).

The **Measurement, Reporting and Verification (MRV)** of these actions is important to generate transparency, built trust on their effectiveness and facilitate decision-making.



Note!
A LEDS and NAMAs can be developed at the same time.

→ *What is a LEDS?*

→ *What is a NAMA?*

Intro IV: Background on MRV

M = **Measurement** (or estimation)

R = **Reporting** – both national and international

V = **Verification** – includes both national QA/QC and international oversight

MRV should be applied in 3 areas:

- **MRV of emissions** (estimation of emissions at national, regional, sectoral levels)
- **MRV of NAMAs** (MRV of the impacts of mitigation policies and actions)
- **MRV of support** (MRV of financial flows/technology transfer/capacity building and their impacts)

Intro IV: Background on MRV – In the Negotiations

- **National Communications** include inventories and information on steps taken and national circumstances, according to guidelines for the preparation of NCs
- **Biennial Update Reports (BURs)** enhance the frequency and quality of reporting through NCs, covering inventories, mitigation actions and their effects, and gaps and constraints/ support received, according to guidelines for the preparation of BURs
- **International Consultation and Analysis (ICA)** will generate a technical analysis by a team of technical experts to identify capacity building needs and serve as a facilitative sharing of views. ICA is supposed to help improve national reporting systems.
- General Guidelines for **domestic MRV** of NAMAs are general, voluntary, pragmatic, non-prescriptive, non-intrusive and country driven, take into account national circumstances and national priorities, respect the diversity of NAMAs, build on existing domestic systems and capacities, and should help countries to set up their national MRV systems based on existing domestic processes, arrangements, methodologies and experts.

All countries should submit National Commuinications every four years

Developing countries should submit BURs every two years

Under ICA a technical analysis of BURs will be conducted by a team of technical experts

For Annex I Parties a **Common Tabular Format** (accounting tables) have been decided upon, including emission trends, quantified economy-wide emission reduction targets, progress in achievement of targets, scenarios and support provided.

Note!: Until 2015 a new global agreement is planned to be finalized and to come into force until 2020. This agreement will also entail robust MRV rules based on the current rules and lessons learnt made pre-2020, but the agreement will also have to address certain additional requirements and include a MRV and Accounting Framework.

Intro IV : MRV in 2015 agreement

Under negotiation in UNFCCC

Robust MRV rules post 2020 might base on the current agreed MRV rules. They might be reviewed later on in order to consider the experiences and lessons learnt made pre 2020.

Additionally to the current MRV rules, a MRV and Accounting Framework will be needed. Already on the way to the 2015 agreement, countries are invited to communicate their **intended nationally determined contributions** to the 2°C objective **post 2020** in a manner that facilitates **clarity, transparency and understanding** of the intended contributions. The **information** which countries shall provide **upfront** when communicating their intended contributions will be defined by the Ad hoc Working Group on the Durban Platform for Enhanced Action (ADP).

All Parties are also urged to communicate their **pre-2020 quantified economy-wide emission reduction targets (QEERTs) or nationally appropriate mitigation actions (NAMAs)**.

Intro IV: Background on MRV – National GHG Inventories

GHG inventories compile **quantifiable** data of measuring and reporting as well as for the verification of emissions and emission trends. GHG inventories can provide the informational basis for identifying mitigation potentials, planning mitigation actions, and tracking progress towards mitigation goals.

Note!: GHG inventories are an essential part of national MRV systems, but not a substitute!

The IPCC has provided Guidelines (2006) for the generation of national GHG inventories.

Countries should submit National GHG Inventories regularly

MRV of Emissions: Getting Started

The guidelines provide general guidance on data collection, how to deal with uncertainties, methodologies, time series consistency, quality assurance and quality control, and reporting (including definitions of gases to be reported).

The guidelines differentiate emissions from the sectors (1) energy, (2) industrial processes and product use, (3) agriculture, forestry and other land use, and (4) waste.

Additionally, a National Inventory Report is part of the National Communication and provides information on the generation of the GHG inventory.

Good practice checklist for generating a GHG inventory

Emission estimation: National GHG Inventory

Typical Inventory development cycle

Case Study: UK Instit. Arrangements

Intro IV: Background on MRV – National Communications

In the UN Framework Convention on Climate Change it was decided at the Earth Summit (UNCED) in Rio de Janeiro, 1992, that the each Party shall **communicate information** on inventories of anthropogenic emissions, on steps taken to implement the Convention, and on any other information relevant to the objective of the Convention and to global emission trends.

This information provided is supposed to serve as the **basis for planning and implementing action at national level** and **tracking impacts of action at a global level**.

At COP 8 in New Delhi, 2002, **guidelines for the preparation** of National Communications of Non-Annex I Parties have been adopted in order to assist countries in meeting reporting requirements, present information in a consistent, transparent, comparable and flexible manner, serve as policy guidance for the provision of financial support, and to enable the COP to track the implementation of the Convention. These guidelines also clarify that information on gaps and constraints, and related financial, technical and capacity needs should be included.

The Consultative Group of Experts (CGE) is mandated to provide capacity building for reporting.

All countries should submit National Communications every four years

Intro IV: Background on MRV – Biennial Update Reports

The agreements of COP 16 in Cancun (para 60), 2010, clarified that National Communications should be submitted every four years, as well as every two years **Biennial Update Reports** in order to **enhance** reporting in National Communications.

In 2011 at COP 17 the Durban outcome defined the objective and scope in the **UNFCCC biennial update reporting guidelines** for NAI Parties (Annex III). These guidelines are to assist countries in meeting reporting requirements, present information in a consistent, transparent, accurate, complete and timely manner, considering national circumstances, serve as policy guidance for the provision of financial support, and to present information on finance, technology and capacity building support needed and received as well as to present social and economic effects of response measures.

The Consultative Group of Experts (CGE) is mandated to provide capacity building for reporting.

Consultative Group of Experts (CGE)

The Consultative Group of Experts (CGE) is supposed to provide flexible and long term technical assistance according to developing countries' problems and constraints in order to improve their reporting capacities, including the elaboration of appropriate institutional arrangements and the establishment and maintenance of national technical teams for the preparation of NCs and BURs, including GHG inventories, on a continuous basis.

The CGE provides technical advice on accessing sources of financial and technical support for the preparation of reports, on how to integrate climate change considerations into relevant policies and actions, and on lessons learnt and best practices in reporting.

It develops training materials and organizes training programmes for nominated technical experts to improve their capacities for technical analysis in the preparation of reports.

It is composed of 24 experts nominated by regional groups:

5 from Africa

5 from Asia and the Pacific

5 from Latin America and the Caribbean

6 from Annex I Parties

3 from intergovernmental organizations

The CGE is established under the UNFCCC

Intro V: Purposes of MRV

Measurement, Reporting and Verification (MRV) are key elements

- for ensuring greater **transparency, accuracy and comparability** of information with regard to climate change in order to identify good practice, foster a learning process, and allow an international benchmarking,
- for **recognition** and **visibility** of mitigation achievements to raise ambitions of other countries,
- for **attribution of quantified impacts to policies**,
- for accounting national and international **progress**,
- for identifying **gaps** and international support needs,
- for creating **access** to international public and private finance, for robust MRV can attract additional finance.

Note: A national MRV system should always be as robust and ambitious as feasible in order to be most useful for domestic purposes of MRV and to address international requirements at the same time. For, to establish two parallel systems for domestic and international purposes would be highly inefficient.

Intro VI: Why do we need M,R & V for planning and implementing mitigation action?

National Drivers

- MRV systems underpin national GHG **data quality**
- MRV helps identify **national priorities** (including NAMAs), as well as challenges and opportunities
- Policy **planning and prioritisation and improving** policy coherence – important to keep track of lessons learnt from NAMA implementation to develop better policies in the future (continuous improvement of MRV systems and implementing NAMAs)
- For internal national record: Keeping a record of NAMAs in place, **tracking progress of the effectiveness** of NAMAs (e.g. emission reductions and progress to achieving objectives)
- **Data quality assurance**: important to access climate finance and participate in market mechanism (e.g. emission trading system)
- To **demonstrate to donors** the emission reduction and impacts of NAMAs

International Drivers

International requirements

- Improve **trust amongst Parties**
- International **recognition** for national performance
- Provide **lessons learned**
- Data quality is key to address national reporting obligations to the UNFCCC mechanisms and progress national engagement in the UNFCCC process:

Biennial Update Reports will include national GHG inventories and data on policies and measures, and these reports will be reviewed by the UNFCCC through International Consultations and Analysis (by a team of technical experts). In addition, National Communications are to be reported every 4 years, also including national GHG emissions data.

Intro VII: Concept to practice

- **GHG Inventories:** established methods and practices => provides good basis for building and improving national inventories
- **Mitigation Actions:** less focus to-date on the MRV of mitigation actions, particularly in developing countries
  - Non-comprehensive description in National Communications leads to vague understanding of mitigation impacts

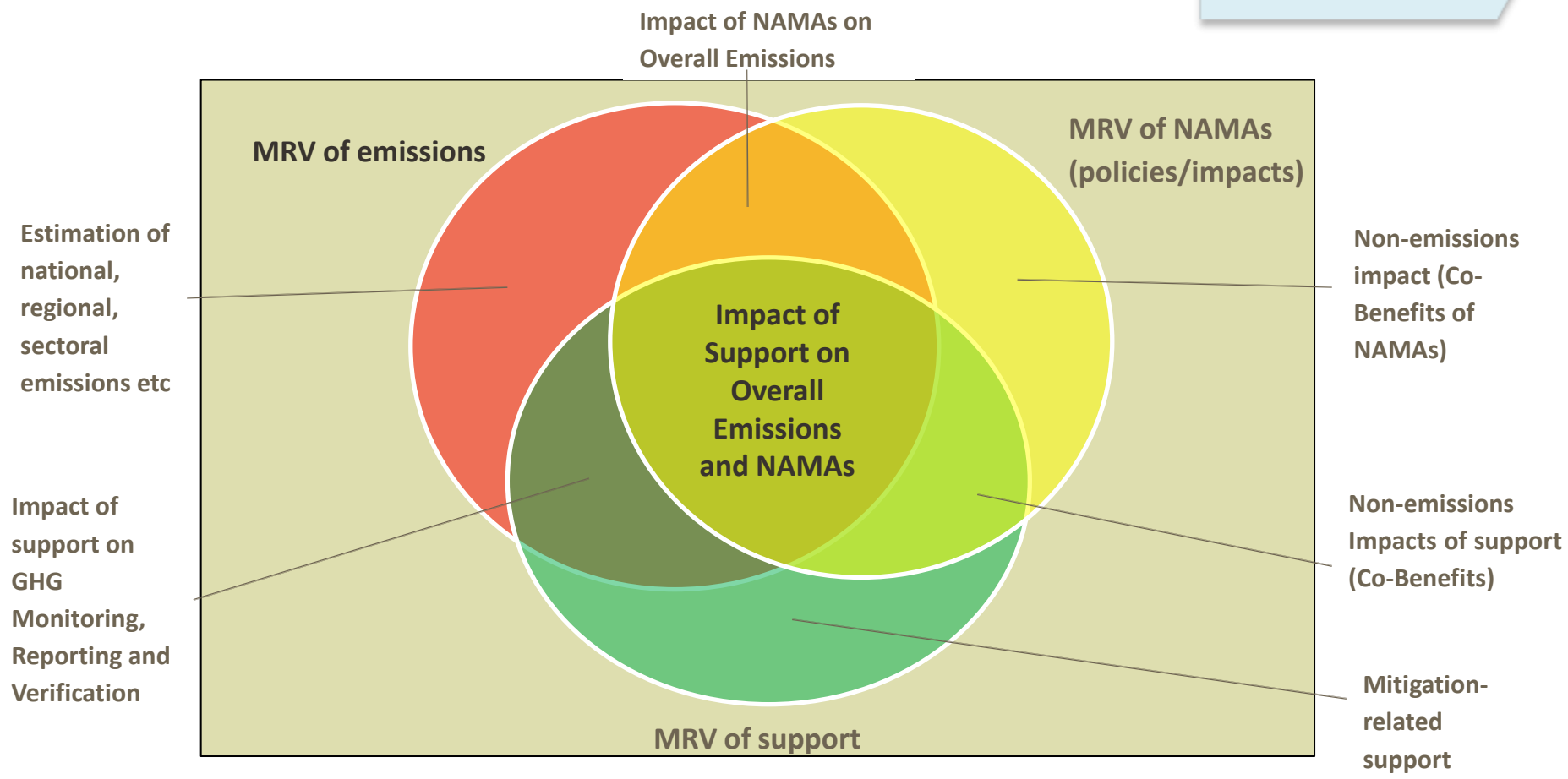
Note!: WRI/WBCSD GHG Protocol has developed a Policies and Actions Accounting Standard (2013) which includes all individual steps like defining causal chains, baseline, boundaries, quantification methodologies, reporting and verification.

- **MRV of Support:** traditionally an area where developed countries are required to MRV the support provided for climate change mitigation activities
  - Some lessons can be drawn from OECD-DAC experience regarding MRV of climate finance, e.g. applying markers to track finance
  - Developing countries are demonstrating growing interest in the MRV of support received for reasons that include greater accountability at home

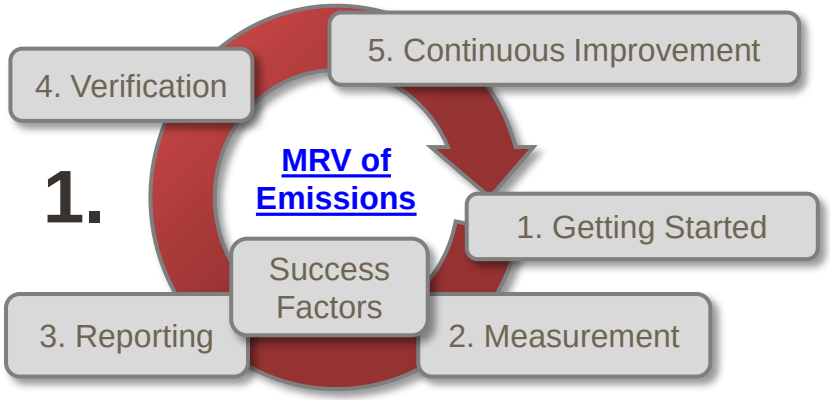
The National MRV System:

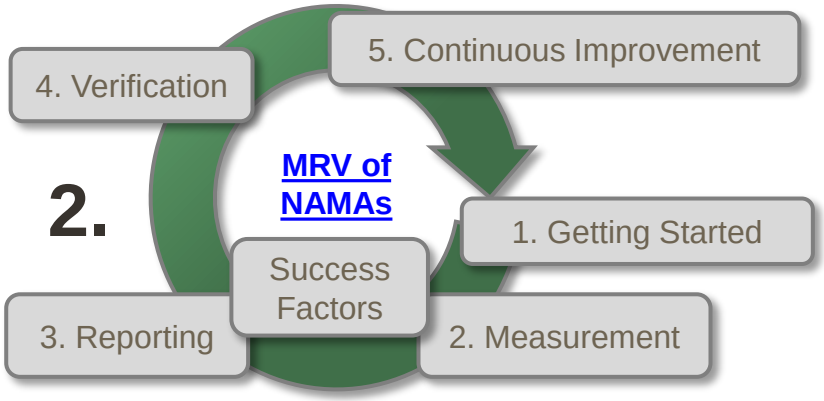
Interaction between MRV of emissions, NAMAs and Support

The national MRV System

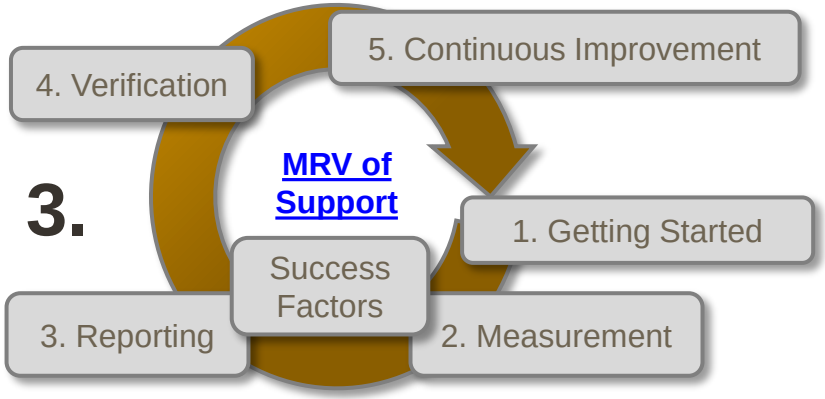


Menu: The 3 „Types“ of MRV*





MRV serves the purpose to continuously improve the intended contribution and the actions.



Ideally, an intended contribution and defined actions to achieve it exist. The impacts of these actions and the progress towards the target are the object of MRV.

* The MRV-Tool is not designed to be read from start to finish. Instead, follow the path you want to take by clicking on the links, forward arrows and back arrows.

Navigate by clicking on a particular Type or click here to start a full tour

Different Forms of Intended Contributions

National emission reduction intended contributions in form of pledges or targets can have different forms:

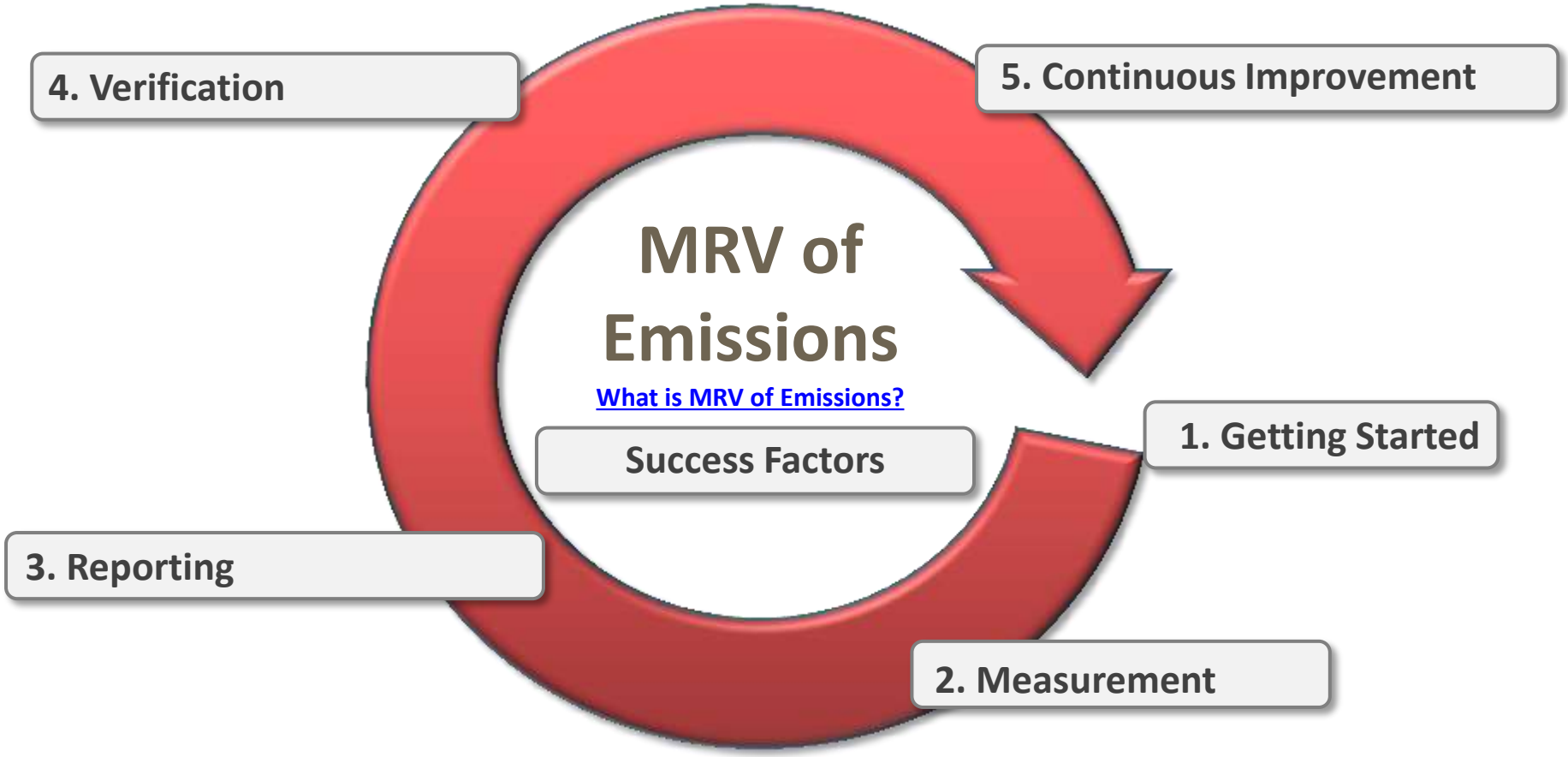
- Climate neutrality
- Emissions below business as usual
- Emissions below base year
- Emissions per GDP

Examples for national pledges and targets are provided in the Annual Status Report on NAMAs (2011), p. 6.

- ✓ National pledges or targets can be quantitative or qualitative.
- ✓ Quantified emission reduction targets can be in absolute terms or in relative terms, i.e. emission intensity per output.
- ✓ Quantified emission reduction targets can be defined nationally or internationally related to benchmarks.
- ✓ Quantified emission reduction targets can be economy-wide or sectoral.

Type 1: MRV of Emissions

Measurement - Reporting - Verification



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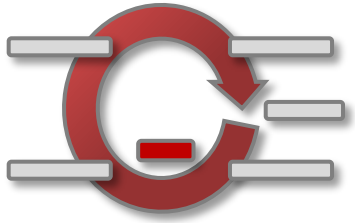
MRV of Emissions: Success Factors



Understanding the objective and scope of MRV of emissions is essential to steering the whole process and monitoring progress in achieving the desired outcomes.

Good information and **good communication** are the building blocks of a successful MRV System. Good information is the product of detailed and consistent monitoring, which is based on credible methods for systematically and comprehensively recorded emissions data. Gathering and reporting good information depends on good communication between all institutions involved.

Institutional arrangements must be in place to coordinate participation of stakeholders. **Clearly defined roles and responsibilities** will ensure the smooth flow of information to all entities producing, reporting and verifying the GHG estimates.

Good **legal arrangements** govern the fulfillment of responsibilities in delivering MRV of Emissions.

Key Outcomes | Good Information | Good Communication | Common Challenges and Solutions | Good practice checklist for generating a GHG inventory

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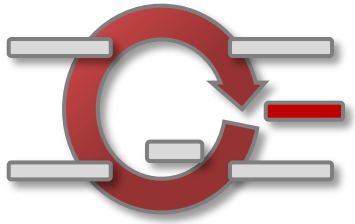
MRV of Emissions: Getting Started



Ideally, there is an **intended contribution** in form of a pledge or a target, operationalized in **actions** which need to be monitored by the national MRV system and around which the MRV Plan should be built.

Assess existing **institutional arrangements**, **methodologies**, **data collection systems** - particularly GHG inventories, and available information on **data quality**.

Identify gaps in **capacities**, **technical skills**, and **data availability** as well as in existing **instruments**.

Note!: The gaps need not be completely bridged in order to move to the next step, as capacity building and tiered approaches form part of the process of continuous learning and improvement.

Use existing **UNFCCC and IPCC mechanisms**, other available **information sources** and **sector-specific estimation tools** to help with the development of a functional system for MRV of Emissions.

Incorporate best practice from other countries in the design of the MRV System.

Consider the **cost-effectiveness** of all measures of the MRV system.

Gap Analysis Checklist | Sample of Guidance & Tools | Institutional Arrangements of MRV Systems | Categories of Relevant Stakeholders | IPCC Guidance

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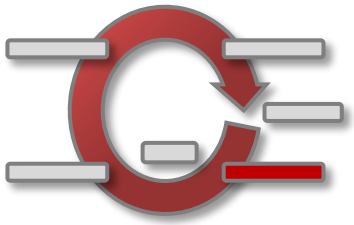
MRV of Emissions: Measurement



Measurement should cover overall emissions and emission reductions of GHGs.

Note: MRV of emissions can be applied at different levels (**national, sub-national), as well as sectoral and facility**. The measuring institution, as well as what, how and when gets measured, depends on the **scope of MRV of emissions**.

Establish **baselines** as a reference point for setting future mitigation targets.

Involve a range of organizations in the measurement process, e.g. companies, industrial operators, trade associations, government departments and research institutes.

Multiply activity data (AD), e.g. energy statistics, **with country-specific emission factors (EFs)** to achieve an estimation of national emissions.

Use/adapt existing standards and protocols for the measurement of emissions from point sources, such as industrial installations.

Harmonize the MRV systems on a national level, as well as in accordance **with international requirements**, e.g. National Communications or Biennial Update Report for the UNFCCC.

Emission estimation: National GHG Inventory | Defining an emission baseline | Emission estimation: Facility and Sector Levels | Case study: Transport emission estimation

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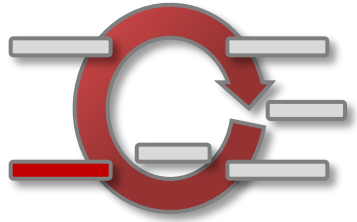
MRV of Emissions: Reporting



Include information on:

- Sectors, activities and types of gas
- Institutional arrangements
- Methodologies used, data sources, underlying assumptions, QA/QC procedures
- Level and sources of uncertainty and description of methodology used to determine the uncertainty
- Methodology of baseline construction (if available)

Countries should submit BURs and subject them to ICA

Use information collected on a facility and sectoral level by **individual companies or operators**.

Entrust a national entity with the development and coordination of the **national GHG inventory**.

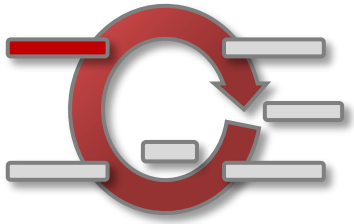
Follow existing guidelines and **time scales** for reporting, e.g. for the production of National Communications, Biennial Update Reports (BURs) and entries into the CDM registry. This will enhance credibility, reduces transaction costs and enables cross country comparison and analysis between MRV systems.

Guidelines for BURs | Principles of GHG Inventory Reporting | Facility and Sector Data – Further Information | Mexico case study

MRV of Emissions: Verification

Implement quality assurance and quality control procedures at national level, in order to improve transparency, accuracy, consistency, completeness, comparability and the overall confidence in the emission estimates. **Apply** QA/QC both for **data providers** and the **national entity** responsible for compiling the emissions estimates.

Countries should submit BURs and subject them to ICA



What? Who? How? When?

International Consultation and Analysis (ICA)

Verification is not supposed to control countries but rather to install an international **learning process** and to foster continuous improvement.
Also, **comparability** is not supposed to point at laggards but rather to enable Parties to add up numbers at national and international level.

Types of verification

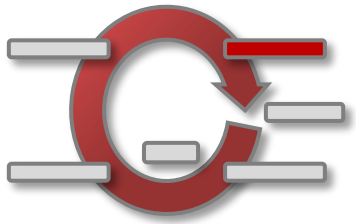
Follow **internationally established time frames** for verification of emission data. GHG inventories for Annex 1 Countries are reviewed annually by the UNFCCC, whereas BURs are subjected to international consultation and analysis (ICA) within 6 months after submission.

Further Info on QA/QC

Verification entities can be **UNFCCC reviewers**, a team of technical experts under the UNFCCC who conducts ICA, or independent auditors for CDM projects.

MRV of emissions in the sub-national context

MRV of Emissions: Continuous Improvement



Increase transparency, consistency, comparability, completeness and accuracy of GHG emission estimates. This can be done through developing **an improvement plan** to guide future efforts and prioritise resources for improving GHG emission estimates for the next time round.

Exchange experience with other countries. This will provide valuable input for the development of the improvement plan.

Steps for developing a **national inventory improvement plan** may include:

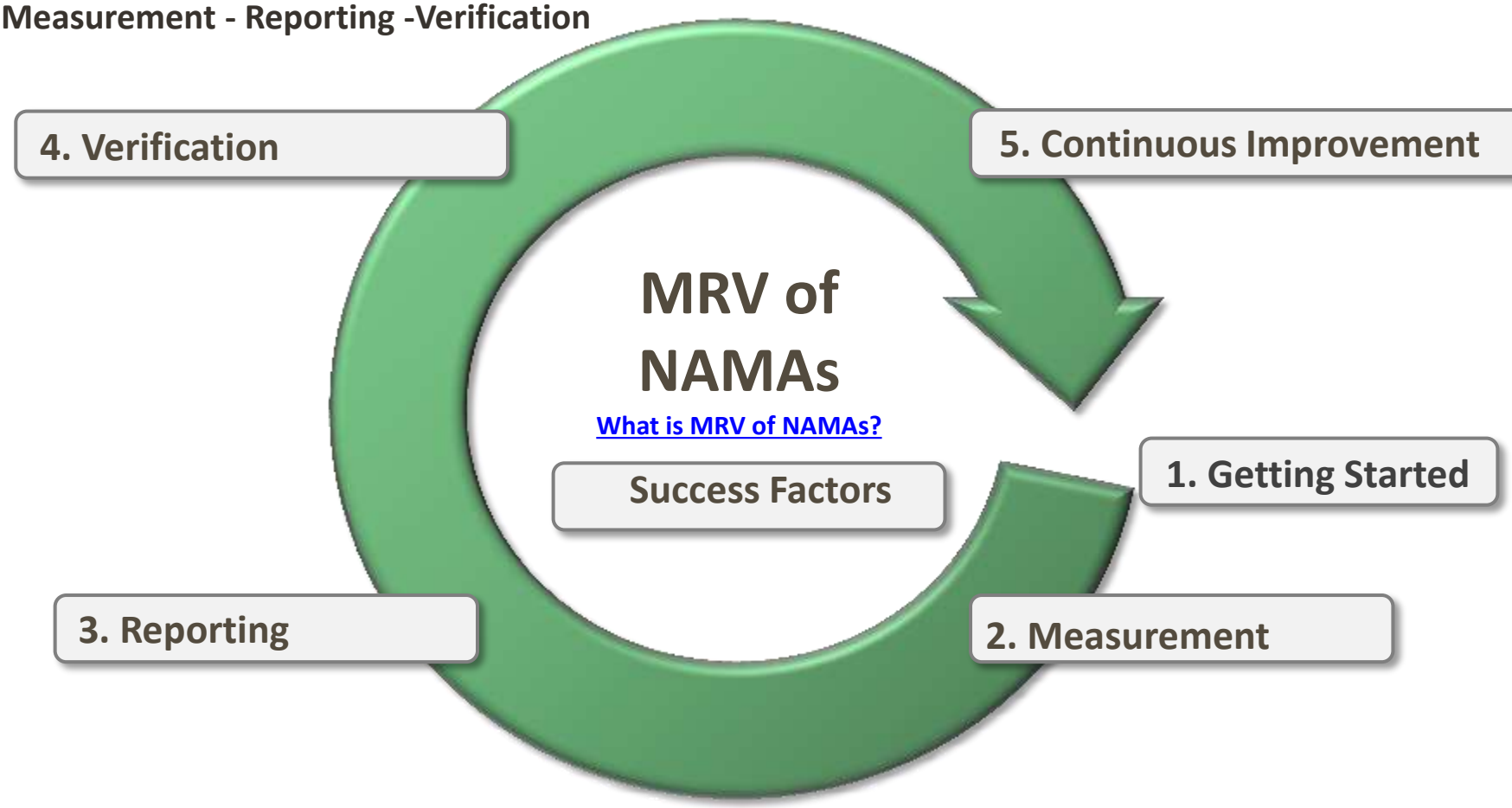
1. **Re-examination** of the gap analysis checklist, collected at the beginning of the process
2. **Identification** of key source categories and individual improvement for each source category
3. **Prioritization** of improvements
4. **Identification** of possibilities for improving institutional arrangements
5. **Development** of actions, projects and programme to implement inventory improvement
6. **Documentation** of the plan

If there is a intended contribution to reduce emissions, the results from the continuously improved inventory should also be reflected in the assessment of the intended contribution.

Continuous Improvement Checklist → Tiered Approaches

Type II: MRV of NAMAs:

Measurement - Reporting -Verification



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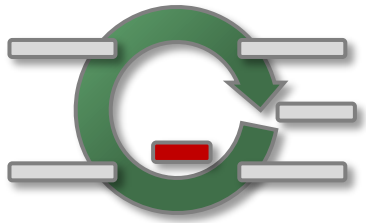
MRV of NAMAs: Success Factors



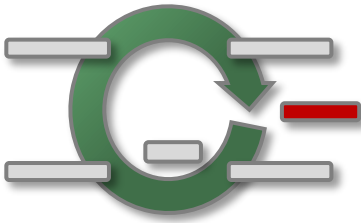
Understanding the **rationale** behind developing a successful MRV plan is the key to understand the MRV of NAMA success factors.

- **Good information and communication** are of vital importance. Gathering and keeping a record of information for reporting relies on good communication and coordination between all entities involved in the monitoring process.
- **Define clear roles and responsibilities** and give **transparent guidance** to each organisation involved in developing and implementing the NAMA MRV-plan. This will ensure the reliability and consistency of the measured information, as well as its timely reporting and verification.
- **Calculate emission** mitigation and mitigation costs based on **proven or credible methods** and using the **best available data**.
- **Monitoring quality and reliability of data** and an **open and transparent access to information** increases the efficiency of the MRV process. Emission mitigation and mitigation costs should be calculated based on **proven or credible methods** using the **best available data**.
- **Examine existing MRV best practice** to ensure the MRV plan is designed according to national requirements.
- **Perform** continuous **review and improvement of the MRV plan**. Organisations with different expertise should be involved, in order to maximise technical capabilities.

