

Exemplary Monitoring, Reporting, and Verification (MRV) system for a mitigation action in the cooling sector.

Intervention to support the deployment of solar photovoltaic (PV) systems to run cooling systems.

Cool Contributions fighting Climate Change II



Cool Contributions fighting Climate Change II (C4 II)

Cool Contributions fighting Climate Change II (C4 II) is a global project implemented by the *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH* to foster sustainable development of the *Refrigeration and Air Conditioning (RAC)* by working towards more policy coherence between the Paris Agreement and the Montreal Protocol. The focus countries are Costa Rica, Grenada, and the Philippines.

C4 II is funded by the *German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)* under the *International Climate Initiative (IKI)*. The overall objective of C4 II is to support partner countries in implementing more ambitious *Nationally Determined Contributions (NDCs)* measures in the RAC sector and additional countries in preparing GHG mitigation strategies for the RAC sector.

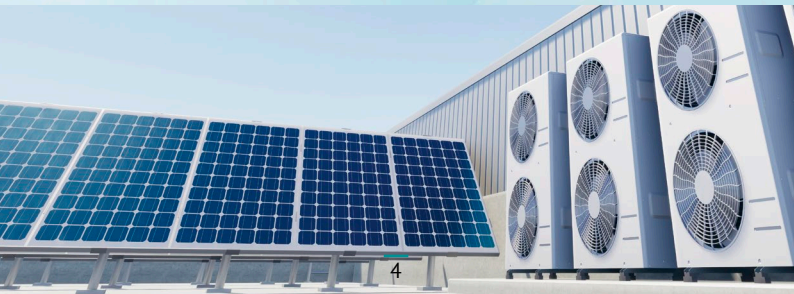
The project adapts existing methodologies and develops new tools for replication in other countries, promoting the transformation towards sustainable cooling. C4 II is part of the *GIZ Proklima programme*, which provides technical support to developing countries to implement the provisions of the *Montreal Protocol* and the *Kigali Amendment* on substances that deplete the ozone layer and affect the global climate.



As part of the general efforts to improve the accountability of Nationally Determined Contributions (NDC) measures, MRV systems are indispensable and need to be strengthened and designed for the specific sector. This module showcases how the MRV of a mitigation measure can be set up to fulfil the requirements of the Enhanced Transparency Framework (ETF) to report on progress and achievement of mitigation measures included in the NDC.

Proposed intervention

This module assumes the implementation of an intervention to support the deployment of solar PV panels to supply electricity to cooling systems to reduce greenhouse gas emissions (GHG) from grid electricity use. It is understood that this type of intervention would provide several co-benefits such as peak load management. The intervention could take many forms, but they would generally include programmes for residential and/or commercial buildings (*see box*):





Option 1

Residential Solar PV Cooling Programme

This intervention would drive solar PV adoption for cooling in residential properties by offering financial incentives such as subsidies or tax credits to homeowners. It encourages homeowners to invest in solar PV systems designed to feed the energy demands of cooling systems. The programme would involve other elements such as a collaboration with local solar installers, educational outreach to inform home owners about energy savings and reduced carbon emissions.

Option 2

Solar-Powered Cooling for Commercial Buildings

This initiative stimulates solar PV technology for cooling in the commercial and industrial sectors. It involves partnerships with businesses and building owners to assess the feasibility of integrating solar-powered cooling systems and exploring financing options to support owners installing solar PV and energy-efficient cooling. Regular energy audits and performance assessments maintain compliance with energy efficiency goals.

MRV for the intervention

Setting up an MRV system for the interventions to stimulate solar PV for cooling will be essential to track and assess the effectiveness of the interventions and ensure they meet the energy and emissions reductions targets to validate them against the country's commitments to the Paris Agreement. A well defined MRV system on measure-level contributes to the transparency, accountability, and the credibility of reported data, aligning with the ETF.

The process of MRV can be roughly summarised *as in Figure 1 on page 8* to ensure a robust and transparent process that supports international reporting (e.g. within Article 6 activities) and supports corrective management of interventions.

Key objectives

Designing an MRV programme begins with understanding the specific objectives for the solar PV cooling intervention, clearly articulating the intended outcomes: reducing GHG emissions, enhancing energy efficiency, or advancing sustainable cooling technologies. A well-defined objective is the foundation for the monitoring and reporting process and guides subsequent management actions.

In the context of the Paris Agreement, the primary reason for this type of programme is the reduction of GHG emissions.



However, international experience in developing countries indicates that many countries are also looking for adaptation and other co-benefits when developing interventions, and these should not be ignored in the MRV systems.

For the Solar PV Cooling programme, the primary objective is emissions reductions, and the ancillary development objectives may include economic development and job creation.

Monitoring

Identifying Key Performance Indicators (KPIs) is critical for quantifying the success of the solar PV cooling initiative. These KPIs are linked to the objectives determined in the previous step and provide a direct measure of progress. With these metrics upfront, the programme can effectively gauge progress towards its goals and adjust as necessary. The programme needs to establish baselines for the KPIs to provide a reference point to monitor progress before the intervention begins such as cooling system emissions and energy consumption.

