South African approaches to measuring, reporting and verifying: A scoping report

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*Prepared for the World Resources Institute as part of the
Measurement and Performance Tracking Project*

*supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety,
Federal Republic of Germany*

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Contents

Acronyms and abbreviations used

AFOLU	Agriculture, forestry and land use
BAP	Bali Action Plan
BUSA	Business Unity South Africa
CDP	Carbon Disclosure Project
CESAR	Centre for Energy Systems Analysis and Research
COP	Conference of the Parties
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DoE	Department of Energy
DoT	Department of Transport
DSM	demand-side management
DTI	Department of Trade and Industry
ERD	Energy Research Centre
FSA	Forestry South Africa
GHG	greenhouse gas
ICA	international consultation and analysis
IEE	Industrial Energy Efficiency
IPCC	Intergovernmental Panel on Climate Change
IPMVP	International Performance Measurement and Verification Tool
IPPU	Industrial Processes and Product Use
LULUCF	Land use, land use change and forestry
MAPT	Measurement and Performance Tracking
MoU	memorandum of understanding
MRV	Measuring, reporting and verifying
NAMA	nationally appropriate mitigation actions
NBI	National Business Initiative
NCCR	National Climate Change Response
NCPC	National Cleaner Production Centre
NEEA	National Energy Efficiency Agency
OPENED	Open Energy Database
QELRO	quantified limitation and reduction objective
SAAQUIS	South African Air Quality Information System
SANAS	South African National Accreditation System
SANEDI	South African National Energy and Development Institute
SANERI	South African National Energy Research Institute
SAPIA	South African Petroleum Industry Association
SASQAF	South African Statistical Quality Assessment Framework
SAWS	South African Weather Service
Stats SA	Statistics South Africa
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute

Executive summary

The South African government announced its intention to make emissions data reporting mandatory for emitters of more than a 0.1Mt of greenhouse gases per year in the 2011 National Climate Change Response White Paper. The government intends to establish a 'climate change response monitoring and evaluation system', that 'evolves with international measuring, reporting and verification (MRV) requirements.' MRV is one of the key topics in the international climate negotiations to create trust and legitimacy.

This report presents a mapping exercise of South African approaches to MRV. Research shows that a lot of databases and collections exist already, particularly in the emissions intensive energy sector. However, there is no coherent overall approach to the management of these data. Coordination is necessary for a comprehensive system. Government needs to lead this process ensuring the participation of all departments. It will be necessary to build on the existing structures and capacities to achieve the commitments in the White Paper.

Three case studies present existing approaches to GHG reporting, besides the overall scoping. This scoping report is the result from the first phase of the Measurement and Performance Tracking Project that the World Resource Institute conducts in cooperation with the German Ministry for Environment and the Energy Research Centre.

1. Introduction

Measuring, reporting and verifying emissions reductions is crucial for creating necessary trust between nations to advance collaborative efforts to slow climate change. Most Kyoto-compliant countries have an interest in creating transparent information on the progress of mitigation actions and their implementation. Transparency might impact positively on other countries and incentivise them to MRV their emissions reductions too. In the negative case, international pressure increases on non-compliant countries.

South Africa ratified the Kyoto Protocol, but has no obligation to report its emissions reductions as a non-annex 1 country. Nevertheless, the South African government reported emissions in three greenhouse gas (GHG) inventories since 1998. The recent national climate change response White Paper frames MRV in terms of 'Monitoring and Evaluation', which is a function established in the Presidency, headed by a Minister in the highest political office (RSA 2011). The White Paper states that 'measurement and monitoring of climate change responses is critical to ensure their effective implementation.' The government plans to establish a system in the next two years to measure, monitor and evaluate actions for both adaptation and mitigation. This report focuses on domestic mitigation measures, to which there is explicit reference to the international concept of MRV in the White Paper.

In the UNFCCC context 'MRV' has become an increasingly significant acronym, particularly since the Bali Action Plan of 2007. MRV stands for measuring, reporting and verifying mitigation commitments, actions and support. It is an important aspect of slowing climate change, because it presents the results of developed countries' mitigation commitments and provides transparency on developing countries' mitigation actions. Increased transparency through MRV can help to build trust in negotiations. For developing countries, MRV can be an opportunity for showcasing mitigation actions and demonstrating their contributions towards the global mitigation effort. On the other hand, there is concern among some countries that MRV will involve inappropriate outside scrutiny of mitigation efforts and of actions that are part of sovereign decisions about development. Developing countries do not currently have to report their emissions reductions in quantitative terms, although this might change under a future climate regime after 2020. However, governments in developing countries prepare for emissions reductions reporting structures in their own interest.

In this scoping study on MRV we map the current systems, data and methodologies that can help to inform MRV of mitigation action in South Africa, from a research perspective. The aim of the research is to build a better understanding of how an MRV system can build on existing capacities and activities. This project contributes to create credible systems to make mitigation actions by developing countries measurable, reportable and verifiable at the national, policy, and industry levels.

The World Resources Institute (WRI) is leading the Measurement and Performance Tracking (MAPT) initiative. In-depth studies on MRV were commissioned in six developing countries: Brazil, Colombia, India, Thailand, Ethiopia and South Africa. The objective of this project is to work in partnership with national actors to build capacity and promote shared perspectives and readiness among key stakeholders on the design and implementation of credible systems to make mitigation actions by developing countries measurable, reportable and verifiable at the national, policy, and industry levels.

This working paper provides an initial mapping out of the existing domestic MRV-related capacity in South Africa and identifies needs and opportunities for capacity development, with special attention to MRV of mitigation actions. This knowledge will become even more comprehensive as the MAPT project evolves in the coming years. The mapping incorporates the relevant actors, institutions and systems that are currently involved in collecting, reporting and verification of data related to mitigation actions in South Africa. The research of the Energy Research Centre (ERC) focuses primarily on domestic MRV.

Interviews, workshops, desktop research and stakeholder consultations inform this research on South African approaches to MRV and practical implications of a domestic MRV system across sectors and institutions. Current approaches to MRV were analysed in terms of actors, institutions, policy and regulation, as well as existing databases. The research focused on mapping the current system to

better understand the actors, their actions as a result from their diverse interests and ideas, and their interactions in collecting and managing emissions data.

As mentioned above, the question of measuring, reporting and verifying has become an important issue on the international agenda. The broader MAPT project has components focused on the international dimensions and industry, but these are not part of ERC's work. The ERC research focuses on domestic MRV, although this itself may become important for mitigation actions seeking international support. Our input will focus on research and analysis relevant to components (I) and (II) of the overall MAPT project relating to the National Inventories and Policy and Measures. Other South African partners will be identified to undertake the industry-level and training components.

This working paper provides an overview of the initial approach taken to domestic MRV in South Africa. It does so by examining the current status of MRV activities in South Africa, mapping out initiatives, stakeholders, institutions and policies that are relevant to MRV activities. The rest of the report is organised as follows: Section 2 presents a literature review outlining the concept of MRV from a domestic perspective and its context in the international negotiations on existing academic literature and policy documents. Section 3 provides more detail on the methodology and structure of the enquiry. Inputs for this study were gathered through desk-based research, informal consultations, semi-structured interviews and a stakeholder workshop. Section 4 presents the mapping exercise in two parts: first, a general overview of the actors and stakeholders, existing initiatives, policies and regulations in the MRV in South Africa; and, secondly, three detailed case studies of existing MRV-related initiatives: M&V of energy efficiency, the national GHG inventory, and the AFOLU sector. The final section offers conclusion from the initial mapping exercise and presents further research areas that could be pursued in later phases of the MAPT project in South Africa

2. Literature review

This literature review presents the small but growing body of research literature on MRV to contextualize the study. Although this scoping study focuses on MRV of domestic mitigation action, much of the existing academic literature focuses on the international context of MRV and its role in the international negotiations.

We examined around twenty articles and reports published over the last four years (an academic journal on *Greenhouse Gas Measurement and Management* started in 2011. These help to provide a better understanding of MRV and how it relates to both the international negotiations and domestic mitigation action. The issues addressed in the current literature on MRV cluster around i) definitions, ii) the role of MRV in the international negotiations, iii) the linkage between MRV and national mitigation action, and iv) some empirical illustration providing experiences and case studies from specific countries.

Few papers have so far investigated MRV structures from a bottom-up perspective. Empirically, there is not yet much evidence from MRV in both developed and developing countries. Most of the literature has emerged from governments and research organisations in the former, with relatively little writing from developing countries. WRI researchers investigated the MRV in China (Feiteng, Alun et al. 2009). Okubo et al (2011) provide case studies on FIT tariffs in Korea and energy efficiency in Thailand.

This scoping report provides a bottom-up perspective on MRV in South Africa and thereby contributes to the body of research literature on MRV.

2.1 Monitoring and evaluation in national climate change policy

The South African National Climate Change Response White paper (October 2011) dedicates a section specifically to monitoring and evaluation of climate change implementation. It calls for a Climate Change Response Monitoring and Evaluation system to be developed within two years of publishing this national climate change policy, which will 'evolve with international measuring, reporting and verification (MRV) requirements' (RSA 2011, 48). Furthermore, the Department of Performance Monitoring and Evaluation in the Presidency took responsibility for integrating climate change implementation across government departments (RSA 2011, 47).

A National Emissions Trajectory range is presented in this policy document against which climate change mitigation interventions will be monitored and measured. The policy supports a diverse application of mitigation approaches that optimise mitigation potential but also take into consideration co-benefits such as job creation and sustainable development. Sectoral mitigation contributions will be set within two years of this policy; furthermore a carbon budget approach is stipulated for significant emitters and again the allocation of this budget will be defined within two years of this policy. The proposed Monitoring and Evaluation system will monitor, report and verify on the implementation of objectives defined in the carbon budget and sectoral mitigation strategies. This monitoring process will be coordinated and overseen by the Department of Environmental Affairs (DEA), which will publish details annually.

Although there is no explicit reference to the term 'nationally appropriate mitigation actions (NAMAs)' in the policy document, it does lay out a foundation that supports opportunities for mitigation actions through both the sectoral mitigation and carbon budget approaches. Furthermore a series of 'flagship programmes' are outlined for various sectors including renewable energy, energy efficiency, transport and waste. These effectively provide a list of potential mitigation initiatives deemed appropriate for the South African context.

2.2 Defining MRV

Defining MRV has been a challenging task in both the negotiations and the research literature. As mentioned above, MRV has received growing academic attention since the Bali Action Plan (BAP) of 2007. So far, the BAP does not define what MRV really means. A range of papers published after the BAP came out try to fill that gap by aiming to provide clarity about activities and actors in MRV, its main purpose and state of the art (Fransen 2009; Breidenich & Bodansky 2009; OECD 2009; Winkler et al 2008).

Sound MRV processes are necessary to demonstrate and track implementation of mitigation efforts and also to ensure that financial support is being delivered. It also provides an opportunity to showcase tangible mitigation actions that have been implemented and estimate their contribution to national emissions reductions. Robust MRV processes in a developing country context will assist in attracting support from international climate finance as it provides a reporting mechanism (UNEP, 2011).

Although there is agreement that mitigation actions, as well as financial support, are subject to MRV, it is not clear yet what metric will be used as a measure. In terms of the mitigation actions, we suggest that metrics of implementation should be used. For example, if South Africa were to build 5 GW of concentrating solar power, the indicator of implementation would be the MW installed (or GWh generated). Of course a calculation of the emissions reduced relative to business-as-usual can be calculated (given a baseline for the electricity sector). But for international MRV, South Africa's commitment is to build the 5GW, not to the reduction of tons. At a domestic level, such indicators are also helpful, because they focus on the key challenge of turning ideas and plans into concrete actions. They are easier to motivate for in the context of development thaN tons of CO_2, which are still abstract for many stakeholders across government, business and civil society. The metrics of implementation will vary depending on whether the mitigation action is based on REDD, energy, transport or land use (UNEP 2011).