MRV of NAMAs: Getting Started

Consider the design of MRV systems in the early stages of the NAMA development.

Countries shall submit BURs and subject them to ICA



• **Design MRV plans for NAMAs that suit the parties involved** – whether it be NAMA developers or national or international supporters – and build upon existing experiences.

•The UNFCCC negotiations reached international agreement on guidelines for reporting (***Biennial Update Reports***) and verification (***International Consultation and Analysis***) of national-level mitigation information, the ***composition of the Teams of Technical Experts*** to undertake the technical analysis of BURs, and on ***general guidelines for MRV of NAMAs*** to set up national MRV systems. Taking this guidance into account, the NAMA developer and those supporting the NAMA – whether it be national or international supporters – may design MRV plans for NAMAs, including processes, arrangements, methodologies and expertise needed, that suit the parties involved and facilitate reporting on their impacts in BURs.

•Development cooperation experience with project monitoring, sectoral experience with measuring and reporting, and CDM experience with verification offer valuable lessons for designing a NAMA MRV plan which answers four major questions during the

Note!: WRI/WBCSD GHG Protocol has developed a Policies and Actions Accounting Standard (2013) which includes all individual steps like defining causal chains, baseline, boundaries, quantification methodologies, reporting and verification.

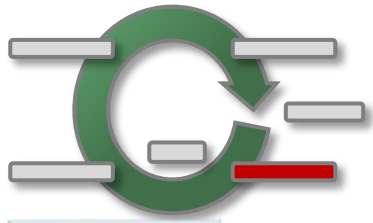
What? Who? How? When?

Important aspects when developing NAMAs

Policies and measures in the NCs

EU Monitoring Mechanism

MRV of NAMAs: Measurement



Define a baseline: calculate the difference between the **emissions projections scenario** with and without the NAMA, in order to obtain an estimation of the emission mitigation impact of the NAMA. (Defining a Baseline)

Creating a marginal abatement costs curve (MAC) can be useful to calculate and compare mitigation costs.

Evaluate co-benefits, as well as economic incremental costs. For this purpose create indicators to track progress on:

- The achievement of NAMA's goal
- The achievement of sustainable development goals

Develop data management systems to identify and record measurable data from different sources. Data management systems should consider different sets of indicator, be transperant, use harmonized methodologies and deliver data in a timely manner. (Data Management System)

Designate a central organization responsible for compiling and evaluating information, received through the data management systems.

Define responsibilities to sectoral organizations, municipalities, companies and other stakeholders.

Conduct measurement on a regular basis, e.g. every year for the purposes of the national inventory system, every two years for BURs, and upon agreement in the case of bilateral arrangements.

What? Who? How? When?

Emission Mitigation Impact

MRV for a Housing NAMA in Mexico

Kenya MRV + Case Study

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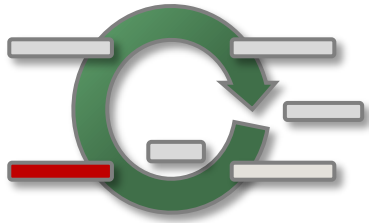
MRV of NAMAs: Reporting



Follow the qualitative and quantitative guidelines for submission of BURs, as adopted in Durban.

- **Quantitative information** – data on emission savings and methodologies
- **Qualitative information** – data on sustainability objectives, coverage, institutional arrangements and activities within the NAMA.

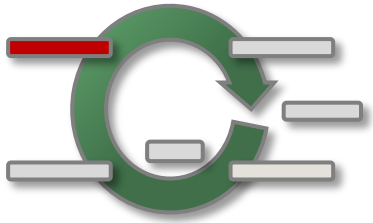
Designate organisations responsible for reporting to the UNFCCC (BURs), to NAMAs' financiers and to the national government.

Define clear responsibilities for the NAMA implementers. The **MRV implementation plan** should give answers to the questions: ***what*** to report, ***how*** to report, ***when*** to report and ***who*** should report.

Reporting in the Cement Sector of South Africa

Reporting on Policies under the EU MM

MRV of NAMAs: Verification



Subject the qualitative and quantitative information reported on the NAMA to **national** verification procedures, such as quality assessment procedures.

At **international level**, BURs will be subject to the process of **International Consultation and Analysis (ICA)** which will support countries in improving their M&R systems and mitigation actions.

It is performed by different **organisations at domestic and international levels**, e.g. technical experts from the UNFCCC roster of experts or by government institutions.

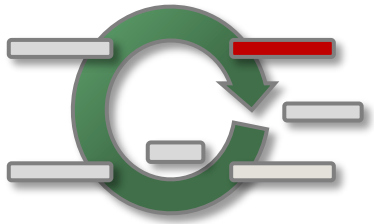
Assign different organisations to verify information at different stages of the MRV framework for NAMAs and apply **Transparency, Completeness, Consistency, Comparability, Accuracy (TCCCA)** criteria.

UNFCCC review of NCs

Case Study Verification: Lessons from the CDM for NAMA Verification

Verification Entities and Stages

MRV of NAMAs: Continuous Improvement



Measurement

- Increase **efficiency of data collection**;
- Increase **capacity for quantifying emission saving estimates**;
- Measure new data previously not available; and
- **Improve** the quality of data through improved methodologies for measuring
- **Revise baseline assumptions**

Reporting

- Ensure that the submission **meets all requirements** in guidelines;
- Improving efficiency through developing tools useful for reporting NAMAs;

Verification

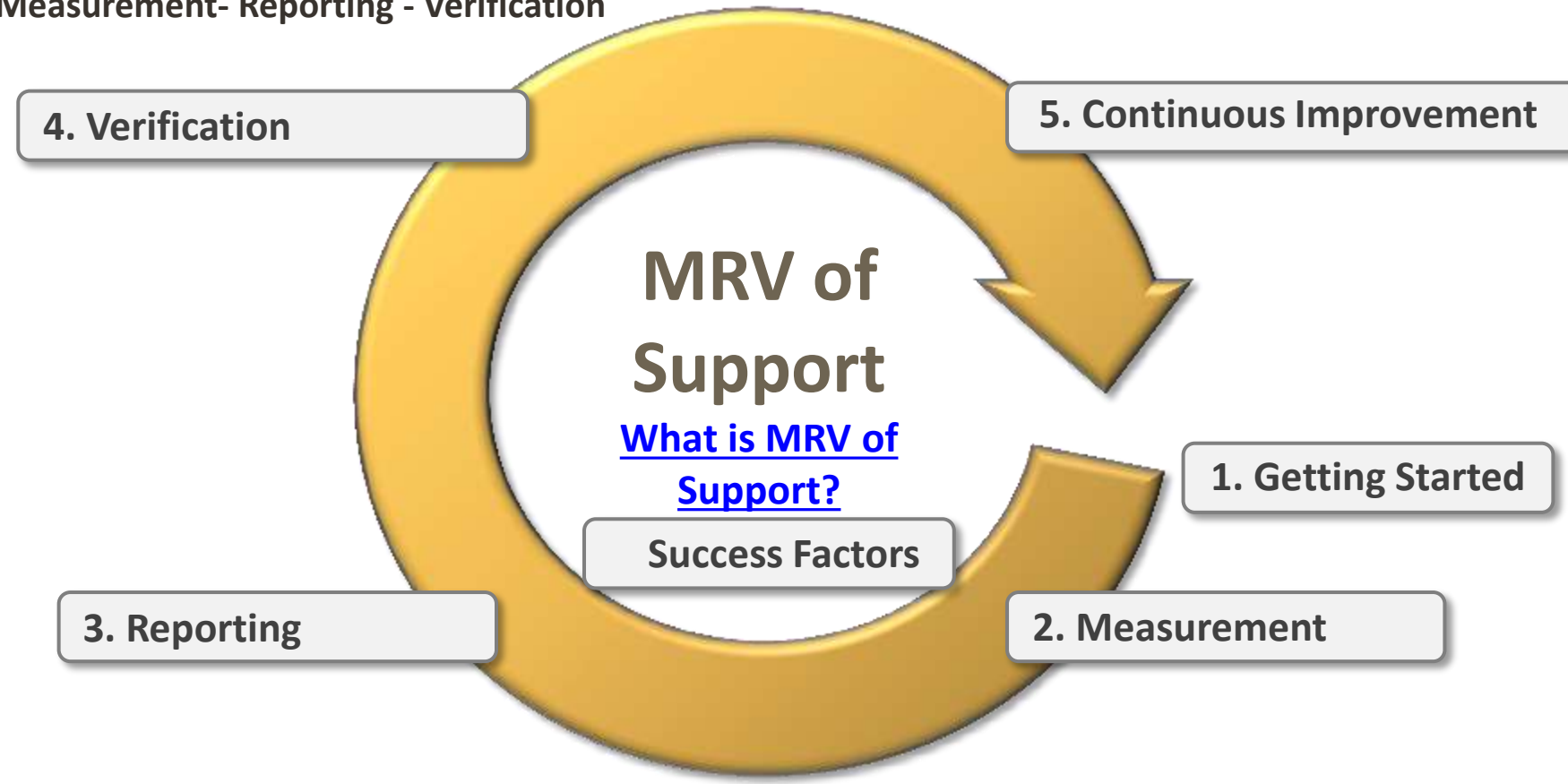
- Implement **feedback** and issues found by independent reviewers;
- In-house post submission review **to develop an improvement plan**; and
- Build in-house QA/QC procedure to improve efficiency of verification in terms of cost and time.

Note!: MRV systems can improve NAMA implementation.
In turn, new NAMAs require continuous improvement of MRV Plans.

Case Study Continuous Improvement: Combining MRV in China

Type III: MRV of Support:

Measurement- Reporting - Verification



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Intro IV /MRV of Support: **What is MRV of Support?**

MRV of Support is a concept to measure, report and verify **financial flows, technology transfer, capacity building** and the impacts of the provided support.

A framework for MRV of Support and long-term climate finance serves the purpose

to keep track of intended contributions and their delivery and building trust among developed and developing countries through improved transparency and accountability

to improve effectiveness of international cooperation and to create incentives for private investment

through providing a clearer **overview of financial flows, trends, sources, and purposes of international and domestic climate support**

The international requirements for MRV of support build on three pillars, the Bali Action Plan, Copenhagen Accord & Cancun Agreements and are **not yet decided**.

What gets Measured: The flow of finance and levels of technology transfer that can be accounted to interventions related to mitigation actions.
What gets Reported: The forms of finance, its purpose, sectoral and geographic distribution, leverage of private funding and disbursement.
What gets Verified: The scale of support between donors and recipients, the effectiveness of support and cost-benefit impacts.

The Rationale of MRV of Support | Key Challenges | The three Pillars

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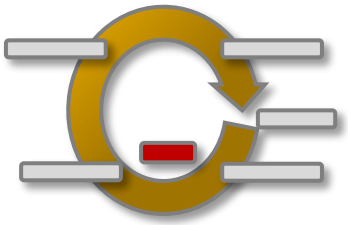
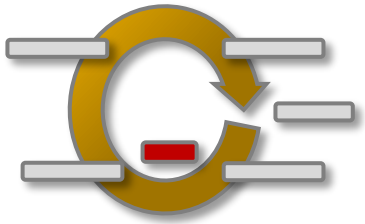
MRV of Support: Success Factors



It is desirable that the MRV of support is not only a task for developed countries but – in the long term – one common system for donors and recipients.

- **Scope of transparency** (pledge, amount disbursed/ mobilized, actions supported, domestic allocation, impacts) must be defined by introducing design options for operationalising MRV of support
- **Completeness** of areas and kinds of information
- **Consistency** with time frames of the current and future reporting under UNFCCC
- **Collectability** of data that are subject to MRV
- **Comparability** to coordinate and adjust different kinds of data, for comparison and aggregation (and avoiding double counting)
- **Accuracy** of the level of collected information on support (received)
- **Predictability** of financial support that is subject to MRV

MRV of Support: Success Factors



There are **several options for designing MRV of support**,
based on level of complexity and scope of transparency of the system:

- Option 1: Transparency over the financial pledge and received amount of support.
- Option 2: Transparency over the actual amount and content of supported actions.
- Option 3: Transparency over international as well as domestic support for climate actions.
- Option 4: Transparency over support as well as impact generated by the supported actions.

Shift in MRV requirements

Option 1

Mainly for donors (developed countries)
Ticks relatively fewer success factors

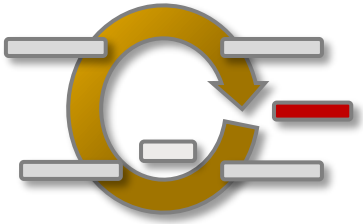
Option 4

For donors and recipients (developing countries)
Based on more success factors and desirable in the long term

Institutional Options for MRV of Support

MRV of Support: Getting Started

Under negotiation in UNFCCC



1. **Define the intended purpose and rationale** of the MRV of Support system as a framework for MRV of long-term climate finance
2. Reflect **intended contributions and actions (depending on support received)** in the design of MRV of Support system
3. **Consider the international finance architecture** when designing the MRV of climate finance and **adjust it reiteratively to progress** in the international negotiations

The institutional arrangements for MRV of support are still work in progress. They build on three pillars – **Bali Action Plan, Copenhagen Accord & Cancun Agreements**.

The Rationale of MRV of Support | Key Challenges | The three Pillars

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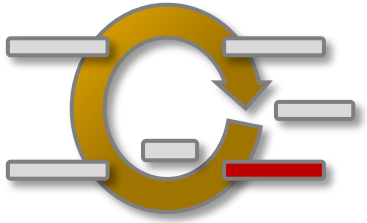
MRV of Support: Measurement

Under negotiation in UNFCCC



Define what MRV of support needs to cover, as e.g.:

- **Financial flows** - from whom to whom, amount, type of financial instrument, private/public, new/additional.
- **Type of support** – financing, technology transfer/advice, capacity building
- **Supported activities** – type of NAMA, level of impact (sectoral, regional etc.)
- **Impact of supported actions** – metric/non-metric indicators

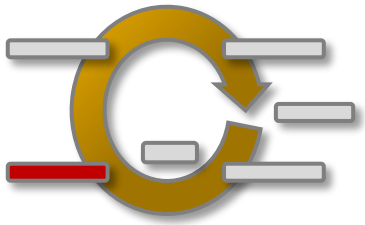
Identify indicators for provided/received support (including technology transfer and capacity building), in order to be able to **measure** and **quantify** them

Designate clear responsibilities to government departments/agencies, or the private sector, according to their expertise

Note: *Given the increasing emphasis being placed on the significant role of private climate finance, countries are strongly encouraged to develop procedures for monitoring private capital flows.*

Defining a baseline to track provision of support | Required actions for private finance | Case study: Climate Fiscal Framework Initiative -Thailand | French Development Agency (AFD)

MRV of Support: Reporting



Include information on:

- **Forms of finance** (grants, concessional lendings, equity, guarantees etc.)
- **Purpose** of the support (typology: mitigation/adaptation)
- **Distributions** of support across sectors/activities, geographically)
- **Private** finance leveraged
- **Impact** pursued/achieved
- **Comparison with donors' pledged** and actually **disbursed** amount of support

Compile information in **BURs and NCs** and make it publicly accessible

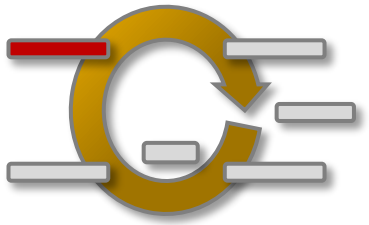
*Public flows of support are reported usually at a national level. Currently reporting systems include the **UNFCCC's National Communications** and the **OECD DAC's Rio Marker system**. However, as of now, only developed countries are required to report under them.*
These two systems need to be improved greatly, in order to meet demand for information and involve developing countries more fully into the reporting process.

Problems with existing systems

Case study: Kenya's National Climate Fund

MRV of Support: Verification

Under negotiation in UNFCCC



Verify:

- **Scale** of support (comparing data from contributors and recipients)
- **Effectiveness** of support (actual GHG reduction and/or achievement of development countries priorities)
- Cost-benefit **impacts** (e.g. for adaptation, green growth development)

Ideally, verification should be carried out by **independent, non-political finance experts**.

Currently, there are **no guidelines for verifying** level of support. The **scope of verification** (project, sectoral, national) determines the **methods** and data requirements.

Verification of support involves **comparing** MRV data from **contributors and recipients of support.** Therefore data should be as accurate as possible and comparable.

Verifying the **impact of support** is a similar process to verifying **impact of NAMAs.**

International Consultation and Analysis (ICA)
Case Study: Indonesian Climate Change Trust Fund
Developed Countries Case Studies (KfW and IFC)

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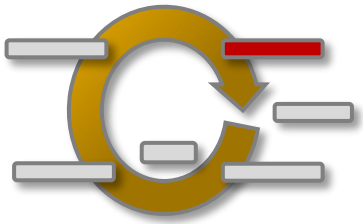
MRV of Support: Continuous Improvement



Examine and evaluate continuously the **strengths**, **opportunities**, **weaknesses** and **constraints** of the existing system (*SWOC analysis*), in order to identify and realize potential for improvement.

Thereby, the following key challenges must be addressed:

- **multiple channels** for climate finance and the possibility to observe them
- **differentiation** of channels of finance flows
- **heterogenous** capacities and governance structures

Note!: Results from the MRV of Support should also be reflected in the reassessment of pledges.

Practical challenges for developing countries

Developing Countries key Challenges and Requirements

MRV
Measuring, Reporting, Verification

Instrument

in individual steps

End Presentation

Main Menu

The National MRV System

- The entire system is where institutional, regulatory, technical, and sectoral bodies at multi-levels of government interact **to check the effectiveness of mitigation actions and support received**, as well as the **quality of emissions monitoring**.
- The System is also where the **impact of support** (domestic and international) on overall emissions reductions is monitored.
- …

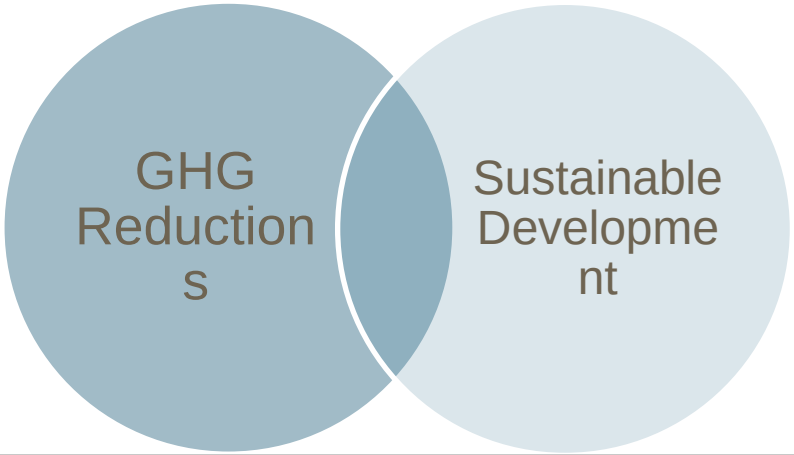
MRV of support will be under negotiation in UNFCCC

MRV in the sub-national context

Intro III- What is a LEDS?

A **Low-Emission Development Strategy (LEDS)** is a **national, high-level, comprehensive, long-term strategy**, developed by domestic stakeholders, which aims at decoupling economic growth and social development from greenhouse gas (GHG) emissions growth, creating a roadmap for continued collaboration and a framework for sectoral activities (like NAMAs) and mainstreaming activities, and taking into consideration time horizons in the global climate process until 2015 (when a global agreement shall be negotiated) and 2020 (when the global emission peak must be reached).

The goal of a LEDS is to make development climate-compatible. NAMAs contribute to the implementation of LEDS. An ambitious climate policy generates and reinforces sustainable development co-benefits, and vice versa, and is, hence, ambitious development policy at the same time.



Developing Countries are encouraged *„to develop low-carbon development strategies or plans in the context of sustainable development"* – Cancun Agreements (2010)

Related Policies and Plans

Intro III- What is a LEDS? – Related policies and plans

- A LEDS and individual NAMAs should build upon **existing national strategies** and processes (see examples in the illustration)
- LEDS do not need to be something new but rather integrate and mainstream mitigation into existing strategies, thereby reinforcing sustainable and low carbon development mutually.

- There are also a number of other denominations for similar policy instruments, such as *Low Carbon Development Strategy, Climate-Compatible Development Plan, or National Climate Change Plan*. But the aims, purposes and basic elements are not very different.

Intro III- What is a NAMA?

The concept of NAMAs was introduced in the **Bali Action Plan** 2007 as:

*„**nationally appropriate mitigation actions** by developing country Parties in the context of sustainable development, supported and enabled by **technology, financing and capacity-building**, in a **measurable, reportable and verifiable** manner.“*

No internationally agreed upon definition exists; however **2 categories** have emerged:

Industrialized country (Annex I)	Domestic Funding for NAMA	Developing country (Non-Annex I)	**Unilateral NAMA**
Industrialized country (Annex I)	Finance, Technology, Capacity building →	Developing country (Non-Annex I)	**Supported NAMA**

At a later stage, carbon markets may also be a mechanism in the long run to attract resources for NAMAs. The role of carbon markets in financing NAMAs is under discussion among various stakeholders and includes the concept of **credited NAMAs**. However, this concept is neither used in any of the official documents nor has it yet been formally established

International requirements

Bali Action Plan (1/CP.13)	Copenhagen Accord (1/CP.15)	Cancun Agreements (1/CP.16)
b) Enhanced national / international action on mitigation of climate change, including, inter alia, consideration of: (i) **Measurable, reportable and verifiable nationally appropriate mitigation commitments or actions**, including quantified emission limitation and reduction objectives, by all developed country Parties, while ensuring the comparability of efforts among them, taking into account differences in their national circumstances; (ii) Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, **in a measurable, reportable and verifiable manner**;	4. ...Delivery of reductions and financing by developed countries will be **measured, reported and verified** in accordance with existing and any further guidelines adopted by the Conference of the Parties, and will ensure that accounting of such targets and finance is rigorous, robust and transparent.	112. Decides to establish a Standing Committee under the Conference of the Parties to assist the Conference of the Parties in exercising its functions with respect to the financial mechanism of the Convention in terms of improving coherence and coordination in the delivery of climate change financing, rationalization of the financial mechanism, mobilization of financial resources and **measurement, reporting and verification of support provided to developing country Parties**; Parties agree to further define the roles and functions of this Standing Committee;

MRV of emissions – additional slides

MRV of Emissions:

An Overview of Measurement: What, Who, How and When?

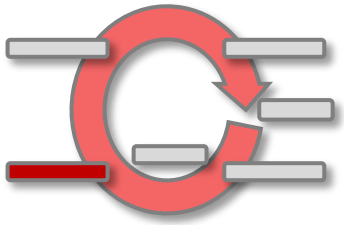
The What, Who, How and When questions will depend on the scope, which can be considered at 4 different levels: National, Sectoral and Facility.

What gets measured?	Who measures?	How to measure?	When to measure?
Emissions and removals of GHGs (CO_2, CH_4, N_2O and F-gases) Underlying activity data (AD) such as energy statistics and country-specific emission factors (EFs) At sub-national level: community-scale GHG inventories	This may involve a range of organisations such as companies, industrial operators, trade associations, Government department and/or research institutes.	Generally derived from estimation rather than measurement, e.g multiplying activity data with emissions factors. Emissions may also be measured from some point sources, including from industrial installations, but recognised standards and protocols need to be used. At sub-national level: GPC (Global Protocol for Community-Scale GHG Emissions)	This is usually driven by reporting requirements at national and/or international level (e.g. National Communications or Biennial Update Report for the UNFCCC)

MRV of Emissions:

An Overview of Reporting: What, Who, How and When?

The What, Who, How and When questions will again depend on the scope, which can be considered at 3 levels: National, Sectoral and Facility.



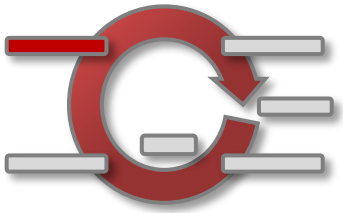
What information is reported?	Who reports?	How to report?	When to report?
• GHG estimates by sector, activity and type of gas • Institutional arrangement • Description of methodologies used in compiling the inventory • Data sources, underlying assumptions, QA/QC procedures • Level and sources of uncertainty and description of methodology used to determine the uncertainty	This depends on the scope: the national entity responsible for the delivery of national GHG inventory, or individual company or operator	• Use of Reporting Guidelines • Through National Communications and Biennial Update Reports (BURs) • CDM registry • At sub-national level carbon*n* Cities Climate Registry	This is driven by reporting time scales at national or international level e.g first BURs (which includes national GHG inventory) need to be submitted by Dec 2014 and subsequent BURs every two years.

MRV of Emissions:

An Overview of Verification: What, Who, How and When?

The What, Who, How and When questions will again depend on the scope, which can be considered at 3 levels: National, Sectoral and Facility.

Under negotiation in UNFCCC



What information is verified?	Who verifies?	How to verify?	When to verify?
• Annex I GHG inventories are reviewed annually by UNFCCC • Biennial Update Report (BUR) subjected to international consultation and analysis (ICA)	• UNFCCC reviewers (and for EU Member States, EU Review team) • A team of technical experts under the UNFCCC who conducts ICA • Independent auditor (for CDM project)	• See Review Process for Annex I Parties • Comparison against guidelines • The Types of verification determines the way verification is carried out	• Annex I GHG inventories are reviewed annually by UNFCCC • First round of ICA of BURs within 6 months of submission of first BURs. Frequency after that will depend on frequency of further submissions.

International Consultation and Analysis (ICA)

Under ICA a technical analysis of BURs will be conducted by a team of technical experts

According to decisions adopted by the Conference of the Parties (COP) on its seventeenth session held in Durban, Biennial Update Reports (BURs) are subject to ICA under the Subsidiary Body for Implementation (SBI) and it will be conducted in a manner that is non-intrusive, non-punitive and respectful of national sovereignty.

The aim of ICA is to help countries **improve domestic reporting systems** and increase the **transparency** of mitigation actions and their effects, **through analysis by technical experts in consultation with the Party concerned and through sharing of view**, and will result in a summary report. The ICA process will consist of two steps:

- A **technical analysis** of the BURs submitted by non-Annex I Parties by a team of technical experts in consultation with the Party, and will result in a summary report. The technical analysis is supposed to identify capacity building needs and will consider the principles applied to the BURs (transparency, accuracy, completeness, consistency, comparability). The information considered should include the national greenhouse gas inventory report, information on mitigation actions, including a description of such actions, an analysis of their impacts and the associated methodologies and assumptions, the progress made in their implementation and information on domestic MRV, and on support received;

- A **facilitative sharing of views**.

The first rounds of ICA will be conducted for developing country Parties, commencing within six months of the submission of the first round of BURs by developing country Parties (i.e. June 2015). The frequency of participation in subsequent rounds of ICA by developing country Parties will be determined by the frequency of the submission of BURs.

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Back to MRV of Support: Verification
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Back to MRV of Emissions: Verification
Back to Intro IV: MRV – In the Negotiations

MRV of Emissions:

What are the Key Outcomes?

What are the key outcomes sought with the implementation of a MRV System ?

- Good quality data from emission sources to help **prioritise effective and cost-effective climate change policy action** on GHG mitigation.

- Data at installation / sector / national levels that **meet the requirements of UNFCCC mechanisms** (e.g. National Inventories, Biennial Update Reports, National Communications) and UNFCCC Principles for Reporting on GHG Inventories: Transparency, Consistency, Comparability, Completeness and Accuracy. This will open the doors to global climate finance mechanisms.

- Clear picture of national priorities and the strengths and weaknesses of the current systems. Clarity on **where improvement to systems, mechanisms or capacity is needed, what further financial support**, transfer of knowledge and technology is required, and what can be done with the existing systems and information.

- Develop a better understanding of common objectives across a wide range of national stakeholders, **fostering buy-in from different stakeholders and clarifying the current and future roles and responsibilities** within a national system of GHG data management: data suppliers, national statistics agencies, research organisations, companies and trade associations, Government agencies, Departments / Ministries.

MRV of Emissions:

Success Factors: Good Information

How to generate high-quality GHG estimates:

National and Sectoral Levels:

- Follow IPCC Guidelines such as:
  - IPCC Guidelines for National Greenhouse Gas Inventories
  - Good Practice Guidance for Land Use, Land-Use Change and Forestry
  - Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories
- Use of complete and accurate **activity data and emission factors** underpinned by **objectives for high quality data** and legal arrangements.

Sub-national /Local level:

- For community scale inventories follow GPC (Global Protocol for Community-Scale GHG Emissions)
- For emissions from Local Government operations the International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP) can be used

Sector and Facility data – further info

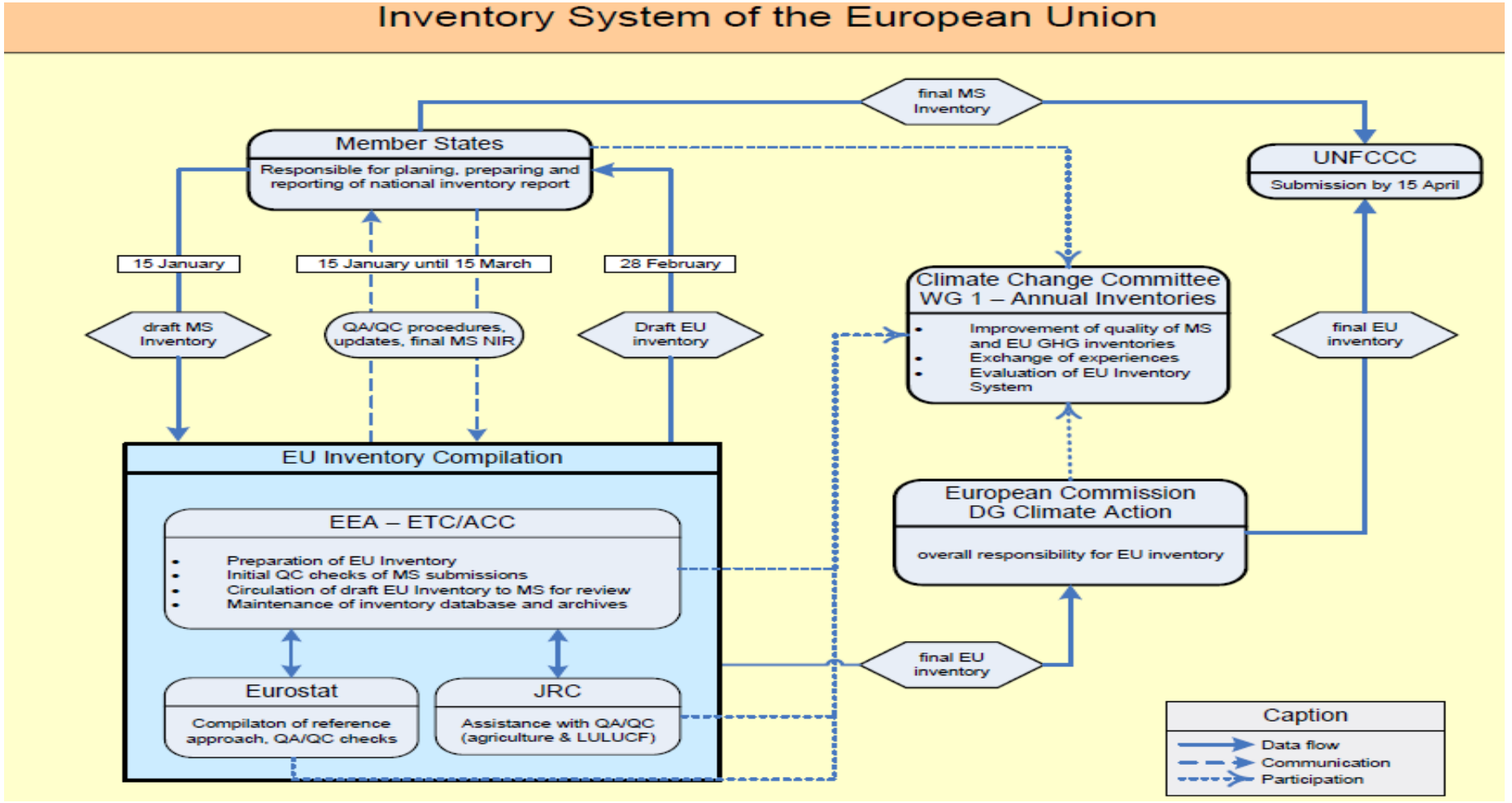
Facility Level:

- Follow established guidelines such as
  - EUETS Monitoring and Reporting Guidance
  - Methodologies for Clean Development Mechanism projects

Corporate Level:

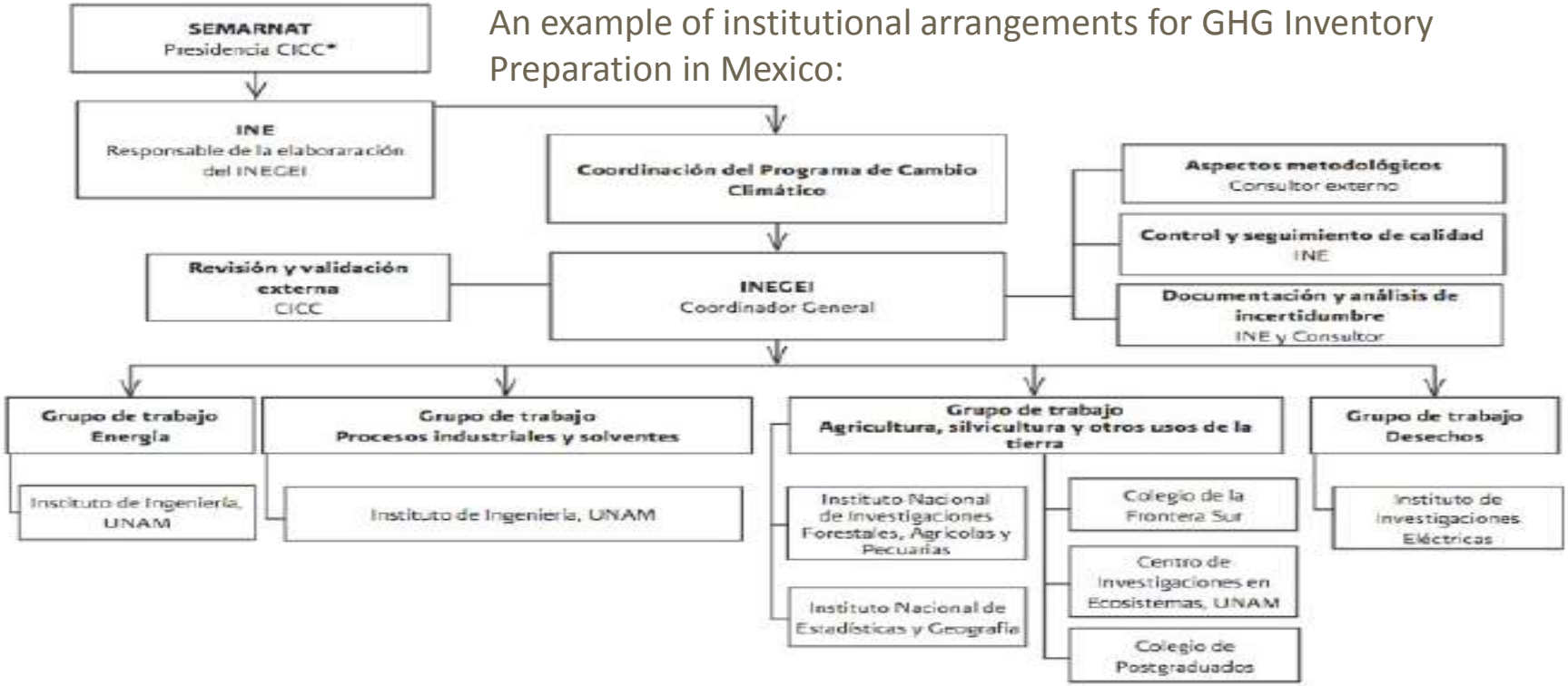
- GHG Protocol guidance from the GHG Protocol Corporate Standard can be used.