1

Key objectives

- ❖ Emissions Reductions
- ❖ Implementation target
- ❖ Co-benefits

2

Monitoring

- ❖ Establish baselines
- ❖ Identify key variables
- ❖ Regular data collection, analysis, and production of results

4

Verification

- ❖ Independent third-party verification
- ❖ Ensure clarity and credibility
- ❖ Trusted international reporting

5

Continuous Monitoring

- ❖ Ongoing data collection and analysis
- ❖ Supports corrective and active management of programmes

Figure 1: Generic elements of a robust MRV process for an emissions reduction intervention (Source: HEAT)



Reporting

- ❖ Regular generation of detailed reports
- ❖ Reporting on key variables identified
- ❖ Inclusion of transparency documentation in the reports (Support Article 6 reporting)



MRV for the intervention (continued)

A data collection process that provides robust data to directly inform (or allows the derivation of) the values associated with the KPIs is required for the duration of the programme to enable reporting. Depending on the intervention, (conservative) averages might be determined based on samples. For this intervention, this may include the following (among others):

- * Number of PV systems installed under the programme
- * Size of PV systems installed and capacity of the related cooling system
- * Energy demand per cooling system (average based on sample collection)
- * Electricity yield of the PV systems installed (average based on sample collection)
- * Cost of the PV systems installed
- * Cost of electricity supplied from the grid
- * Grid emission factor (update in regular intervals).

Establishing a robust and transparent data collection system requires:

- * Clear information on how data was collected, its source and the level of accuracy
- * Where possible, independent data (or methods) that support transparency and accuracy should be collected
- * Transparent and well-organised data storage
- * Regular data updates.



Reporting

Effective reporting mechanisms ensure that the data collected is transformed into actionable insights. The form of reporting may vary from reports to dashboards, but it is important that it aligns with the requirements of the Enhanced Transparency Framework (ETF) established under the Paris Agreement. It is recommended to follow the structure of GHG reporting categories established by the Intergovernmental Panel in Climate Change (IPCC) such as the specific activity under which emissions reductions should be reported.

For the PV for cooling intervention, there would be a need for regular (monthly or quarterly) reporting of operational data such as number of installations, to manage the intervention, and annual reporting relating to the impacts, such as energy and emissions reductions.

Verification

A verification process to ensure the credibility and reliability of the reported data is established as part of the intervention. This may involve third-party testing of the PV systems and energy demand reductions supported. This process is of importance to build trust among stakeholders, assuring them that the reported results accurately represent the environmental benefits achieved. Specially in programmes where emissions reductions are linked to financial rewards such as the awarding

of emissions credits (such as the Sustainable Development Mechanism (SDM), formerly the Clean Development Mechanism (CDM) or linking to international financing to scale up the programme.

For this programme, a verification process would include:

1. Verification that the reported number of installations actually took place
2. Sample testing of systems to ensure that they produce the assumed benefits
3. Horizontal or vertical crosschecking with results of similar initiatives or with previous year's results of the same initiative.

Continuous Monitoring

Continuous monitoring is an integral component of an MRV system that supports the success of the intervention. It involves consistent data collection and analysis, providing insights into energy production, consumption, and emissions data. Its primary purpose is to enable timely identification of any deviations from predefined objectives, allowing stakeholders to take corrective actions promptly.

By monitoring trends and patterns over time, continuous monitoring empowers stakeholders to optimise the solar PV cooling intervention, enhance energy efficiency, and achieve emissions reduction goals effectively.



The table on the next page summarises the main points that should be included in the MRV mechanism.

Proposed MRV mechanism for the Solar PV for cooling intervention

Stage	MRV Measure
Intervention Objectives	Definition of targets and indicators: <ul style="list-style-type: none"> ✳ Target number of solar PV installations for cooling to replace grid electricity with renewable electricity, indicator of new installations/ added capacity per year or cumulative ✳ Target reduction of GHG emissions, per year or cumulative
Monitoring	Collect data on indicators and identified additional info to track progress, such as: <ul style="list-style-type: none"> ✳ Total PV systems deployed through the intervention. (Number of units, size, electricity generated by PV) ✳ Proportion of cooling demand supplied through solar systems ✳ Grid emissions factor <i>and</i> expenditure by the intervention
Reporting	Providing information to the overall MRV system of the NDC, matching the required format, interval, and transparency documentation. Reporting also supports project management and illustrates the outcomes.



Stage	MRV Measure
	<p>Operational information (quarterly/monthly)</p> <ul style="list-style-type: none">✧ Number of systems deployed✧ Detailed breakdown of the type of systems (size, technology, etc.) deployed✧ Yield (grid electricity replaced)✧ Project expenditure✧ Breakdown of market segments using the programme <p>Outcomes information (co-benefits)</p> <ul style="list-style-type: none">✧ Emissions reductions✧ Energy demand reductions✧ Co-benefits such as job creation, skills creation
Verification	<p>Some key information might require third party verification to ensure transparency. For example:</p> <ul style="list-style-type: none">✧ System effectiveness audits to ensure PVs are providing the needed electricity, and that cooling systems can make use of the electricity✧ Deployment verification to ensure the systems are in place and operating
Continuous monitoring	<p>Systems established to collect the information above and generate the reports with an agreed regularity to support the project managers</p>



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