2.3 Domestic MRV for developing countries

The decisions about the format and metrics for the international guidelines for MRV are not yet made. Therefore, it is important to consider the implications for those actions which are only subject to the domestic MRV. Firstly, one has to explore what a 'domestic MRV' system entails for a developing country. Sufficient capacity and resources are needed just for identifying existing systems and data collection methodologies, which can then be built upon to create a robust domestic MRV system. Furthermore, mitigation actions can span different sectors such as transport, energy or agriculture, and inevitably data availability and reporting will vary across them. There are different stakeholders potentially already involved in such processes and there will be issues around confidentiality.

Textbox 1: Bali Action Plan

The Bali Action Plan initiated a new round of negotiations under the UN Framework Convention on Climate Change (UNFCCC) with the aim of achieving an 'agreed outcome' addressing the full range of climate-related issues, including mitigation, adaptation, technology, and finance. In framing these negotiations, the Bali plan introduces a new construct with its requirement that certain actions be 'measurable, reportable and verifiable.' Specifically, in paragraphs 1(b)(i) and (ii), addressing mitigation, the plan calls for consideration of:

'Measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, by all developed country Parties.... [and] Nationally appropriate mitigation actions (NAMA) 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.'

The Bali plan appears, then, to anticipate that a new climate agreement will provide for the measurement, reporting, and verification (MRV) of three categories of action: developed country mitigation commitments or actions, developing country mitigation actions, and the provision of support for developing country mitigation actions. (Breidenich 2009)

The Bali Action Plan does not define 'measureable, reportable and verifiable'. (Okubo 2011

MRV is included in paragraphs 1(b)(i) and 1(b)(ii) of the BAP, and relates to three parts (see Winkler (2008)).

1. MRV mitigation commitments by developed countries;
2. MRV mitigation actions by developing countries;
3. MRV of support by developed countries for actions by developing countries.

MRV applies to both developed countries and developing countries, but in differentiated ways. While increasingly taking on common responsibility, the differences remain important.

Table 1: MRV obligations in developed and developing countries

	Developed countries	*Developing countries*
MRV applies to	Commitments (or actions, incl. QELROs)	Actions (nationally appropriate mitigation actions, in the context of development)
Emission reductions are	Absolute	Relative
MRV	For compliance	Through national communications
Support		Enabled by MRV means of implementation (T, F&C)

2.4 Domestic MRV for NAMAs in developing countries

The BAP introduced the concept of measuring, reporting and verification for developing countries in the context of NAMAs. Here there is an important distinction: the requirement for developing countries is MRV of the *mitigation action*, not of the *emissions reduction*. In Cancún the MRV requirements were further specified where domestic MRV of unilateral NAMAs is required and potentially international MRV of supported NAMAs. However, currently both the format and functions of NAMAs are undecided as well as the structure of a domestic MRV or international MRV system, which makes the design of a domestic MRV system complicated and quite abstract. This study focuses on the domestic MRV system, for which there are currently no international guidelines. Yet bearing in mind that the purpose of a domestic MRV system is in the context of NAMAs, it is helpful to start thinking about the function of a national MRV system, which can accommodate the potential format of mitigation activities in South Africa.

The South African Government has not officially submitted NAMAs to the UNFCCC, but it has committed internationally under the Copenhagen Accord to

> take nationally appropriate mitigation action to enable a 34% deviation below the 'Business As Usual' emissions growth trajectory by 2020 and a 42% deviation below the 'Business As Usual' emissions growth trajectory by 2025…The extent to which this action will be implemented depends on the provision of financial resources, the transfer of technology and capacity building support by developed countries. (DEA, 2010a).

Even if South Africa has not formally submitted NAMAs, there are mitigation activities happening in South Africa. From 2006–8 the Long Term Mitigation Scenario (LTMS) process combined scientific research with stakeholder engagement to identify a suite of mitigation opportunities available to it (ERC 2007; SBT 2007; Winkler 2007). In Cancun four proposed NAMAs for South Africa were presented including for renewable energy generation (wind and CSP), electric vehicles and sustainable low cost housing. A recent case study on approaches to mitigation actions in South Africa (ERC, 2011) outlines the current activity contributing to South Africa's mitigation effort. One of the important findings from this study in relation to MRV of mitigation actions is that in many cases the reduction of emissions was a co-benefit of a particular activity. This raises an important issue of metrics for MRV. Taking the example of the Bus Rapid Transit system in the City of Cape Town, although this was framed as a public transport initiative, it could be classified as a mitigation action. However the MRV process would focus on the successful *implementation of the action* e.g. number of buses, or passenger miles rather than the *actual emissions*. Furthermore, NAMAs are to promote mitigation activities with particular focus on sustainable development benefits therefore appropriate metrics beyond CO_2 emissions needs to be considered. Regardless of the metrics, whether a mitigation action can be MRVed will potentially be an important component of translating a non-climate driven initiative (e.g. the BRT) into a NAMA. Also in the context of NAMA registry, which is also yet to be determined but will likely require inputs that are a result of MRV processes.

2.5 MRV in the context of international negotiations and domestic mitigation action

MRV is necessary to create legitimacy and credibility for the implementation of a new climate regime. Many developed countries have already committed themselves to report emissions reductions under the Kyoto Protocol. The transparency of mitigation commitments by developed countries that are not willing to take (further) commitments under the Kyoto Protocol also raises question of transparency, but these are not the focus of this report. If developing countries commit to reduce emissions there needs to be a basis from which the the emission reductions will be 'MRV'ed. This basis is the highly political 'business of usual' (BAU) baseline. This hypothetical baseline indicates how emissions would develop without any interventions. At present only industrialied countries need to effectively cut emissions from the 1990. Depending on the future climate regime, also developing countries must do so. Therefore a measurable, reportable and verifiable structure to track the emission cuts needs to be established internationally and domestically.

According to Breidenich and Bodansky (2009), MRV can contribute in many ways to slowing climate change in a new climate agreement. MRV makes it possible to keep track of the progress of the countries' efforts in reducing emissions. Measuring emissions helps the countries to establish baselines and to identify mitigation potentials. If MRV is done in a credible way, it helps to establish trust in the negotiations and to strengthen a country's position. Finally, credible MRV can strengthen mutual confidence in countries' actions and in the regime, thereby enabling a stronger collective effort (Breidenich 2009).

A body of literature evolved on MRV and its role in the international negotiations (Ellis and Larsen 2008; Guay, Corfee-Morlot et al. 2008; South Centre 2008; Winkler 2008; Winkler, Höhne et al. 2008 ; Breidenich and Bodansky 2009; Ellis and Moarif 2009; Moncel, McMahon et al. 2009), with a predominance of writing from authors in developed countries and mostly focused on MRV in the international negotiations.

Brief history of MRV concept in UNFCCC negotiations

In the negotiations under the UNFCCC, all Parties have general commitments to mitigate – that is, to reduce their GHG emissions in terms of Article 4.1 (UNFCCC 1992). However, there has been

agreement that developed countries should take the lead as a matter of equity in Article 3.1. This was operationalised at the first meeting of the Conference of the Parties (COP) in Berlin in 1995, with an agreement that developed countries would set quantified limitation and reduction objectives (QELROs) for their emissions, whereas the same was not expected of developing countries. The result of the Berlin Mandate was the Kyoto Protocol in 1997, quantifying the mitigation commitments – with Annex I Parties (broadly, developed countries) inscribing specific numbers in Annex B of the Protocol (UNFCCC 1997). These are expressed as percentages of emissions below 1990 levels, or for some Parties, limits above 1990 levels. In aggregate, the QELROs for the first commitment period (2008–2012) add up to 5.2%.

It has become clear that all countries need to do more, if dangerous climate change is to be avoided. Developed countries need to deepen their cuts (take stronger QELROs, including the US), and at least some developing countries need to take action on mitigation. In this context, the notion that developing countries would commit to actions that are also 'quantifiable' emerged. More precisely, the BAP (UNFCCC 2007) included the term MRV (measurable, reportable and verifiable).

Adding international consultation and analysis in Copenhagen

The negotiations leading up to COP15 in Copenhagen developed the concept of MRV further, in the attempt to agree a new legally binding agreement or treaty. The issue of 'transparency' became central to negotiations between the US and BASIC countries in particular (Brazil, China, India and South Africa). The notion that MRV would be applied to those NAMAs seeking international support was unproblematic. The understanding was that this is similar to contracts for international funding, and indeed the reporting and verification requirements are often more stringent than what is contemplated for MRV.

The US in particular wanted to be able to review all mitigation actions in China; but China, supported by others, refused to accept a review of domestically supported NAMAs. The compromise reach coined a further term: international consultation and analysis (ICA). The Copenhagen Accord (UNFCCC 2009) was eventually a political agreement (as distinct from a legal agreement), and only noted by the COP, but included this sentence in paragraph 5:

> Non-Annex I Parties will communicate information on the implementation of their actions through National Communications, with provisions for *international consultations and analysis* under clearly defined guidelines that will ensure that national sovereignty is respected. (UNFCCC 2009: para 4, emphasis aded)

Note that, meanwhile, developed countries including the US were no longer taking commitments as in Kyoto, but 'quantified economy-wide emissions targets for 2020' (UNFCCC 2009) in para 4. There was also no longer any reference to a compliance system, which with enforcement can be considered one of the strongest possible forms of MRV in a multi-lateral agreement.

Cancún brings in some balance with international assessment and review

During 2010, there was much elaboration of ICA, with Minister Ramesh of India making proposals (Ramesh 2010). The general sense was that non-Annex I national communications would be the main information base of ICA. The Cancún Agreements included the following language:

> 63. Decides to conduct international consultations and analysis of biennial reports under the Subsidiary Body for Implementation, in a manner that is non-intrusive, non-punitive and respectful of national sovereignty; the international consultations and analysis will aim to increase transparency of mitigation actions and their effects, through analysis bytechnical experts in consultation with the Party concerned and through a facilitative sharing of views, and will result in a summary report, (UNFCCC 2010)

Note the ICA is framed as a facilitative sharing, that is distinct from a system of compliance, or a review with consequences. Also, in Cancún the new aspect of biennial reports was introduced. In this way, developing countries have moved from national communications with no specified frequency, to every four years – and biennial reports in between. The debate continues whether the biennial reports are just updates, or whether frequency is effectively two years.

Textbox 2: Cancun Agreement

MRV & ICA Provisions for developing countries:

1. Financial support for enhanced reporting (52).
2. More frequent and enhanced reporting (60).
3. Guidelines for MRV for internationally supported actions (para 61).
4. Guidelines for MRV of domestically supported actions (para 62).
5. ICA of biennial reports (63) 52,60-64 Cancun Agreement.

Cancun also added yet another new acronym to the climate lexicon: international assessment and review. This was introduced to restore some balance with a process to assess progress by developed countries in achieving their quantified economy-wide emission reduction targets. Paragraph 46 introduced some language that makes reporting and review under the Convention more extensive (and more like the Kyoto Protocol). It includes specific information to be reported on progress and targets, including how accounting of LULUCF and carbon credits affects those targets.

> 46. Decides on the following work programme for the development of modalities and guidelines described above, building on existing reporting and review guidelines, processes and experiences:
>
> …
>
> (d) Modalities and procedures for international assessment and review of emissions and removals related to quantified economy-wide emission reduction targets in accordance with paragraph 44 above, including the role of land use, land-use change and forestry, and carbon credits from market-based mechanisms, taking into account international experience (UNFCCC 2010).

The OECD included a contribution to the literature on IAR and ICA (OECD 2011). This information is purely to understand the full context of the multilateral negotiations.

MRV is likely to remain an important issue as the mitigation activity/NAMA paradigm develops (Tyler, Boyd et al. 2011). The context of international MRV is much broader than the scope of the work that ERC is conducting as part of the MAPT program. Most relevant to our work are mitigation actions by developing countries and support.