Success Factors - Good Communication (1)



Success Factors - Good Communication (2)

An example of institutional arrangements for GHG Inventory Preparation in Mexico:



Note: An organogram is a useful tool to show the roles and responsibilities, the connection between ministry departments and the relevant agencies involved in the MRV system of Emissions. However, this alone doesn't mean good communication – it has to be facilitated by clear leadership and clear vision.

MRV of Emissions:

Common Challenges & Solutions

The common challenges are of two distinct forms: Institutional and Methodological.

Common Challenges	Possible Solutions
Institutional • Unclear National System - lack of clarity on the roles and responsibilities • Lack of political will and buy-in from across stakeholders • Weak coordination capacity between national and sub-national entities • Difficulty in maintaining expert human resources - loss of institutional memory and capacity	• Establish a solid national system with clearly defined roles and responsibilities for the institutions involved • Staff institutions sufficiently and provide staff with training on methodologies • Establish coordination mechanism between governmental departments • Develop a common understanding of the objectives across all relevant stakeholders • Promote awareness of the importance of a quality GHG inventory
Methodological • Limited technical and analytical capacity • Limited systems for data management and reporting • Lack of country specific activity data and emission factors for sources and sinks	• Implement capacity building and identify funding and resources for training • Learn from other countries that have established a well respected data management systems. Consider bilateral exchanges to share experience • Develop new data collection systems or augmenting existing systems

MRV of Emissions:

Good practice checklist for generating a GHG inventory

Institutional

- **Clearly defined roles and responsibilities** of key organisations within the government departments and agencies responsible for delivery of the national GHG inventory
- **Inter-ministerial working group** with other involved ministries
- **Training/capacity buildings**

Procedural

- Use of **IPCC Guidelines**, internationally accepted protocols and methods
- Identification of **key categories/priority sectors**
- **Country-specific data** used in emissions calculations
- Well-established **QA/QC procedures**
- Clear identification of **sources of uncertainties** and methods for measuring it
- Clear and transparent **documentation** of processes
- Systems for **preserving data/archiving**
- **Verification** and peer review processes
- Plan for future **National Communications**/Inventory improvements
- **Stakeholder engagement**

MRV of Emissions:

UNFCCC Principles for Reporting on GHG Inventories: TCCCA

These principles can also be applied to estimation of emissions at national, sectoral and installation levels.

1. **Transparency** means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information.
2. **Consistency** means that an inventory should be internally consistent in all its elements with inventories of other years. An inventory is consistent if the same methodologies are used for the initial and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. Under certain circumstances an inventory using different methodologies for different years can be considered to be consistent if methodologies provided by the IPCC for such situations have been applied.
3. **Comparability** means that estimates of emissions and removals reported by Non-Annex I Parties in inventories should be comparable among Non-Annex I Parties. For this purpose, Non-Annex I Parties should use the methodologies and formats agreed by the COP for estimating and reporting inventories.
4. **Completeness** means that an inventory covers all relevant sources and sinks, as well as all gases, included in the IPCC Guidelines. Completeness also means full geographic coverage of sources and sinks of a Non-Annex I Party.
5. **Accuracy** is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, as far as can be judged, and that uncertainties are reduced as far as practicable. Appropriate methodologies should be used, in accordance with the IPCC good practice guidance, to promote accuracy in inventories.

Getting Started: Gap Analysis Checklist

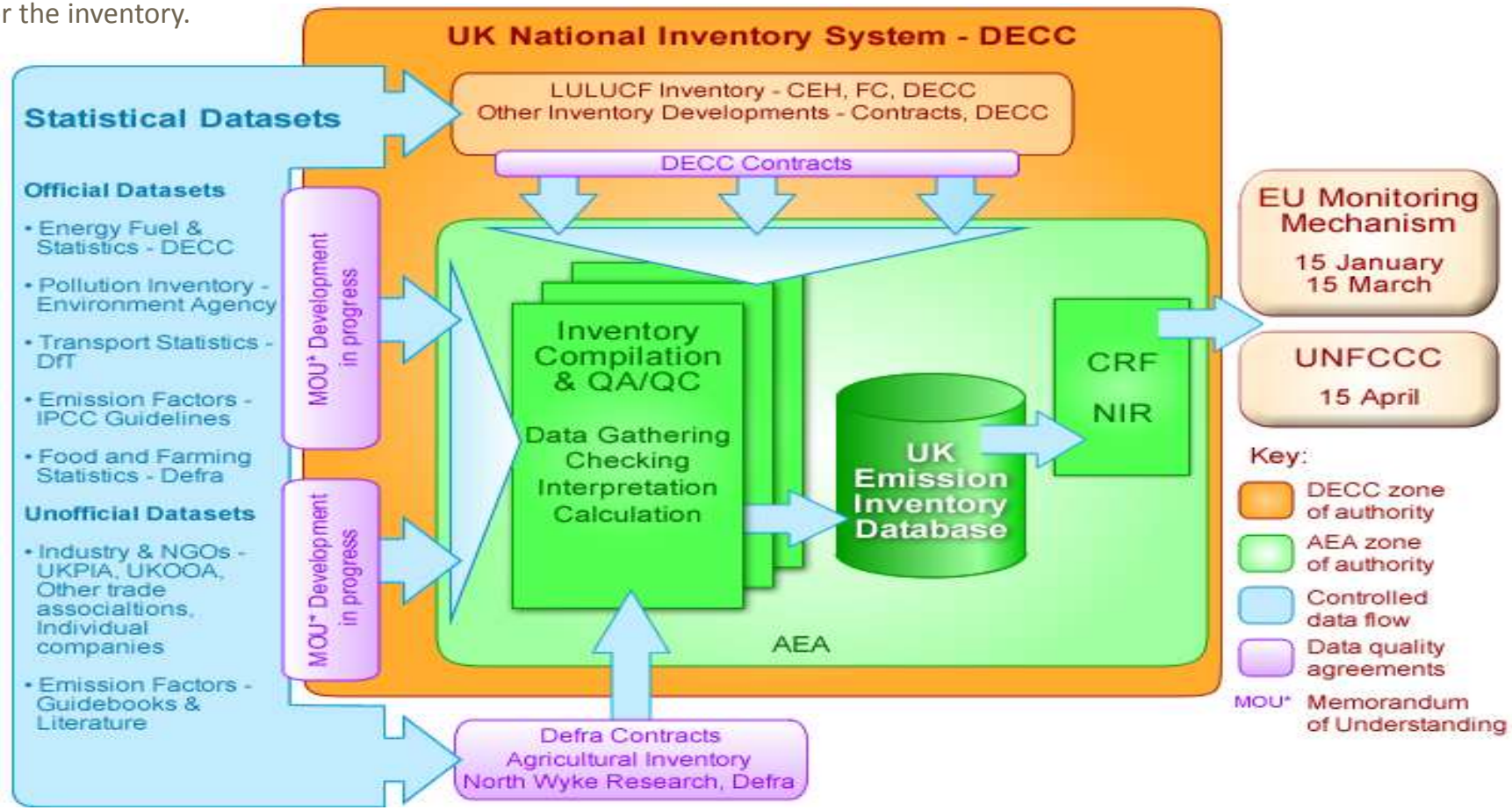
Elements	Questions to be considered
Institutional Arrangement	✓ Which institutions are involved in the MRV system – clarity of roles, responsibilities and institutional network? ✓ Who has the overall responsibility for delivery of the MRV system for GHG emissions? ✓ What is the experience of the level of cooperation between different departments and organisations? ✓ Does new legislation need to be implemented? ✓ The funding source(s) for setting up an MRV system for GHG emissions?
Methodologies	✓ What are the existing methodologies to estimate or model GHG emissions for the different source sectors?
Data Availability & Data Collection Systems	✓ Identify the key dataset (of identified indicators) that are required for GHG emissions estimation for different source sectors – is there a centralised data collection system (e.g. national statistics agency)? ✓ Is the data collection based on voluntary or mandatory basis and whether there is a need to establish data agreement with key data providers? ✓ Frequency of data collection (annual or ad-hoc basis?)
Data Quality	✓ Method of data collection – do they follow established guidelines and protocols? ✓ What QA/QC procedure is carried out by data suppliers on the data used to compile the inventory?
Capacities & Technical Skills	✓ Identify the skills required at each stage of the MRV process and review whether such capacities and skills exist in the current state of play.
Tools & Instruments	✓ What are the existing tools or instruments used to measure or model GHG emissions? ✓ Are these existing tools 'fit for purpose' or further development is required?

Sample of Existing Guidance, Data and Tools

Source	Detail
United Nations Framework Convention on Climate Change (UNFCCC) **UNFCCC non-Annex I Greenhouse Gas Inventory Software is available here.** **Information on Biennial Report and ICA, available here.**	Various guidance and training documents available to help with compilation of an inventory. Information from Consultative Group of Experts (CGE) workshops also available. An Excel-based software has been developed to support non-Annex I parties to the UNFCCC in the compilation of their GHG inventory and national communication. In general, the Software uses Tier 1 methodologies for estimating GHG emissions and removals for all source categories described in the Revised 1996 IPCC Guidelines.
Intergovernmental Panel on Climate Change (IPCC) – more information available here.	Guidelines for national GHG inventories and good practice guidance.
US Environmental Protection Agency (EPA) - more information available here.	Provides templates which can be worked through to help develop an inventory cycle (such as QA/QC, Key category analysis, documentation, archiving)
International Energ y Agency (IEA) - more information available here.	Various country specific data including fuel balances are available.
Global Observation for Forest and Land Cover Dynamics - more information available here.	Draft "sourcebook" to explain, clarify, and provide methodologies to support REDD actions and mechanisms, to build national REDD monitoring systems
Colorado State University - more information available here.	Agricultural and Land Use software, for estimating emission reductions from deforestation and forest degradation
Global Protocol for Community-Scale GHG-Emissions (GPC) - more information available here	Guidelines for sub-national GHG inventories building. It provides standardized requirements and step-by-step guidance for cities to prepare and report GHG emission inventory.
Harmonized Emissions Analysis Tool Plus (HEAT+) - more information available here	HEAT+ is ICLEI's multilingual online emissions inventory tool to help local governments account greenhouse gas emissions (GHGs), Common Air Pollutants (CAP) and other Volatile Organic Compounds (VOC).

Example of Institutional arrangements: GHG Inventory in the UK

This example shows the links between the *relevant actors*: **key data providers** (in blue), **inventory agency** (in green) that is responsible for compiling the GHG inventory, and the **single national entity** (in orange) who has the overall responsibility for the inventory.



Scope for MRV of Emissions

The scope for MRV of emissions can be considered at FOUR different levels:

National Level	• Historic GHG Inventory – component of BURs and NCs to the UNFCCC • GHG projections – to help inform national programme , strategy on GHG mitigation, to underpin policy appraisal and planning (link to MRV of NAMA)
Sub-national Level	• GHG Inventory by sectors and facilities – could be component of annual report to National Government • GHG Inventory by Emission Sources – tracking changes and reflecting policy impacts
Sectoral Level	• To set and track sector emission targets, to engage within sector policy mechanisms (e.g. sector-wide trading mechanisms) • Also underpin historic inventory and/or projected data
Facility Level	• To monitor and report facility-level or company-level GHG emissions • To address regulatory requirements or to engage in mechanisms such as Emissions Trading Schemes or CDM projects • Also underpin historic inventory and/ or projected data

The common parameters across all levels are: EMISSIONS, ACTIVTY DATA, EMISSION FACTORS (and FORECAST DATA for projections).

Bottom-up approaches of Emission Estimation

Top-down approaches of Emission Estimation

Bottom-up emission estimation - Facility and Sector Levels (1)

Use **bottom-up methods and data** to calculate or model the change in GHG emissions **for each source, project, or entity** (e.g., through changes in behavior or technology), **then aggregate across all sources, projects, or entities** to determine the total change in GHG emissions.

- There is a lot of existing guidance for how to estimate emissions at the facility or sector level, for example EU ETS, BREF notes and company reporting (WRI, UK Government etc).
- Reporting requirements vary considerably according to the mechanism being used to report and the local arrangements. Monitoring and Reporting requirements are defined by estimation method:
  - Source Monitoring
    - Emissions monitoring data from **continuous or periodic tests**
  - **Emission = Activity Data x Emission Factor**
    - Activity data used in emission estimates, e.g. fuel use by fuel, use of mineral products (e.g. limestone, dolomite), plant production
    - Emission factors
    - Oxidation factors
  - Mass Balance or Engineering Calculations
    - Input and output data, with Carbon content data
    - Assumptions on oxidation, carbon content of residues
  - **Uncertainty estimates** for data used in estimation methods, and on results

Facility and Sector Level (2)

MRV of Emissions:

Bottom-up emission estimation - Facility and Sector Levels (2)

- MRV systems for facility and sector estimates have similar objectives as those for national inventories, and many similar practices are employed
  - Provision of tailored guidance
  - **Reporting Templates** to ensure consistency and comparability
  - Provision of **default factors**
  - **Tiered approach** to data M and R, to focus resources on improving accuracy of the highest emitting sources
  - **Quality checks, Time series consistency checks**
  - **Benchmarking** between sites, across years
  - Identification of **outliers**, resolution of data **inconsistencies**
  - **Peer / expert review**
  - **3rd party verification** of data

- Systems may be implemented for: corporate reporting, regulatory reporting, engagement in facility-level or sectoral market mechanisms

Further Information
Linking MRV of mechanisms and inventories

Back to MRV of Emissions: Measurement
Back to Facility and Sector Levels (1)
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Linking MRV of market mechanisms and inventories: Facility Data

Trading schemes and project mechanisms provide facility-level emissions data, usually for the highest-emitting energy and industrial process sources in an economy [e.g. in the UK, around 50% of all CO_2 emissions are accounted within the EUETS].

Facility-level data from trading schemes or project mechanisms such as CDM are useful to compile sector and national estimates:

- **Activity data** (fuel use)
- **Emission factors**
- Calorific values (energy unit for the heat produced by the complete combustion of a fuel)
- Oxidation factors (used to calculate the amount of the fuel that is contributing to GHG emissions)
- Identify new emission sources

They can provide quality data for most major sources and activities.

EUETS Case Study
Further information
Back to MRV of Emissions: Measurement
Back to Facility and Sector Levels
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EUETS Case Study - MRV procedures

Lessons Learnt: What makes the EUETS work? What can support MRV procedures?

- **Co-ordination and communication between regulators, industry, verifiers** through workshops and the Emissions Trading Group.
- **Standard forms, electronic permits and reporting systems, helpdesks, guidance notes** for operators with case studies "exemplar" monitoring and reporting plans.
- **Verification checks compliance** against plans, permits and Monitoring and Reporting Guidance.

Regulators / inventory experts may conduct other checks:

- **Sector- and fuel-specific benchmarking** of underlying data (CVs, EFs, AD), as QC in derivation of country-specific EFs.
- **Specific research to target limited datasets** (e.g. EU-wide benchmark study into Refinery Fuel Gas, COG and BFG).

MRV of Emissions:

Facility and Sector Data – Further Information

Examples of available guidance for M&R of facility level data include:

- **EUETS Monitoring and Reporting Guidance**

  More Information available here.

- **BREF Notes**

  More Information available here.

- **Methodologies for Clean Development Mechanism projects**

  More Information available here.

- **Climate Change Agreement Guidance (UK Government sector mechanism)**

  More Information available here.

MRV of Emissions:

Emission estimation – National GHG Inventory

Key elements to consider:

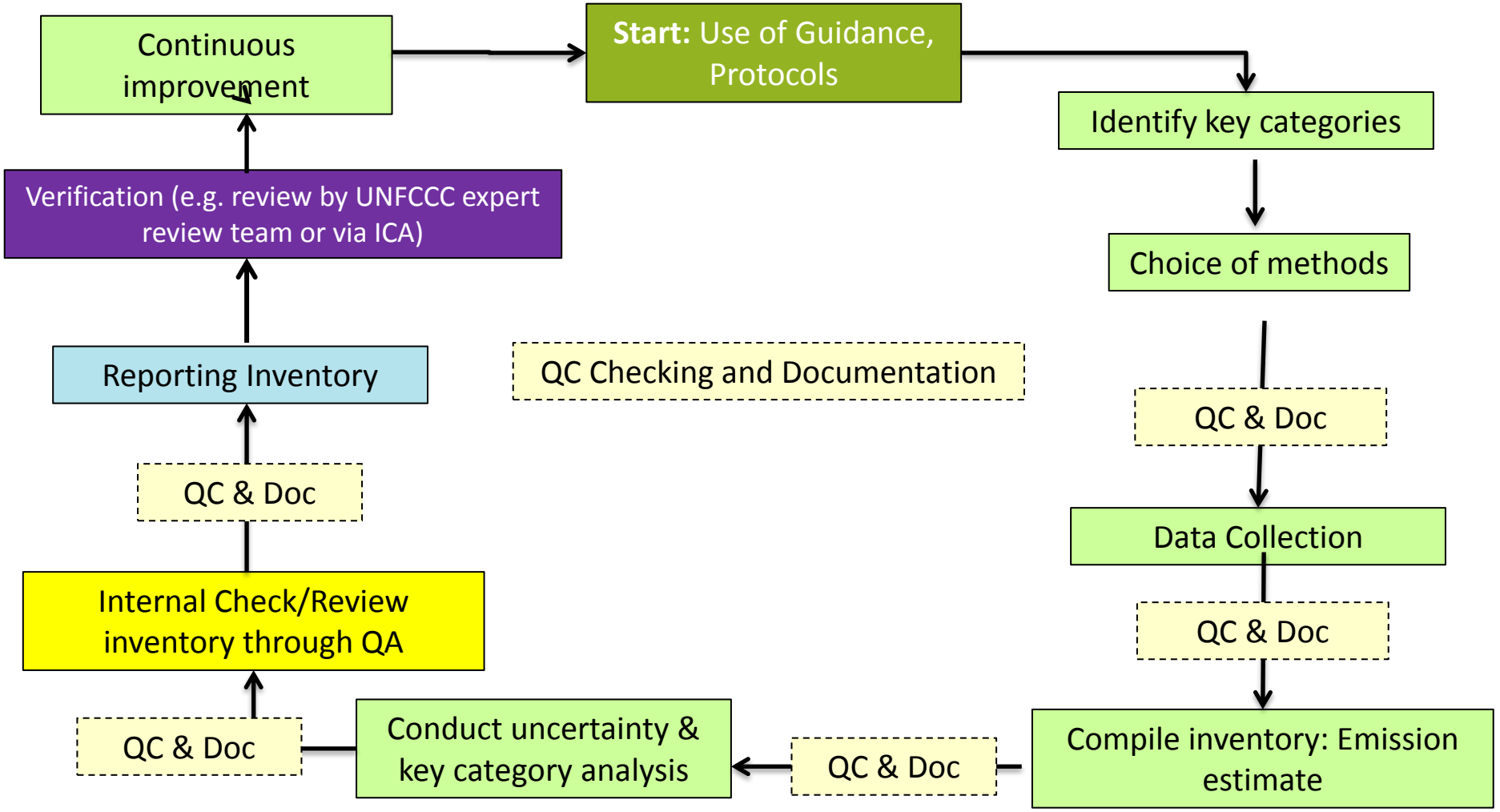
- **Use of IPCC Guidelines**, Good Practice Guidance, Emission Factors Database
- **Tiered approach** to emission estimation:
  - ✓ Tier 1 (International default factors)
  - ✓ Tier 2 (National default factors)
  - ✓ Tier 3 (Country-specific methods, more complex models)

  Note: The choice of method has an impact on the data quality; the uncertainty in the estimate decreases as higher Tier methods are used.

Emissions = Activity Data x Emissions Factors

- **Activity Data (AD) Sources**: surveys, national statistics, proxy data, bottom up data
- **Emission Factors (EFs) Sources**: international defaults, country-specific factors, used of data from other countries with similar national circumstances.

Typical Inventory Development Cycle



MRV of Emissions:

Linking MRV of projects and MRV on a national level: Design choices

- **Top-down or bottom-up quantification methods** might be employed to measure and monitor the evolution of emissions. Top-down approaches are based on macro-level indicators (e.g. using econometric models or regression analysis), whereas bottom-up approaches make use of source, project or entity data. Both bottom-up and top-down data and methods are valuable for different purposes. **Hybrid approaches that combine elements of both bottom-up and top-down approaches may also be employed for mutual review and correction**.

Simple choices in the design of the measurement mechanism will affect the usefulness of GHG data for GHG inventories. **Examples of good practice include:**

- ✓ Clear names for fuels / activities. Use a limited set of fuel names that operators must choose from, to ensure aggregation to inventory fuel types is simple. Seek **consistency** with IPCC nomenclature.
- ✓ Source allocation definition. Ask operators to **allocate sources to a specific IPCC emission source category**, for GHG inventory reporting.
- ✓ Design such that mechanisms **provide activity data and emission factors** that may be useful for sector or national GHG inventories.
- ✓ Mechanisms that use mass balance of carbon from inputs (fuel mass and carbon contents) to outputs (flue gases and residual ash) provide an accurate estimate of emissions and improve inventories.

MRV of Emissions:

Different forms of emission targets

Under negotiation in UNFCCC

National emission targets can have different forms:

- **Climate neutrality**
- Emissions **below business as usual**
- Emissions **below base year**
- Emissions **per GDP**

And these targets can differ in:

- Related to a **base year**
- Related to a **baseline scenario**
- Related to an **absolute emissions level**

- National targets can be **quantified or qualitative**.
- Quantified emission reduction targets can be **in absolute terms or in relative terms**, i.e. emission intensity per output.
- Quantified emission reduction targets can be defined **nationally or internationally related to benchmarks**.
- Quantified emission reduction targets can be **economy-wide or sectoral**.

Examples for national targets are provided in the Annual Status Report on NAMAs (2011), p. 6.

The WRI/WBCSD GHG Protocol has developed a Mitigation Goal Accounting Standard (2013), which compares reporting year emissions with base year emissions, including traded emission reductions. (see p. 84)

MRV of Emissions:

Defining an Emission Baseline

A **baseline scenario** characterizes the likely evolution of GHG emissions in the absence of new, specific policies to reduce GHG emissions. An ambitious baseline scenario takes into account policies and laws with a beneficial impact on emissions. It can be used as a reference point for a **mitigation assessment and emission reduction scenarios** including the development of a quantified projection on how emissions will evolve, the definition of targets for future reductions and monitoring progress.

A baseline scenario may be intended to be a **"business as usual"** projection, or can represent other scenarios referring to emission reduction targets and be based on different assumptions or conditions. Ideally, multiple baseline scenarios should be constructed to reflect uncertainties. It is important, however, that baselines take into account all UNFCCC gases (CO_2, CH_4, N_2O, SF_6, PFCs, HFCs, NF_3) and use the GWP established by the IPCC.

Approaches for determining the baseline could range from simply drawing a flat line from **status quo** emissions (if no other reliable information is available), to **extrapolating current emission trends** to **complex scenarios which take into account all covered activities** and are based on a multitude of indicators. Depending on its purpose and the scope of information used for its development, a baseline can be defined on a **project, sectoral or national level.** *More information on baselines can be found in chapter 7 of the WRI draft Mitigation Goals Standard or chapter 8 of the WRI draft policies and actions standard.*

Since mitigation scenarios are mainly evaluated on the basis of the **incremental *costs*** *and* ***benefits*** *relative to the baseline scenario,* ***reasonable baselines*** *are critical to preserving the environmental integrity of mitigation actions!*

Baseline construction | Difficulties Setting Up a Baseline: Q&A | South Africa's BAU Scenario

MRV of Emissions:

Baseline Construction

There are no international requirements nor internationally recognized guidelines for the construction of a baseline. **Methodology** is chosen based on the desired level of detail, availability of data and technical expertise. However, the following **design element** should be considered in the process of baseline setting:

- **Scope** of covered activities: processes, space, product, technology etc. which the baseline should covers
- **Indicators:** historic and predicted emission trends, their economic lifetime, macroeconomic and socio-demographic indicators , policy implications. Can be presented as a linear extrapolation or incorporate expected changes in key driver indicators.
- **Reference period**: a single time period (e.g. base year), an average of several periods or time series of data
- Definition of **metrics**: absolute or relative terms of emission projection; projections with respect to other indicators (e.g. technology penetration) and other **co-benefits**.
- Calculation of **uncertainty levels** (through regular uncertainty assessments of parameters like activity data, emission factors, GWP, of methodologies, or of models, and sensitivity analyses), definition of **boundaries** (temporal (short/medium/long-term), geographical, gases coverage) and consideration of **leakages** (esp. on a project level)
- **Frequency of revision** and updating.

The use of comprehensive data, which is consistent over time will improve the accuracy of the baseline. However, considerations of costs, simplicity and transparency need to be balanced with accuracy. There are several internationally recognized analytical tools, which help come up with a plausible and robust GHG projection:

- ✓ *The Energy and Power Evaluation Programme (ENPEP)*
- ✓ *The Long-range Energy Alternatives Planning system (LEAP)*
- ✓ *The Market Allocation Model (MARKAL) and its successor (TIMES)*
- ✓ *The Renewable Energy and Energy-efficient Technologies Screening system (RETScreen)*

MRV of Emissions: Difficulties Setting up a Baseline: Q&A

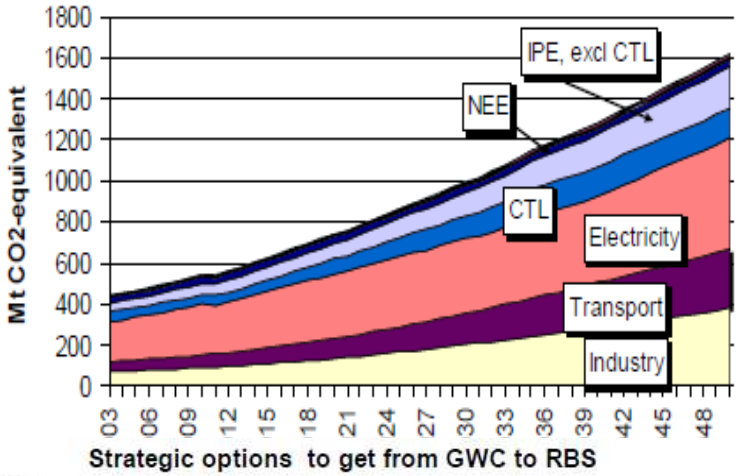
Questions:	Answers:
How to ensure the availability of activity data?	• Enhance the data collection process and improve bottom-up sectoral information gathering • Establish a central database and if necessary set up a legislation on data collection • Implement regular data validation and verification
How to calculate country-specific emissions factors?	• Use guidance and good practice (e.g. IPCC guidance) to decide under which circumstances and for which sectors specific emissions factors should be developed. This will increase baseline accuracy and improve access to international support
How to choose a methodology?	• If data is available, use bottom-up, sector-based models for baseline construction at project, sectoral and national level • Use guidance and good practice (WRI mitigation goal standard, OECD report on national and sectoral GHG mitigation potential) to ensure the appropriateness of a simpler top-down modeling approach in some cases
What to do in the absence of standard guidelines for non-Annex I countries	• Allow in-country reviews by relevant experts and peer review for baselines presented internationally • Encourage transparency and disclosure of all major assumptions on key emissions drivers, in order to facilitate the establishment of good practice.
What if multiple baselines scenarios are equally feasible?	• Baselines are not predictions, but rather plausible representations of future emission pathways • Encourage more than one baseline scenario in order to highlight uncertainty in key drivers, technology and policy development, determine when future/existent policies and measures should be accounted for in the baseline
How to select the right key indicators (economic, demographic etc.)?	• Robustness of assumptions can be improved by ensuring strong stakeholder engagement combined with scientific research and modeling early in the baseline setting process • Sensitivity analysis can aid to verify the importance of each driver and the assumptions made
How often should the baseline be revised?	• Still no straightforward answer to this question, however, establishing a system of guidance for good practice , possibly accompanied by a peer review or other form of review process, should help regulate the revision process in the future
Why is transparency of the baseline setting important?	• It increases trust and comparability between countries. Furthermore it enables international and domestic funding. • Allows for the establishment of good practice and recognized guidelines
How to ensure the necessary technical and institutional capacity?	• Identify capacity gaps at national level and explore sources of specific support for developing capability • Allow for international/expert guidance in the process of baseline construction • Encourage transparency and the use of good practice in order to identify flawed assumptions in an early stage

MRV of Emissions:

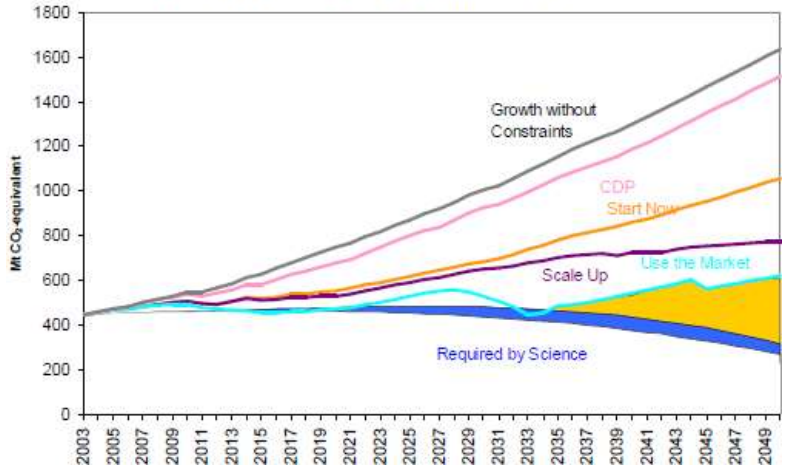
South Africa's „Growth without Constraints" Scenario

- South Africa's GWC baseline covers the entire economy disaggregated by sector: Industry, Transport, Electricity, Coal-to-liquids (CTL), Industrial Processes excluding CTL and Non-Energy emissions. Specific activity data for all sectors were used as input.
- The key drivers in the baseline were economic growth (time-dependent GDP) and population. Other drivers include future fuel prices, discount rate, and technology learning
- Emissions in the GWC scenario increase four-fold from 446 MtCO2-eq in 2003 (base year) to 1637 MtCO2-eq in 2050. Most of the emissions in this scenario continue to come from coal-based fuel combustion for energy supply and use.
- The MARKAL tool was used to model the energy sector, while a spreadsheet model was used for non-energy emissions. The baseline and mitigation scenarios were subjected to international Peer-review by the World Bank. The Peer-review concludes that: "*The methodologies used in the research were consistent with international best practice and the results are robust*".
- An alternative baseline is the "Current Development Plans" (CDP). This assumes that existing and planned policy measures have some abatement impact in the future, and the emissions trajectory is lower in 2030 and 2050.
- The GWC forms the reference scenario for South Africa's Long Term Mitigation Scenarios (LTMS) accepted by Cabinet in 2008. South Africa has pledged in Copenhagen to reduce emissions to 34% below BAU by 2020 and 42% below BaU by 2030.

Projected emissions by sector



Strategic options to get from GWC to RBS



Back to: Defining a Baseline

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MRV of Emissions:

What do we mean by AD and EFs?

Activity Data and Emission Factors: Make the best of what is available, and seek opportunities to improve existing data gathering systems and implement new ones. Learn from regional/ national/ international workshops. If you have AD or EFs for only one year or a handful of sites, try to identify other parameters you can use to extrapolate / interpolate to derive a defensible time series.