The aim of this research is to focus primarily on the implications of a domestic MRV system in South Africa in the context of mitigation activities. This requires both an understanding of the types of mitigation activities in South Africa and also an understanding of how a domestic MRV system could respond to this. Existing activities that would be helpful in establishing a domestic MRV system in South Africa are often in other domains. Stakeholders do not at this point necessarily see an obvious link with mitigation actions. Reporting of emissions (which is more advanced through engagement on inventories) and reductions needs also to be understood as a distinct matter. One might expect that this understanding will improve as work on domestic MRV progresses.

This working paper was mostly prepared before the COP 17 in Durban and shortly after the publication of the South African National Climate Change response policy. The COP 17 meeting will certainly advance the issues of NAMAs and the way their impacts are measured, reported and verified. Without clear existing guidelines on the format of domestic MRV, for the purposes of this report we refer to MRV as the process of measuring, reporting and verifying mitigation actions in both public and private sectors. MRV is an open process that involves different actors with different motivations, rationales and interests in data collections and analysis. In our perspective, MRV goes beyond the narrow purpose of reporting emissions reductions into the international frameworks and captures all mitigation efforts across the economy.

3. Methodology

This research project is an explorative study that maps out the existing initiatives, databases, actors and regulations from a bottom-up MRV perspective in South Africa. Although the context of MRV in the international climate change negotiations is important in terms of the implications for future national reporting requirements, this scoping report was undertaken with a focus on MRV of domestic mitigation actions. In South Africa, many MRV-related initiatives are already in place and therefore it makes sense to build on the existing structures.

However, these structures are often disparate. Therefore, the study started with a mapping exercise through online searches and informal conversations within our own networks. We did 15 semi-structured interviews with the stakeholders indicated below in Table 2.

Table 2: Overview of the stakeholder engagement

Organisation	*Interaction*
Department of Environmental Affairs	3 Workshop participants and 4 semi-structured interviews
Department of Energy	2 Semi-structured interviews
Eskom	1 Semi-structure interview
Stats SA	3 Semi-structured interviews, Workshop participation
SASOL	Workshop participation, phone interview
Central Energy Fund / SANERI	1 semi structured interview with 2 participants
Prominthium Carbon	Workshop participation
M&V Professional representative	Workshop participation, 1 interview
CDP (Incite Sustainability)	1 semi-structured interview, workshop participation
Woolworths	Interview
City of Cape Town	Interview
Workshop on MRV in South Africa at ERC	Workshop hosted at ERC, first event in South Africa on MRV, kick off with 16 workshop participants
Workshop WRI at COP17	Participation
Side event DEA MRV in South Africa at COP17	Participation
Workshop MRV Promethium at COP17	Participation
	15 interviews, 16 workshop participants at ERC workshop, 3 workshops attended

ERC hosted a workshop on ‘ Domestic MRV in South Africa’ at its offices on 18 October 2011. The workshop was well received by participants who noted that it was relevant, necessary and timely to have this kind of discussion between the key stakeholders from government, academia and the private sector on domestic MRV in South Africa in the context of the current MRV debate under the UNFCCC. A particularly valuable aspect of the workshop was that key themes emerged through the discussions, which are helpful in framing the issues that need to be considered in the evolution of a domestic MRV network.

4. Mapping MRV in South Africa

This section presents the analysis in two parts: Part 4.1 presents the findings from the mapping exercise and is structured in terms of existing initiatives, regulations and actors. It presents the overall databases that report emissions data, regulations and policies that require reporting of these data and the actors who drive these processes. These initiatives are mostly governmental and publicly driven, but some examples appear in the private sector as well. The examples are illustrative rather than complete and provide a bottom-up perspective of the MRV-related institutions, actors and systems in South Africa.

Part 4.2 presents three in-depth case studies on existing and different types of MRV-related systems in South Africa. The first describes the measurement and verification (M&V) of Eskom's demand-side management and energy efficiency initiative. This case study represents an example of a well-established MRV system. The second case study describes the Greenhouse Gas Inventory in more detail, representing an example of a cross-sectoral emissions database in alignment with international reporting requirements. The third example describes the MRV structure of non-energy emissions in agriculture and respresents a decentralised and emerging MRV system.

4.1 Mapping MRV in South Africa: Existing initiatives, actors, regulations and databases

The mapping exercise of MRV-related initiatives in South Africa shows that there is a wide range of actors, activities, databases and regulations in place, which can provide a strong basis for a domestic MRV system. These existing initiatives are rather disconnected from each other, so establishing a coherent framework for MRV will require careful coordination and linking between existing systems and coordination. This section provides an overview of i) the main institutions and actors involved, ii) the regulations, policies and guidelines that contribute to collecting emissions data, and also iii) the data they collect and the databases where they store this information. This section presents findings from the South African economy as a whole, although most of the current MRV initiatives cluster around the energy sector. This mapping is a rather superficial exercise that shows the current actors matrix and their relations and interests in MRV. Table 3 below outlines some of the institutions, policies, guidelines and stakeholders that were engaged with as part of the mapping process.

Table 3: Mapping MRV: Existing initiatives, databases, actors and regulations

Institutions	*Actors*	*Policies, guidelines and standards*	*Initiatives relating to MRV*
DEA	Government representatives	National climate change response paper	GHG inventory
DoE	M&V teams	Draft energy efficiency tax regulation	SAAQUIS
DTI	Municipalities	Draft provision of energy regulations	CDP
Dept of Transport	Industry (Eskom, Sasol)	IPMVP	OPENED
Statistics South Africa	Civil society	SANAS/SABS	M&V energy eficiency
SANEDI		SANS:50001	NMEC
		AQA – draft GHG reporting	

The following three sub-sections elaborate on these concepts based on available literature, semi-structured interviews based on a questionnaire and the workshop. Section 4.1.1 provides an overview on actors and institutions with an overall actors matrix of the current state of the system. Section 4.1.2 provides an overview on the current state of the regulatory framework for MRV. Section 4.1.3 presents an overview of the four main data collections.

4.1.1 Key institutions and actors in MRV

The current systems in South Africa for collecting information on mitigation initiatives are decentralised and lack formalised coordination. A range of public and private sector actors collect emissions-related data according to their diverse interests. As would be expected at this stage, there is no centralised or compulsory data collecting authority for MRV. This system has advantages and disadvantages, because it leaves the different actors the freedom to collect and use the information for their own purposes. On the other hand, synergies and duplicated efforts are frequent in the lose structure of the system.

Public institutions

A national MRV system will ultimately have to be coordinated across core government departments and incorporate relevant stakeholders. The *Department of Environmental Affairs (DEA)* is officially responsible for climate change and acts as the key interface for the international climate change negotiations. The DEA represents South Africa in the UNFCCC together with delegates from other government departments and South African institutions. Therefore, in terms of MRV in the context of climate change and mitigation actions, the DEA is well positioned to lead and coordinate a domestic MRV system, as indicated in the White Paper. The DEA has recognised the need for a more coordinated approach. For this purpose, the DEA is in the process of appointing three MRV specialists. The DEA is responsible for reporting South Africa's greenhouse gas emission internationally through the Greenhouse Gas Inventory (see also the case study in section 4.2.2). The DEA is in charge of all reporting requirements to the UNFCC Convention. For this purpose, the DEA maintains the Environmental Statistical System and the South African Air Quality Information System (SAAQUIS, see below). On the other hand, DEA has no formal mandate over data collection in the energy sector.

The energy sector is the largest contributor to emissions in South Africa. Energy emissions are central to MRV. *Department of Energy* (DoE) has the mandate for collecting emissions data from the energy sector. DoE has a key responsibility in providing data on energy use and supply. The DoE collects energy data for energy balances and the integrated resource plans. It is currently developing a Central Energy Database, which is, however, not publicly accessible. It is quite unclear what data are in the DoE and how they are used. So far, the Central Energy Database is not officially accessible to other departments. There is also not much information-sharing between the DoE and Eskom.

Eskom is South Africa's main electricity provider, a public enterprise that maintains a quasi-monopoly in the South African electricity sector. Eskom's coal-fired power plants contribute a third of South African emissions. As a public enterprise, Eskom reports to the Department of Public Enterprises, not to the DoE. Eskom currently is the main custodian of data relating to energy savings from energy efficiency particularly from its DSM programmes. Eskom has access to company-level data due to individual project level M&V projects, but this information is not publicly available for reasons of confidentiality. DoE has no official reporting mandate over Eskom and no access to its data collection.

Although the DoE is supposedly the overarching agency focusing on energy it has a limited role in the coordination of the energy emissions data. The process for data collection as well as the data management at Eskom and DoE are not clear. Other departments, such as the *Department of Trade and Industry* (DTI) and the *Department of Transport* (DoT) both have increasingly started initiatives on energy and energy efficiency that generate information about electricity and energy savings. Currently there does not appear to be a visible process for energy data collected in the DTI and DoT to be captured by the DoE.

Beside the departments and public enterprises, other government agencies serve in the South African MRV system in different functions.

Statistics South Africa (Stats SA) is the official national statistics organisation in South Africa. Stats SA reports to the Minister for National Planning. Stats SA is not responsible for collecting data, unless specifically mandated, but rather responsible for quality, assuring data that is published as official or national data.

The mandate of Stats SA is to promote co-ordination among statistical producers in South Africa in order to improve the quality, consistency, comparability and optimal use of official statistics, provide statistical advice to organs of state and to liaise with statistical agencies of other countries and international agencies. The National Statistics System Division (NSSD) coordinates institutional arrangements between Stats SA and line ministries to meet user needs. NSSD also plays an important role in the certification or standards such as the South African Statistical Quality Assessment Framework (SASQAF).

In terms of environmental statistics, Stats SA is involved in environmental economic accounts, which measure the contribution of the environment to the economy and the impact of the economy on the environment, environmental statistics (describing the state and trends of the environment), and developing Environmental indicators.

The common practice of Stats SA is to sign memoranda of understandings (MoUs) with individual government departments, under which they will operate on Service Level Agreements. Currently Stats SA has MoUs with the DoE and the DEA. This would ensure that statistics could be measured by SASQAF and disseminated as official statistics in future. Stats SA will also get involved with data and statistics when mandated to do so by government departments. Official agreements are necessary for these engagements. Stat SA engages, for example, by participating in the advisory committee to the State of the Environment Report prepared by the DEA. Stats SA has assisted the DoE with the energy balances and the integrated energy plan, as well as the natural resource accounts (StatsSA 2005) as well as the updated energy resource accounts in 2009. In transport, Stats SA has recently surveyed land transportation (StatsSA 2011) and post, telecommunications and the general transport sector (StatsSA 2007). Stats SA's MoUs provide experience in linking and coordinating information and data systems. This experience is valuable in designing a domestic MRV system.

There are budget constraints to environmental programmes, and environmental statistics are not a priority within government. Frameworks for environmental statistics do exist, but are not yet established within Stats SA. This lack of an environmental statistics places pressure on resources to source and collect data for EEA. The process to formalise agreements with all line ministries that collect and house environmental statistics has not yet commenced. For this reason, many publications are national statistics, but not yet official statistics. For that status, the correspondent department needs to agree.

Overall, Stats SA is also responsible for ensuring the principles of the *National Statistics System* are adhered to. However, Stats SA is rarely involved in the collating of data specifically for the national greenhouse gas inventory.

Although Stats SA is at the core of the statistics systems in South Africa, a representative estimated that only around 10% of all statistics in South Africa are done within Stats SA. The remainder is compiled in other agencies.

Especially in the energy sector where is a tendency towards decentralised energy data collection. Further institutions such as the Council for Scientific and Industrial Research (CSIR), Energy Research Centre, the University of Stellenbosch, South African National Energy Research Institute (SANERI) and South African National Energy and Development Institute (SANEDI) collect energy data. The CSIR undertakes research on atmospheric emissions data and ocean emissions. These emissions are measured through metering stations on towers. Cape Town has a pilot programme to measure the city's emissions. These data are rough estimates and better used to double check the GHG inventory data, rather than serving as a primary source.

The Centre for Energy Systems Analysis and Research (CESAR) administers some of the energy data as well. CESAR is one of the six energy research centres in the SANERI. SANERI is a DST-funded agency that focuses on energy research. SANERI is in the process of merging with the National Energy Efficiency Agency (NEEA) to become SANEDI, and this change will probably increase the amount of energy data collected at this institution. The latest energy efficiency tax regulation assigns the role and responsibility for certifying energy efficiency savings to SANEDI. SANEDI was established through an act in 2008 and has now slowly begun to function as an umbrella organisation between the NEEA and SANERI. So far, SANERI is not involved in emissions data collection, which will change when it merges to become SANEDI. The institutions are physically hosted at the Central energy Fund.

So far, there are plenty of activities taking place in an uncoordinated way. DEA has the official mandate for the reporting requirements under the UNFCCC, but it has not the mandate over data collection in the energy sector. The cross-departmental effort to collect, share and elaborate on energy emissions data requires coordination that embraces all the different actors in the public sector and engages with the private sector as well.

Industry

Industry has a responsibility in terms of reducing emissions and implementing mitigation activities. Reporting requirements do already exist for industry under the GHG inventory and the reporting guidelines under the Intergovernmental Panel on Climate Change (IPCC). So far, there is no compulsory reporting structure for industrial firms to report their emissions.

Industries with a very high GHG intensity are aware of their responsibility in climate change mitigation. The South African oil and gas multinational Sasol, for example, is South Africa's heaviest polluting industry and reports its GHG emissions to the DEA through the GHG inventory and to the Carbon Disclosure Project. Measurement and reporting activities are done in-house whereas the verification is a task for external consultants. Consulting firms provide verification services, but there are no official coordination efforts or standardised guidelines for verification yet. Sasol represents its interests actively through lobbyists in Business Unity South Africa (BUSA) and in the international negotiations. Both BUSA and the National Business Initiative (NBI) are engaged and well positioned to play coordinating roles amongst business. The trade unions should not be left out in the discussions of MRV of industry emissions, as regulations might affect the price of doing business in the country.

The carbon footprint becomes more and more part of a business's competitiveness. High emissions factors can harm a firm's reputation. The *Carbon Disclosure Project (CDP)* uses this competitive edge in their rankings of firms' carbon footprints for investors. The CDP covers the top 100 listed JSE companies in South Africa, which provided the opportunity to examine issues around monitoring, reporting and verification of data in different sectors such as finance, agro-processing and transportation.

According to the recently released Carbon Chasm report, if achieved and maintained, targets from the JSE 100 companies could result in a 0.5% annual reduction in the JSE 100's overall direct emissions. The CDP has collected climate change data since 2000 and has now undertaken the fifth CDP in South Africa (run through a partnership with the NBI).

The CDP is now focusing more on the verification process, where they have defined verification as 'a systematic, independent and documented process for the evaluation of climate data against a set of predefined criteria' (CDP White Paper).

The aim of this focus is to build trust in the CDP data and increase use of the data in analysis and decision-making. Currently the key drivers for verification are to increase market demand from investors, customers, regulators, non-governmental organisations and other stakeholders for assured and reliable climate data (Dane, 2011). Target-setting amongst the JSE 100 has shown a strong upward trend, with 31 of them reported as having an emissions reduction target in 2010, as compared to 20 companies in 2009. The most carbon-intensive sectors are leaders in target-setting. Target-setting companies account for 93% of the JSE 100 direct emissions, and 19% of South Africa's national emissions. In line with South Africa's status as a developing country, the JSE 100 average reduction target of 0.5% is lower than the Global 100 average target reduction rate of 1.9%7 and the FTSE 100 target reduction rate of 2.5%.

The CDP proved that the simple psychology of ranking works well as an incentive for firms to reduce emissions. These rankings are available to investors, and publicly available in aggregated form.

Specific sectors require specific reports and measures. Some sectors have some specific standards and reporting cycles. Therefore any 'new' system such as a domestic MRV system would have to build up on existing structures to avoid reporting fatigue amongst industry and public actors.

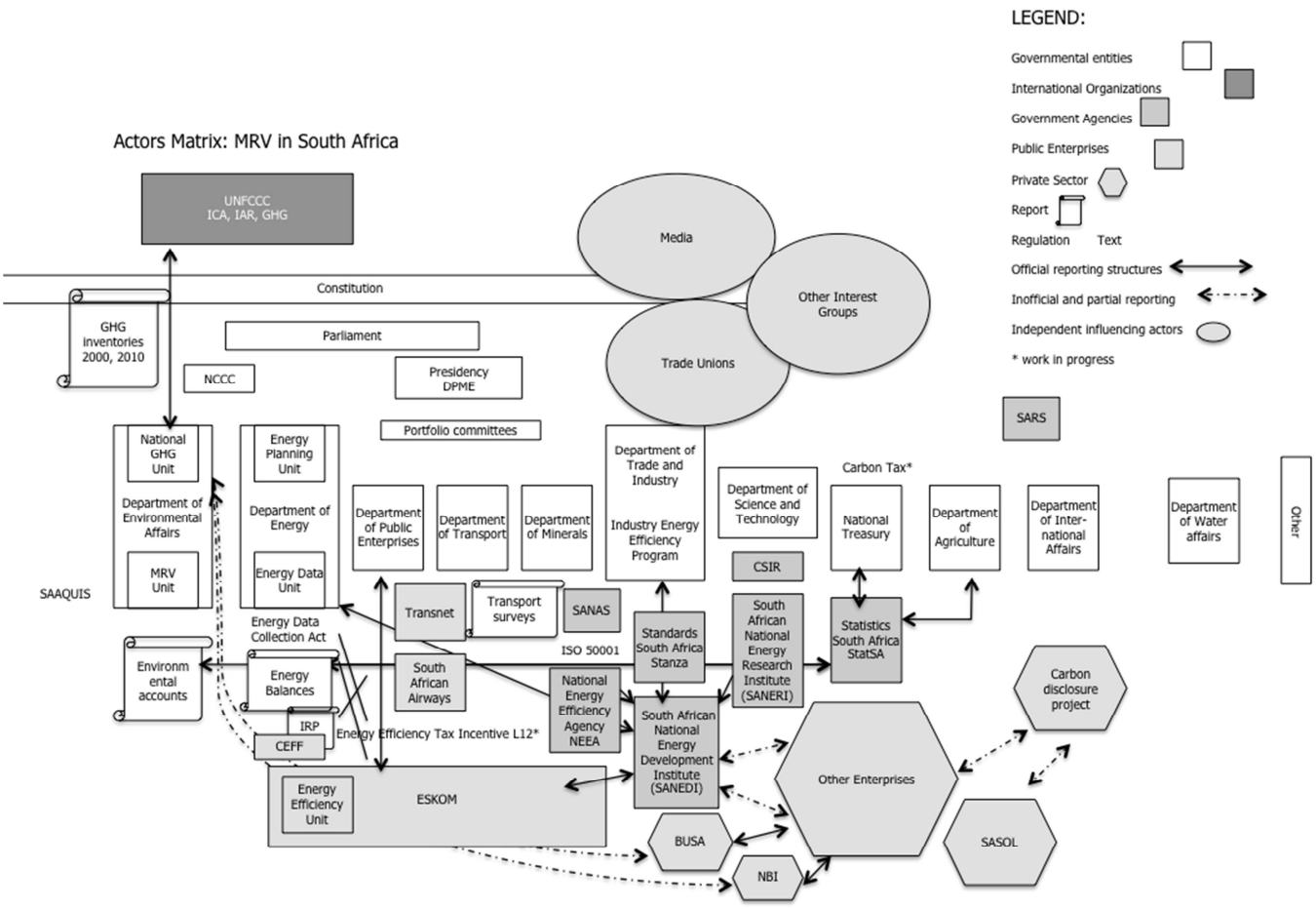

Figure 1: Overview of actors, institutions and regulations: Elements of the current MRV system in South Africa

Summary: coordination and linkages

The overall MRV system in South Africa is rich in actors, institutions, regulations and data collections as Figure 1 illustrates. However, the actors and institutions have not yet created any hierarchical or non-hierarchical coordination mechanism. The governance structure has multiple poles and entry points for MRV, as in the Departments of Environment and Energy. The relationship between the government departments is rather imbalanced. DEA has the main responsibility for ensuring that MRV systems are implemented in the context of UNFCCC requirements in the future. However, Eskom, the DOE as well as other institutions hold most energy-related data. This might not be significant in other countries, but in South Africa mitigation actions will predominantly focus on the energy sector, as it is the main source of the high emissions. The DEA has no direct mandate over any of the crucial public enterprises like Eskom and little influence on industrial development policies. Therefore, actors like the presidency, the treasury and the DTI, DPE and DoE need to come on board to tackle MRV as a cross-governmental issue. A cross-departmental steering committee would be useful, to create ownership for MRV in all departments, not just the DEA.

Other government agencies could support this steering committee. The National Climate Change Committee should be involved and the steering committee should be represented in the NCCC in return. StatsSA could have a stronger mandate to structure data systematically and to ensure data quality. A central agency, like the South African Weather Service (SAWS; currently involved in coordinating SAAQUIS) could be the coordinator of the system on behalf of DEA. These decisions about institutional arrangements still need to be made in South Africa.

The main decision is about the structure of the system. There are four potential approaches: a centralized vs a decentralised system, with either mandatory or compulsory reporting requirements.

4.1.2 Regulations, policies and guidelines

There are overarching policies, as well as very specific regulations and standards relevant to MRV in South Africa. The overarching national climate policy is the *National Climate Change Response White Paper* that the Cabinet approved in 2011 (Gazette No. 34695, Notice No. 757, 19 October 2011). This White Paper is South Africa's first policy focusing specifically on climate change. The DEA was the main architect of this policy framework. The white paper covers mitigation and adaptation, institutional arrangements as well as a dedicated chapter on monitoring and evaluation. The national climate change response White paper contemplates that 'a national system of data collection to provide detailed, complete, accurate and up-to-date emissions data in the form of a Greenhouse Gas Inventory and a Measurement and Evaluation System to support the analysis of the impact of mitigation measures' will be developed (DEA, 2011:Section 6, (g)). The White Paper specifies further that

> reporting of emissions data will be made mandatory for entities (companies and installations) that emit more than 0.1 Mt of GHGs annually, or that consume electricity which results in more than 0.1 Mt of emissions from the electricity sector. Qualifying entities will also be obliged to report energy use by energy carrier and other data as may be prescribed.
>
> The emissions inventory will be a web-based GHG Emission Reporting System and will form part of the National Atmospheric Emission Inventory component of the SAAQIS. It will be developed, tested and commissioned within two years of the publication of this policy' (RSA 2011)

There is recognition that it is important to be able to monitor cost, outcome and impact of implemented climate change responses, and therefore there is a commitment that within two years a draft climate change response monitoring and evaluation system will be designed and published. It is stated that although this system will be based on South African scientific measurement standards and undertaken through the Presidency's outcomes-based system, it is expected that the system will evolve with international MRV requirements (DEA, 2011). The White Paper sets the overall framework and a clear timeline for the government to establish a 'measurement and evaluation system' to track mitigation.

The carbon tax is currently the second main climate policy in South Africa, but it is still under debate. The National Treasury issued a carbon tax discussion document in 2011 to explore possible implementation options. The recent NCCR White Paper also refers to the carbon tax as a potential instrument to contribute to emission reductions. Yet it is not clear how a carbon tax would align with the carbon budget approach also outlined in the NCCR policy. The government still needs to sort out the implications for MRV of a carbon tax. However, in both instances of a carbon tax and a carbon budget approach, data is key for identifying high emitting sources.