Source specific	Derived from national macro-level data	Default factors
National energy statistics (AD)	National data on housing / vehicle numbers / population / industrial output	IEA statistics, Energy statistics from similar countries that can be used with national proxy data
National livestock numbers, agricultural production by crop (AD)	National data on food production, economic data on agricultural sector output	FAO statistics, Agricultural statistics from similar countries that can be used with national proxy data
Country-specific fuel compositional data (EF)	Fuel composition data from CDM or from similar / neighbouring countries	IPCC default EFs for fuels

Case Study: Transport emission estimation

The starting point to estimate carbon emissions from transport is by obtaining total petroleum fuel sales data by each transport mode and combining with carbon content for each fuel (Tier 1 Approach). To develop a more detailed inventory, for instance, separating emissions into different vehicle types (passenger car, freight and buses) will require further information such as vehicle registration data, annual traffic activity and fuel efficiency for each vehicle type. An example of approach adopted by Ghana is shown below:

Ghana – Transport Methodology – 2nd National Communication (2011)	
Data Type	Number of vehicles, Fuel consumption
Data Source	Energy Commission, Environmental Protection Agency and Driver Vehicle Licensing Authority
Methodology	Determine total fuel consumption by fuel type and sector - petroleum activity data for Ghana is obtained directly from the Ghana Energy Commission and other organisations. Total carbon is estimated by multiplying the amount of fuel consumed by the amount of carbon in each fuel based on IPCC default values. COPERT III is used to model emissions from transport sub-categories.
Planned Improvement	Revise activity data from road transport (especially on fleet population and fuel consumption to include LPG component and all gases) and also to the extent practical, move to a higher tier methodology in the inventory in accordance with the IPCC guidelines.

Key: Start with what data is available, check against data quality objectives and identify area of improvement.

MRV of Emissions:

Reporting Guidelines for BURs on National Greenhouse Gas Inventory

- For Non-Annex I Parties, GHG inventories are submitted as part of their national communications (NCs). Following decision at COP16, Non-Annex I countries will need to submit **Biennial Update Reports** (BURs) containing updates of national GHG inventories.

- The first BUR is due by December 2014 and non-Annex I Parties shall submit a BUR every two years either as a summary of parts of their NCs in the year in which the NC is submitted or as a stand-alone update report.

- The guidelines for the preparation of BURs from non-Annex I Parties are contained in annex III of decision 2/CP.17 (page 39) and one of the requirements is that:

  ✓ Non-Annex I Parties should submit updates of national GHG inventories according to paragraphs 8-24 in the "Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention" as contained in the annex to decision 17/CP.8.

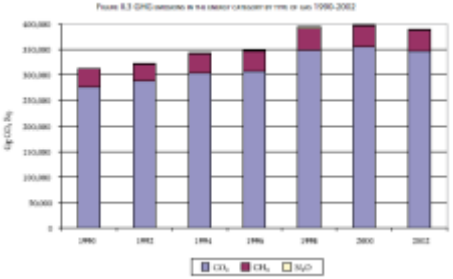
Note: The scope of the updates on national GHG inventories should be consistent with capacities, time constraints, data availabilities and the level of support provided by developed countries Parties for biennial update reporting.

Case study – Mexico – GHG Inventory

Mexico has submitted five National Communications (NCs) to date – below is an extract of what has been reported regarding their GHG Inventory in their 3rd NC published in 2009:

Measurement: Emissions of six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) were calculated for six emissions categories defined by IPCC: Energy, Industrial Processes, Solvents, Agriculture and Waste for 1990-2002.

Diagram shows GHG emissions in the energy category by type of gas.



Reporting: Type of information reported on GHG inventory -

- Institution Arrangement
- Description of process of preparing the inventory
- GHG emissions by category and trends by type of gas
- Information on indirect GHG
- Key Sources (including brief description of methodology - most categories were based on Tier 1 approach)
- Level of uncertainty

Verification:

- Comparisons of Mexico's National GHG Inventory 1990-2002 were made with data for CO_2 emissions from the burning of fossil fuels estimated by the International Energy Agency (IEA). In general, the estimates made by the IEA for Mexico vary by approx. 5% with respect to the estimates made by Mexico using IPCC Guidelines.

Link to NAMA:

Mexico's GHG inventory formed the basis of its National Climate Change Strategy published by the Inter-ministerial Commission on Climate Change in 2007. The inventory facilitated understanding of emissions trends and enabled the Commission to identify opportunities for GHG mitigation in the energy use and vegetation and land use sectors.

MRV of Emissions:

Types of verification

"Verification" can cover a range of activities and for the purposes of this tool we are defining verification in a broader sense than the 2006 IPCC Guidelines. These verification activities are designed to cross check estimates of emissions, activity data and implied emission factors against other independent, reputable sources.

- **Data checking / validation**
  - **Benchmarking emissions or activity data** against other installations / sectors / countries; check how country-specific EFs compare against IPCC defaults;
  - **Checking trends** against other parallel reporting mechanisms, e.g. emissions versus production, employment or economic indicators;
- **Third-party verification of estimates and methods**
  - **Expert Reviews of inventory** and feeding back improvement recommendations e.g. UNFCCC Expert Review Teams and the ICA approach;
  - Verifying nationally-reported data against **international statistics/ independently compiled estimates** such as IEA, EUROSTAT, FAO stats, Emission Database for Global Atmospheric Research (EDGAR);
  - **Third party verification** within Emission Trading Schemes; **verification by independent auditor** accredited by the CDM Executive Board to verify whether implemented CDM projects have achieved planned greenhouse gas emission reductions.
- **Overall inventory trend verification against remote–sensing data**
  - **Verification by Remote Sensing**: Comparison by gas of observed estimates and trends in inventories against the observed data and trends from atmospheric emissions ambient monitoring, and/or against satellite data.

MRV of Emissions:

Quality Assurance/Quality Control (QA/QC)

It is *good practice* to implement QA/QC procedures as they help improve the transparency, consistency, completeness, comparability and overall confidence of the emission estimates. This should be implemented by both the data providers as well as the entity who is responsible for compiling the emissions estimates.

Quality Control (QC) is a system of routine technical activities to ensure data integrity, correctness and completeness; identify and address errors and omissions; document and archive relevant information and record all QC activities.

Quality Assurance (QA) is a planned system of reviews (e.g. through expert peer review or audits) conducted by those *not* directly involved in the compilation/development process of the datasets. Reviews verify that data quality objectives are met; determine conformity of the procedures taken, effectiveness of the QC system and to identify where improvements could be made.

Further examples of QC activities

For further information:

- 2006 IPCC Guidelines – QA/QC and Verification (Volume 1: Chapter 6)
  (See also Annex 6A.1 which provide QC checklists and templates for use)
- CDM – Guidelines for QA/QC of data used in establishment of standardized baselines

MRV of Emissions:

Examples of QC activities

- Check that assumptions and criteria for the selection of activity data, emission factors and other estimation parameters are properly recorded and archived;
- Check for transcription errors in data input and references;
- Check that units are properly labelled and are correctly carried through from beginning to end of calculations;
- Check for internal consistency (e.g. ensuring the total GHG emissions equal to the sum of emissions by gas, or total GHG emissions equal to sum of sectors reported);
- Identify parameters (e.g. population) that are used across various sectors/calculation spreadsheets and that consistent values have been used;
- Check time series consistency and completeness;
- Check implied emission factors
- Trend checks (are there any unusual and unexplained trends, any outliers?)

Hint: Setting up *automated checks* is useful to deal with large quantities of data.

MRV of Emissions:

Continuous Improvement Checklist

Elements	M, R, V	Examples
Institutional Arrangement		• Establish annual system of review and inventory improvement plan (e.g. the development of country-specific emission factors so that higher Tiered Approaches can be adopted to improve emission estimates for key source category) • Schedule stakeholder meetings • Set up a network to share lessons learnt, disseminate good practices, and instigate peer-to-peer exchange
Methodologies	M	• Use higher IPCC Tier as appropriate
Data Availability & Data Collection Systems	M	• Review and improve data collection systems to improve completeness; engage all relevant data providers as part of this process
Data Quality	M, V	• Aim to improve completeness and accuracy of data with the aim of reducing uncertainty of emissions
Capacities & Technical Skills		• Improve capacity and technical skills as part of the development plan
Tools & Instruments	M	• Make best use of efficient data collection and process system, ensure staff are trained to use them effectively, keep tools & instruments use under review

Continuous Improvement: Tiered Approaches

- Currently the concept of **tiers** is applied to the preparation of GHG Inventories. The IPCC Guidelines set forth three methods or tiers that allow for flexibility with regard to methodologies used for the inventory. For example, the Tier 1 Method allows countries to calculate emissions based on **default emissions factors** or **surrogate data**, when the real data is not available or is of poor quality for specific sectors.
    - To learn more about tiered approaches to creating a GHG Inventory, see the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* here or the *GIZ Knowledge Product: Elements and Options for National MRV Systems* here.
- Other aspects of the reporting process may also take a tiered approach when, for example, a country does not have the capacity to report on other key elements, such as on **NAMAs and their impacts or providing emissions projections**. The tiered approach would allow countries to initially report according to certain **minimum requirements** and to **gradually enhance the quality** of their reporting.

Tiered Approaches (2)

Continuous Improvement: Tiered Approaches (2)

Tier	Level of rigor/ accuracy	Quantification approach	Data sources	Use of resulting data
1	Lowest	Simplified approaches	Default or average data; use of existing data	Limited uses of data; typically cannot claim that specific actions (or groups of actions) result in specific GHG reductions
2	Intermediate	Intermediate approaches	Mix of data sources and quality	Some, but not all, uses of data are appropriate
3	Highest	Complex approaches (if relevant)	Source-specific data; collection of new data (if relevant)	All uses of data are appropriate; typically can claim that specific actions (or groups of actions) result in specific GHG reductions

From: WRI: GHG Protocol – Policies and Actions Accounting and Reporting Standard (First Draft), p. 16

MRV in the sub-national context

	M	R	V
Why ?	• Understand development circumstances • Identify reduction opportunities • Facilitate capacity building • Track policy impacts and mitigation results	Development information disclosure for public and higher level government	Enhance the credibility of government policy and GHG inventory
What?	• Local development circumstances and priority • Institutional structure and responsibility distribution • Local GHG inventory • Mitigation measures and its results • Constrains and gaps, and related financial, technical and capacity needs		• Local GHG inventory (emissions source-based) • Mitigation measures and their results
How?	Local government coordinating responsible entities to conduct assessment, collect information and enforce policy		Currently no international standard for verification
Who?	Local government coordinating responsible entities		Certified third party
Rules and Tools	• GreenClimateCities (GCC) program • Global Protocol for Community-scale GHG emission (GPC) • HEAT+	carbon*n* Cities Climate Registry (cCCR)	Not yet available

Source: http://www.iclei.org/

Relevance of sub-national governments

GreenClimateCities (GCC) program

- Process for local governments (LGs):
  - communities of all sizes
  - start-up / intermediate / advanced levels
  - Global North and South
- Concise methodology, tailor-made for LGs – to institutionalize local climate action
- Process, guidance and tools offered at each step
- Includes MRV-approach for local climate action
- Network, peer exchange, capacity development

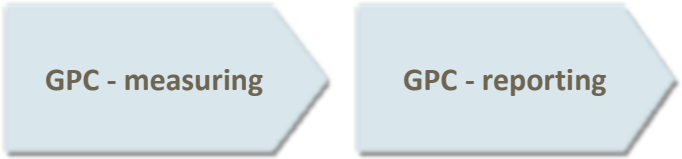
Source: http://www.iclei.org/

Global Protocol for Community-scale GHG Emissions (GPC)

- The GPC supports sub-national governments with:
  - Developing GHG inventory
  - Keeping consistent and transparent in GHG measurement and reporting
  - Empowering vertical integration of GHG measurement and reporting between national and sub-national levels
- It sets out requirements and provides guidance for calculating and reporting community-scale GHG inventories; consistent with the 2006 IPCC Guidelines for National GHG Inventories
- GPC is the result of a collaboration between the World Resources Institute (WRI), C40 Cities Climate Leadership Group (C40) and ICLEI – Local Governments for Sustainability (ICLEI).

For community scale inventories follow GPC (Global Protocol for Community-Scale GHG Emissions

Visit GPC-website



Source: http://www.iclei.org/

HEAT+: Harmonized Emissions Analysis Tool plus

- With embedded formula, HEAT+ supports local government in:
  - Building Emission (GHG, CAP and VOC) Inventory
  - Forecasting Emission Trends
  - Quantifying Impacts of Actions
- HEAT+ is an online tailor-made tool for local governments to account and manage emissions.
- HEAT+ contains formula consistent with 2006 IPCC Guidelines for National Greenhouse Gas Inventories and is compliant with the Global Protocol on Community-Scale Greenhouse Gas Emissions (GPC).
- Operated by ICLEI - Local Government for Sustainability (ICLEI) it is available in multiple languages for different countries around the globe.

Visit Heat+-website

Source: http://www.iclei.org/

carbon*n* Cities Climate Registry (cCCR)

- carbonn Cities Climate Registry (cCCR) is a global reporting platform of local and sub-national climate action

- cCCR connects 1/7th of the world's urban population to local climate action

- Launched at the World Mayors Summit on Climate in Mexico City on 21 Nov. 2010 (COP 16 in Cancun)

cCCR - approach | cCCR – purpose | cCCR –data analysis I, II, III, | Example of city report

Source: http://www.iclei.org/

GPC for Community scale GHG emissions - measuring

- **What to measure:**
  - GPC's guidance starts with setting up boundaries and identifies emission sources within assessment boundaries.
  - Balanced considering of city-emission-specific character as well as commonly accepted emission categories in IPCC, GPC categorizes sub-national emissions to six sources: Stationary energy, Transportation, Waste, IPPU, AFOLU and others.
- **How to measure Activity Data:**
  - GPC provides detailed methodological guidance for all emission sources.
  - For each methodology, GPC also directs how to source Activity Data needed.
- **How to quantify GHG emission with measured data:**
  - For each Activity Data, GPC provides default emission factors as well as a method on how to source emission factors.

Source: http://www.iclei.org/

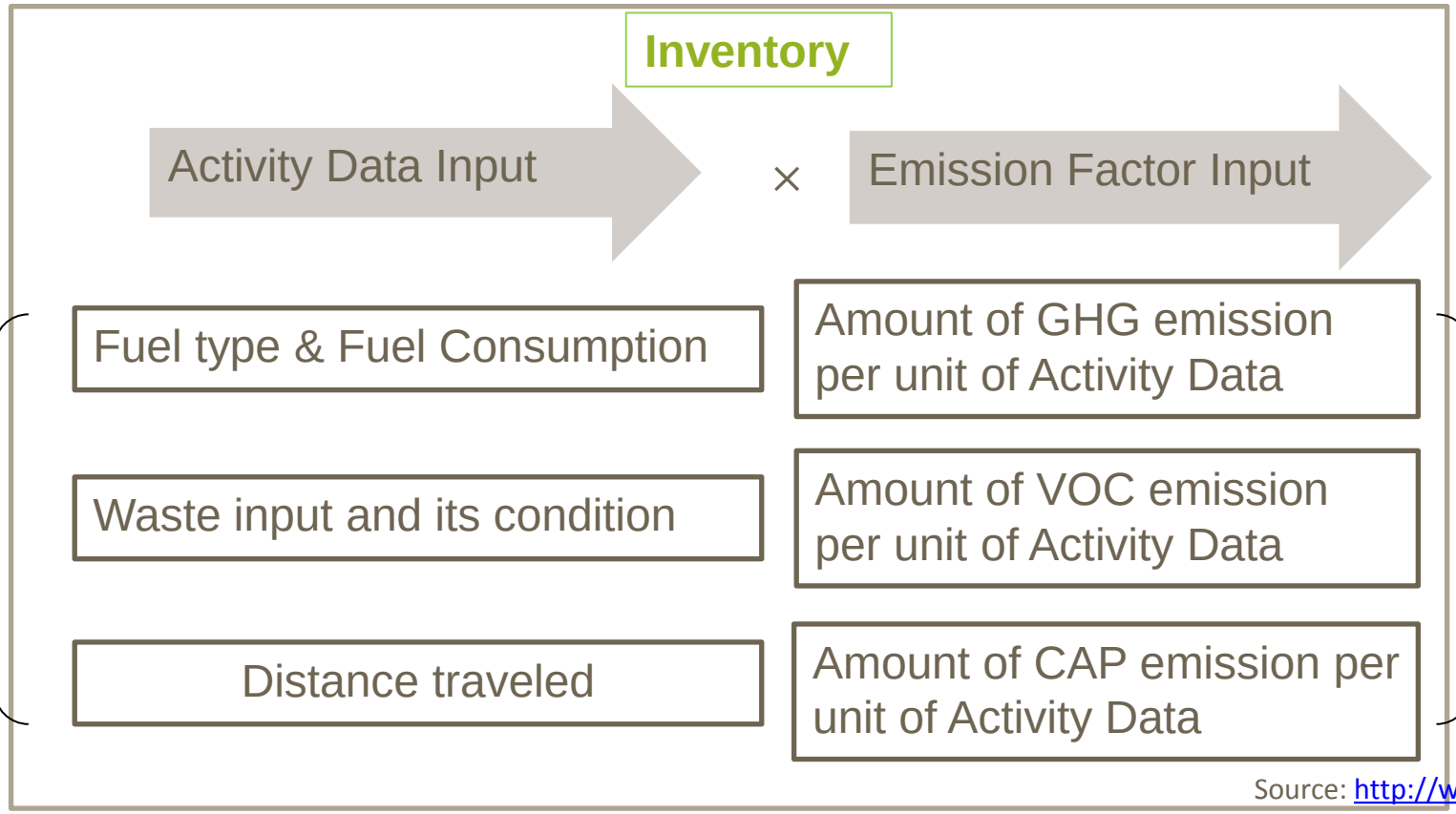
GPC for Community scale GHG emission - reporting

- GPC supports sub-national governments reporting all production- and consumption-based emissions in order to ensure better management of emissions across city value chains.
- GPC allows sub-national governments with different capacity levels to report with different comprehensiveness
- With notation keys and a special reporting structure, GPC supports vertical-integration between sub-national and national inventories.
- GPC provides notation keys and special reporting structure to avoid double counting.

Source: http://www.iclei.org/

HEAT+: Building Inventory

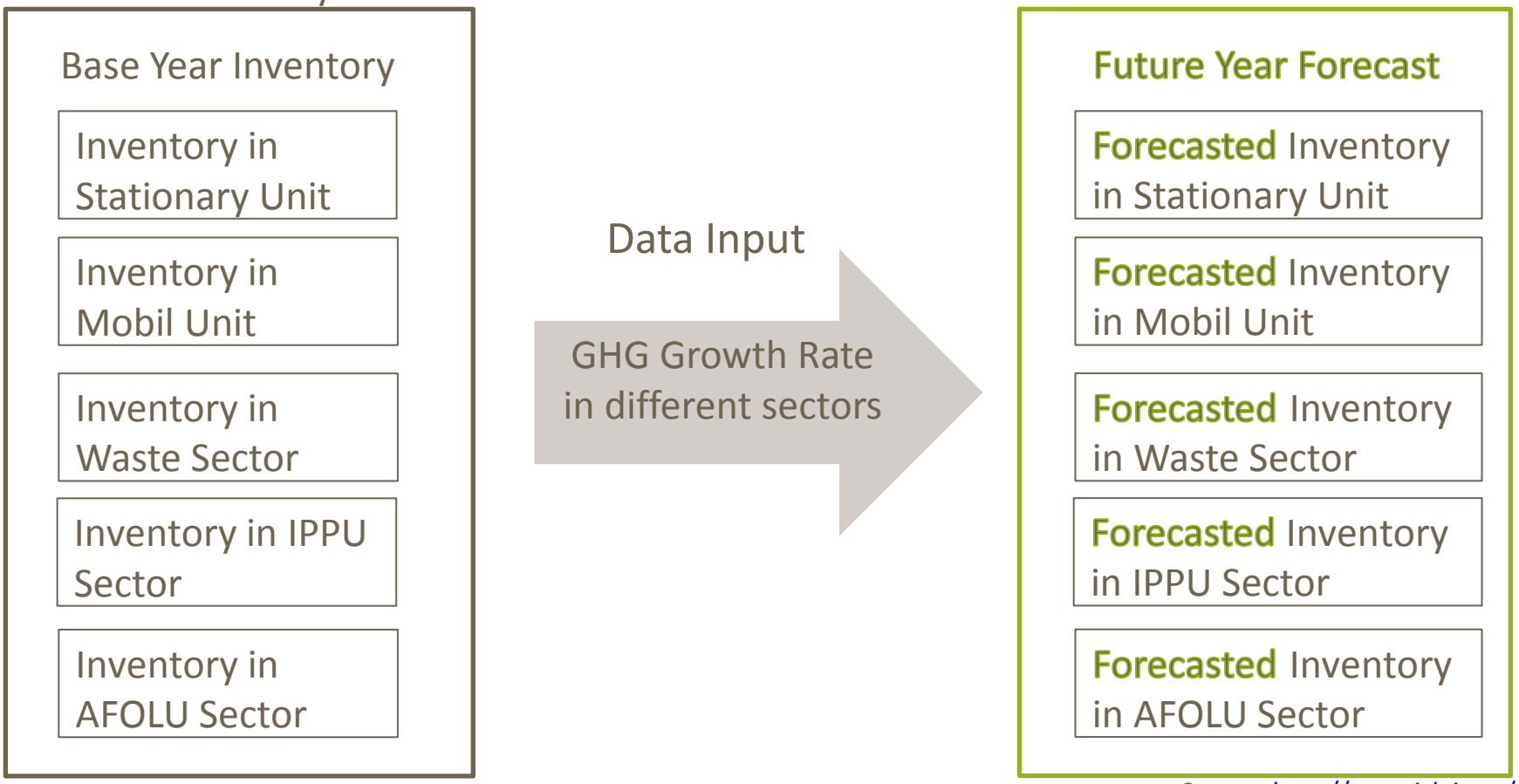
By inputting Activity Data and Emission Factors, local government will have the Greenhouse Gas Emissions (GHGs), Common Air Pollutants (CAP) and other Volatile Organic Compounds (VOC) calculated automatically. The local government can then compile its governmental & community inventory with ease.



Source: http://www.iclei.org/

HEAT+: Forecasting Emission Trend

Based on a base year inventory, HEAT+ can help a local government forecast emissions in future years.



Source: http://www.iclei.org/

HEAT+: Quantifying Impacts of Measures (Actions)

HEAT+ also supports local government in measuring the impact of mitigation actions. By inputting data of actions in the relevant sector, the local government compares emission levels after action implementation against the forecasted business as usual (BAU) emission level. This can be used to assess the effectiveness of the mitigation action.

- Action Type
- Emission Source
- Implementation Year

Forecasted Emission Level

\- (minus)

Post-Action Implementation Emission Level

=

Action Impact

Source: http://www.iclei.org/

carbon*n* Registry - approach

- Open and free use by any **local AND sub-national government** (region, province, state)
- **Reporting can be done at any time** - encouraged to update by mid-May and by mid-October.

- **Analyses made twice a year** – used towards the UNFCCC and international climate negotiations
- Operated by the **Bonn Center for Local Climate Action and Reporting** (carbon*n* Center)

Source: http://www.iclei.org/

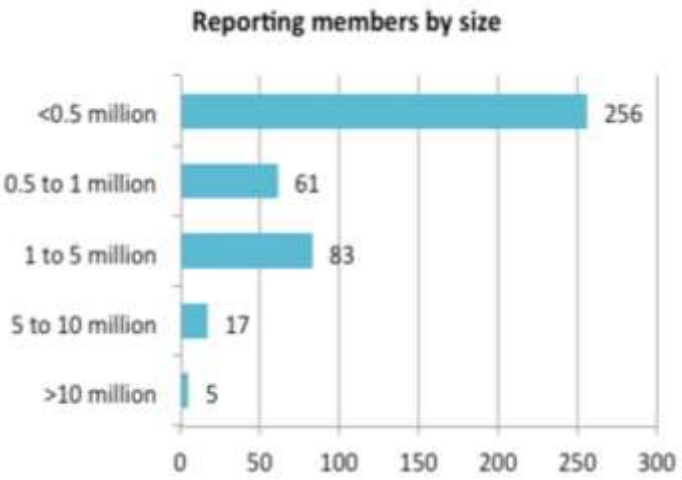
Purpose of the cCCR

- Promotes **Transparency & Accountability** of commitments/targets and GHG developments
- Improves **Measurable, Reportable, Verifiable (MRV)** local climate action
- Leaders are **recognised, promoted, used at events** to illustrate
- **Thousands of entries** – mitigation and adaptation, diverse examples, ambitions shared

Source: http://www.iclei.org/

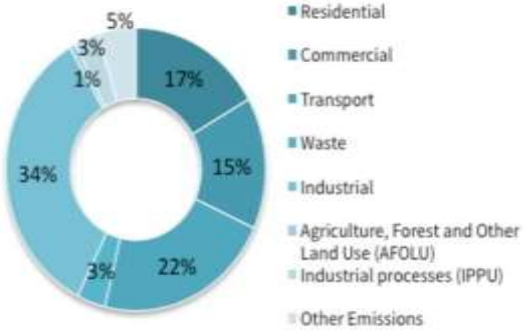
carbonn Registry - data analysis (I)

61% of the 422 cities and local government have a population of less than 0.5 million



Transport and industrial sectors account together for 55% of reported community emissions.

Emissions by sectors

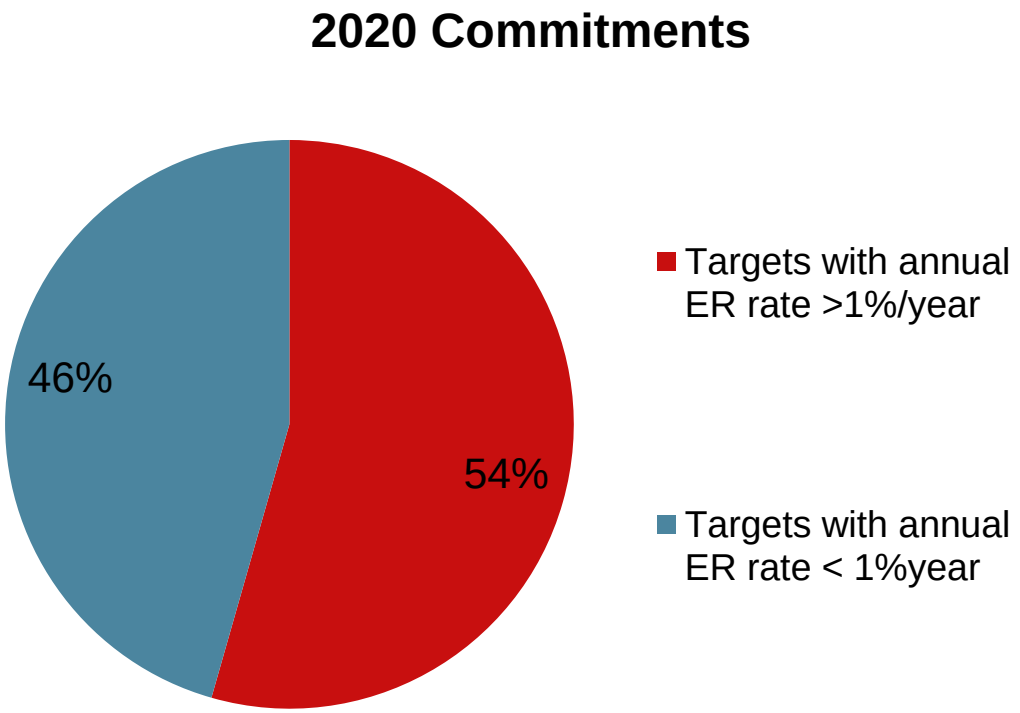


Source: http://citiesclimateregistry.org/archive/reports

Back to cCCR | Back to MRV in the sub-national context | Next Data Analysis II

carbonn Registry - data analysis (II)

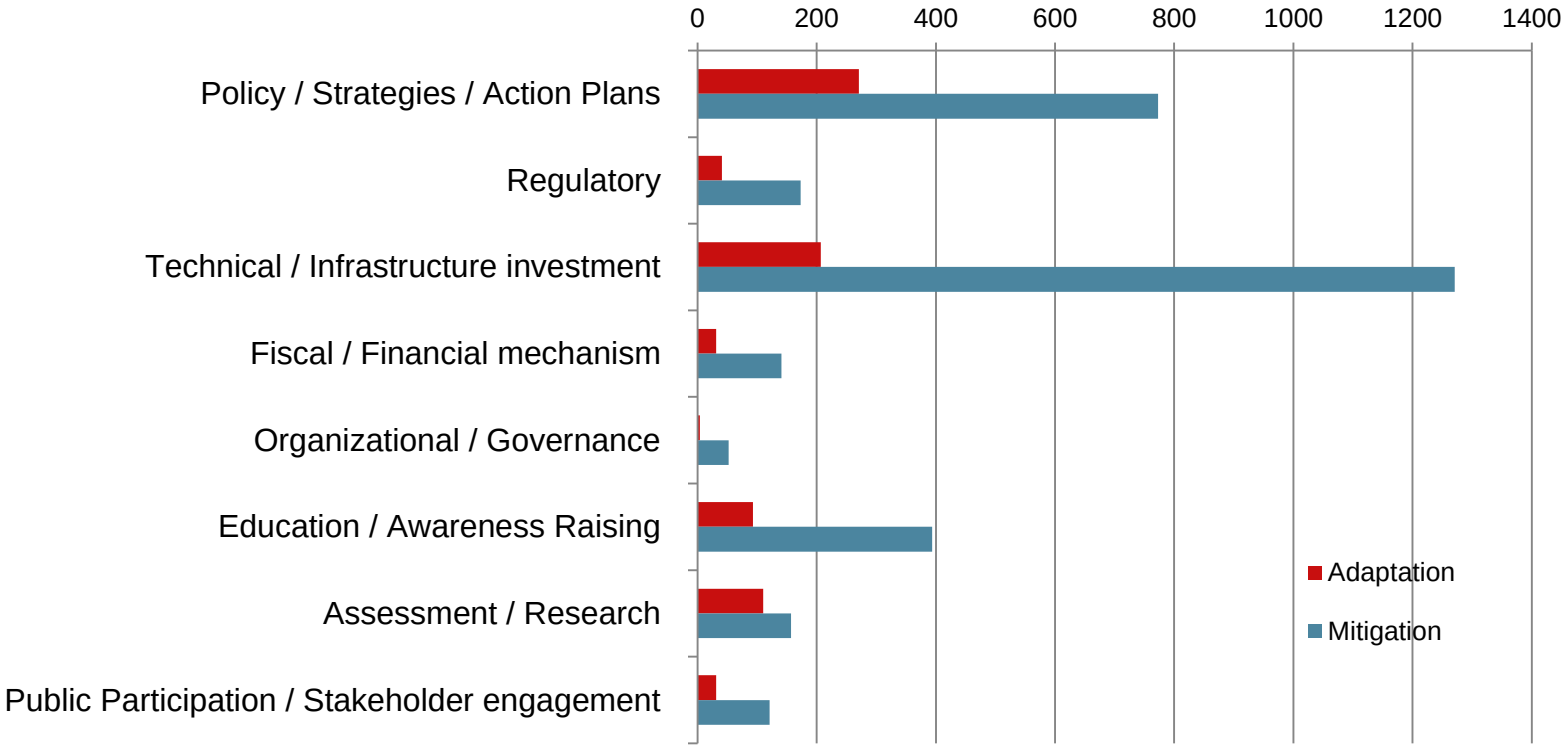
Of the 147 climate commitments with a target year in the period 2014-2020, 80 (54%) exceed the reduction commitments of most national governments under the Kyoto Protocol.