Specific legislation on energy emissions data collection is still in the implementation process. The *National Energy Act* (Act No. 34 of 2008) has enabled the drafting of various regulations, which could support MRV related activities. The draft regulations on the *Provision of Energy Data* under Section 19(1) aim to

> assist the Department of Energy to effectively collect, collate and publish quality energy data and information (3 (1)) and provide for the form and manner of the link between the energy database and information system to any other system within the public administration.

The implementation plan for these regulations is not yet finished. The DoE plans to design a questionnaire to collect information for a centralised energy database. The DoE will coordinate and manage this database.

In consultation with the Ministers of Finance and Trade and Industry the *Regulations on the Allowance for Energy Efficiency Savings* have been prepared under section 19 of the National Energy Act, 2008 to be read in conjunction with section 12L of the Income Tax Act 1962 9Act No. 58 of 1962). This regulation outlines the methodology and process for issuing energy saving certificates. The regulations introduce SANEDI as the body responsible for approving Measurement And Verification Reports, undertaken by a professional person accredited by the South African

National Accreditation System (SANAS) and registered with SANEDI (Polity, 8th November 2011). In order to be eligible for a tax break, applicants must submit a report undertaken by an accredited M&V professional to a committee at SANEDI who will, on approval of the report, issue a certificate. The certificate would include the baseline, reporting period, annual energy efficiency savings and details of the accredited M&V professional. This certificate has to be submitted to the South African Revenue Service (SARS) in order to claim for the tax allowance. This regulation was out for comment at the time of writing this report. Should it be successfully implemented it will have large capacity implications particularly in terms of sufficient accredited M&V professionals.

Since the power cuts in 2008, the DTI has started several programmes on energy efficiency and cleaner production. The main initiatives are the National Cleaner Production Centres (NCPCs) and the Industrial Energy Efficiency (IEE) Project. The IEE is run in cooperation with the Business Unit South Africa and funded by UNIDO. The project aims to promote energy efficiency in industry through the Energy Management Standard (ISO 50001) (Visagie 2008). The revision and update of the Energy Efficiency Strategy from the year 2005, is part of this process.

In Energy Efficiency, South African legislation is quite advanced. The *International Performance Measurement and Verification Tool (IPMVP)* presents guidelines for the M&V process of energy savings. The tool consists of sections: i) guidance to prepare a baseline, ii) defining indicators to measure and defining project boundaries. The IPMVP is the main tool for electricity savings. The IPMVP could serve as a basis to develop similar guidance for other sectors such as transport or agriculture.

The *South African National Standard (SANS) 500010:2011* is based on the principles of the IPMVP and provides a national standard for undertaking M&V activities in South Africa. South Africa is the first country to adopt such a standard. More details on the application of the IPMVP and the SANS 500010 and the role of the SANAS are outlined in section 4.2. A new standard for energy efficiency is in the process now. The government incentivised industry to develop this standard to receive tax incentives in energy efficiency (12L see above).

Finally there is the *National Environmental Management Air Quality Act* (Act No.39 of 2004) which superseded the Atmospheric Pollution Prevention Act No 45 of 1965. The revised Act introduced ambient air quality standards into South African air quality control legislation for the first time, in addition to retaining point-source control of emissions (Warburton et al, 2006).

Certain categories of these regulations are relevant as vehicles for the implementation of greenhouse gas mitigation (Warburton et al, 2006). Including for example:

a) any matter necessary to give effect to the Republic's obligations in terms of an international agreement relating to air quality;
b) matters relating to environmental management co-operation agreements, to the extent that those agreements affect air quality;
c) emissions, including the prohibition of specific emissions, from point, non-point and mobile sources of emissions, including motor vehicles;
d) requirements in respect of monitoring;

DEA put forward a proposal to use the AQA to regulate industrial greenhouse gas emission data collection and reporting and the development of GHG emission reduction plans in respect of industries that make a significant contribution to South Africa's GHG emissions (Discussion Document, 2009, DEA[1]).

Summary: Policy, regulations and guidelines

There are new dynamics in the regulatory framework for mitigation and data collection. In the White Paper the government commits to a transparent measurement and evaluation system of carbon emissions reductions. For the first time, the South African government officially recognises the carbon constraint and commits to emissions reductions targets and to tracking mitigation performances. This is a major advance in the climate policy. The carbon tax debate is the second

[1] 'AQA and Industrial Greenhouse Gas information management and mitigation: A discussion on the proposed use of the national environmental management: AQA to regulate industrial GHG emission data collection and reporting and GHG mitigation plans', 21/10/08

major climate policy endeavor that will still take some time to develop. The carbon tax is a specific mitigation action, the White paper is the overall umbrella. The MRV structures for the carbon tax is not yet clearly define, but emissions reductions will have to be reported from the private sector. SARS may play a significant role here. A centralised system to report emissions with taxes might be an efficient system to record emissions reductions.

In energy, the implementation of the Energy Data Collection Act moves slowly and the process is not clear to the external observer. In energy efficiency, mature regulations and standards exist and work well to their purposes. The new tax incentives for energy efficiency have triggered a new standard and will create a greater demand for M&V professionals, and therefore more data on energy emissions reductions in the future.

Overall, the necessary regulatory framework is in place. The implementation is slowly, but mostly advancing. Specific standards are quite advanced in the energy sector and might bear potential for standardisation and regulation in other sectors.

4.1.3 Overall emissions databases

In South Africa, it is worth mentioning four major databases with emissions data. These are the most general data collections: i) the Greenhouse Gas Inventory, ii) the South African Air Quality Information system (SAAQIS), iii) the Open Energy Database project (OPENED), and iv) the DoE's central energy data base.

Obviously, there are various sectoral databases or those that record the emissions reductions of specific programmes. An example is Eskom's databases for the energy efficiency programmes.

South Africa prepared its first *Greenhouse Gas Inventory* and submitted this to the UNFCCC in 1998, using 1990 data. It was updated to include 1994 data and published in 2004.[2] The GHG inventory in South Africa is a case study outlined in section 4.2 in more detail.

The *South African Air Quality Information system* is recent and still in development. SAQQUIS is an initiative in the Department of Environmental Affairs Air Quality Management Unit. The SAAQIS system aims to respond to various existing issues relating to information availability and technological and human capacity of capturing large amounts of data from disconnected sources. The aim is to ensure that the national emissions profile is readily available to inform air quality management decision-making. The SAAQUIS system aims to achieve the following: A web-based emissions monitoring and reporting system is designed, developed, tested and implemented that provides accurate, current and complete information on all significant sources of atmospheric emissions. Regulations ensure the mandatory provision of emission data to the web-based emissions monitoring and reporting system (DEA, 2011).

The data remain with SAWS. There are many elements of the proposed SAAQUIS system that will form an integral part of a domestic MRV system. The Emissions Reporting module will focus on packaging data based on sectoral, provincial local and national level data and the Emissions Inventory System is considering signing MoUs between the various agencies gathering the data sources.

The *Open Energy Database project* is a register of existing energy data. SANERI supports the project at the Energy Research Centre realising that a large amount of energy data exists in the public domain, which is not housed in a central repository. Hence energy data is difficult to access for the public, academia, the private sector and government.

The database contains all relevant energy related information to follow the energy value chain from resources to extraction to transformation and usage:

- Information from other organizations (e.g. Stats SA): This information will not be housed within the database, but will be accessed through a transaction server, for each and every query.

[2] Greenhouse Gas Inventory, South Africa, Compilation under the UNFCCC May 2009, 1990 to 2000, National Inventory Report

- Aggregated energy data, which will be retained directly in the database itself such as the energy balance, fuel sales, demand profiles.
- End use technology data, quantities, characteristics, to facilitate bottom up analysis.
- Cross-links to publications (journal papers, reports, theses etc) containing energy-related data.
- Links to scanned versions of rare documents, pdf versions of which will be housed directly in the database.

In addition to quantitative data, the database indexes other information which can support energy related decisions and research including:

- research organisations and individuals working in specific research areas, including contact details and relevant research outputs; and
- relevant energy policy and legislation, at the national, provincial and local level.

The data is limited to what is relevant to South Africa. However some web links will be provided to other key international organisations conducting work in a specific area, such as the IEA, IAEA etc. Data derives principally from other available databases and resources relevant to energy in South Africa. The information is principally available through a web-based search engine that allows reporting according to type of source information. The data suppliers continue to own the data. OPENED does not verify their data, but presents it for analysts to use in further study. Obtaining access to energy data has been extremely difficult due to confidentiality and market sensitivities. OPENED makes data publicly available through the website, as far as legislation and intellectual property allows. However, the accuracy of data is not reported unless by the data supplier.

OPENED offers information to support research for MRV, especially for verification. The project is currently in development and the website will be launched upon completion of products. Guidelines on development of OPENED have evolved based on needs assessment report and consultation with the funders.

The DoE holds its own central energy database, as mentioned in the previous section under the Energy Data Collection Act. The DoE's 'Master energy database' contains comprehensive information on energy consumption sorted by fuels. This database informs the national energy balances as well as the fuel price reports that the Department releases on a regular basis. The Department collects most energy data itself. According to an interview with the Deputy Director of Energy Efficiency at the Department of Minerals and Energy, the DoE had outsourced these services to external consultants, which resulted in reduced the quality of the reports. The Department works on the basis of MOuS to compile ITS energy statistics, e.g. with Stats SA for quality of the statistics, with the Department of Minerals for mining data, and liquid fuel, with NERSA, Eskom and the municipality to gather electricity data.

Summary: Data collection

These four databases exemplify South Africa's existing data on energy, emissions and energy consumption. They also exemplify the lacking coordination of the different data collections.

The central energy database is classified for non-governmental use as it contains sensitive data. It is unclear to which extent other departments have access. The OPENED database is an attempt to make national energy data more accessible and publicly available. However, South Africa is a country with a legacy of secrecy, especially in respect to energy data.

Textbox 3: Key messages from the mapping exercise in 4.1

Multi-polar governance structures: The relationship amongst the departments is imbalanced. DEA serves as an entry point for MRV through the UNFCCC, although much of the energy data collections sits in the DoE and Eskom. Other important actors are the DTI (especially in Energy Efficiency), the DPE for their mandates over Eskom, the Department of Transport and obviously the National Treasury.

Basic regulatory framework for MRV is in place: implementation needs time and commitment. The basic regulatory framework is there. New specific standards and incentives emerge in a dynamic process.

Many energy databases exist, but they lack coordination and accessibility. The lack of coordination derives from the institutional set up. South Africa has a historical legacy of secrecy especially to energy data that constrains data sharing and access.

4.2 Case studies on existing MRV systems in South Africa

The following section presents three case studies on existing MRV structures. The case studies illustrate the different development stages and organisational patterns of these MRV structures. The case study on M&V in Energy Efficiency is of a mature and well-established domestic system that has been ongoing for many years. The second case study illustrates South Africa's national GHG inventory as the main international reporting agreement and its implementation in South Africa. The third case study illustrates the MRV structures in the agricultural sector. This system is rather new and in early stages of development.

4.2.1 Case study: Industry: Energy efficiency M&V

M&V is a well-established monitoring system of Eskom's energy efficiency programme. The energy efficiency programme is part of the larger DSM initiatives at Eskom to help ensure energy security and to avoid blackouts.

Drivers and local structure

Eskom's energy efficiency DSM initiatives are funded through NERSA, and it is thus necessary to determine the return on these investments in terms of demand and energy savings. NERSA collects the revenues from electricity sales in the country and redistributes parts of them for the energy efficiency programmes. The DSM initiative began in 2002. In addition, the DoE and the DTI have started to fund specific energy efficiency programmes that run under the same umbrella.

The M&V process is, in essence, energy auditing. Like any auditing process it is essential that reporting is objective, transparent, credible and impartial. In general, this type of auditing reduces risk and encourages investments in energy conservation. This highly quantitative process of auditing is internationally known as measurement and verification. In order to perform the task of M&V, Eskom has contracted eight teams, which are based at universities throughout the country. These teams are typically involved in energy efficiency research. The structure of being separated from Eskom is in the interest of independent reporting and over the years that these teams have been in place a mature fraternity of M&V practitioners has evolved.

Standards, guidelines and acronyms

Internationally, M&V is typically carried out according to guidelines and principles laid down in the International Performance Measurement and Verification Protocol (IPMVP). Efficiency Valuation Organization publishes this document.[3]

The American Association of Energy Engineers host an examination on the IPMVP towards a qualification which they issue known as the Certified M&V Professional (CMVP). South Africa has published a National Standard for M&V (SANS 50010:2011) and was the first country to do so. This publication is completely compatible with the IPMVP in terms of principles of M&V for energy saving interventions. Eskom has also published a guideline for M&V procedures to be

3 EVO is a voluntary organization and the IPMVP is freely available at www.evo-world.org.

followed in the context of its DSM programme. The guideline stipulates the protocol to be followed for M&V of DSM projects. It includes not only general M&V information, but also stipulates the project plan to be followed, the report types required and the communication channels between the M&V team and the other project stakeholders. The consistent application of this guideline has contributed to the success of M&V of Eskom's DSM projects. It has provided all stakeholders with a common understanding of M&V procedures and requirements. The guideline is freely available from Eskom.

M&V as a discipline

The IPMVP offers a succinct definition of M&V as.

> the process of using measurement to reliably determine actual saving created within an individual facility by an energy management program. Savings cannot be directly measured, since they represent the absence of energy use. Instead, savings are determined by comparing measured use before and after implementation of a project, making appropriate adjustments for changes in conditions. (IPMVP 2010: 9)

A few things are worth mentioning here. Firstly, since savings cannot be measured directly, M&V is a process of comparison. However, it does not simply compare energy use after an intervention with what the usage *was*. Rather, it compares the energy use after an intervention with what it *would have been* under the same set of circumstances had the intervention not taken place. This necessitates the adjustments mentioned.

Secondly, M&V uses measurement data to obtain results. It follows then that M&V cannot be performed where no measurements have taken place. In some cases where measurements are not possible, a calibrated simulation is allowed.

General method

The data describing the energy use of a particular facility is used to create a *baseline* against which future measurements are compared. It is critical that such a baseline is linked to an *independent variable.*

As an example, a factory may use a certain amount of energy to produce goods. It may be that after some energy efficiency measures have been installed, the factory actually uses *more* energy than before. Initially it could seem as though the intervention has had a negative effect. However, the factory's output may have increased substantially. In order to make a fair before-and-after comparison of the energy use, it is necessary to account for the change in factory output. In this case then the *factory output* could be an independent variable. A relationship between the energy used and the factory output would be needed to make appropriate adjustments to the baseline.

The data required differs from one project to the next. For instance if the energy use of a facility is highly seasonal, then a year's worth of data may be required to construct an accurate baseline and meters would typically need to be installed for that entire period. On the other hand in the case of a lighting intervention, only a spot measurement may be necessary. Then just the hours of operation would be needed to compute the energy used by the lights.

The reported savings are the difference between the energy used after an intervention and the adjusted baseline describing what would have been used had the status quo remained.

Boundaries and assumptions

It is important to note that a measurement *boundary* around the facility is required. It is possible that an energy conservation measure in one area could adversely affect the energy use somewhere else. A classic example of this is in lighting and air conditioning systems. Suppose that a building uses old inefficient lighting, which emits large amounts of heat. The heat from the lighting actually eases the load on the building heating required. If those lights are retrofitted with more efficient ones, the heating system is bound to use more energy during cold periods. These are called *interactive effects* and quantifying them can be very costly. It is normal M&V practice to put in place a measurement boundary and only the energy savings within that boundary are considered. The likely interactive effects would be mentioned but not usually quantified.

The IPMVP provides for various types of measurement boundaries depending on which is most appropriate. Some of the boundary types allow *key parameter* assumptions to be made while others

require *all parameters* to be measured. The decision about which boundary type should be used is often determined by accuracy requirements and the cost of such measurement accuracy vs. the predicted value of the energy savings.

M&V data
Data for M&V derive through electricity metering in the facilities that carry out energy efficiency programmes within the DSM initiative.

Metering
Sometimes energy-conscious businesses install their own metering systems. When M&V needs to be performed, access to that data is provided. Eskom may require that such a system be calibrated and if they are satisfied, then the data may be used for M&V purposes. In other cases Eskom may install metering at its own cost.

Reporting accuracy and data integrity
In any data collection, there will be certain levels of uncertainty. Eskom requires that meters used for M&V are accurate to 1%. Even so, it is often difficult to quote an accurate level of uncertainty. This is particularly true when boundary assumptions are made, which is in turn often a result of metering costs. It could also be the case that the independent variables used are not measured to the same level of accuracy.

It is possible that an M&V problem could be solved using different approaches, all of which could both be justified, but yet each one may yield slightly different results. Thus rather than quoting a certain level of uncertainty, M&V always aims to report conservatively. The savings reported are minimum values and might be quoted as 'the average demand saving achieved during July was 2.31MW, or more'. An external auditor annually audits each M&V team. The auditor selects projects at random and inspects both data integrity and also reviews methodologies used.

Data ownership and aggregated reporting
Each M&V team is required to enter into a non-disclosure agreement with Eskom and since Eskom funds the M&V process they also claim ownership of the data and the reported savings for each project. Clients also generally keep such information private as this may allow them to maintain a competitive edge.

Eskom has established an online reporting system, which allows them to perform high-level, aggregated reporting on all DSM projects. Such a system is useful in that verified energy-saving reports can be produced fast, according to technology type or sector, etc. Eskom's annual report publishes savings as a result of its DSM initiatives, thus the aggregated data is made public.

Outlook for M&V in South Africa
South Africa is aiming to introduce tax-incentives for companies who undertake energy efficiency projects. However these benefits will only apply where M&V has taken place. Thus the country has a growing need for M&V professionals and capacity. Through the implementation of the tax incentives (L12), the demand for M&V capacity will grow in South Africa. The eight M&V teams at South African universities will probably not be able to attend the increased demand. Yet, there are no targeted capacity building programs to prepare for the increase within Eskom. Some efforts are underway with funding through the German International Cooperation (GIZ). Eskom relies on the private sector to provide these services in the future.

The service providers will have to train their professionals towards official accreditation as only be able to practice once accredited to perform M&V by the South African National Accreditation System. This approach to grow M&V capacity is a way of maintaining the quality standards.

Support for SANAS accreditation and small business start ups in this service sector is necessary and an adequate entry point for international cooperation.

4.2.2 Case study: National emissions reporting: The Greenhouse Gas Inventory system

National GHG inventories are an integral part of reporting under the UNFCCC. Annex I Parties to the Convention are required to submit to the secretariat annual national GHG inventories (GHG-I),

by the 15th of April each year, covering anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol. In addition, Annex I Parties provide inventory data in summary form in their national communications under the Convention. In accordance to the Convention's principle of equity and common but differentiated responsibilities and respective capabilities, Non Annex 1 parties have been required to submit their summarised inventories as part of their periodic national communications. With agreements in Bali to make mitigation actions measurable, reportable and verifiable (MRV) and in Cancún to enhance transparency, more regular and detailed reporting will be required in future of South Africa. Domestic MRV systems are crucial to tracking implementation of mitigation actions; GHG-I are central to understanding emissions.

The quality and credibility of GHG inventories rely on the integrity of the methodologies used, the completeness of reporting, and the procedures for compilation of data. To promote the provision of credible and consistent GHG information, the COP has developed standardised requirements for reporting national inventories, with different stringency required for developed and developing countries. Developing countries may, of course, report more than the minimum required, e.g. use 2006 IPCC guidelines rather than 1996.

Lack of activity data and technical capacity are among the biggest problems in developing countries. Under existing legislation, companies and other data holders have no obligation to provide activity data. While, for many countries, information on energy production and consumption can relatively easily be accessed locally or from international institutions like the International Energy Agency, international data sources are not always sensitive to local data, especially for smaller developing countries. Production and consumption statistics for industrial processes, agriculture, forestry, land use and waste are typically more difficult to find. The data challenges for South Africa's inventory are detailed below. While inventories are about emissions, rather than reductions, some data issues would be similar in designing a domestic MRV system.

South Africa GHG inventories: Overview, data sources and players

South Africa has compiled three GHG inventories. The inventories for 1990 and 1994 were prepared in accordance with to the 1996 IPCC Guidelines, and submitted as part of South Africa's Initial National Communication (RSA 2004). The latest national South African GHG inventory of the country was completed and published in 2009, reporting emissions for the year 2000 (DEA 2009). Unlike its two predecessors, it was decided that the latest GHG inventory be prepared voluntarily using the 2006 IPCC Guidelines to enhance accuracy and transparency, and also to familiarise researchers with the latest inventory preparation guidelines.

The following is an outline of the data sources used for the different sectors, highlighting the main players in each case:

Energy

The DoE was the main source of data for the energy sector, in particular the energy balance contained in the Digest of South African Energy Statistics (DoE 2009). The South African Petroleum Industry Association (SAPIA) was used as a source for additional energy data (SAPIA 2009). For coal mining the Chamber of Mines was utilised and data from the DME was used to verify these figures (DEAT, 2009). Energy consumption by the large energy companies in the country was obtained from the companies themselves.

Industrial Processes and Products Use (IPPU)

The main source of data for IPPU was the different industry associations, the DME, and Statistics South Africa. Additionally in some cases data was captured through meetings or consulting directly with different plants (DEAT, 2009).

Agriculture, forestry and land use (AFOLU)

In order to estimate emissions from the agricultural sector livestock data was used from FAO and the Department of Agriculture. Due to the fact that there were a number of sinks and sources of GHG emissions in the sector a number of different data sources were used to capture the appropriate information. Forestry South Africa (FSA) provided the required data for forestland area, whereas data for grassland areas was obtained from National Land Cover datasets as well as from relevant l literature. NLC datasets also provided data on settlements.

The Department of Land Affairs, Chief Directorate of Surveys and Mapping, and the Department of Water Affairs and Forestry (forestry and water are now separate departments), were used in conjunction in order to gather sufficient wetlands data.

Biomass burning data was compiled through using FSA datasets, satellite data and other literature (DEAT, 2009).

Waste

In order to estimate waste generation, South African population statistics adopted from UN statistics were used. These were available online at http://esa.un.org/unpp. The reason why UN statistics were needed was that the South African data did not cover the entire period under investigation (DEAT, 2009).

Data on air quality and GHGs

Emissions inventory compilation in South Africa is generally accompanied by problems with information gathering, data availability, data quality issues, technical constraints, and resource constraints. In order to work towards a sustainable system for emissions inventory compilation, South Africa is currently establishing a national GHG system under the framework of the Air Quality Information System (SAAQIS) to be managed by the national Department of Environmental Affairs (DEA, 2011b).

The overall objective of SAAQIS is to have a national air quality information system to make up-to-date and accurate data accessible for decision-makers. The system is expected to exceed what is required of national and international information management (DEA, 2011). To the extent that activity data for local air pollutants and greenhouse gas emissions

While the DEA develops and drives the system, other relevant national departments and industries participate in the Project Steering Committee, which is responsible for the compilation of the inventory (Witi, 2011).

It has been proposed that the South African Weather Service will be the designated National Inventory Unit and the custodian of GHG data by 2013, accountable to the DEA of which SAWS is an agency. There is also an aim to develop sectoral inventories through line departments such as the Department of Transport (Witi, 2011). Currently the Atmospheric Quality Information Unit and SAWS are responsible for the joint implementation of phase 2 of SAAQIS (DEA, 2011b).