Source: http://www.iclei.org/

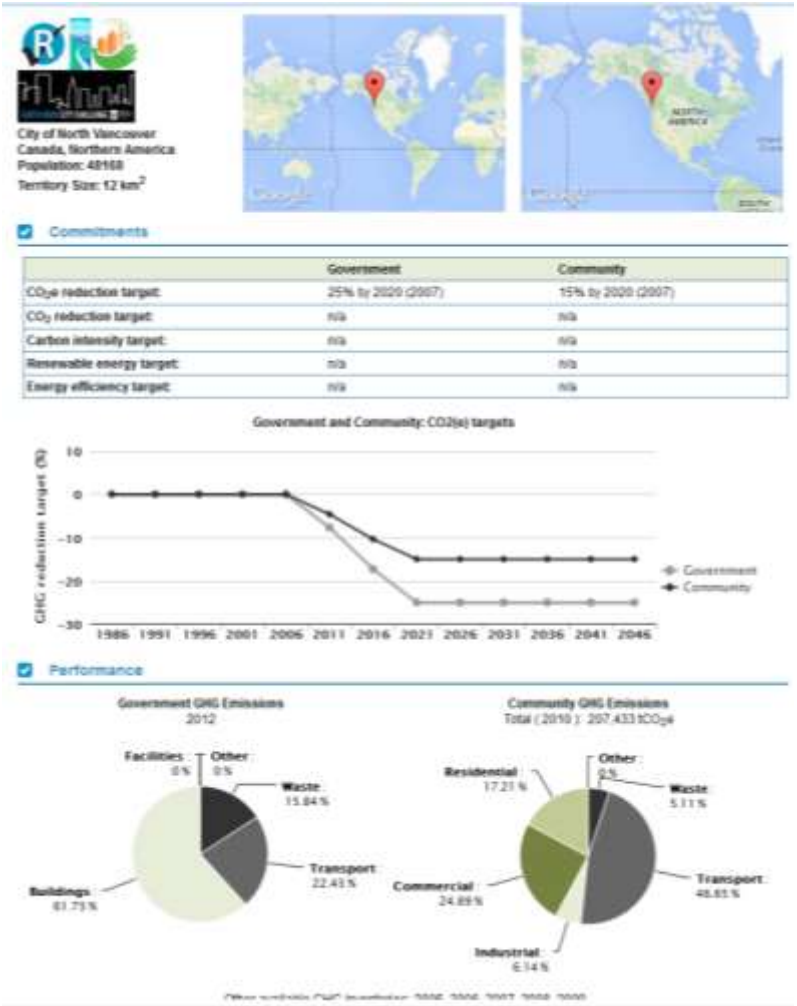
carbonn Registry - data analysis (III)

Over **3000 mitigation and 1000 adaptation actions** were reported in the cCCR since the launch of the platform in Nov. 2010



Source: http://citiesclimateregistry.org/archive/reports

Example of city report: public



Action Title	Sector	Field	Funding Source	File	Status
Canadian Solar City Designation				download	In Progress
Living City Summary Report				download	
Lonsdale Energy Corporation (LEC) District Energy Heating System	Energy – switch to low-carbon fossil fuels	Technology Investment	Public Private Partnership		In Progress
Heat Recovery and Geo-Exchange System at School District No. 44 LEC Connection	Energy – switch to renewable energies	Technology Investment	Public Private Partnership	download	In Progress
Solar Thermal Panels Contribute Renewable Energy to the LEC's District Energy System	Energy – switch to renewable energies	Technology Investment	Local	download	Completed
Solar Hot Water Ready Regulation Opt-in	Energy – switch to renewable energies	Technology Investment	Local	download	Completed
City Plaza Fountain Conversion to Cooling Tower	Facilities	Technology Investment	Local		Completed
Higher Energy Efficiency Zoning Bylaw Amendment and Density Bonusing Bylaw	Buildings	Legislation	Local	download	In Progress
Retrofit Program for Improved Energy Efficiency in City Facilities	Buildings	Technology Investment	Local		In Progress
New Civic Building Design Guidelines	Buildings	Technology Investment	Local	download	In Progress
Corporate and Community Energy Reporting and Management System	Other Emissions	Capacity Building	Local	download	In Progress
Climate Action and Energy Implications in Budget Process	Other Emissions	Capacity Building	Local	download	In Progress
Interdepartmental Climate Action Teams	Other Emissions	Capacity Building	Local	download	In Progress

Source: http://www.iclei.org/

Back to cCCR
Back to MRV in the sub-national context
Next

Relevance of sub-national governments in national climate action

- Typical Local Government mandates include (for cities worldwide):
  - 75% have direct control over their transit system
  - 80% have control over roads
  - 80% control residential waste collection
  - Most cities have control over building codes
  - Many can mandate energy efficiency standards
  - Procurement, taxes, fees, spatial development patterns, etc....
- Most investments for mitigation and adaptation take place at sub-national and local levels

Source: GIZ. (2013). Sub-national involvement in NAMA development. Current and emerging practice towards vertical integration. Baseline-Study.

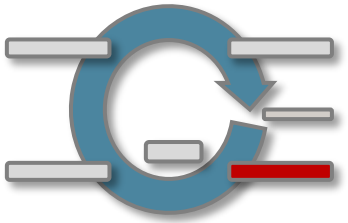
Voluntary mechanisms:

- Covenant of Mayors
- cCCR
- Earth Hour City Challenge

MRV of NAMAs – additional slides

MRV of NAMAs:

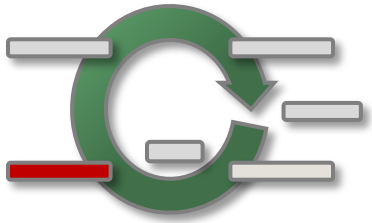
An Overview of Measurement: What, Who, How and When?



What gets measured?	How to measure?	Who measures?	When to measure?
1. Emission mitigation impacts; 2. Marginal Mitigation costs. 3. Indicators to track progress of: - Objective of the NAMA - Sustainable development; [requirements according to National Communications and BuRs]	1. Emission mitigation impacts; 2. Marginal mitigation costs. 3. Indicators for tracking progress (consider the challenges in using indicators) A data management system should be developed to store and analyse collected data from different sources.	1. Different organisations that are responsible for measuring similar indicators now 2. Central organisation responsible for measuring data (e.g. statistics team) The data collection system should be harmonised with the one used for the MRV of emissions inventory to increase consistency of the data and the efficiency of data collection.	1. Every year for annual inventory 2. Every 2 years for the update of BURs. 3. Depends on agreement for bilateral agreements.

MRV of NAMAs:

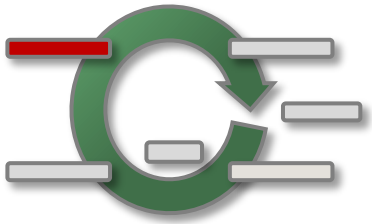
An Overview of Reporting: What, Who, How and When?



What information is reported?	Who reports?	How to report?	When to report?
Information on actions to mitigate climate change (NAMAs), which address anthropogenic emissions of GHGs. This includes both quantitative (e.g. emission mitigation savings and methodologies) and qualitative (e.g. name and objective of NAMA) information.	Organisation within the country responsible for reporting to: 1. UNFCCC 2. Funders 3. National Government	Through BURs and NCs. To funders: No specific agreed format, depends on bilateral agreement.	- Current (by summer 2012): Non-Annex I Parties invited to report information on NAMAs by the UNFCCC in the Copenhagen Accord held in 2009 - December 2014: Due date for first BURs - Ongoing: Bilateral agreement with funder.

MRV of NAMAs:

An Overview of Verification: What, Who, How and When?



What information is verified?	Who verifies?	How to verify?	When to verify?
All quantitative and qualitative information reported for NAMAs.	Verification can be performed by different organisations at domestic and international levels, e.g. UNFCCC reviewers or by government institutions.	Guidelines for verification yet to be developed. Verification examples include: sensitivity tests and uncertainty analysis. E.g. UNFCCC review of NCs.	Different organisations should verify information at different stages of the MRV framework for NAMAs to ensure fulfilment of the Transparency, Completeness, Consistency, Comparability Accuracy (TCCCA) criteria.

Important Aspects when Developing NAMAs

1. Understand the emissions profile of your country using the MRV of emissions system. Identify **sectors where largest emissions** can be tackled;
2. Derive a comprehensive **list of NAMA options** based on the emissions inventory, literature and case studies on NAMAs and GHG mitigation policies implemented in other countries;
3. **Prioritize** the list of potential NAMAs based on:
   - Mitigation potentials;
   - Mitigation costs;
   - Adaptation benefits;
   - Sustainable development benefits;
   - Alignment with the countries development goals.
4. Consider the development of the **MRV system at an early stage of the NAMA planning**. These considerations are of vital importance at a national level and will guide the future policymaking process. MRV should always reflect what a national government wants to know to plan, implement and coordinate individual mitigation activities. Therefore the development of NAMAs and the MRV system should be done hand in hand.
5. Consider the practicability and cost-effectiveness of a NAMA MRV system – MRV requirements for NAMAs do not need to be as rigid as the methodologies used under the CDM.
6. Use **submission templates** for the UNFCCC registry and through NCs and BURs. The first are due in December 2014.

For more information on developing NAMAs, see: **GIZ NAMA tool 2012**.

MRV of NAMAs:

MRV of policies submitted in National Communications

Annex I Parties to the Convention have been submitting information on policies as part of the NCs every 4-5 years since 1994 (click here for submitted NCs). The MRV of NCs are:

- **M:** It is up to the Party to decide how to monitor/ measure policies to meet their reporting requirements;
- **R:** Detailed reporting requirements are listed in the 'Annotated Outline for Fifth NCs of Annex I Parties under the UNFCCC'. Policies are to be reported in a table format as shown below.

Table 1. Summary of policies and measures by sector[a]

Name of policy or measure[b]	Objective and/or activity affected	GHG affected	Type of instrument	Status[c]	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative,in CO_2 eq.)[d]					
						1995	2000	2005	2010	2015	2020

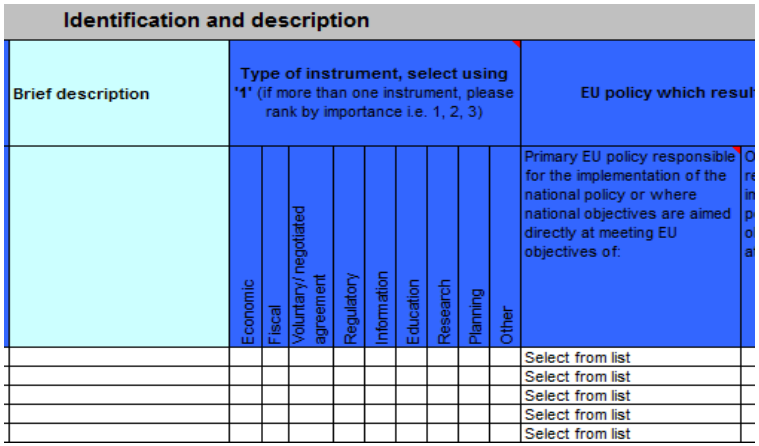
- **V:** See the case study example on the UNFCCC review of National Communications.

MRV of NAMAs:

MRV of policies submitted under the EU MM

Member States of the European Union (EU) are required to submit information on policies every 2 years under the EU legislation governing the MRV of emissions and policies (EU MM). The M & R components are similar to the MRV of National Communications.

- **R:** What is reported under the EU MM is similar to the reporting requirements for the BURs. To increase the **comparability** and make clear the reporting requirements, the EEA and its European Topic Centre on Air and Climate Mitigation (ETC-ACM) developed an excel 'Projections and Policies and Measures Reporting Template'. A guidance document 'Additional guidance for Member States for the reporting of Policies and Measures under the EU MM Decision in 2011' was also developed to also improve the **comparability** of the submissions.
- **V:** In 2011, a 'Quality assurance procedure' document was developed by the EEA and its ETC-ACM. The QA assesses the quality of the submission based on the success factor criteria and improves the quality of the submission through an iterative communication process with the member states. The **accuracy** of the mitigation estimates are assessed through a comparison with projections and benchmarking the submissions across the member states.



Identification and description										
Brief description	Type of instrument, select using '1' (if more than one instrument, please rank by importance i.e. 1, 2, 3)									EU policy which result
	Economic	Fiscal	Voluntary/ negotiated agreement	Regulatory	Information	Education	Research	Planning	Other	Primary EU policy responsible for the implementation of the national policy or where national objectives are aimed directly at meeting EU objectives of:
										Select from list
										Select from list
										Select from list
										Select from list
										Select from list

A screenshot of the policy reporting template

MRV of NAMAs:

Biennial Update Reports (BuRs)

Building on the less frequent reporting of National Communications (NCs) by non-Annex I Parties, a decision was taken at the UNFCCC level requiring non-Annex I Parties to report Biennial Reports by December 2014 (every 2 years). BURs must contain information on:

1. **National circumstances** and institutional arrangements for preparing BURs;
2. **National inventory report** of anthropogenic emissions of all GHGs not controlled by the Montreal Protocol;
3. **Mitigation actions** and their effects including methodologies and assumptions;
4. **Constraints** and **gaps**, and related **financial, technical and capacity needs**, including description of **support needed and received**;
5. Level of **support received** to enable the preparation and submission of BURs;
6. **Domestic MRV**; and
7. Any other information that the non-Annex I Party considers relevant to the achievement of the objective of the Convention and suitable for BURs.

No detailed guidelines on the format and content specific to BURs exist, but BURs are summaries or more frequent updates of NCs. Thus, the UNFCCC guidelines for the preparation of national communications for non-Annex I Parties and its user manual should be used for reporting. BURs must be submitted in a single document in English or another UN language.

MRV of NAMAs

MRV of NAMAs:

Data Management Systems

1. A data management system must **identify measurable data** and also actually **record** the data
2. Different sets of **indicators** and data must be considered to be able to monitor the effects of NAMAs;
3. Data collection and management systems should be **transparent** and has to be done in a **timely manner**. Harmonised systems for different NAMA types and sectors are essential. Consistent methodologies should be used by different organisations collecting data, or data measuring could be performed by one central body.
4. **Methods** which can be used to measure:
   - Surveys and sampling (primary data);
   - Literature reviews (secondary data);
   - Stakeholder consultations, and
   - Memorandum of Understanding agreements which ensure key data collection from e.g. private sectors and other government departments;
5. Due to the lack of harmonised framework for NAMAs, in many countries the MRV of NAMAs is less robust than those for emissions inventories (CPI 2012). For example in Germany, methods to develop mitigation estimates are still evolving. For policies with much clear objectives which have been in place for a long period of time the MRV framework is much more evolved (e.g. German feed-in tariff for renewables).

Memorandum of Understanding is a document describing an agreement between parties. In this case it will be a data supply agreement.

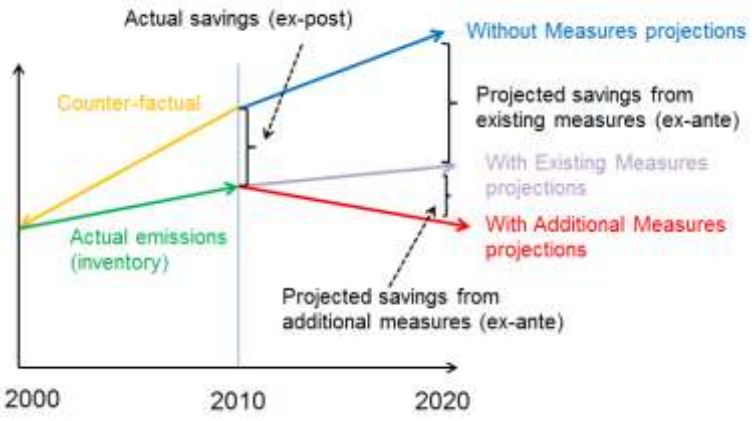
MRV of NAMAs:

Emission mitigation estimate of NAMAs

- **No internationally agreed methodology** exists for the quantifying emission mitigation estimates (both ex-ante and ex-post)
- Different methodologies exist; **top-down, bottom-up or an integration of the two**, ranging in complexity.
- In simple terms, **both ex-ante and ex-post** are quantified by calculating the difference between the emissions projections scenario with and without the impact of the policy. More accurate baseline analysis can be done if detailed data is available by performing bottom -up complex modelling.

Main methodological challenges with quantifying emission savings of policies:

1. **Disentangling impacts of a number of policies**;
2. Defining **baseline scenarios** and development of emissions in the absence of policies;
3. **Geographical coverage** and indirect effects;
4. **Data availability**



Useful methodology documents

Barriers-to-objective weighting method (BOW)

MRV of NAMAs Glossary

Defining the Baseline

Variables for producing a baseline:

- *Scope:* Project, Programme, Sub-Sector, Sector, Country, Technology.
  - The baseline should take into account all UNFCCC gases (CO2, CH4, N2O, SF6, PFCs, HFCs, NF3) and use the GWP established by the IPCC.
- *Metrics or Indicators*: Absolute GHG or CO_2 emissions; Relative GHG Emissions (e.g. emissions intensity); indirect metrics (e.g. MW of renewable energy capacity installed, m3 of forest stock, or qualitative aspects such as mitigative capacity, co-benefits)
  - *When choosing indirect metrics, consider whether it will be important to „convert" the outcomes into GHG reductions with emission factors!*
- *Historical Data*: single time period (e.g. one year); multiple time periods (e.g. an average over several years)
- *Future Assumptions*: assumed continuation of historical emissions (project); continued rate of growth of emissions / emissions intensity (sector); modeling based on policies included in the baseline
- *Co-benefits*: indicators for sustainable development (e.g. resource efficiency, social inclusion, economic viability)

Policy and technical considerations may influence the overall ambition of a baseline, e.g., data availability, expertise, legislation etc. It is also important to carry out uncertainty assessments and sensitivity analyses on existing data, key parameters, applied methodologies and assumptions in order to properly interpret GHG assessment results.

For an example on the development of a baseline for the power sector in Indonesia, please consult the NAMA Sourcebook (2012), p. 43. For more information on baselines, see the draft WRI standards on mitigation goals (chapter 7) and policies and actions (chapter 8).

MRV of NAMAs:

MAC: Marginal abatement costs of NAMAs ($/ CO_2 saved)

- No internationally agreed methodology exists for quantifying emission mitigation costs (both ex-ante and ex-post) and different methodologies exist; top-down, bottom-up or an integration of the two, ranging in complexity.
- Cost = Direct costs (e.g. capital costs: cost of building a more efficient power plant) + Indirect costs (e.g. benefit for the environment and health quantified as cost)
- In simple terms, mitigation costs are calculated by comparing two alternative ways of achieving the same objective. For example, generating electricity through an old inefficient plant or building a wind farm to generate the electricity instead. Indirect costs can be difficult to quantify. Given the additional data and calculation requirements, indirect costs and benefits could be only accounted for when it is relatively easy to do so. If this method is followed, it is important to clearly note this and understand that the mitigation costs could be overestimated. The cost needs to be annualised and discount rates needs to be taken into account.
- The marginal abatement cost of a NAMA is then the ratio of mitigation costs/ emission mitigation estimate for a given year.
- See useful documents for further guidance on how to measure marginal abatement costs.

MAC of NAMA

MRV of NAMAs:

Marginal abatement cost (MAC) curve

MAC curves rank technological options by costs and mitigation potentials. They can thus be useful in choosing and prioritising mitigation options.
When interpreting MAC curves, it is important to be aware of their **caveats**, such as:

- no consideration of co-benefits
- little or no reflection of institutional, transaction and implementation costs or market barriers.
- inability to capture impacts of climate policies on agents, sectors or income groups

The World Bank offers a MAC Tool available here.

In order to enable policy-makers and multiple stakeholders to weigh the sustainable development co-benefits of various technologies additional to emission reductions the UNEP Risoe Centre developed a **Multi Criteria Decision Analysis** (MCDA) as part of the TN Assess tool. A description of the MCDA approach may be found here.

A supplementary tool for rating the co-benefits of mitigation measures in a MAC is currently under development by a working group of CLEAN: Development Impact Assessment tool (forthcoming)

MAC Curve Example Indonesia

MRV of NAMAs:

Using indicators to track the progress of NAMAs

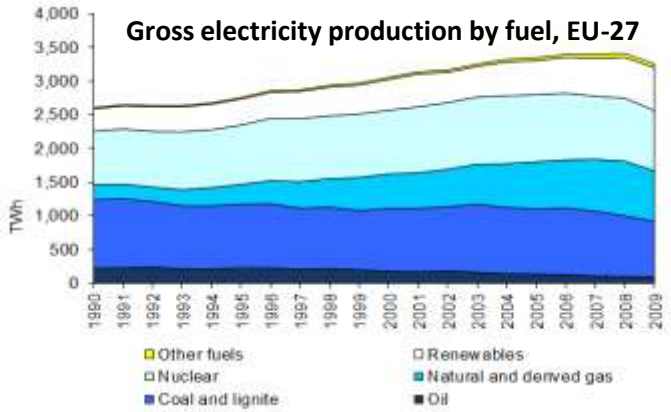
- A simpler method to measure the progress of emission mitigation impact of NAMAs is to identify key indicators linked to the objective of the policy to use as a proxy (e.g. The EEA measures the electricity generated from renewable sources to track the effectiveness of policies promoting renewable electricity generation – see below). Indicators make it possible to more precisely measure the attainment of goals. They may measure quantitative or qualitative results of a project. Individual NAMA implementation activities should have separate indicators.

- Indicators should reflect what the NAMA seeks to achieve, e.g.:
  - Direct emissions reductions (defined by: absolute or intensity-based
  - (e.g. gCO2e/km), gas targeted, geographic coverage of mitigation etc.)
  - Indirect emissions reductions, i.e. those hard to attribute to NAMA
  - Mitigative capacities to be developed
  - Sustainable development co-benefits

- Indicators may be applied at different levels of the impact chain
  - For direct outputs of an activity
  - For direct impacts of an activity
  - For indirect impacts of an activity

- For monitoring implementation, it needs to be defined:
  - The specific interventions included in the NAMA (taxes, grants, etc.)
  - Who monitors the indicators,
  - Timing and frequency of monitoring of indicators,
  - Procedures for reporting and verification.

A guide on designing a climate impact monitoring system can be found here.



Challenges Using the Indicators

Standard Impact Chain

Co-benefits

Back to Qualitative/Quantitative requirements for Reporting

Back to Measurement of NAMAs

Back to Who, When, How, What: MRV of NAMAs

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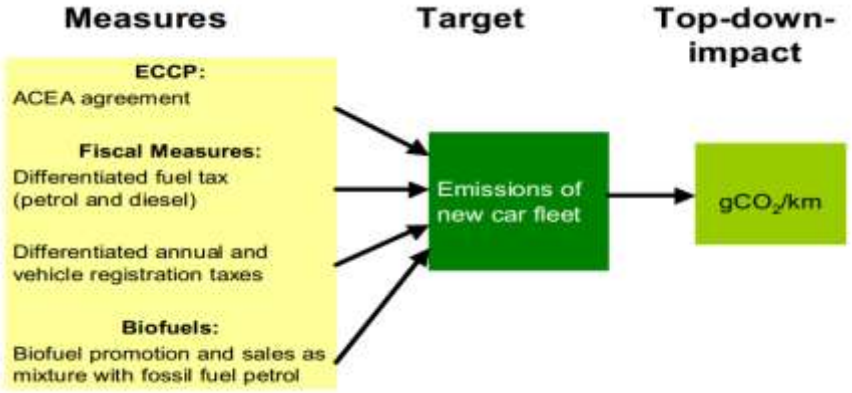
MRV of NAMAs:

Challenges with monitoring the impact of NAMAs using indicators

Often, indicators to monitor the progress and calculate the mitigation impact of NAMAs overlap for a number of policies and it is difficult to disentangle the impact from different NAMAs. E.g. few policies impact CO2/ km of cars:

Without untangling the impact it is possible to MRV a 'package of NAMAs' or overall objectives for certain sectors. Some EU MS, e.g. Belgium report quantified emission savings for a group of policies linked to promoting public transport in their 5th NC. This increases the accuracy of the calculated emission reduction impacts. But has a negative impact on the ***comparability*** and ***usefulness*** of information if donors want to support a specific NAMA.



Often unintentional, out-of-boundary, long-term effects of policies and actions include less obvious environmental, economic, and social consequences than intentional, in-boundary, short-term effects (for a full typology of effects, see chapter 6 of the draft WRI policies and actions standard. In addition, **analysis of these long-term effects requires forecasting uncertain but reasonably foreseeable events**. Suitable methods for modeling cause-effect relationships and establishing impact hypotheses on the effects of NAMAs can be based on:

- Professional judgment or **expert opinion**
- Previous **policy assessments**, evaluation studies, or other relevant literature for similar policies
- **Consultations with local stakeholders**, statutory authorities, regional/national/global entities
- Use of **complex computer models** or geographic information systems (GIS)
- Cross-sectional approaches, e.g. by using policy and control groups, which are equivalent in all respects except for the existence of the NAMA (method applicable for ex-post assessment only).

Glossary

Emission mitigation impact (Mt CO2 mitigated/ annum): A quantitative estimate of the effects of individual policies and measures, or collections of policies and measures. Presented as and/or emissions and removals due to adopted and implemented policies and measures reported for a particular year (e.g. 2020 – ex-ante) and not for a period of years. Helps understand what emission savings are achievable from implementing the NAMA;

Mitigation costs ($/ Mt CO2 mitigated over a period of time): Cost effectiveness of NAMAs. The ratio between the emission mitigation impact and the cost associated with the NAMA, which may include administrative and transaction costs (e.g. capital costs and operational costs) as well as cost to the overall economy and society (e.g. environmental and health benefits). Helps understand whether the policy objective is worth achieving given the cost, and if the objective is being achieved in the most cost efficient way.

Marginal abatement cost curve (MAC) can be useful to calculate, compare and display mitigation costs. MAC curves rank technological options by costs and mitigation potentials. They can thus be useful in choosing and prioritising mitigation options.

Indicators: Effectiveness of policies can be monitored by using indicators. Indicators are trends of parameters or activity values, which may be already collected during the inventory compilation process.

Discount rates: Applying a discount rate enables the comparison of costs occurring at different times. Discounting coverts future economic impacts into their present day value.

MRV of NAMAs – A Case Study:

Designing a Monitoring System for a Housing NAMA in Mexico

- **National Circumstances:**
  - 50 Million Mexicans live in poverty, 80% of which have no access to funding for appropriate housing.
  - Mexico committed to ambitious GHG emissions reductions until 2020, dependent on support
  - Additional details on Mexico's NAMAs can be found here.
- **Proposed NAMA:**
  - Sustainable Housing Program to target mortgage market to provide low-income families with low GHG-emitting homes
  - 75% of the NAMAs in Mexico are transport related and 25% relate to buildings
- **Monitoring to focus on GHG and non-GHG metrics:**
  - GHG Reductions => GHG Metrics needed
  - Increased access to energy-efficient housing => construction and demographic metrics needed

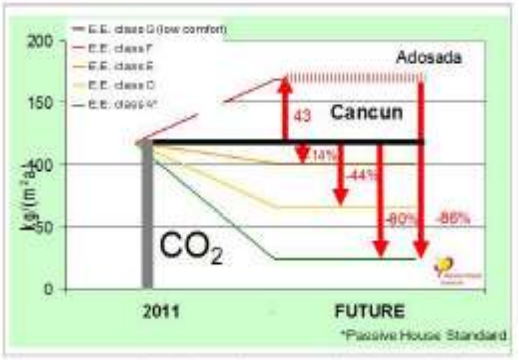


Figure 5: Estimation of CO_2 emission reduction (PHI 2012)

What? Who? How? When? Of Housing NAMA Mexico

Non-GHG Metrics for the Mexican Housing NAMA

GHG Metrics for the Mexican Housing NAMA

Data sources for measuring mitigation outcomes:

Data needs and sources for a **Residential Housing NAMA** in Mexico:

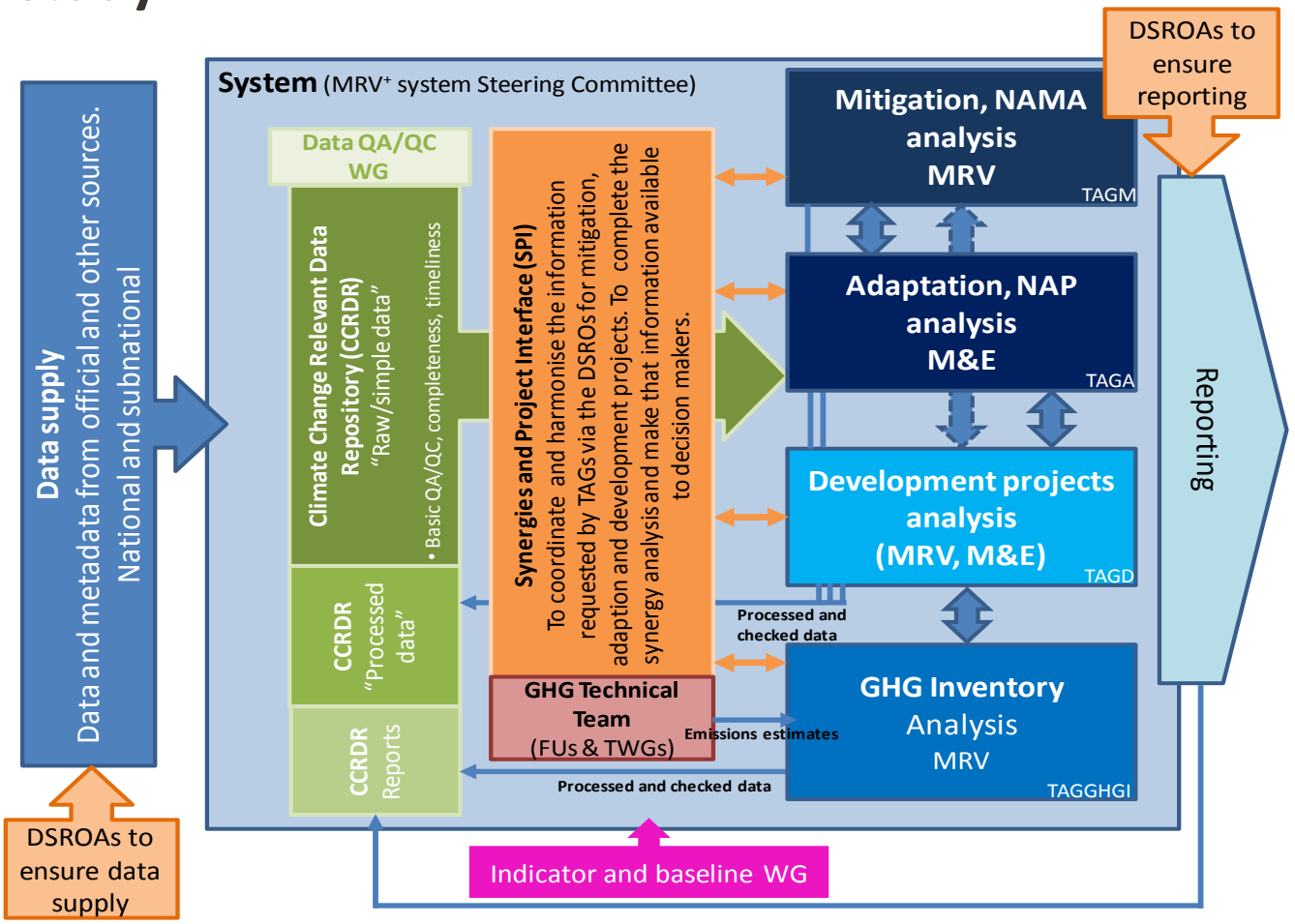
Data to measure	Type of measuring
Electricity consumption	Direct and continuous metering of electricity consumption (including generation from PV). If available, utility billing records can be used.
Emission factor of the grid electricity	As per CDM Tool to calculate emission factor for an electricity system, or use published data.
Transmission & distribution loss	Data from utility or an official government body.
Fuel consumption	Direct and continuous metering of fuel consumption. If available, utility billing records or fuel purchase invoices can be used.
Net calorific value of the fuel	Values provided by the fuel supplier in invoices, own measurement, or regional or national default value.
CO_2 emission factor of the fuel	Values provided by the fuel supplier in invoices, own measurement, or regional or national default value.
Gross floor area of a building unit	Building plan, or onsite measurement.

Source: Perspectives, Thomson Reuters

MRV of NAMAs:

Kenya MRV+ case study

- MRV+ system designed to cover mitigation actions, adaptation actions and development actions
- Central to system is a climate change relevant data repository, where all data is stored (raw data, processed data and final reports)
- Data requirements decided through Data Supply Reporting Obligation Agreements
- Raw data processed by the respective Technical Analysis Group (e.g. for mitigation, adaptation, development and GHG inventory)
- For more info – click here



MRV of NAMAs:

Qualitative and quantitative reporting requirements

Reporting guidelines of BuRs for non-Annex I Parties can be found in the Decision adopted at the COP in Durban. The below are required to be included in BuRs:

- ***Name and description*:** Unique policy name and any other key information not included in 'objective and steps to achieve actions'.
- ***Nature of the action:*** Legal nature (binding/ non-binding and type of policy, e.g. strategy, single projects etc.)
- ***Coverage :*** Sector and gas type affected by the NAMA, consistent with the categories in 1996 IPCC Guidelines.
- ***Quantitative goals:*** Targets set by NAMAs with goals, e.g. emission reduction compared to a BAU scenario – 5% reduction in 2020 compared to Business as Usual projections.
- ***Progress indicators***: Key indicators affected by the NAMA used to monitor its progress.
- ***Objective and steps to achieve actions***: Specific objective the NAMA is designed to achieve and detailed steps of how the NAMA will achieve its objective.
- ***Progress of implementation:*** Actions and activities carried out or planned to implement the policy. What is the status of the policy, e.g. adopted, implemented or in planning.
- ***Results achieved/ expected outcomes including methodologies and assumptions used***: Ex-post and ex-ante emission mitigation estimates or progress based on indicators.
- ***International market mechanism***: Is the NAMA supported? By who, through what mechanism and how much?
- ***Description of the MRV framework***: Qualitative description of the MRV framework in the country.

MRV of NAMAs:

Organisation responsible for reporting

If countries have Designated National Authorities (DNA) currently serving as national focal points for CDM institutions, the organisation responsible for reporting NAMAs may be based on this design.

For NAMAs, the organisations responsible for coordinating reporting may be the same organisation as for measuring.

In general, the organisation responsible for coordinating reporting of emissions, NAMAs and information on support must handle the following:

1. **Incorporate reporting from all ministries** and other organisations and **keep an updated registry** of NAMAs;
2. **Report financial flows** to policy schemes from national and international sources including disbursements, collaborate with the line ministries, and record the effects of regulatory initiatives compared to baseline scenarios;
3. **Oversee** the application of **relevant methodologies** for assessing emissions reduction from concrete project activities;
4. **Support** national and international **verification teams** by providing open access to information;
5. Devise principles to **avoid double counting** of emission reduction for related NAMAs (how to avoid double counting see also the GHG-Protocol Policies and Actions Accounting Standard, p. 15);
6. **Build a national emissions inventory system** to facilitate reporting of BUR to the UNFCCC secretariat.

Consistent information needs to be reported to the National Government, UNFCCC, and international funders.

UNFCCC NAMA Registry

Includes information on the NAMA seeking support: (Durban Outcome, § 46)

- Description of the NAMA and the National Implementing Entity (contact)
- Timeframe
- Full costs (estimated) for
  - preparation and implementation
- Amount and type (financial, technological, capacity building) of support needed
- Emission reductions (estimated)
- Indicators
- Co-benefits and other relevant information

Includes information on support available by the providers of support: (Durban Outcome, § 48)

- Whether support available is for preparation or for implementation
- Source of support and executing entity (contact) channelling the support
- Amount and type (financial (type), technological, capacity building) of support available
- Status of delivery
- Types of action eligible for support
- Process of provision of support

The NAMA registry is only facilitating the matching of providers and recipients of support. It is **not** an automatic outlet for gaining international support, for example via the Green Climate Fund, and it gives no guarantee for funding. Click here to view the **NAMA registry**.

MRV of NAMAs – A Case Study:

Reporting emissions and mitigation information in the cement sector of South Africa

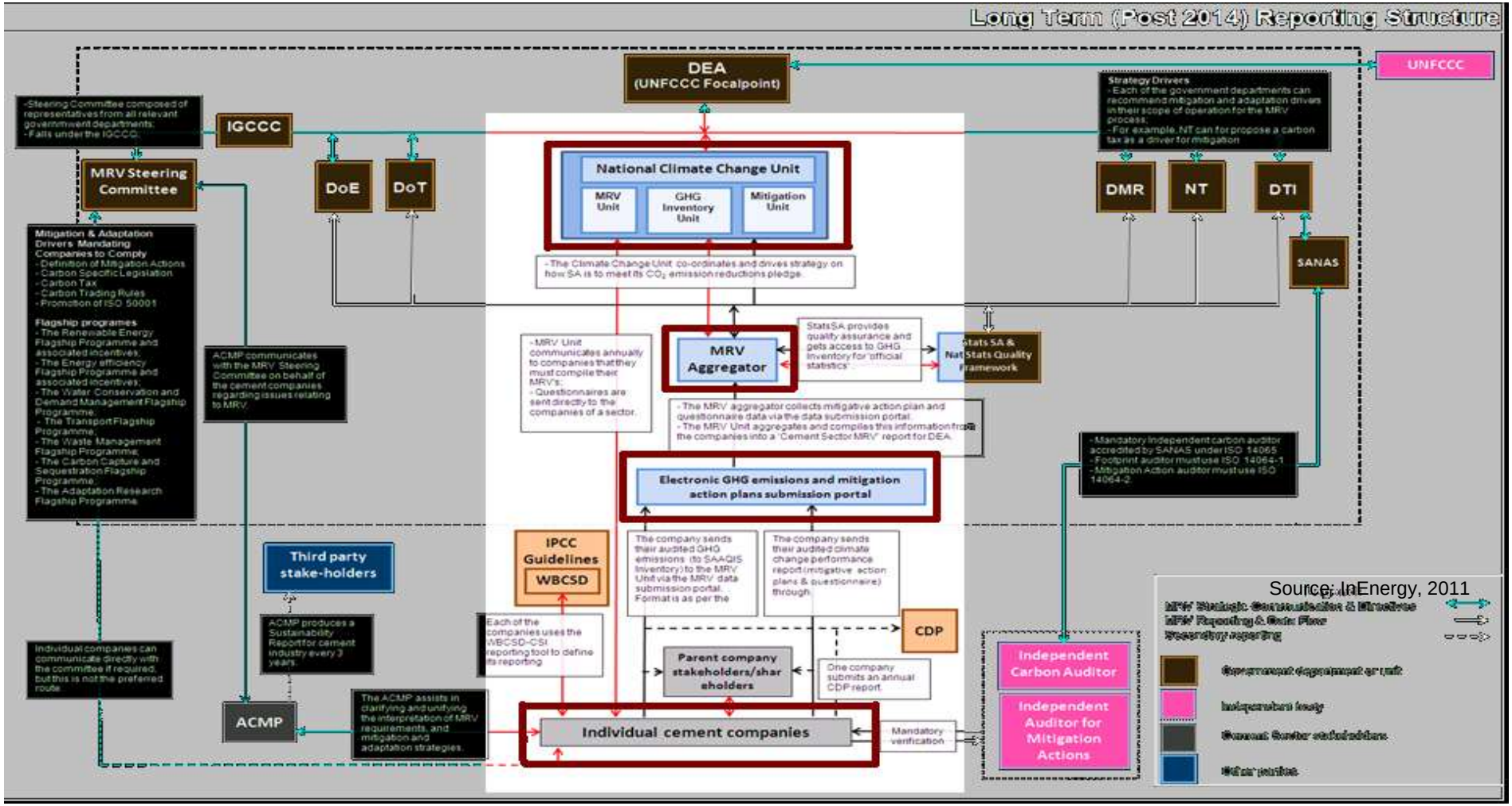
Reporting Level	Reporting to Whom:
International-level reporting	Carbon Disclosure Project
National-level reporting	Department of Environmental Affairs (DEA) => compiled for national communications to the UNFCCC
Sectoral-level reporting	The Association of Cementious Materials Producers (ACMP)
Individual cement producer reporting	To international holding companies and shareholders

- WBCSD used as reporting tool to avoid duplicate reporting

Depiction of the reporting system for the Cement Sector in SA

MRV of NAMAs – A Case Study:

Proposed Reporting Structure for the Cement Sector in South Africa



Source: InEnergy, 2011

Back to: Reporting in the Cement Sector in South Africa

Back to: Institutional Arrangement of MRV Systems

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MRV of NAMAs:

UNFCCC review of National Communications

Post submission, the UNFCCC secretariat coordinates in-depth reviews of NCs submitted by Annex-I Parties.

Why? To provide a thorough and comprehensive technical assessment of the reported information to see if they are in accordance with the convention. Review of the information acts as **feedback** and promotes **consistency** and **future improvements**.

Who? Carried out by an international team of experts selected from the Roster of Experts.

How? The review team conducts a **desk and centralised review** followed by an in-country visit. The content of the NC will be reviewed against the current guidelines for reporting (GL for 5th NC). Problems identified during the assessment is classified as relating to: transparency, completeness or timeliness.

When? The expert review team aims to complete the review within 2 years of the NC being submitted.

The expert review team produces a NC review report within 8 weeks of the visit . The Party concerned has an opportunity to comment on the report before it is finalised. Part VII of the Annex of Report of the Decision adopted at COP 2005 contains more information on the review of NCs by the UNFCCC.

MRV of NAMAs:

Different types of verification entities and stages

Specific entities can verify reported information at different stages of the MRV of NAMAs:

1. During measuring and prior to reporting, there should be a **first party verification**: An internal audit that the organisation reporting performs on itself using an in-house QA/QC procedure. Any simple issues with the data should be resolved internally at this stage;
2. A second party verification could be conducted by a **buyer, supplier or an organisation that has a direct interest** in the results of the verification;
3. A third party verification can be conducted by an **independent qualified** individual or organisation.
4. The final verification before reporting may be performed by the **Government body**. This can act as the declaration that the government has approved the data to be reported;

Post submission

NAMAs which are internationally supported (funded) are subject to international MRV according to guidelines of the COP. Thus, these NAMAs will be verified by UNFCCC reviewers. If BURs are subject to in-depth reviews similar to NCs, other NAMAs may also go under a third party UNFCCC. In addition a domestic verification post-submission is vital for continuous improvements!

For a case study on the inter-ministerial coopreation in the case of MRV of NAMAs in Indonesia, please consult the NAMA Sourcebook (2012), p. 35

MRV of NAMAs:

International Consultation and Analysis (ICA)

ICA and NAMAs:

- Progress on NAMAs will be aggregated into a biennial update reports to be submitted to the UNFCCC
- ICA is intended to broadly **analyze a country's progress** on GHG mitigation through an examination - by a team of international technical experts - of biennial update reports. It is non-punitive, non-intrusive and respectful of national sovereignty, supporting a country to improve its M&R systems and mitigation actions.

ICA is not intended to scrutinize individual NAMAs in detail.

- The requirements for NAMA verification, therefore, remain the domain of NAMA implementers and those supporting the NAMA to determine.

Countries have commited to submit BURs and subject them to ICA

MRV of NAMAs:

Lessons from the CDM for NAMA Verification

- Verification ensures **credibility and accountability** of a project's estimated GHG emission reductions
- **Independence of verifiers** (i.e. third party) is needed to ensure confidentiality of industry data and credibility
- Domestic capacity for verification services are often weak, need to draw on international auditors or **build capacity**
- *What to verify* must be made clear: Verifiers should only be responsible for data that is easily verifiable (e.g. data on fuel use, compliance with procedures) and not for assessing politically-influenced elements, such as baselines.

Methane case study
Showing Additionality under CDM
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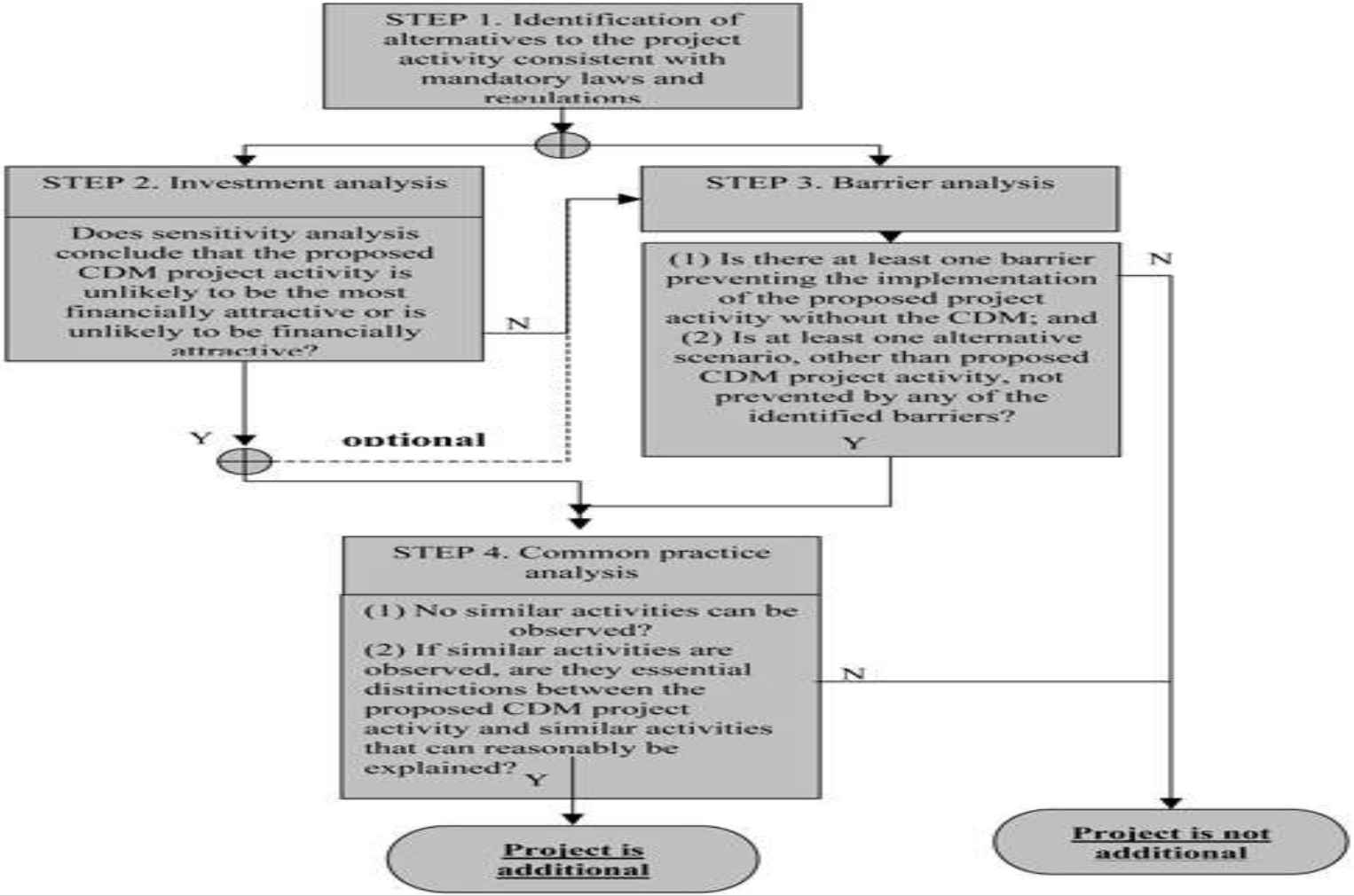
Verification of a project under CDM – Showing Additionality



MRV of NAMAs – a Case Study:

Verifying a CDM Methane project in the Phillipines

Data collection for CDM Project

- Livestock populations from farm records
  - Breeding population
  - Market population
- Average livestock weights by category from farm records
- Biogas production and disposition from data logger or mechanical meter with record of meter maintenance and testing to confirm accuracy
  - Total
  - To engine-generator set
  - To flare
- Biogas methane content from data logger with record of analyzer maintenance and testing to confirm accuracy
- Engine-generator set performance to determine methane combustion efficiency from data logger with record of maintenance and repairs
  - Hours of operation within and outside of manufacturer's specifications
  - kWh generated
  - Parasitic load
- Flare performance to determine methane combustion efficiency from data logger with record of maintenance and thermocouple testing to confirm accuracy
- Confirmation of the various assumptions and default values used in the PDD preparation.

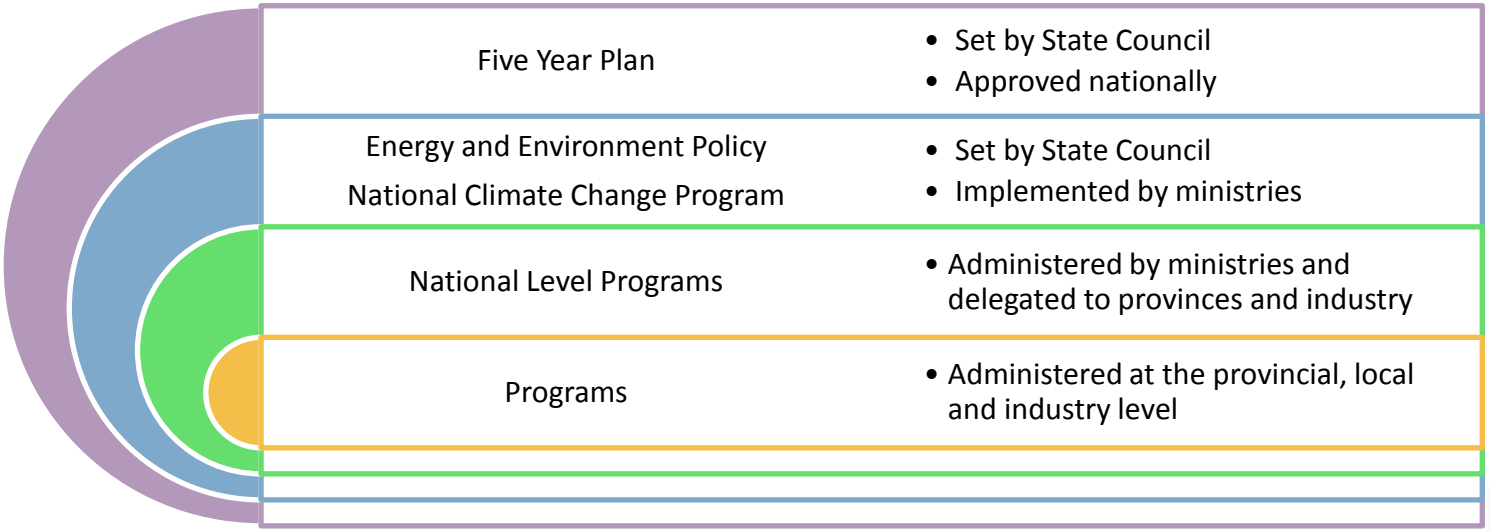
Verification Checklist

- **A certified third party audit to determine the validity of the estimated project emission reductions in the PDD and the claimed CERs.**
- **Projects audited may be determined by random sampling. In other words, a project may not be audited every year.**
- **All data should be archived electronically and retained for at least five years.**

MRV of NAMAs – a Case Study:

Combining Monitoring, Reporting and Verification in China

- When looking for examples of national policies and measures called for under the Bali Action Plan (BAP), China provides a rich set of policies that can be measured, reported and verified (MRV). China has made active efforts to cut its growth in energy use and reducing its dependence on fossil fuels through it's Five-Year Plans.
- The national program and the various sector-specific programs within it have monitoring associated with them, as well as reporting and in some cases verification procedures. The diagram below shows the hierarchy of supportive plans and NAMAs in China.



On China's MRV systems see also CPI's study.

Metrics in China

MRV of NAMAs:

MRV Metrics and mechanisms in China's five-year plan*

NAMA	Scope	1. Monitoring	2. Reporting	3. Verification	Timeframe
Five-Year Plan	National comprehensive planning document	Qualitative evaluation of policy implementation	Annual work report by premier and each ministry	Verified by standing committee of National People's Congress	New targets set every five years
GDP Restructuring	National	Share of GDP represented by the service sector	National Bureau of Statistics publishes an annual statistics bulletin	Internal data quality system at National Bureau of Statistics	Annual progress report & five year goal
Technology Development	National	Share of GDP represented by R&D spending	Yearly statistics bulletin by National Bureau of Statistics, Ministry of Science and Technology and Ministry of Finance	Enterprise level data collected by National Bureau of Statistics and Ministry of Science and Technology	Annual progress report & five year goal
Energy Intensity	National (with province, locality and state-owned enterprise targets	Energy used	Semi annual statistics bulletin published by National Bureau of Statistics,	Collected from multiple sources for cross-checking	Five year goal. Data tabulated annually alongside semi-annual province reports
Renewable Energy	National (power generation company and province targets)	Percentage of renewables in total output	Energy Bureau aggregates data from National Bureau of Statistics, industry and ministries	Internal data quality assurance system with cross-checking	Goals to 2020 calculated annually
Waste Recycling	National (Industrial sector)	Percentage of industrial solid waste recycled	Published in a yearly report	Internal quality assurance system within Ministry of Environmental Protection	Five year goals
Forest Cover	National	Percentage of total landmass planted in trees	State Forestry Administration conducts natural forest resource inventory	Remote sensing and ground-truthing	Five year and longer term goals

* Taken from World Resources Institute working paper "Mitigation Actions in China: Measurement, Reporting and Verification"

The Who, What, When and How: MRV of NAMAs

1. **What to MRV?**
   - Individual activities of the NAMA should have their own **indicators**, whether they seek to measure GHG reductions or other benefits. The indicators will determine what gets reported and verified.
2. **How to MRV?**
   - How will benefits be measured (methodologies used)? How accurate must measurement be? Can measurement be conducted "on-site" or will official data sources be used to measure results? How will results be compiled and stored, and through which channels will they be reported? Is on-site verification required?
3. **When to MRV?**
   - How often will particular activities of the NAMA be "MRV'd"? E.g. Performance monitoring annually? Reporting Biennially? Verification of reported information?
4. **Who should MRV?**
   - The person /institution responsible for the M, R and V of the NAMA need to be identified during the design phase.

Standard impact chain checklist

When assessing the impact of a NAMA we can differentiate between intended and unintended, in-boundary or out-of-boundary (spillover), short-term or long-term effects.

Impact chains are useful tools for fine-tuning activity-planning, as well as for monitoring. A standard impact chain includes:

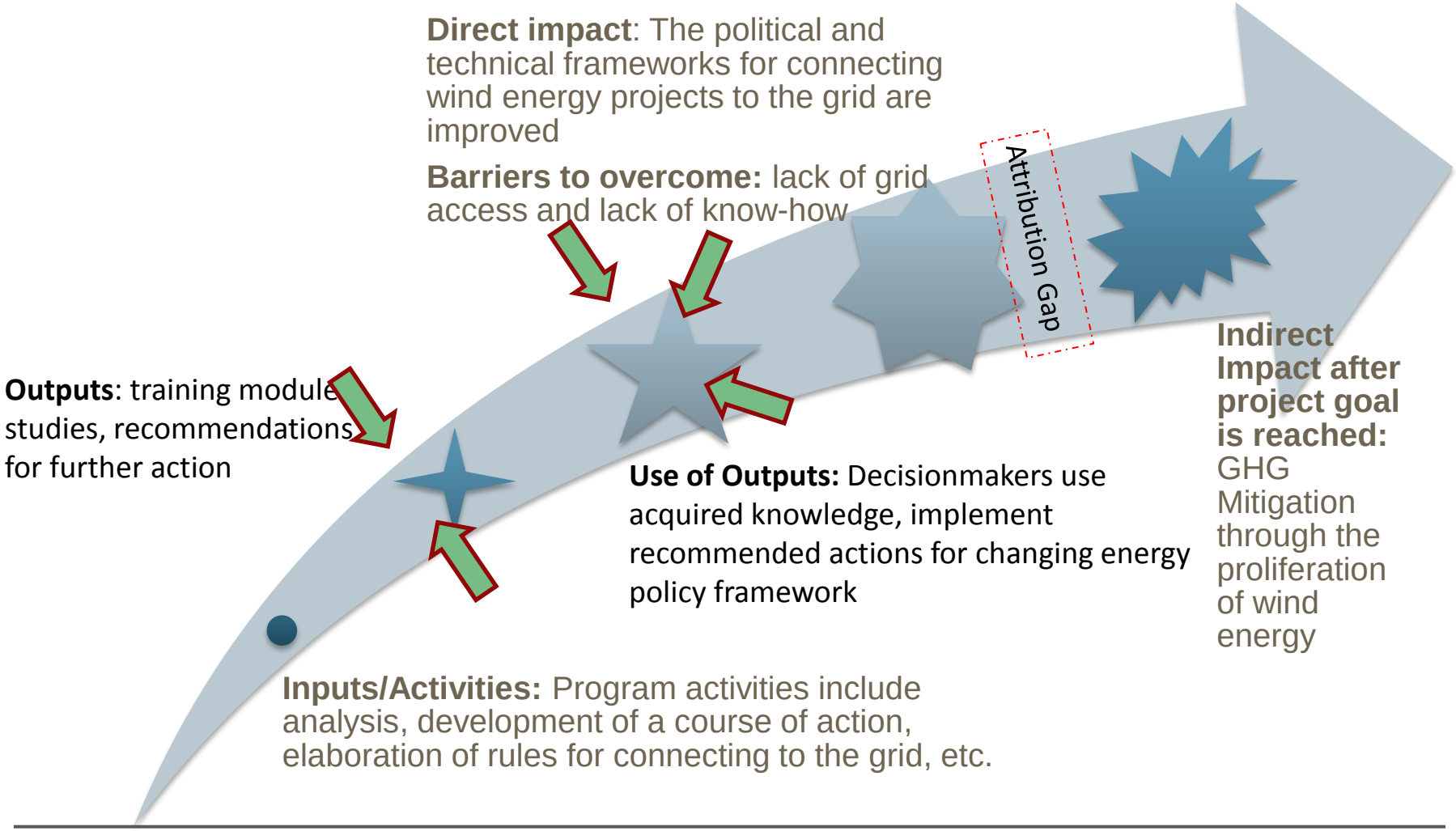
- **Inputs**: (material and immaterial) contributions of donors, national partners, international partners, businesses and civil society to produce outputs
- **Activities**: immediate interventions
- **Outputs**: short-term results of activities
- **Use of outputs**: to make the intervention effective the target group must make use of the outputs, depends on complex circumstances and (enabling) environment
- **Direct Impact**: direct result of activities
- **Indirect Impact**: indirect result after achieving the project goal. The indirect impact is the actual benefit that is sought through the activity.

A Visualization of the Impact Chain

More information on options for monitoring and reporting can be found in the NAMA Sourcebook, (2012), p. 62. More information on different types of effects, see chapter 6 of the draft WRI policies and actions standard.

MRV of NAMAs – a Case Study:

An Impact Chain for a GIZ Project promoting Wind Energy in Vietnam



MRV of NAMAs:

Co-Benefits and Mitigative Capacities achieved by NAMAs

Depending on the scope of MRV for the NAMA, the NAMA may also seek to monitor and report **non-GHG reduction outcomes**, such as the NAMAs' contribution to development goals and/or the improvement of mitigative capacities amongst NAMA stakeholders.

Co-benefits may include a wide range of national development goals, such as:

- Job creation
- Access to energy of transport
- Improved Water or Air quality
- Protection of Biodiversity

Barriers-to-Objective Weighting Method (BOW)

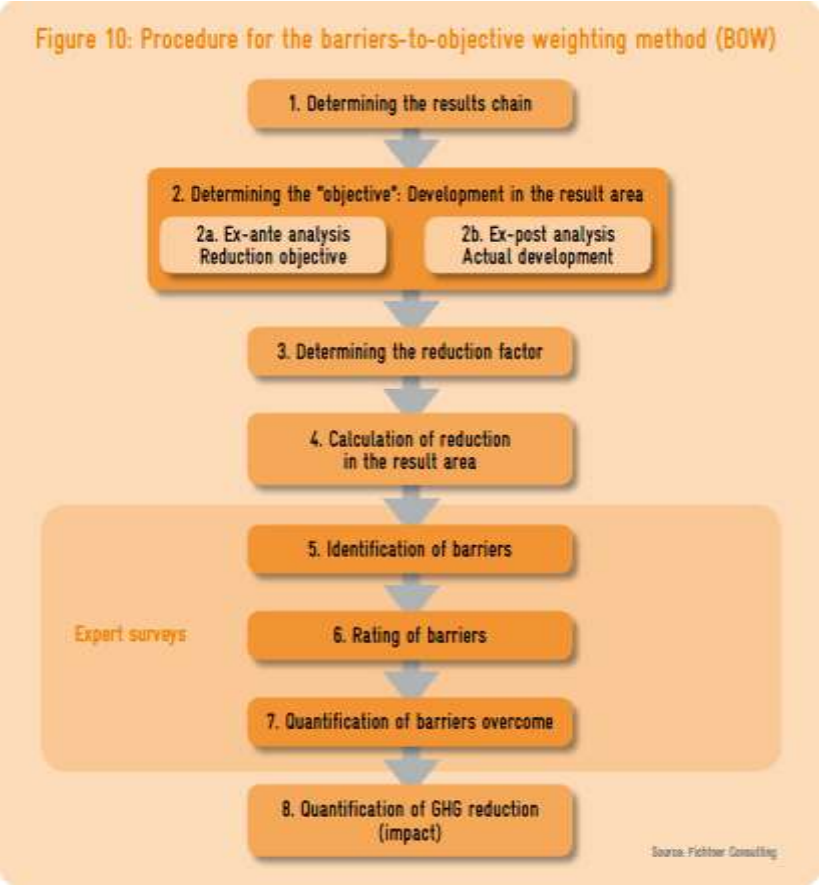
Improved **Mitigative Capacity** may include:

- Institutional arrangements are in place to promote low-emissions development
- Technical and human resource capacities are strengthened
- The policy environment for low-emission development is improved

A supplementary tool for rating the co-benefits of mitigation measures in a MAC is currently under development. The Development Impact Assessment tool will be made available soon.

MRV of NAMAs:

Barriers-to-objective weighting method (BOW)



- The ***barriers-to-objective weighting method (BOW)*** estimates emission reduction (in tonnes of CO2 eq.) achieved by projects, which aim at the increase of the ***mitigative capacity*** of a country as an intended outcome.
- The contribution by the project to GHG reduction is estimated by ***weighting*** the negative impact of each barrier (**transaction costs**) that obstruct the implementation of the climate protection measure or the scaling up of investments in ER.
- A target of emissions to be reduced by the project needs to be quantified.
- Once the obstructive barriers no longer exist (or are lowered), the investment is possible i.e. climate protection measures can be implemented.
- If the quantified target is multiplied by the weighting of the overcome barrier, the ER effect can be quantified.

For more information on the BOW method, please consult GIZ Sourcebook on Climate Results, available here (p.58).

UNFCCC Principles for Reporting on GHG Inventories: TCCCA

These principles can also be applied to estimation of emissions at national, sectoral and installation levels.

1. **Transparency** means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information.
2. **Consistency** means that an inventory should be internally consistent in all its elements with inventories of other years. An inventory is consistent if the same methodologies are used for the initial and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. Under certain circumstances an inventory using different methodologies for different years can be considered to be consistent if methodologies provided by the IPCC for such situations have been applied.
3. **Comparability** means that estimates of emissions and removals reported by Non-Annex I Parties in inventories should be comparable among Non-Annex I Parties. For this purpose, Non-Annex I Parties should use the methodologies and formats agreed by the COP for estimating and reporting inventories.
4. **Completeness** means that an inventory covers all relevant sources and sinks, as well as all gases, included in the IPCC Guidelines. Completeness also means full geographic coverage of sources and sinks of a Non-Annex I Party.
5. **Accuracy** is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, as far as can be judged, and that uncertainties are reduced as far as practicable. Appropriate methodologies should be used, in accordance with the IPCC good practice guidance, to promote accuracy in inventories.

MRV of Emissions: GHG Projections

MRV of NAMA:

Useful Documents

1. Methodology on quantifying policies -Quantification of the effects on greenhouse gas emissions of policies and measures methodologies report (AEA et al. 2009)
2. Paper discussing MRV of NAMAs – Measuring, Reporting, Verifying – A Primer on MRV for Nationally Appropriate Mitigation Actions (UNEP, 2012)
3. Cost-effectiveness Assessment of Greenhouse Gas Mitigation Options: A Proposed Methodology
4. GHG Protocol: Policies and Actions Accounting and Reporting Standard
5. GHG Protocol: Mitigation Goals Accounting and Reporting Standard
6. How to develop a NAMA by scaling-up ongoing programmic CDM activities on the road from PoA to NAMAs, a Study by KfW/South Pole
7. Setting baselines for the new market mechanism: Examples from the power, cement and buildings sectors (Öko-Institut, 2012)
8. Greenhouse Gas Emission Baselines and Reduction Potentials from Buildings in: Mexico /South Africa (UNEP, 2009)
9. Climate Results: The GIZ Sourcebook for climate-specific monitoring in the context of international cooperation (GIZ 2011)
10. Knowledge Product: Elements and Options for National MRV Systems (International Partnership on Mitigation and MRV, 2013)

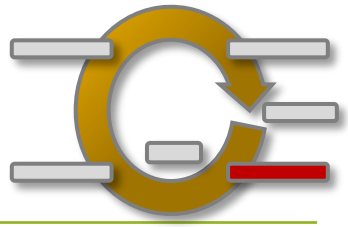
MRV of NAMAs: Marginal Abatement Curve

MRV of support – additional slides

MRV of Support:

An Overview of Measurement: What, Who, How and When?

Given the increasing emphasis being placed on a significant role for private "climate finance", clarity is urgently needed on what private flows might be eligible to be counted.



What gets measured?	How to measure?	Who measures?	When to measure?
Flow of finance (how much has gone from whom to whom) and levels of technology transfer. What contributions should be counted under MRV of support? What is "new and additional"? When a project has multiple objectives, how much of the total finance is accounted as climate finance? How should the distinction between gross and net finance be made?	Government department or agency, or private sector organisation with expertise? Different types of data and metrics are conceivable: • Monetary – i.e. quantified financial support (e.g. costs of capacity building), disaggregated by use/purpose. • Non-monetary – some description of the delivery of "in-kind" support, technical advice or expertise, and other non-monetary forms of support. This occurs on multiple levels. Each country must develop a data collection system for public finance to fit its domestic needs. Data collection may also necessarily involve multilateral institutions, since these are responsible for directing a significant portion of climate finance and make allocation decisions independent of the countries.	Need information with which to assess eligibility of technology/ programme/ project for support. Need information on monetary support (financial resources, technology transfer, capacity-building and technical support received from GEF etc) and non-monetary (in-kind support such as technical advice or support). To measure impacts of funding, will have similar requirements to measurement of NAMAs.	Depends on requirement of funder? Likely to be at least annually?

Under negotiation in UNFCCC

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

MRV of Support:

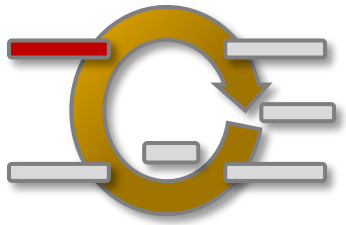
An Overview of Reporting: What, Who, How and When?

What gets reported?	How to report?	Who reports?	When?
What forms of finance are covered (e.g. grants, concessional lending, non-concessional lending, equity)? What data are reported? -Purpose: mitigation (including or excluding REDD+), adaptation, etc. -Specific sectors and/or activities supported. -Geographic distribution -Disbursed funds only, or also pledged funds? Private financing leveraged by public funds.	UNFCCC National Communications (NCs), OECD Development Assistance Committee (DAC) Creditor Reporting System (CRS) database, efforts by the bilateral and multilateral development banks, and the EU's Fast-start Finance reporting. NAMA registry: Article 53 of the Cancun Agreements, COP16, endorsed requirement to record NAMAs seeking international support and to facilitate matching of finance, technology and capacity building to these actions. Private climate finance registry: • EcoSystem Marketplace, in collaboration with Bloomberg New Energy Finance • UNEP Risoe compiles a CDM pipeline overview	UNFCCC and OECD DAC guidelines. The DAC guidance on use of the Rio Markers remains the only semi-detailed international guidance on how to identify and account for climate finance.	OECD DAC Annual. UNFCCC NCs every 3-5 years. Biennial reports.

Public flows should be reported at the national level, rather than by individual (sub-national) channels. This may require boosting institutional capacity, and also creates a need for concerted dialogue among state departments and finance institutions within countries and between countries and international agencies. In some cases it may require new expertise, as well as new arrangements for institutional cooperation.