Industry

The inventory for 2000 sought to improve reporting for this sector, with improved data from industry. South Africa's Business Unit is the main umbrella body engaging on inventory issues for industry, but other organisations like the NBI, BLSA and others have engaged in industry data collection. Some firms have reported their emissions directly to BUSA that then reports to the DEA. While there is no compulsory reporting of GHG emissions, the National Environmental Management Act provides the legal framework for possible mandatory reporting in future. The White Paper on climate change response contemplates that 'reporting of emissions data will be made mandatory for entities (companies and installations) that emit more than 0.1 Mt of GHGs annually, or that consume electricity which results in more than 0.1 Mt of emissions from the electricity sector' (RSA 2011). It continues to suggest that entries above the limit will also obliged to report energy use by energy carrier and other data.

The standardisation in reporting structures is closely aligned to the business needs through BUSA and its representation in the South African National Accreditation System ((Standards SA 2007). BUSA advises the government towards a sustainable inventory system, with mandatory reporting requirements. The measuring, reporting and verification requirements should, on the other hand, not increase the cost of doing business in South Africa.

Data collected under the CDP does not feed into the GHG inventory directly. The CDP is an independent and voluntary reporting initiative, focused in recent years on reporting by the largest countries listed on the Johannesburg Stock Exchange (and Eskom, which as a publicly owned company is not listed on the JSE, but reports to CDP). CDP is an international initiative encouraging investors to measure and report carbon emissions. A local office and consultants (Incite

Sustainability), working with the National Business Initiative compile the South African reports. NBI is a membership organisation with participation by CEOs.

Outlook

Overall, the reporting requirements to the GHG inventories under the UNFCCC have triggered a dynamic learning process in enhancing the reporting of GHG emissions in South Africa. The process is still underway, with further improvements being considered, including mandatory reporting. Related initiatives, such as a national standard and voluntary carbon disclosure, have potential to further improve GHG inventories. Inventories are specifically about emissions, not implementation of mitigation actions. Yet the GHG inventory system is a learning process and it improves with every report. The inventory provides a solid basis for GHG emissions reporting in South Africa. Together with an emerging MRV system it would enable a better picture of SA's emissions and mitigation actions to be developed over time.

4.2.3 Case study: MRV in agriculture, forestry and land use

The MRV of mitigation and adaptation actions in the AFOLU sectors is still way behind even in the GHG inventory itself. These sectors have received little attention, possibly because of the low emissions in these sectors compared to the energy sector in South Africa. Development of an MRV system in these sectors would improve land use and management through increasing and maintaining soil carbon stocks that generate multiple benefits: climate change mitigation, increased agricultural and food production, pro-poor income generation, environmental services and improved resilience/adaptive capacity of farming systems.

Origins of M&V initiative

Major drivers of MRV in this sector are the need for adaptation measures and some mitigation potential in the sector. Agriculture emissions data in South Africa is collected by the Department of Agriculture, Forestry and Fisheries (DAFF) and other affiliate institutes including the CSIR and ARC. This is mainly to contribute to the national communication on climate change and GHG emissions to the UNFCCC and for national GHG inventory.

The DEA runs the national inventory with assistance from other ministries or departments that commission data collection. In the AFOLU sector DAFF is mainly the custodian of the data and there is a close collaboration between the two departments in GHG inventory work.

Definition and boundaries

GHG inventory in the AFOLU sector is guided by the IPCC 1996 guidelines, and South Africa has followed Approach 1 for 2000 inventory in this sector, due to lack of and access to data.

Agriculture

Mitigation options from agriculture are already known in many parts of world and also in South Africa, and are readily available and relatively inexpensive. The sector has some unique characteristics that call for methods from other sectors (DEA 2009). The sector has many long-term processes that lead to both GHG emission and removals. The IPCC 2006 guidelines were adopted for the 2000 and 2004 inventories and the current inventory update. Based on the IPCC 2006 guidelines and the 2004 inventory the following agricultural categories are reported when estimating emissions:

Livestock

- Enteric fermentation (IPCC section 3A1).
- Manure management (IPCC section 3A2).
- Aggregate sources and non-CO_2 emissions on land.
- Biomass burning (IPCC section 3C1).
- Liming (IPCC section 3C2).
- Urea application (IPCC section 3C3).
- Direct N_2O emission from managed soils (IPCC section 3C4).
- Indirect N_2O emission from managed soils (IPCC section 3C5).
- Indirect N_2O emission from manure management (IPCC section 3C6).

Emissions from livestock come primarily from enteric fermentation and manure management. Emissions from enteric fermentation are significant in South Africa and this source has been identified a key category source (DEA 2009).

Land use, land use change and forestry
The LULUCF sector is still behind in both the measurement and activity data availability in the South African GHG inventory. The IPCC 2006 Guidelines (IPCC 2006) were followed in this sector for the 2000 GHG inventory. In some instances, however, the 1996 guidleines were followed, depending on data avilability. The 2000 GHG inventory followed the recommended IPCC 2006 land use categories; forestland, cropland, grasslands, wetlands, settlements and other lands. However, GHG invetory, South Africa had additional land use categories to cater for the unique vegetation (incdluing the Fynbos, succlent karoo, etc) that is not catered for in the broad IPCC land use categories.

For Forestland, the following sub classes were quantified for emissions using Tier 1 IPCC guidelines: plantation, indigenous forest, woodlands, and thicket.

FSA keeps annual statistical data on plantation in South Africa dating back to the1970s (DEA 2009). DAFF and FAO also keep some data on forest resources. Other land use types are also reported in the 2000 inventory (DEA 2009) with more details.

South Africa's current land use dataset is incomplete in both its spatial cover and its coverage of the relevant time period (DEA 2009). A total of nine land cover classes (three more than the IPCC's) were used for reporting in the 2000 inventory. Six recommended IPCC classes will be used for the current inventory update.

Actors involved in reporting data include DAFF, DEA and the Witwatersrand University's Climatology Research Group.

Outline of the process
Previously, the research institutes (CSIR, Wits, Agricultural Research Council) have collected data with contracts from the government departments. This is published in research reports, and often data is not availed to the departments. This has caused many problems for government departments for their inventories because they have no data but only reports to verify and update. DEA has always commissioned individual research institutes for data collection and inventory compilation due to lack of capacity within the department. This means that the data ownership remains with the research institution that undertook the research is and often not verified. With the current inventory update, DEA has commissioned the research institutions and has a responsible person in the department who understands the process; this should lead to data ownership by the government for continuity in subsequent inventories and MRV systems.

Challenges
Due to lack of institutional and technical capacity in this sector, DEA/DAFF are not aware of any data from studies or initiatives around the country on MRV. The research institutes collected the data independently or were commissioned by the government departments previously, keep most of the data. These are not freely available when requested for susequent inventories. Most of the data are reported as part of the national climate change communication and for the national GHG inventory.

The system for MRV in this sector for South Africa is not well established despite clear IPCC guidelines on most of the categories and activity data. However, in 2011, DEA and DAFF assembled a National Working Group on emissions from AFOLU in South Africa for the GHG inventory update and MRV. This group comprises mainly government officials from the two departments and also researchers from ERC, the Agricultural Research Council, the Climatology Research Group and the CSIR.

Outlook
The two government departments have put together a proposal on data collection of forest resources, agricultural data and land use data set towards the current national inventory update. The current inventory update is done using the UNFCCC-approved software (Agriculture and Land Use) developed by Colorado State University and the authors have trained government officials and other

researchers on the use of the software, activity data requirements and some mitigation options and data accuracies.

4.2.4 Synthesis

The above case studies have provided some insights into existing national (M&V in Energy Efficiency), international (GHG Inventory) systems and evolving approaches (AFOLU) that are useful to inform the thinking of a domestic MRV network.

M&V is an established system that has been in place for almost ten years now. It has very clear scopes and boundaries, regulations, standards and reporting cycles. The new tax regulation will trigger a demand for M&V capacity. The GHG inventory is more ambitious in its nature in trying to report the overall emissions of the country. This is a clear response to support the global efforts to reduce emissions. However, it is a learning process in which actors constellations, mandates, regulations and standards still emerge. AFOLU in turn, also feeds in the GHG, but it's a recent and very new process that requires learning and technical support.

Textbox 4: Key messages from the case studies

M&V is a well-established subsystem in energy efficiency:

- Over ten years specific guidelines, standards and regulations evolved.
- The methodologies and guidelines might provide learning potential for other countries and other sectors in South Africa.
- The growing demand for M&V services might offer a good entry point for capacity support.

Greenhouse Gas inventory reporting is a dynamic learning process:

- GHG is one entry point for an MRV system as it requires similar cross-institutional coordination.

AFOLU reporting is recent and still emerging:

- Need for capacity on data collection.
- Lack of funding for AFOLU data collection.

Table 3: Overview: Detailed synthesis of the case studies

Characteristics	*Useful lessons*	*Challenges*	*Key actors*	*Regulations, policies and guidelines*
M& V in electricity sector				
This is a well-established system in SA & is undertaken in accordance with international best practice. Eskom sets out the guidelines & independent professional teams undertake the M&V.	Consistent application of guidelines has contributed to the success of Eskom's M&V programme as they provide common understanding to all stakeholders. SA has recently published a National standard for M&V, based on the IPMVP (SANS 50010:2011) and is the first country to do so. An online tool for high-level aggregated reporting is being developed.	The new Energy efficiency tax regulation will require a significant increase in M&V professionals who are also accredited by SANAS. Therefore capacity and training is a concern, also there are cost implications for M&V professionals becoming SANAS-accredited.	NERSA, Eskom, DoE, SANEDI	Energy Efficiency Tax, Eskom M&V guidelines, IPVMP, SANS 50010:2011, SANAS
GHG Inventory				
The first GHG inventory was prepared in 1998, the latest in 2009. It is compiled through government, with the mandate from the DEA.	The inventory is compiled centrally (DEA) with input from research institutions (e.g. CSIR, ERC). However there is no formalised system of coordinating data and the provision of data e.g. by industry, is not compulsory. A domestic MRV system will also rely on coordination across different institutions. It would be beneficial to establish a structured approach to providing and coordinating data. Bearing in mind the inventory captures *emissions data* & an MRV system would focus on *mitigation actions.*	Coordination of data capturing Increase linkages between data derived across different government departments and industry.	DEA coordinates. Energy: DoE, SAPIA, Chamber of Mines, DME, BUSA IPPU: DME, StatsSA Some large para-statal firms report directly to the government, e.g. according to the IPCC requirements.	UNFCCC, IPCC
AFOLU				
MRV in the AFOLU sector is in its early stages of development.	As MRV in the AFOLU sector is in early development, there is a need for refining methodologies and approaches to data collection. This requires additional capacity and resources. DEA would like to have inhouse capacity to work with institutions/ consultants on data collection.	Data capturing and accessing available data is a challenge and requires human and technical capacity. There has been lack of funding from government for data collection.	DEA, CSIR, ARC, ERC, Wits, National Land Cover (NLC), Forestry SA, FAO, DAFF	CC White paper, Forest Act, UNFCCC, IPCC

5. Findings, recommendations and conclusion

This section presents the main findings from this initial scoping phase. From each finding a recommendation is derived.

5.1 Findings and recommendations

This scoping study has indicated that much work is already happening in South Africa which could feed into the establishment of a domestic MRV system. However, the challenge lies in understanding the dynamics and interaction between the different stakeholders, institutions, incentives and drivers and using these insights to start initial thinking of what a domestic MRV system in South Africa could entail. The following section presents initial findings and recommendations.

Institutions and actors: Increase coordination

The mapping exercise showed that many actors and institutions already contribute to measuring, reporting and verifying of emissions and reductions. Yet this system lacks coordination. Coordination is necessary for establishing an MRV system. Government needs to lead the process in order to coordinate a national MRV system. The DEA is establishing an MRV unit to prepare for guiding this process.

Coordination needs to be efficient, because duplication can cause resistance, fatigue and unnecessary cost.

> **Coordinate MRV efforts** under government guidance.

It will be necessary to overcome the imbalance in the governance of energy data. The energy sector is the main source of emissions. If DEA is in the lead of this process, the Department should make sure to engage the energy related departments, DoE, DPE, DoT, DTI and the umbrella organs like the Treasury and the Presidency as well as the NCCC.

> **Create a cross-governmental steering committee**: to ensure ownership and engagement in the MRV process in other departments.

International cooperation for MRV also requires coordination. We have seen that MRV is one of the key issues on the mitigation agenda in the international climate change negotiations. Accordingly, there is great international interest in getting better insights into MRV capacity and quality in developing countries. In South Africa, international donors support the current efforts in MRV.

> **Create a small project steering group** within the DEA to coordinate efforts in MRV to avoid duplication

Cost effectiveness

There was a very clear message, particularly in the stakeholder workshop, that the design of a national MRV system needs to be 'simple, flexible and cost-effective'. For example the current costs of undertaking monitoring and reporting for CDM projects is too costly. A useful lesson that can be taken from the existing Eskom M&V programme is that the cost of the M&V process is only viable up to 8% of the project cost. Also the IPVMP guidelines which the Eskom M&V approach is based on is designed to allow for flexibility at a project level. The IPVMP provides overarching guidelines on a methodological approach to developing a project-specific M&V plan which is then agreed upon with the relevant stakeholders.

> **Coordination needs to ensure cost-effectiveness** and keep the additional cost for reporting to a minimal. Costly compulsory MRV requirements may affect the business environment and the competitiveness.

Build on national capacity

National institutions such as Statistics South Africa are well placed for quality-assuring data and supporting collaborations with the relevant institutions. Accreditation bodies such as SANAS and SABS can assist in setting appropriate standards and guidelines.

> **Build on existing structures**: Engage government agencies and research institutions according to their expertise in data collection and management.

Coordinate data systems

In many cases different institutions use the same data sets but in different formats. Different assumptions and parameters can, however, be applied to raw data, which can lead to nuances of data being lost in the process. A more efficient process, for example in terms of documenting methodologies applied in order to later understand the numbers, would be beneficial. Further work on how to package the same meta-data for different uses without increasing the reporting burden and maintaining good quality data would be valuable.

> **Develop guidelines and standards** for data collection and management and build capacity accordingly. This facilitates transfer and data sharing between institutions.

The foundation of a domestic MRV system will potentially rely on linking up different data sources collected through existing data collection systems (e.g OPENED, Stats SA, CDP). New databases such as those under SAAQUIS and the DoE centralised energy database (as part of the Provision of Energy Data regulation) will also contribute to the number of relevant databases. Different levels of data disclosure may be necessary, which could require various agreements or MoU's between institutions. Ensuring accurate data disclosure and sharing of data is also strengthened if the custodian of the data can be trusted. There is potentially a reputational risk involved for firms if data is misinterpreted.

Identify and fill capacity gaps

The issue of capacity, or lack thereof, has been raised in various contexts of this mapping process. In terms of coordination across government departments, currently departments have their own individual mandates to prioritise, and insufficient focus and resources have been allocated to coordinating MRV related activities. The DEA is now appointing a specific MRV team, but it is likely that MRV specialists may be required across more departments. Currently much of the work is being outsourced or supported by international donor money.

As mentioned earlier regulations targeted at improving MRV activities – for example the energy efficiency tax regulation will require a large increase of professional M&V teams who are SANAS accredited. This has both training and data management implications.

Eventually the MRV of NAMAs – for example a large-scale roll out of solar hot water heaters, will have additional MRV requirements for a decentralised NAMA of this nature.

A structured and coordinated domestic MRV system requires significant skills training to be successful. There is potentially a significant opportunity for skills development and capacity building in technical areas such as building audits, technical commissioning and the management of databases.

> Fund training and capacity building in:
>
> - data collection and management in governmental agencies and departments;
> - SANAS-accredited M&V personnel;
> - master-level experts on GHG and emissions management; and
> - master-level statisticians

Measurement, reporting and verification requirements

We have seen that South Africa currently prepares and reports a national GHG Inventory to the UNFCCC and reporting systems for this are already in place. The emissions data reported as part of the national GHG inventory plays an important role in the MRV of emissions in terms of

methodologies, reporting structures as well as the current institutions that are already involved in this process. However, in terms of reporting the implementation of individual project level mitigation actions, the national GHG inventory or the proposed SAAQUIS systems are not designed to capture this. The reporting structures for implementation of mitigation actions will require some further conceptualisation.

Beyond the current existing reporting processes, such as the GHG inventory and the Stats SA surveys and the CDP, there are proposals for additional reporting channels such as the SAAQUIS online reporting tool and the questionnaire being developed by the DoE as part of the Provision of energy data draft regulation. The issue of 'reporting fatigue' is very real for both the private and public sector, and therefore any MRV reporting requirements must not add to the reporting burden.

Avoid duplication and reporting fatigue caused by multiple reporting cycles and requirements.

The issue of voluntary vs mandatory reporting also emerged in discussions and how the effectiveness of either depends on the incentives and drivers to report. The White Paper indicates a tendency towards mandatory reporting. Some stakeholders indicated that a move towards mandatory reporting of emissions seemed very likely and not a major problem. The issue of double counting was also raised and ensuring that an MRV system had to be established is such a way as to avoid this.

Undertake further research on institutional arrangements and benefits of compulsory vs voluntary reporting.

The question of trust and independence in verification of data and to what extent verification could contribute to building trust in sharing data and information must be taken into account. Experiences from the CDP in South Africa suggest that verification systems appear to be moving towards measuring performance rather than disclosure. The CDP is moving towards a more comprehensive verification process going beyond just emissions data to other quantitative data (such as targets, intensity and performance data), and finally to verification of qualitative data (www.cdproject.net/en-US/Respond/Pages/verification-roadmap.aspx). The CDP has recently launched a verification white paper and consultation on a verification roadmap (2013-2018) aiming to encourage more companies to verify their climate data (Dane, 2011), which is currently out for public consultation and should be launched in January 2012.

The new Energy Efficiency tax regulation has outlined a rigorous verification system, which stipulates that all M&V teams who can verify emission savings must be SANAS-accredited. These accredited M&V professionals must then submit the report to SANEDI to approve and provide a certificate, which can then be shown to SARS. These new verification requirements have significant implications on capacity. The majority of professional M&V teams are currently not SANAS accredited and this process has large cost implications. Also the number of M&V professionals required will increase significantly.

The issue of intellectual property must also be considered both in terms of actual company level data as well as the intellectual property of methodologies to obtain and verify data.

Undertake further research on institutional arrangements and benefits of a centralised external verifier with 'policing' function vs. a decentralised, participative self- certifying system.

Alignment of different protocols, guidelines and methodologies

There are currently a series of protocols, standards and guidelines which are relevant for the MRV process – for example IPMVP, SANS and ISO. Currently reporting data is, for example, undertaken according either to ISO or IPCC reporting standards. The SANS50001 is standard is a recent national standard for M&V in energy efficiency. SAAQUIS is another example where reporting requirements will be suggested. The IPVMP and CDP set out methodologies, approaches and guidelines for verification. The draft regulations on GHG reporting (DEA, 2009) are also aiming to be operational from 2013 onwards.

It would be helpful to investigate further the alignment across these different approaches and extract useful lessons, such as the flexibility in the approach of the IPVMP, which could inform the domestic MRV system. Experiences from the CDP highlighted the importance of not constantly revising guidelines – it takes time for firms to establish the necessary systems to respond to guidelines therefore they must not constantly change.

> **Compare internationally** and learn from other developing and developed countries. Compare overall governance systems and institutional arrangements, as well as specific standards.
>
> **Assess carefully** if they work in other country's context or other sectors (IPMVP/SANS 500001:2011)

Create clear incentives

Incentives for institutions to operate and cooperate within a domestic MRV system can vary. The institutions currently undertaking MRV-related activities are not doing them due to UNFCCC requirements but, in the example of the DoE, to obtain national energy balances for energy planning purposes, or in the case of the M&V in electricity sector to monitor electricity savings from Eskom's DSM perspective. Therefore, once a national MRV system has been proposed, a sufficiently strong mandate will be needed to ensure the necessary cooperation across institutions.

> **Create long-term incentives for reporting:** The MRV system requires clear incentives and regulations for reporting. These should be well thought through, because rules should not be changed easily to ensure the credibility of the framework.

The incentives to undertake MRV-related activities vary for public and private sector stakeholders. Even across government departments there are different incentives to undertake MRV. For example, in the case of the DoE an effort to improve data collection systems is driven from an energy planning perspective and wanting to prepare energy balances in a more efficient manner. For the DEA, data collection and reporting has been prepared in order to report to the UNFCCC through GHG inventory and now the drivers to develop and improve an MRV system will be for assisting in preparing biennial reports and also for demonstrating MRV of mitigation actions.

Acceptance of firms to undertake MRV of climate data is mostly driven by the benefits. These benefits are mostly the implementation of a mitigation of efficiency measure or increases in competitiveness or reputation. Reputation has been mentioned often as a driver for voluntary reporting by firms. However, there is not clear guidance to industry the hierarchy of reporting requirements – there have been examples in industry where on one hand there is pressure for companies not to share information so as not to jeopardise their competitiveness, whilst on the other hand they are instructed to disclose and share data due to reporting requirements. Solutions may lie in appropriate MoUs with those requesting the data and appropriate aggregation of data.

Considerations for MRV of NAMAs

It is fair to say that the majority of stakeholders who are currently involved in MRV activities in South Africa would not necessary be familiar with the context of NAMAs under the UNFCCC – certainly not in terms of seeing the MRV of NAMAs as a driver or incentive to undertake MRV. Similarly, measuring emission reductions is often a co-benefit to an energy saving project, rather than the main driver, apart from in the context of CDM projects where measuring, reporting and verification of emission reductions is essential for realising the carbon revenue.

The sustainable development co-benefits of MRV beyond policies and measures are key. NAMAs should be framed to ensure sustainable development is a key co-benefit. How to MRV the sustainable development co-benefits of a mitigation action, for example related to poverty alleviation or job creation, and the possible indicators needed for measuring these, requires further consideration.

> **Nationally Appropriate Mitigation Actions** should be framed to ensure sustainable development is key.
>
> MRV should ensure to report on the 'co-benefits' as well.

The next phase of the MAPT work in South Africa requires more investigation and conceptual thinking about the MRV of NAMAs in terms of indicators, resources and capacity to implement.

5.2 Conclusion

A domestic MRV system should be based on existing MRV-related activities and be able to respond to the characteristics of individual mitigation actions and NAMAs. The scoping exercise has highlighted that a number of MRV-related systems exist already. The main activities focus on measuring electricity consumption and monitoring of GHG emissions. These different MRV activities exist in parallel to each other but without formal coordination.

A system for the domestic MRV of mitigation actions will require coordination across sectors, institutions and stakeholders. Mitigation actions have many variables, including a variety in scale (from project to national level), type (renewable energy or sustainable transport) and timeframe for implementation. The approach for MRV will therefore have to be suitably flexible to accommodate this. It will require a wide range of stakeholders, coordination across policy domains, provision for different capacity gaps and technical requirements. A 'one size fits all' approach imposed by external models is likely to be unsuccessful and ineffective.

This scoping report has provided an opportunity to initiate dialogue amongst stakeholders and raise awareness of the collaborative approach that will be required to work towards a domestic MRV system. The focus has been on the energy sector because it presents the sector contributing the largest proportion of emissions in the South African economy, but also it provides case studies of existing MRV related activities such as the well established M&V system in the energy efficiency sector and the preparation of energy balances.

Further analysis is required into the necessary institutional linkages that would be required to facilitate a coordinated domestic MRV system. Concurrently, research will continue to complement the work undertaken by the DEA as they move towards the establishment of a domestic MRV system.

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