MRV of Support

An Overview of Verification: What, Who, How and When?



What to verify?	Who verifies?	How to verify?	When ?
3 levels of verification: • Verify scale of support (i.e. of financial flows themselves) by comparing data from contributors and recipients. • Verify effectiveness of support –the actual achievement of climate-related outcomes (e.g. GHG emission reductions) and consistency with developing countries' own priorities. • Verify cost-benefit impacts e.g. of adaptation activities, or the wider benefits of low-carbon development.	Ideally independent, non-political finance experts. Introduce process for review by independent, non-political technical finance experts.	Currently, there are not guidelines for verifying level of support. Scope of verification determines methods and data requirements • Level of support verified by comparing data from funders and recipient countries. • Impacts of support can be verified in same way as for NAMAs	Annual, UNFCCC NCs every 3-5 years. Biennial reports

- Introduce process for review by independent, non-political technical finance experts.
- Consider scope for ex-ante quantitative assessment of social, economic and environmental impacts (e.g. through use of carbon footprint tools).
- Assess supported actions against expressed domestic priorities in recipient countries, such as priorities identified in National Adaptation Programmes of Action (NAPAs) and nationally appropriate mitigation actions (NAMAs) as well as National Development plans and the Millennium Development Goals.

MRV of Support:

The rationale of MRV of Support

The overarching purpose of an improved framework for MRV of support, including technology transfer, capacity building, and financing, and long-term climate finance is to:

- **Building trust** among developed and developing countries through improved **transparency** and **accountability**: design option 1
- Providing a clearer **overview** of financial flows, trends, sources, and purposes of international and domestic climate support: design option 2
- **Keeping track** of intended contributions and their delivery: design option 3
- Identifying best practice and improving **effectiveness** of international action and creating **incentives for private investment**: design option 4

Note: *"MRV of Support" encompasses support already received by the state, as well as the way developing countries will MRV climate support in the future.*

MRV of Support:

The three pillars of MRV of support

Bali Action Plan (1/CP.13)	Copenhagen Accord (1/CP.15)	Cancun Agreements (1/CP.16)
b)Enhanced national / international action on mitigation of climate change, including, inter alia, consideration of: (i) Measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, by all developed country Parties, while ensuring the comparability of efforts among them, taking into account differences in their national circumstances; (ii) Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner;	4. …..Delivery of reductions and financing by developed countries will be measured, reported and verified in accordance with existing and any further guidelines adopted by the Conference of the Parties, and will ensure that accounting of such targets and finance is rigorous, robust and transparent.	112. Decides to establish a Standing Committee under the Conference of the Parties to assist the Conference of the Parties in exercising its functions with respect to the financial mechanism of the Convention in terms of improving coherence and coordination in the delivery of climate change financing, rationalization of the financial mechanism, mobilization of financial resources and measurement, reporting and verification of support provided to developing country Parties; Parties agree to further define the roles and functions of this Standing Committee;

CoP Discussion on MRV of Support and Developing Countries

MRV of Support:

Monitoring support received by Developing Countries

The prospect of recipients playing a part in MRV by reporting financial support received within their NCs has already been raised, at COP16 in Cancun. For this to work well, the UNFCCC would need to provide detailed guidance and capacity-building in non-Annex I countries. However, a number of national and international requirements are already in place that can serve as a starting point:

- COP16 in Cancun agreed that developing country recipients of bilateral and multilateral climate finance are obliged to document it in their **biennial update reports** to the UNFCCC. However, common and systematic reporting is not yet in place.
- Many developing countries already keep track of their **ODA flows**. The OECD has suggested **biennial reporting** with flexible guidelines which provide for different "levels" of reporting. The reporting levels could reflect the different national circumstances and capacities of Parties; those with greater capacities would use higher reporting levels and provide more comprehensive information.

BURs require recipient countries to report on support needed and received, in essence to keep comparable books. Having two sets of books (one on the donor side, one on the recipient side) may necessitate some expert analysis to **ensure there is no double-counting and avoid apparent misreporting**.

Example: A donor country may give $50 million to another country to assist with climate-related capacity-building. If the donor counts this toward its climate finance contributions, but the recipient counts it as general capacity-building support, this will appear as a discrepancy between the two accounts.

Options for Reporting Guidelines For Biennial Update Reports (OECD, 2011) can be found here.

MRV of Suport:

Strengths and Weakness of UNFCCC National Communications (NCs)

	Strengths	Weaknesses
Coverage	All Annex II countries including EU-12 Member States are required to report.	Annex I countries not included in Annex II e.g. new EU-15 Member States are not required to report on financial aid to climate change-related activities in developing countries.
Measurement	Public and private funds including disbursed funds and private sector leveraged funds.	New and additional not clearly defined. Mitigation classifications are not broken down by specific categories. The adaptation classifications leave out several important aspects of adaptation, e.g. water, forests, health, energy, and infrastructure. Issues with Guidelines: • No information as to how climate change financing is to be distinguished from development assistance support. • The guidelines do not distinguish among funding for research and development, planning, assessments, capacity building, demonstrations, or technology deployment. • No information on how to report projects having multiple components.
Reporting	Provides good high level summary. This reporting remains light and respectful of national specific channels and resource availability. Data are broken down into sectoral and regional categories. Can provide a consistent, standardised format for reporting finance across Parties, if improved guidance is made available.	Not all financial flows are currently being reported, though there is technically scope to do so. Lack of primary data on private financial flows (including CDM). Currently, the data do not always distinguish between different financial instruments (among grants, loans, and guarantees). Member States have tended to report those flows for which data are readily available (i.e. public development finance) but not those for which there is considerable uncertainty and/or difficulty (i.e. private finance, innovative instruments) although these data may be very relevant.

MRV of Support:

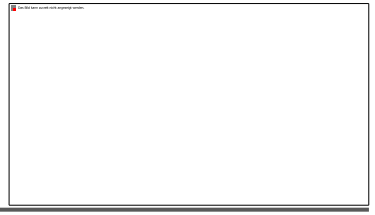
Challenges of existing systems (Rio markers)

The OECD DAC guidance on use of the Rio Markers remains the **only semi-detailed international guidance on how to identify and account for climate finance**. However, the Rio markers are descriptive and do **not allow accurate quantification** of climate finance – which was not their original purpose. Reporting of climate finance is currently based heavily around the OECD DAC system for reporting ODA flows. This makes sense from a donor perspective because climate finance and ODA are so heavily intertwined. However, the OECD DAC system's role in the governance of climate finance – in particular, the responsibility for defining measurement and verification procedures – has not been agreed. While the **OECD CRS system might provide one useful tool** for reporting, it will **need to be linked to reporting through the UNFCCC NCs and BURs** and to guidance from the COP/UNFCCC in order to gain legitimacy in the eyes of developing countries.

The way how OECD CRS reports gros, net and committed/disbursed public finance is currently under reform.

The World Bank's internal tracking system for Climate Finance tracks co-benefits at the lowest level of financing information available, even considering individual components of the project, thus adding granularity to the Rio Markers. The WB published a detailed Typology of Activities with Climate Co-Benefits by WB Sector. For example, if only $10m of a $100m power project tackles energy efficiency, then only $10 million will be recorded as having mitigation co-benefits. The WB is also part of the MDB group on mitigation finance tracking, and results show differences between the WB approach and the MDB approach, though harmonization is planned going forward. More information on this issue can be found here.

Strengths and weaknesses of UNFCCC National Communications

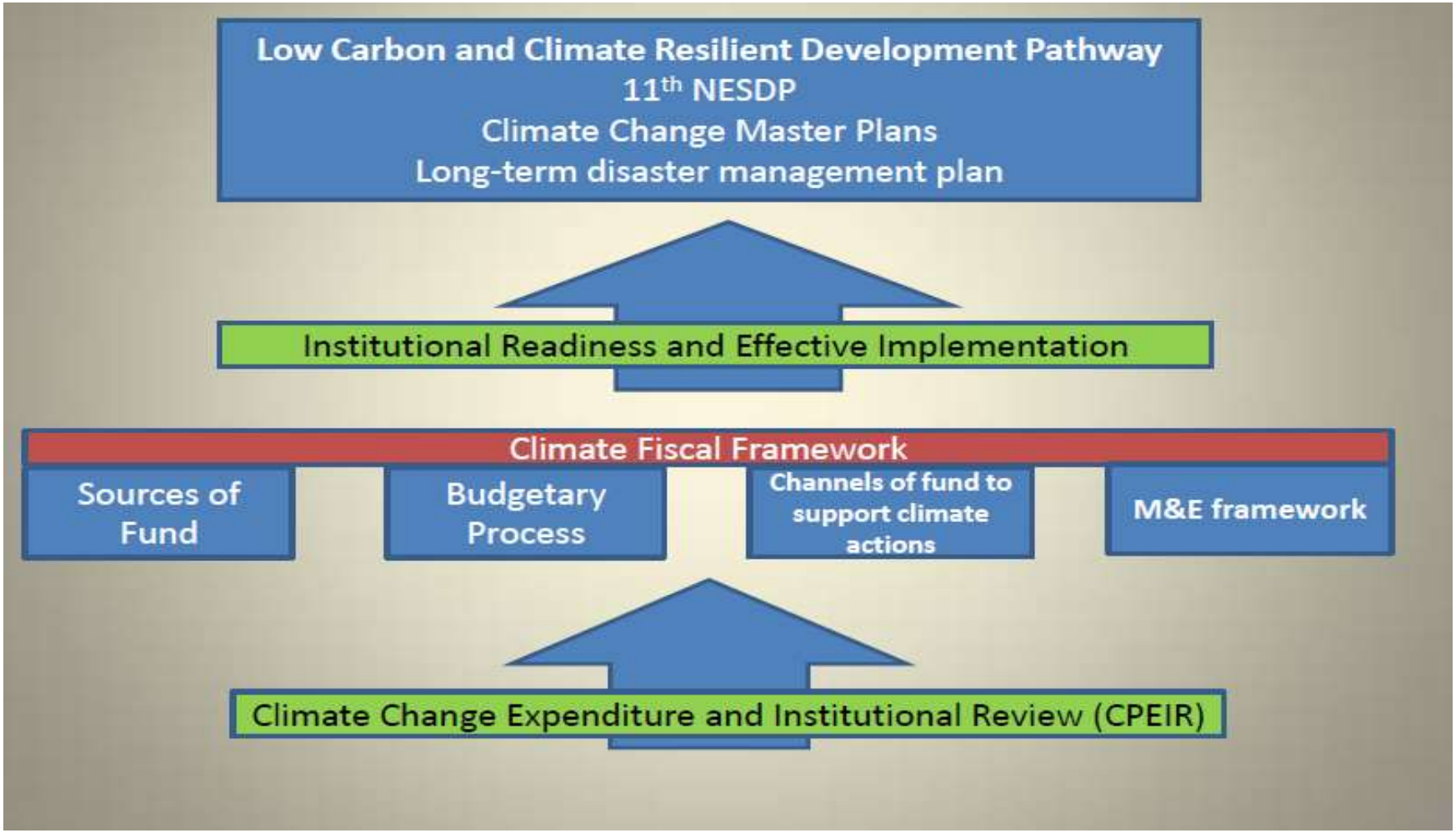


MRV of Support:

Strengths and Weaknesses of OECD-DAC system

	Strengths	Weaknesses
Coverage	Rio Markers are mandatory reporting requirements for DAC members. Data are added annually. Strong interest from other OECD and non-OECD countries. Other Regional developments banks IBRD, EIB already use CRS coding and can easily adapt to the Rio markers. However, questions remain on the willingness of the MBDs to apply OECD DAC methodologies consistently when in-house tracking methodologies of various standards and purposes are being developed.	Not all Member States or all Annex I Parties report to the OECD DAC. All OECD-DAC members do not use the Rio Markers for reporting climate finance. Covers only ODA flows (a subset of all climate finance). Plans are in place to consider expanding the coverage of Rio Markers to non-ODA flows, such Other Official Flows (OOF).
Reporting	Increasingly stable and comprehensive statistical system. Since CRS reporting is based on agreed definitions and classifications, it permits comparisons between contributing countries. As there are standardised definitions, the OECD Rio Marker data represent a more systematic treatment of the same bilateral delivery channels for mitigation support than what is reported by countries in the UNFCCC monitoring system. Allows reporting of high level of detail in relation to the content of climate finance, for instance project level breakdown of financial flows. The principal and significant Rio Markers provide an approximate lower and upper threshold of climate related aid. Export credits and MDBs (Multilateral Development Banks) are partially reported to OECD-DAC. Well established channels and forums for regular discussions and improvements. Working groups exist between: • OECD members • European Commission • UNFCCC • International Energy Agency	Some data inconsistencies /gaps between Member States Does not allow exact quantifications of aid activities' contributions to the objectives and thus figures based on Rio Markers are approximate Coding system limits accuracy of reported climate aid and can generate political bias. Current method for reporting data using climate change Rio Markers separates finance into four different markers that cannot be analysed together. To get the full picture of climate finance from a country, it is necessary to add up statistics from: • climate change only; • biodiversity and climate change; • desertification and climate change; • biodiversity and climate change and diversity. Only limited reporting of different channels. No breakdown by individual institutions or funds.

Climate Fiscal Framework Initiative in Thailand



MRV of Support - Case Study 1:

Definitions of Climate Expenditure

Climate Expenditure (CE) is any expenditure which drives Thailand towards a Low Carbon Society.

- CE is expenditure which can avert climate change impacts in particularly vulnerable regional areas and affected sectors (Adaptation).
- CE supports actions that can directly or indirectly induce a reduction of carbon emission (GHG emission reduction) or mitigates carbon intensity caused by production and consumption activities (Mitigation).
- Expenditure on Capacity Building and Human Capital Investment towards a better aware society can be either climate expenditure and/or development expenditure.

MRV of Support - Case Study 1:

Relevance and Rationale for Climate Expenditure

Relevance	Rational
High : (Climate dimension weighting more than 75%)	Clear primary objective of delivering specific outcomes that improve climate resilience (adaptation) or contribute to mitigation, technology transfer and capacity building
Mid : (Climate dimension weighting 50% to 74%)	Either secondary objectives related to building climate resilience or contributing to mitigation, or mixed programmes with a range of activities that are not easily separated but include at least some that promote climate resilience or mitigation
Low : (Climate dimension weighting 25% to 49%)	Activities that display attributes where indirect adaptation and mitigation benefits may arise
Marginal : (Climate dimension weighting less than 25%)	Activities that have only very indirect and theoretical links to climate resilience and in some cases may lead to an increase in carbon emissions

MRV of Support - Case Study 1:

Key findings of the Climate Change Expenditure and Institutional Review

- The climate budget as identified using the methodology outlined in the previous chapter, suggests that on an indicative basis, this budget represents around 0.5% of GDP and 2.8% of the government budget.
- There are 137 sub-ministerial agencies involved in the delivery of climate activity in Government This represents a significant policy and institutional coordination challenge. However, over three quarters of the budget is concentrated in only 10 agencies.
- In terms of the climate relevance of activity, around 1/5 of the climate budget was allocated to codes that were assessed as being highly relevant to climate change, whilst the majority of the budget was found in the mid-relevance programmes. The most financially significant element of the overall climate budget is the mid relevance adaptation component, largely undertaken by the Ministry of Agriculture through its water distribution and storage.
- In respect of fiscal measures there has been limited use of specific initiatives to date for climate related issues. However, given the balance of revenues between direct and indirect measures there would appear to be scope for review with a view to identifying potential specific initiatives.
- Extra-budgetary funds fall under the governance of individual ministries and as a result the operation of each fund is independent of one another. Policy coherence through such funds is therefore rather limited.

MRV of Support - Case Study 2:

Kenya National Climate Fund

Kenya is in the process of developing a national climate fund.

The fund framework will be governed by the principles for reporting national GHG inventories under the UNFCCC, following the main principles of: Completeness, Transparency, Comparability, Accuracy and Efficiency.

Its governance will also allow broad stakeholder representation (government including Counties, civil society, private sector, development partners.) The Fund will regularly report, in its annual report; and six-monthly or more frequent updates published on its website, to stakeholders on its operations and financial status, including but not limited to:

- Projects and programmes supported, including names, names of beneficiaries, sector to which belong, location, and expected project or programme impact
- Amount of funding mobilised by the Fund by contributor, window, etc.
- Financial status
- Performance indicators
- Amounts of financing committed and disbursed by the Fund in total (portfolio), and from each period

MRV	Projects have to provide: 1. Information, in a tabular format, on actions to mitigate climate change, including for each mitigation action or groups of mitigation actions: (a) Name and description of the mitigation action, including information on the nature of the action, coverage (i.e. sectors and gases), quantitative goals and progress indicators; (b) Information on methodologies and assumptions; (c) Objectives of the action and steps taken or envisaged to achieve that action; (d) Information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emissions reductions, to the extent possible; (e) Information on international market mechanisms. 2. Information on the description of domestic measurement, report and verification arrangements. 3. Information on constraints and gaps, and related financial, technical and capacity-building needs. 4. Information on financial resources, technology transfer, capacity-building and technical support received from the Global Environment Facility (GEF), Annex II Parties and other developed country Parties, the Green Climate Fund and multilaterals institutions for activities relating to climate change, including for the preparation of the current biennial update report. Fund beneficiaries will be held to reporting obligations to the Fund (on execution of the project; climate-related impacts; etc). The Fund will develop reporting templates adapted as appropriate to each type of projects and/or category of beneficiaries.

MRV of Support: Case Study 3:

Indonesian Climate Change Trust Fund

The Indonesian Climate Change Trust Fund (ICCTF)

Monitoring and Evaluation

There are six criteria of monitoring and evaluation practices that are applicable to projects, programs, and themes but that do not all need to be systematically reviewed in all cases. The six specific monitoring and evaluation criteria (efficiency, effectiveness, impact, transparency, relevance and sustainability) used in combination provide all the stakeholders with essential information in connection with present and future decisions on projects and programs.

Verification:

The auditing arrangements for the fund are as follows:

1. Annual 'policy compliance 'audit. The ICCTF Steering Committee will be held accountable for ensuring that external grants are allocated according to the provisions stipulated in grant agreements with development partners. An independent auditor, and paid for by the ICCTF, will conduct annually a 'policy compliance' audit.
2. ICCTF service providers. The same independent auditor will audit the performance of the ICCTF Trustee, based on contracts with the Ministry of Finance.
3. Recipients of ICCTF grants. An independent auditor will audit the use of ICCTF funds by ICCTF recipients. The recipient ministries will be totally responsible for ensuring compliance with prevailing regulations on the use of public funds.

Further information → link

MRV of Support:

Key Challenges of the MRV Design

MRV of support design options depend on overcoming key challenges!

Definitions

+ Climate finance (public / private)
+ "New and additional"
+ Innovative sources of finance

Institutional factors

+ Numerous sources and channels
+ Various actors
+ Various instruments / mechanisms

Reporting systems

+ Overlapping reporting systems
+ Inconsistent reporting
+ Inconsistent guidelines

MRV of Support:

Strengths and weaknesses of Option 1

Grasping Coherence between Financial Pledge and Amount Disbursed/Mobilized by Donors (Comparison of Financial Volume)		
	Advantage	Disadvantage
Scope	Ensures transparency of actual pledged and disbursed/mobilized amount	Does not cover distribution in recipient countries and impacts/effectiveness
Predictability	Predicts overall amount from pledge	Disbursed and mobilized amount may change in case of unexpected events(eg financial crisis, natural disasters, etc)
Consistency	Timeframes can be easily adjusted to existing systems	—
Collectability	Most information on public finance is readily available in existing and future reporting system (NC, BR, CRS)	Information on private finance flow may not be sufficiently captured by existing systems.
Accuracy	Existing systems (NC, CRS) supports accuracy to some extent.	—
Completeness	Captures public finance by developed countries	Does not capture financial flow other than public finance by developed countries
Comparability	Already established methods for avoiding double counting for reporting ODA	—
Other Matters	• Early introduction may be possible by relying on existing systems. • Some technical challenge may exist in comparability of donor information. • The option does not capture impact of support. • Focus only on MRV of financial commitment. • It does not lead to technical discussion on improvement of modes of delivery • NAMA support or the process as a whole.	

MRV of Support:

Strengths and weaknesses of Option 2

Grasping the Amount Disbursed/Mobilized by Donors and the Contents of Supported Actions/Plans (Disclosure of Contents of Support)		
Main Actions/ Types of NAMA to be supported)	Supported Actions/Plans (projects, programs, sectoral supports, LEDS, etc)	
	Advantage	Disadvantages
Scope	Ensures transparency of actual disbursed/mobilized amount(public finance) and the contents of supported actions/plans)	Does not cover distribution in recipient countries and impacts/effectiveness
Predictability	Predicts information on disbursed and mobilized amount as they are decided a priori	—
Consistency	Timeframes can be easily adjusted to existing systems	—
Collectability	Some information on public finance may be captured in existing and future reporting system (NC, CRS)	Information on private finance flow may not be sufficiently captured by existing systems.
Accuracy	Existing systems (NC, CRS) supports accuracy to some extent.	Requires newly introducing methods of measurements for information not captured existing systems
Completeness	May capture not only public finance by developed countries, but also other voluntary channels	Highly accurate information is limited to public finance by developed countries +α. Information on private finance rely on voluntary information provision
Comparability	Already established procedures for reporting and methods for avoiding double counting	Requires newly introducing methods of measurements for information not captured existing systems
Other Matters	• Early introduction may be possible by relying on some existing systems. • New reporting modality is necessary for information not captured existing systems.	

Back to MRV of Support: Success Factors
Back to Rationale of MRV of Support
Content Main Menu Acronyms

MRV of Support:
Strengths and weaknesses of Option 3

Grasping Coherence between the Amount Disbursed/Mobilized and the Budget Allocation within Recipient Countries		
Main Actions/ Types of NAMA	Supported Actions/Plans (projects, programs, sectoral supports, LEDS, etc)	
	Advantage	Disadvantage
Scope	Captures transparency on both disbursed amount and contents, and financial distribution in recipient countries	Challenge may exist in acceptability of disclosing recipient countries decisions on domestic distribution and capacity of information collection
Predictability	Disbursed/mobilize amount is connected with contents	Predictability on actual domestic distribution (amount and timeframe) relies on actions by recipient treasury
Consistency	Timeframes can be easily adjusted to existing systems	—
Collectability	Some information on public finance may be captured in existing and future reporting system (NC, CRS)	May require additional reporting by recipient countries (some are readily available, e.g. in existing operation in ODA and multilateral finance)
Accuracy	Existing systems (NC, CRS) supports accuracy to some extent.	Requires newly introducing methods of measurements for information not captured by existing systems
Completeness	Disclose both inputs from developed countries and outputs in developed countries including total received amount and domestic distribution	—
Comparability	Already existing system are available (NC, CRS) for part of developed countries'support	Methods are not readily available on domestic distribution (requires new guidance)
Other Matters	• Information on impact at macro level(mitigation impact, result of technology and capacity building support) may be supplemented with a separate report. • The option may require introducing methods to verify appropriateness of domestic distribution, and actors to verify it. • Fungibility of finance provided may be an issue	

MRV of Support:

Strengths and weaknesses of Option 4 (part 1)

Grasping the Amount Disbursed/Mobilized and the Mitigation Effects Generated (MRVing the Impact of Support)		
	Project-based Support	
	Advantage	Disadvantage
Scope	Captures both financial amount and impact on project-based support	—
Predictability	High predictability as support budget amount is decided a priori	Low predictability on budget for post project period
Consistency	Timeframes can be easily adjusted to existing systems	—
Collectability	Relatively easier by utilizing existing systems (NC, CRS)	—
Accuracy	Accurate and quantified information may be available as budget and reduction amount per project are easily identified	Requires to establish a common methods or framework according to supported sector and activity types
Completeness	Public finance budget and mitigation effect per project are easily disclosed	Private finance budget may not be disclosed due to confidenciality
Comparability	Already existing system are available (NC, CRS) for part of developed countries'support	Technical challenges may exist in aggregating mitigation effect , in different sectors and activities
Other Matters	—	

MRV of Support:

Strengths and weaknesses of Option 4 (Part 2)

Grasping the Amount Disbursed/Mobilized and the Mitigation Effects Generated (MRVing the Impact of Support)		
	Program-based Support , Sector-based Support	
	Advantage	Disadvantage
Scope	Captures both financial amount and impact on program-based support/sector-bases Support	—
Predictability	High predictability as support budget amount is decided a priori	—
Consistency	Timeframes can be easily adjusted to existing systems	—
Collectability	Relatively easier by utilizing existing systems (NC, CRS)	Information may not be sufficiently captures if support involves private finance
Accuracy	Accurate and quantified information per programme and sector is available	Accuracy level of quantification of mitigation effect may vary
Completeness	Captures budget per programme or sector	Low completeness if support involves private finance
Comparability	—	Aggregation of impact may be not be appropriate due to variety of support contents
Other Matters	l Technical challenge may exist when more than one donor support the same programme or sector	

MRV of Support:

Strengths and weaknesses of Option 4 (Part 3)

Grasping the Amount Disbursed/Mobilized and the Mitigation Effects Generated (MRVing the Impact of Support)		
	Supporting Low Carbon Development Plans and Strategies(LEDS)	
	Advantage	Disadvantage
Scope	Captures both financial amount and contents of plans and strategies	Support to plans and strategies may not be directly linked with quantified mitigation effect (quantification of impact may not be relevant)
Predictability	High predictability as support budget amount is decided a priori	—
Consistency	Timeframes can be easily adjusted to existing systems	—
Collectability	Relatively easier by utilizing existing systems (NC, CRS)	—
Accuracy	Accurate information is available for budget supporting plans and strategies to some extent	Support to plans and strategies may not be directly linked with quantified mitigation effect (quantification of impact may not be relevant)
Completeness	Captures budge to support plans and strategies	Captures only budget for supporting plans and strategies (and not subordinated programmes or projects)
Comparability	—	May not be appropriate to compare only budget, due to various needs of different countries
Other Matters	Evaluation method should be established for non quantified impacts Technical challenge may exist when more than one donor support the same plan or strategy	

MRV of Support:

Required Actions for Private Finance

Need for a **clear, common guidance** at the international level.

It has been argued that relevant private climate finance might include:

- Carbon market flows, possibly including CDM and/or voluntary markets;
- Foreign direct investment (FDI) flows, for instance investments in clean energy or activities that have a clear adaptation benefit;
- Philanthropic contributions;
- Risk guarantee and insurance services.

Such private flows might be privately initiated or publicly mobilized.

The OECD works on these questions and how to define and account financial flows.

Under negotiation in UNFCCC

MRV of Support:

Defining a Baseline to Track Provision of Support

Parties to the UNFCCC have not yet reached consensus on a clear and specific definition of 'new and additional' that can be applied to developed country financial pledges. The diversity of information provided by countries reflects the current absence of:

- agreement among countries on what the baseline of 'new and additional' should be. Several options dominate the current international debate:
  - Climate finance classified as aid, but additional to (over and above) the '0.7% GDP' ODA target
  - Increase on 2009 ODA levels spent on climate actions
  - Rising ODA levels and including climate change finance as a pre-defined percentage
  - Increase in climate finance not connected to ODA
- a common format to report contributions to increase transparency and enable comparisons among countries in order to assess whether climate finance is being diverted from ODA.

Defining 'new and additional' is complicated by the inherent difficulty in determining a counterfactual if financial flows are compared to a BAU.

- On the one side, it is hard to know with certainty what countries would have given as development assistance under business-as-usual (BAU) in the absence of climate financial transfers.
- On the other side, **climate change and other developmental needs are not mutually exclusive on the ground**. Accordingly, climate and development needs **should be mainstreamed** where possible in order to maximize the impact of assistance.

MRV of Support:

Mitigation and Adaptation typologies

- The World Bank's internal tracking system for Climate Finance tracks co-benefits at the lowest level of financing information available, even considering individual components of the project, thus adding granularity to the Rio Markers. The WB published a detailed Typology of Activities with Climate Co-Benefits by WB Sector. For example, if only $10m of a $100m power project tackles energy efficiency, then only $10 million will be recorded as having mitigation co-benefits.
- The WB is also part of the MDB group on mitigation finance tracking, and results show differences between the WB approach and the MDB approach, though harmonization is planned going forward. MDG group on adaptation prepared their report in Doha 2012.
- OECD DAC Rio Markers

Developing Countries Key Challenges and Requirements

Challenges	Requirements
Multiple channels for climate finance – many outside the direct oversight of developing country government officials	Clear definition and common guidelines for what is to be considered as climate finance – attempts should be made to build consensus amongst developing countries before definitions are adopted.
Differentiating between ODA finance and new climate finance – development activities on the ground often relabelled as climate finance, particularly community-level Climate Change adaptation and resilience activities	Third party verification is essential – needs to be genuinely independent, not developed countries reporting for developing countries.
Developing countries are not homogenous unit – have different perspectives, incentives, and priorities in relation to climate change and climate finance as well as widely varying capacities and governance structures to report on climate finance.	Limit additional reporting burden – advantage if UNFCCC either issues detailed guidance on standardised reporting requirements for developing countries to report in their National Communications, or UNFCCC actively brings together reporting and verification data in a single database.

MRV of Support - Case Study 4:

The French Development Agency (AFD)

Targets	AFD has a climate-financing goal of 50% of AFD's foreign-aid funding and 30% of PROPARCO's. AFD Group has reached an average level of approximately 40% of 'climate' projects in its annual commitments portfolio.
Governance	Governance. AFD's governance process has involved the establishment of a group Climate Change Committee, chaired by AFD's managing director. The Committee controls and manages the group's climate related commitment and its implementation, promotes coordination between the various AFD group entities on climate related topics and informs the highest management level of progress on the construction of the international financial architecture on climate change and the international commitments made by France on the subject.
Screening criteria	Screening criteria. AFD has developed a project selectivity matrix for selecting projects, this defines exclusion criteria for projects that would not be funded based on a combination of their GHG characteristics and geography.
Measuring	Definition of climate finance. For mitigation projects, AFD has developed its own definition, if a project's GHG reductions are greater than its emissions over its lifetime, compared to options by list of eligible sectors, it is considered climate finance. For adaptation projects, AFD has adopted OECD's definition, in combination with an operational matrix to classify adaptation projects (which is currently being reinforced with the participation of French research institutes).
Reporting	Tracking mitigation finance. AFD systematically calculates the carbon footprint of all projects in its portfolio. In addition, for certain types of projects for which there is currently no tool to quantify the carbon footprint, a qualitative method is used to determine whether or not emissions will be reduced; in particular this is relevant to budget support to countries or local authorities, credit lines dedicated to financing renewable energy or energy efficiency and capacity building actions.
	Tracking adaptation finance. AFD's approach for adaptation is less developed than its approach for mitigation; AFD is experimenting with a practical tool aimed at estimating projects' vulnerability and aims to develop more integrated tools to assess these impacts.

MRV of Support - Case Study 4:

German Development Bank (KFW)

Targets	KfW has a climate-financing goal of 50% of all development investment (i.e. by KfW Entwicklungsbank) and 30% of all investment for the whole bank group should be climate change or environment related investment. The targets are not evening spread between business units, i.e. some units have more challenging targets than others. 60% of all current KfW Entwicklungsbank projects have environment or climate change as auxiliary goals.
Governance	Governance. KfW has a strong governance process in place for tracking progress against these goals, with monthly reporting by business units to the Board on progress against the 30%/50% targets, which is the most escalated and prominent reporting channel within KfW. This means that the reasons for underachieving against targets must be justified and explained at Board level.
Screening criteria	KfW does not have any screening criteria for climate-related finance and projects are not specifically selected based on their climate characteristics; if projects are viable on their own basis, then Rio markers are attributed.
Measuring	Definition of climate finance: KfW is driven to undertake projects with strong development qualities, if these projects conform to the Rio markets, they are considered to be climate finance projects (for both mitigation and adaptation projects). In addition, KfW has an internal definition for energy efficiency projects, which includes both grounds for including and excluding projects from the definition of climate finance – this is confidential, but aspects of this definition may be able to be shared on request.
Reporting	Tracking mitigation finance. KfW undertakes an ex-post evaluation of projects regarding emissions reduction and with regards to implementation. A well-defined set of monitoring instruments are used to ensure projects stay on track both financially and with regards to implementation; if KfW have reason to believe a project is not on-track, then KfW will visit the project onsite.
	Tracking adaptation finance. KfW applies a well-defined set of monitoring instruments are used to ensure projects stay on track both financially and with regards to implementation; if KfW have reason to believe a project is not on-track, then KfW will visit the project onsite.

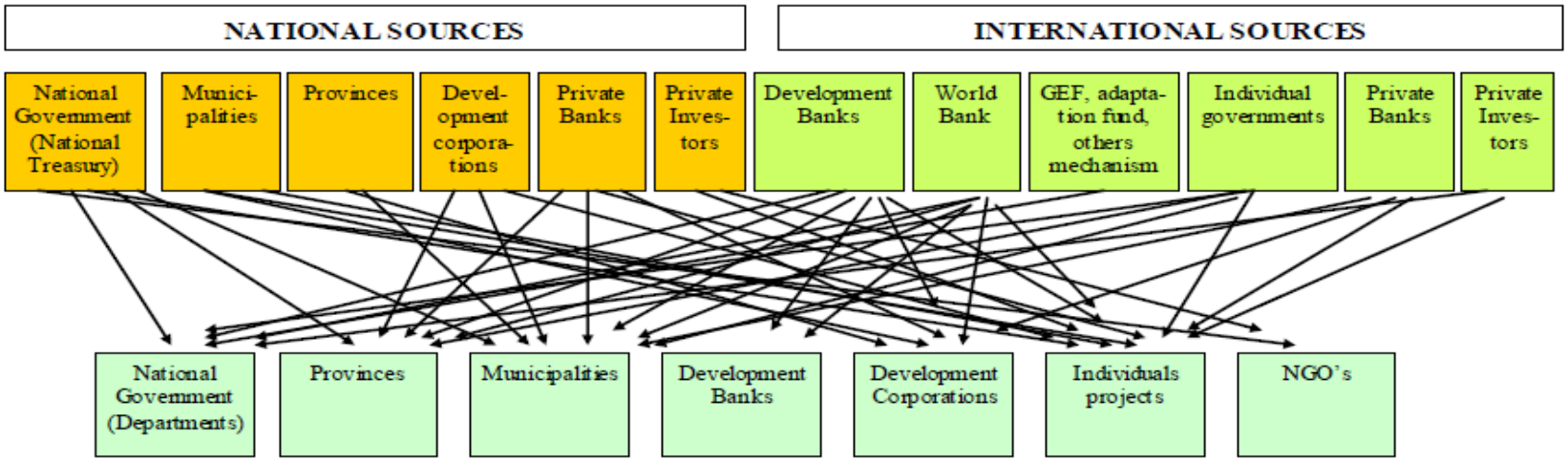
MRV of Support - Case Study 5:

International Finance Corporation (IFC)

Commitment	The International Finance Corporation (IFC) as a member of the World Bank Group (WBG) aligns its climate policies and processes with the World Bank's Strategic Framework for Development and Climate Change (SFDCC). In January 2012 the IFC's Sustainability Framework was revised to better integrate risk management in IFC's operations.
	In 2010 the Climate Business Group was created to allow for a 'one-stop shop' to support climate change activities within the IFCs different departments and to promote advisory services.
Reporting	Capital invested for IFC's own account in climate-related projects grew from $221 million in FY05 to $1.7 billion in FY11. However a breakdown of the FY 2011 figure by sector / technology is not publicly available. Information on renewable energy lending by sector and lending to other sectors is available on the IFC Annual Report and on IFC Investment Summary by sectors.
	IFC is an active participant in the MDB working group which has recently developed a joint approach to harmonise tracking of mitigation finance, along with a parallel effort to implement a joint approach that looks at adaptation activities to be released by December 2012 at the UNFCCC conference in Qatar.
Verification	Under the IFC Performance Standards prior to board approval of the project, the client should review in a systematic and documented manner the potential environmental and social risks and impacts of the project to be financed, and determine the need to (i) eliminate or minimize (mitigate) the identified risks and impacts; (ii) modify the project plan; or (iii) conduct further focused assessment. 'The risks and impacts identification process will consider the emissions of greenhouse gases, the relevant risks associated with a changing climate and the adaptation opportunities, and potential transboundary effects, such as pollution of air, or use or pollution of international waterways'.

MRV of Support:

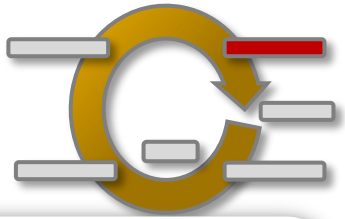
Complicated structures and practical challenges



1. Poor cohesion across donors on: standards, definitions, MRV
2. Integration with development priorities of developing countries
3. Packaging programmes and projects to deliver development co-benefits
4. fragmented and unrealized scale/replication
5. Low impact, high transaction costs
6. Creating donor and country disciplines to better coordinate

MRV of Support:

Continuous Improvement: SWOC Analysis



Strengths

- Existing systems well recognised and can serve as robust tool for measuring climate finance
- **Building on existing systems** reduces burdens for Parties who already have established domestic systems for tracking and reporting data
- Some countries have sophisticated systems that can be applied more universally
- Increasing inter and intra country **communication and coordination** in Europe

Opportunities

- Greater recognition of climate finance in UNFCCC conventions
- Harmonise existing systems so that the National Communications and CRS data adopt the **same definitions of climate finance and the same methodologies for accounting** (measurement).
- Proposed changes to scope of UNFCCC National Communications and the option of UNFCCC as the origin of all guidance on climate finance, even where it relates to use of the OECD CRS system can address key weakness and constraints and complement needed data to improve effectiveness and track support needed for achievement of the global 2°C objective.
- Fast-start finance can provide practical experience to aid design of future MRV framework for climate finance

Weaknesses

- Climate finance **definition**, specially for adaptation and private finance can restrict progress
- **Inconsistent coverage** and requirements of existing systems
- Existing guidelines provide too much scope for interpretation
- Existing systems have not been set up for the purpose of supporting MRV of climate-related finance, so there may be limits to the extent to which they will fully and easily meet the needs of an MRV framework.
- The scope of verification is unclear and requires greater involvement of developing countries

Constraints

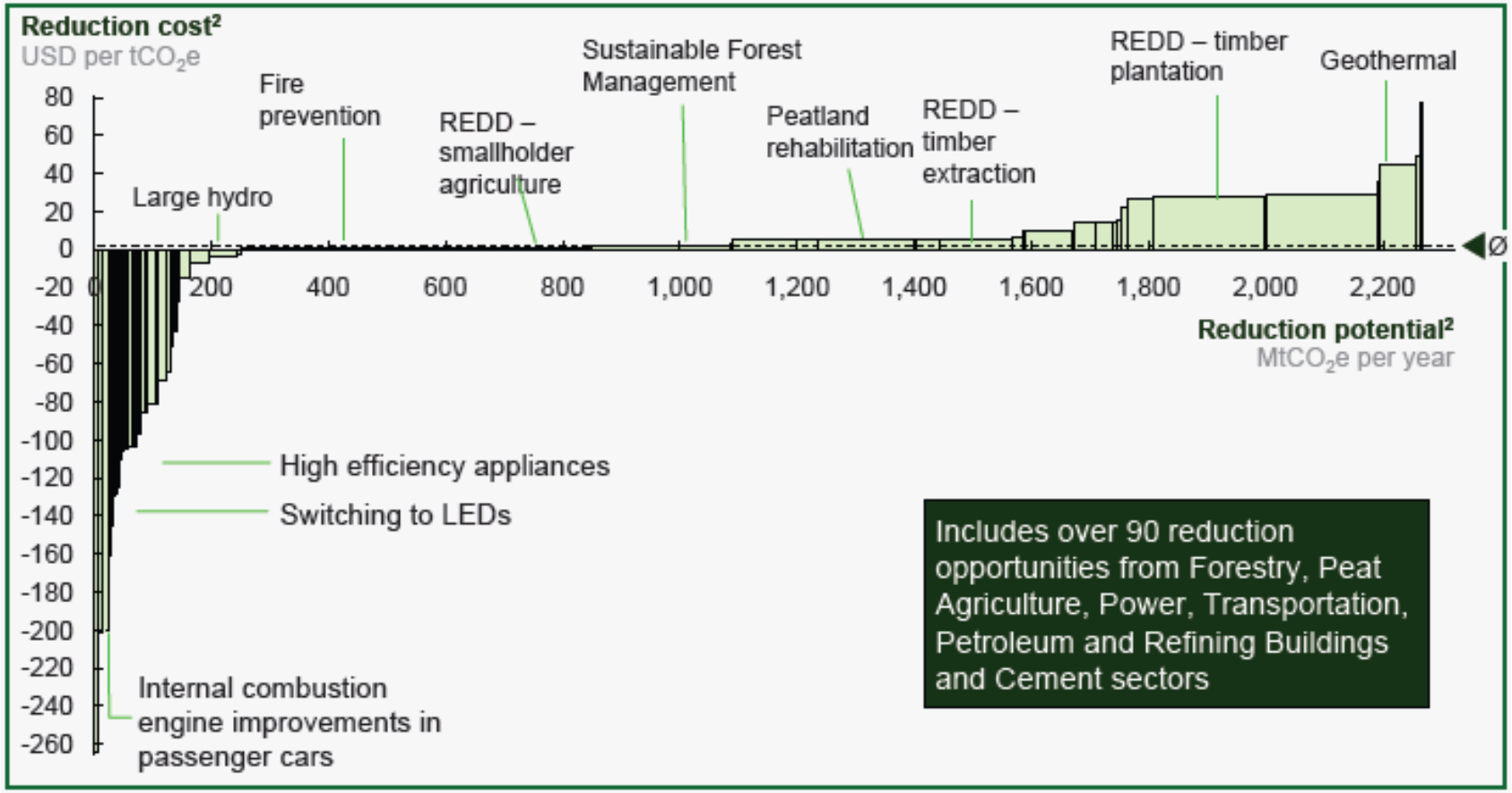
- **Private climate finance stakeholders are not integral part** of key discussions
- Developing country views are not in sync with developed countries, especially on definition, objectives and institutions involved in climate finance
- Lack of formal governance and legitimacy for tracking climate flows - The OECD-DAC CRS database and the associated Rio Markers were not developed within the UNFCCC and nor were they developed to support MRV of climate finance specifically. Therefore, while potentially useful tools for reporting, if used to progress issues related to the governance of climate finance – such as what finance is eligible and how it should be accounted – they are likely to lack legitimacy for developing countries.

Scope and Content of Biennial Update Reports

BURs report information on

- National circumstances and institutional arrangements for continuous reporting
- National **inventories of anthropogenic emissions** and a national inventory report
- **Mitigation actions** and their effects
- Constraints and gaps related to financial, technical and capacity **needs and support** received, including support for reporting
- Domestic MRV
- Any other relevant information for mitigation

GHG MAC Curve Indonesia



Click here for more in depth information and elaboration on the Indonesian GHG MAC curve.

Non-GHG Metrics for a Housing NAMA in Mexico

Number of Houses constructed / year

- Demographic data
- Inhabitants/house (to compare baseline and NAMA houses)
- Energy costs for poor families
- Peak-load of the electricity grid*
- Air quality
- Water use (NAMA in water sector under consideration)

**Low-energy houses will need no/smaller air-conditioners and therefore consume less electricity at peak hours*

Intro IV/ MRV of emissions : What is MRV of Emissions?

MRV of emissions is a concept to **measure, report and verify quantifiable emissions data** at national, regional, sectoral levels. MRV of Emissions underlies national ownership and is under constant negotiation.

A comprehensive MRV System is essential to **improve the basis of information and to monitor mitigation actions** for national planning, implementation and coordination of individual mitigation activities of bottom-up actions and policies and top-down goals

MRV of Emissions includes the identification and/or definition of **clearly defined roles and institutional responsibilities** to ensure the smooth flow and **standardization** of information to all entities producing, reporting and verifying GHG estimates.

What is Measured:

- Emissions and emission reductions from emission sources on national, regional, sectoral levels based on IPCC Guidelines

What is Reported:

- Emissions from emission sources on national, regional, sectoral levels based on UNFCCC intended contributions (e.g. through National Communications, Biennial Update Reports, GHG Inventory)

What is Verified:

- Emissions from emission sources on national, regional, sectoral levels based on national emission targets, indicators - compared to baselines (e.g. through International Consultation and Analysis ICA)
- Implementation of quality assurance and quality control

What is MRV of NAMAs?

MRV of actions is a concept to measure, report and verify the **impacts of mitigation policies and actions**. Activities of the action are assigned their own **indicators**, whether they seek to measure GHG reductions or other benefits. Therefore, the indicators determine what gets measured, reported and verified.

MRV of Actions helps to identify challenges and opportunities, as well as the **overall effectiveness of Mitigation Actions** (e.g. emission reductions and progress to achieving objectives and co-benefits).

At COP 19 in Warsaw the General Guidelines on domestic MRV for nationally supported NAMAs have been agreed. They should help countries to set up their **national MRV systems for policies and measures** based on existing domestic processes, arrangements, methodologies and experts.

Little focus to-date on the MRV of mitigation actions, including non-comprehensive descriptions in National Communications often lead to a vague understanding of mitigation impacts.

MRV in the sub-national context

What gets Measured:

- Emission reductions according to emission baseline scenario
- Progress of achievement of sustainable development goals/co-benefits

What gets Reported:

- Data on emission savings and methodologies/sustainability objectives, coverage, institutional arrangements and activities, based on the qualitative and quantitative guidelines for submission of Biennial Update Reports (BURs)

What gets Verified:

- All quantitative and qualitative information reported for the mitigation action
- Guidelines for verification are still under negotiation in the UNFCCC; Data may be verified through national procedures, International consultation and Analysis and should apply Transparency, Completeness, Consistency, Comparability, Accuracy (TCCCA) criteria.

Institutional Arrangements of MRV Systems

A country MRV System needs to **institutionalize structures**, **define procedures and methodologies**, and **train the staff** on these procedures and methodologies. Leadership and the creation of a champion for the design and introduction phase of the MRV system to make it operational, can be supportive to the process.

There is no best practice for institutional MRV arrangements but mutual learning from other countries is possible and helps to identify certain steps in developing national MRV Systems. The approaches that countries have taken vary widely:

- top-down integrated MRV systems that cover multiple reporting needs
- bottom up systems that focus on a specific policy, action, or region

A country's institutional arrangements for MRV are reflective of the specific drivers and types of MRV that have been prioritized based on their national context. **Drivers for the Institutional implementation** of MRV Systems are:

- to design and evaluate policies and actions
- to ensure transparency in reporting of the GHG mitigation effects
- to facilitate support and enable financing
- for the quantification of mitigation actions in terms of emissions reductions and other non-GHG impacts

See Knowledge Product: Institutional Arrangements for MRV for more detailed Information.

Case Study: UK Instit. Arrangements

Depiction of the reporting system for the Cement Sector in SA

Institutional Arrangement: Mexico Housing NAMA MRV System

Categories of Relevant Stakeholders

Who should be involved in MRV planning process should be decided individually in each country, considering interests of, for instance, gender, ethnic, and indigenous groups if relevant stakeholders do not need to be mandated, but need to be knowledgeable of their respective sectors.

In general, leaders and laggards, early movers and foot draggers should all be included. For, only after having considered all different rationales resistance to changes can be overcome. In general, stakeholders should comprise representatives from the following categories:

- all ministries involved with low emission development
- sub-national authorities
- big emitters
- private sector
- committed local, national, and international NGOs
- potential financiers and international providers of support
- organizations providing technical assistance
- academia
- labour

- Process is important! The involvement of different stakeholders is key to a good result.
- Evidence is pivotal for convincing and mobilizing actors.
- Champions are necessary

For more information on the development of Mitigation Action Plans (MAPS) in the case of Brazil, please consult the NAMA Sourcebook, p. 48

Institutional Arrangements of MRV Systems

MRV in the sub-national context

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IPCC Guidelines

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 Guidelines) are to update the revised 1996 Guidelines and associated good practice guidance (2000 GPG) which provide internationally agreed methodologies intended for use by countries to estimate greenhouse gas inventories to report to the UNFCCC. The major change towards the 2006 Guidelines is the reduction to four sectors to reduce double counting or omissions and to improve transparency and completeness.

Sector guidance for Emission Inventory Estimation:

Energy emissions	Industrial Processes & Product USE	Land Use, Forestry and Land Use Change	Waste
Based on carbon content of fuel	Based on chemistry of process. Some use mass balance of product used.	Stock changes – Emissions/Removals 1. Inputs (e.g. growth) - outputs (e.g. decay, harvest) 2. Total Stock at end minus Total stock at beginning	Tracks carbon (fossil & biogenic) in waste

Methodological Guidance (Tiered Approach):

The IPCC Guidelines set forth three methods (or tiers) that allow for flexibility with regard to methodologies used for the inventory compilation.

Guidance on Standard Default Factors (EF):

The quality of national GHG inventories depends substantially on reliable emission factors and activity data. Although it is preferable to use emission factors that reflect national circumstances, emission factor development is expensive, time consuming and necessitates a wide degree of expertise. The IPCC EF Database (EFDB) compiles standard default Factors.

Top-down emission estimation – National Level

The top-down label comes from the way modellers apply techniques to historical data based on aggregate, national energy statistics that reflect the production plus net imports and exports of carbon within a country and taking future socioeconomic development expectations into account.

Top-down emission estimation models can be detailed, but in a different way to bottom-up models. Top-down models account for various industrial sectors and household types, and many construct demand functions for household expenditures by summing “individual demand functions”. Such functions can facilitate a reasonably detailed assessment of economic instruments and distributional impacts of climate change mitigation policies.

The major limitation of the Top-Down method, however, is that it does not provide the type of detailed, disaggregated emission estimates that are often required for analysis. Therefore, the distinction between Top-down and Bottom-up is not that clear-cut, as Bottom-up approaches can be integrated in a number of top-down models.

MRV of Support:

Different Types of Measurement

Will come under negotiation in UNFCCC

When financial flows are measured, there are different ways to account their amounts:

- **Gross value** of financial flows: accounts for the full amount of financing provided in the reporting year. E.g. for loans it includes the face value of the loan provided by development banks.
- **Net value** of financial flows: deducts the reflux (repayments of loans etc.) from the gros value in the reporting year
- **Budgetary support for climate finance**: accounts for the costs in public budgets of donor countries in the reporting year. E.g. for loans it accounts for the grants provided to development banks which then in turn provide concessional loans

There are good arguments for each type of measurement as well as distorting incentives for the choice of a financing instrument and how it is accounted for. According to the individual type of measurement, results can differ significantly.

Which measurement type is most appropriate depends on the purpose of the MRV of Support system.

Discussion of leverage factors

The developed country parties committed to mobilize jointly 100 billion USD annually by 2020.

What amounts of investments ultimately will be accounted to a country‘s commitment to provide support depends on the definition of what is acknowledged as ‚mobilized private finance‘.

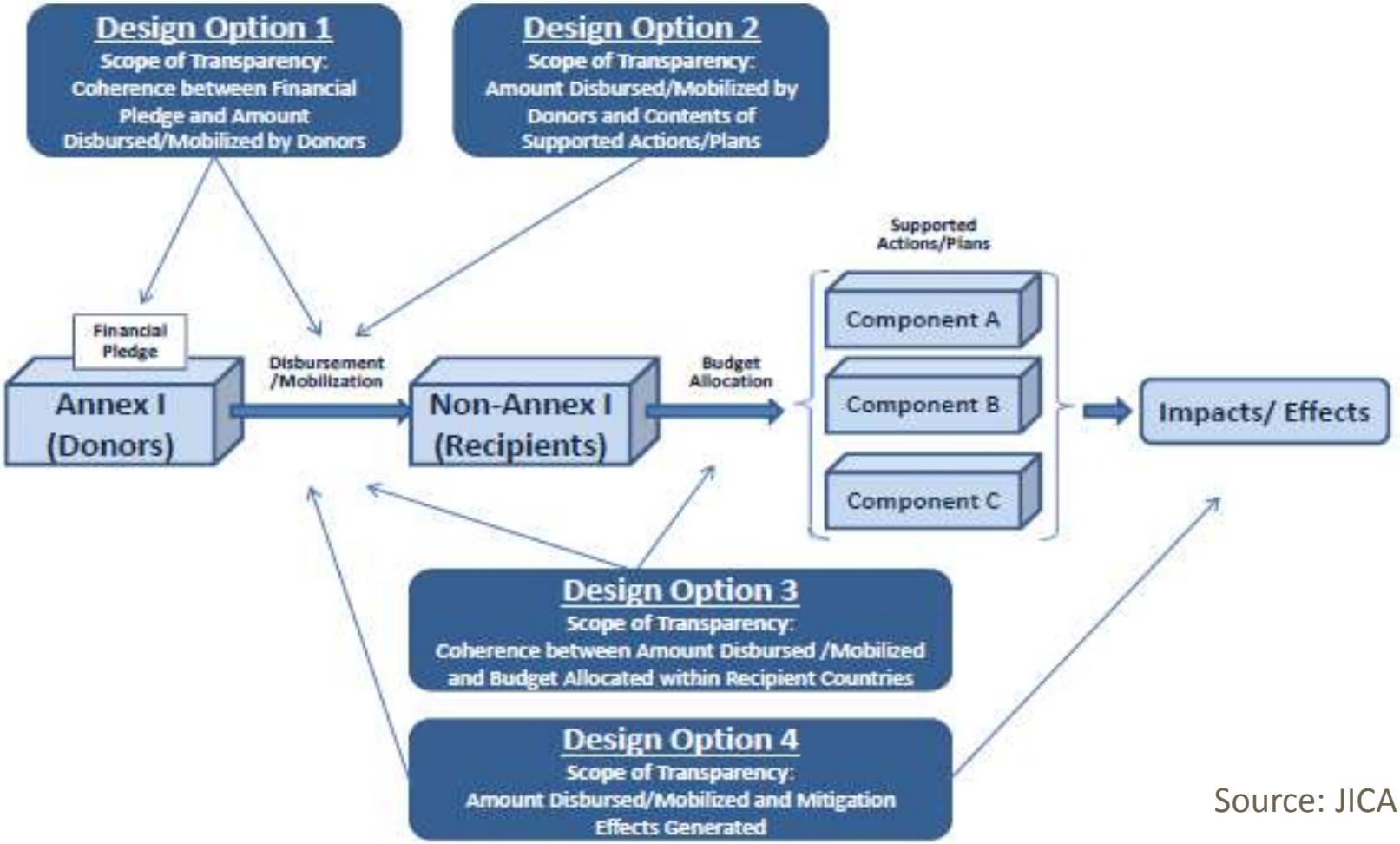
A leverage factor can be defined as the ratio of the **share of public money in a bank‘s credit line**,

or it can be defined as the difference between the **private investment made and the private investment that would have been made without public support**.

The first definition reflects basically co-financing. The latter requires a robust counterfactual and can indeed indicate which intervention or instrument could successfully mobilize private finance.

A high leverage factor does not mean that the instrument has a large mitigation impact.

Potential Institutional Options for MRV of Support



Source: JICA

Measurement:

What? How? Who? When? MRV System for a Housing NAMA in Mexico

What gets measured?	How to measure?	Who measures?	When to measure?
- expansion of the financial system that promotes the construction of new residential buildings with high energy performance in the national mortgage market - Energy use baseline and project residence characteristics - Estimation of emission reduction ex ante - sustainable development benefits such as benefits to the economy (e.g. increase in number of jobs and reduced energy subsidy costs), environment (e.g. reduction in water consumption) and population (e.g. comfort)	- direct GHG emissions by monitoring the energy use; - Based on metering sample group of baseline and NAMA houses - Energy metering (Power/gas) - Possible use of survey data sheets for simplification - Differentiated by building type, size and climate zone	- CONAVI will develop an electronic database to record and manage all relevant baseline and monitoring information 2. Housing NAMA Office" that organizes data collection, including installation of meters and hiring of the survey teams - To create and maintain NAMA Monitoring Database	1. Continued Metering of sample households' energy consumption (change every 2 years) and Beneficiaries;

Reporting of Housing NAMA Mexico

Verification of Housing NAMA Mexico

Back to Housing NAMA MRV System

Content Main Menu Acronyms

Reporting:

What? How? Who? When? MRV System for a Housing NAMA in Mexico

Figure 2: *Adosada* building typology
(CAMPOS/ GIZ-GOPA-INTEGRATION/INFONAVIT)

What information is reported?	Who reports?	How to report?	When to report?
- NAMA Monitoring Report on Emission reductions achived through the NAMA - Start/end date monitoring period - Baseline emission - Project emissions - Emission reduction of sample groups (baseline and NAMA) - Estimation of overall emission reduction under the NAMA of all houses covered	- NAMA Housing Office - Financial institutions / mortgage provider - CFE - Registry of Housing Supply (Registro Único de Vivienda, RUV)	-Compilation of Identification Records (Beneficiary/house owner unique identification) and Monitoring records (Data recording)	- at least once every second year - Report to Donors and UNFCCC registry

Measurement of Housing NAMA Mexico

Verification of Housing NAMA Mexico

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Verification:

What? How? Who? When? MRV System for a Housing NAMA in Mexico

What information is verified?	Who verifies?	How to verify?	When to verify?
All quantitative and qualitative information reported for Housing NAMA.	- UNFCCC reviewers - SEMARNAT NAMA Office for formal quality assurance - data and information provided to the Housing NAMA Office will be checked internally to ensure the accuracy and completeness of data	- monitoring protocol that allows any third party verifier to verify all relevant data - NAMA Monitoring Database will be established that contains all the specific data required to identify and locate each NAMA activity	- at least once every two years

Measurement of Housing NAMA Mexico

Reporting of Housing NAMA Mexico

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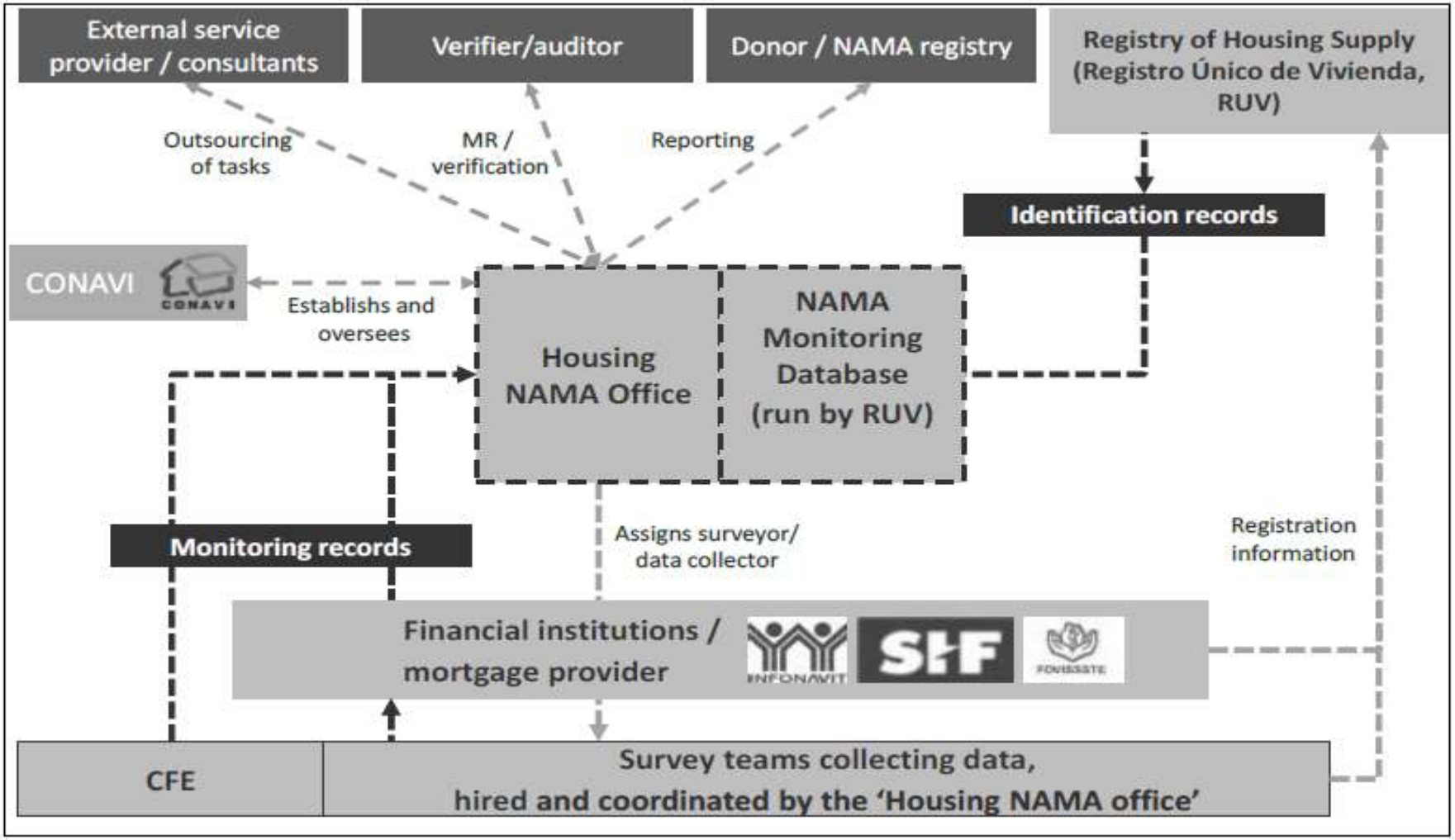
Institutional Arrangement: Mexico Housing NAMA MRV System



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Content – MRV of Emissions

Content – MRV of NAMAs

Content – MRV of Support

Acronyms

QA/QC	Quality Assurance/ Quality Control
AD	Activity Data
EF	Emission Factor
GWP	Global Warming Potential
BUR	Biennial Update Reports
MRV	Measurement Reporting Verification
GHG	Greenhouse Gas
LEDS	Low Emission Development Strategy
CDM	Clean Development Mechanism
UNFCCC	United Nations Framework Convention on Climate Change
ADP	Ad hoc Working Group on the Durban Platform for Enhanced Action
BAU	Business as Usual
MAC tool	Marginal Abatement Cost tool
CGE	Consultative Group of Experts on National Communications
NCs	National Communications
ICA	International Consultation and Analysis
TCCCA	Transparency, Consistency, Comparability, Completeness, Accuracy
ODA	Official Development Assistance
OECD DAC	Organisation for Economic Cooperation and Development – Development Assistance Comittee
OECD CRS	OECD Creditor Reporting System
FDI	Foreign Direct Investment
IPPU	Industrial Processes and Product Use
GEF	Global Environment Facility
PoA	Program of Action
BOW	Barriers-to-Objective Weighting Method
CV	Calorific Value
COG	Coke Oven Gas
BFG	Blast Furnace Gas
NAMA	Nationally Appropriate Mitigation Action
QEERT	Quantified Economy-wide Emission Reduction Target
CoP	Conference of the Parties (UNFCCC)
PV	Photovoltaic
REDD	Reducing Emissions from Deforestation and Forest Degradation
IPCC	International Panel for Climate Change
KfW	German Development Bank
IFC	International Finance Corporation
AFD	French Development Agency
SWOC Analysis	Strengths, Weeknesses, Opportunities, Constraints Analysis
DNA	Designated National Authorities
WRI/ WBCSD	World Research Institute/ World Business Council for Sustainable Development
CER	Certified Emission Reductio
MDB	Multilateral Development Bank
ICLEI	ICLEI -Local Governments for Sustainability
AFOLU	Agriculture, Forestry, and other Land Use

Glossary (1)

Glossary 2 Glossary 3

Accuracy	is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, as far as this can be determined, and that uncertainties are reduced as far as needed for the respective purpose of the estimate and as it is cost-efficient. Appropriate methodologies conforming with guidance on good practices should be used to promote accuracy in inventories.
Capacity building	enabling humans, organizations, inter-organizational networks and systems to meet their own needs by achieving low emission and sustainable development
Co-benefits	Social, economic or other environmental benefits than emission reductions, contributing to sustainable development, often essential for making changes long-term sustainable and transformational
Commitment/ intended contribution	objective of a country to contribute through enhanced action to achieving the global 2°C objective, can be voluntary or internationally binding
Comparability	allows to add up numbers of different actions, and MRV systems (and internationally of countries) in order to be able track progress towards national objectives
Consistency	Collected and reported data should be free of internal contradictions or overlaps as well as gaps across MRV systems and over a period of years
Country-specific data	Data on either activities or emissions that are generated through monitoring and research in a country and are the basis for planning and implementation of mitigation actions as well as the tracking of the impacts of these actions
Good Practice	Good Practice is a set of procedures intended to ensure that the MRV System is accurate in the sense that it systematically neither over- nor underestimates, and that uncertainties are reduced as far as possible. Good Practice covers choices of measuring methodologies appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties and data archiving and reporting to promote transparency.

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Glossary (2)

Glossary 1 Glossary 3

Guidelines	Instrument for technical support for implementers how to implement and meet international requirements, not (always) binding
Impact	causal effect (desired or not) at the end of a causal chain, long-term
Indicator	Are qualitative or quantitative, supposed to enable to evaluate if or how far a goal (outcome, output) has been achieved
Mitigation actions/ policies and measures	Measures that countries do to achieve their national objectives and contribute to the global 2°C objective. Policies are elaborated political aims put into effect, while mitigation actions are the means to achieve politically agreed goals.
MRV Plan	Document defining roles and responsibilities in institutions and procedures of MRV system
MRV System	Institutions, processes, and external relations, including responsibilities, methodologies and procedures to collect data, quantify impacts, process data, compile reports and verify reported results
National appropriateness	mitigation actions and low emission development strategies depends on national development priorities, level of national development and economic competitiveness, emission profiles, opportunities for sustainable development co-benefits and emission reduction potentials
National/ Regional/ Sectoral Levels of data aggregation	In order to track emission reductions towards the 2°C objective national/regional/sectoral data need to be aggregated: A Sector is a division, most commonly used to denote type of energy consumer (e.g., residential/ transport) or according to the IPCC, the type of greenhouse gas emitter (e.g. industrial process).

Glossary (3)

Glossary 1 Glossary 2

Objective	To shift onto a sustainable development path at a global level, limiting global temperature increases to below 2°C, and making societies and economies climate resilient
Pledge	Voluntary objective of a country to reduce GHG emissions
International Requirements	Fulfillment of international agreed upon strategies, mechanisms , goals (e.g. UNFCCC Framework Convention and subsequent Agreements)
Sustainability/ sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Target	To reduce emissions, usually quantified, and internationally binding
Technology transfer	cooperation to transfer or share technologies internationally among implementers to enable developing and developed countries to achieve their development objectives and their climate change intended contributions
Transparency	Enhances ability of a country to identify opportunities for mitigation actions and planning and implementation thereof nationally, as well as the ability to track progress towards national objectives and the global 2°C objective internationally. Transparency means that the assumptions and methodologies used for an MRV System should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of MRV Systems is fundamental to the success of the process, for the communication and consideration of information.