MEASUREMENT, REPORTING AND VERIFICATION (MRV)
TECHNICAL PAPER

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Measurement, reporting and verification (MRV) is foundational to our global response to climate change. MRV enables countries to meet international reporting requirements such as National Communications, Biennial Update Reports, and National Greenhouse Gas (GHG) Inventories. It also importantly enables countries to demonstrate progress under measures such as Low Emission Development Strategies, intended Nationally Determined Contributions, and nationally appropriate mitigation actions (NAMAs). Finally, MRV processes provide the information that countries need to inform their broader climate change and sustainable economic development objectives.

The Low Emission Capacity Building (LECB) Programme (the Programme, www.lowemissiondevelopment.org) is supporting 25 developing countries to undertake MRV, as part of their broader objectives under the Programme. The Programme was launched in 2011 as a collaboration between UNDP, the European Commission, German Federal Ministry for the Environment (BMUB), and the government of Australia, has MRV as one of the five primary areas of work. For the purposes of this paper, MRV also includes a second primary area of LECB work – GHG national inventory system development – as inventory development can be considered a sub-set of the broader MRV concept. All LECB countries are implementing some form of MRV system, with countries at varying stages of development based on when the work was commenced and their national circumstances.

This paper is based on results from a questionnaire sent to all LECB countries, follow-up discussions, and in-person country visits. Seventeen of the 25 countries under the Programme submitted questionnaire responses, covering all geographic regions[1]. Follow-up interviews were conducted with select countries. Based on the results of these processes, four countries were selected for detailed case studies - Chile, Costa Rica, Lebanon, and the Philippines, with country visits undertaken in Chile, Costa Rica, and the Philippines.

The case study countries demonstrate the different scope of MRV systems that are being developed – a national level database system (Philippines), a common MRV framework and guidance for NAMA developers (Chile), and a specific NAMA-level MRV system (Costa Rica). They also demonstrate the different areas that countries are choosing to emphasise as they develop their systems – utilising existing data sources (the Philippines), augmenting existing data management processes (Lebanon) and developing new data sources (Costa Rica).

The paper is structured around five substantive sections. The first four cover emerging themes arising from the survey process, while the fifth section presents eight broad lessons learned from the case study countries. The first section examines some general system design considerations, such as the scale and scope of systems, the type of guidance applied, and links to international mechanisms. The second and third sections examine governance arrangements and data collection from both new and existing sources. The fourth section discuss technical considerations such as emissions calculations and methodologies and look at some MRV system support tools such as quality assurance/quality control (QA/QC) and verification processes.

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1   Chile, Colombia, Costa Rica, the Democratic Republic of Congo, Ecuador, Egypt, Kenya, Ghana, Indonesia, Lebanon, Mexico, Malaysia, Moldova, the Philippines, Tanzania, Thailand, and Vietnam.

2 System Design Considerations

2.1. SCALE AND SCOPE OF MRV

LECB countries are designing MRV systems at different scales and scopes, and are often implementing systems that cover multiple scales – 65 per cent address the national level, 71 per cent are sector-wide, and 59 per cent are at the project/firm level. Implementing systems with multiple scales can add to the complexity of design and implementation, particularly in countries with limited capacities. Multiple scales also raise the question of how, or whether, to integrate the systems. LECB countries are choosing to integrate systems and to operate systems in parallel. It should be noted the challenge of integrating these data is an issue that developed countries are also grappling with.

FIGURE 1: VARYING STAGES OF LECB PARTNER COUNTRY MRV SYSTEM DEVELOPMENT
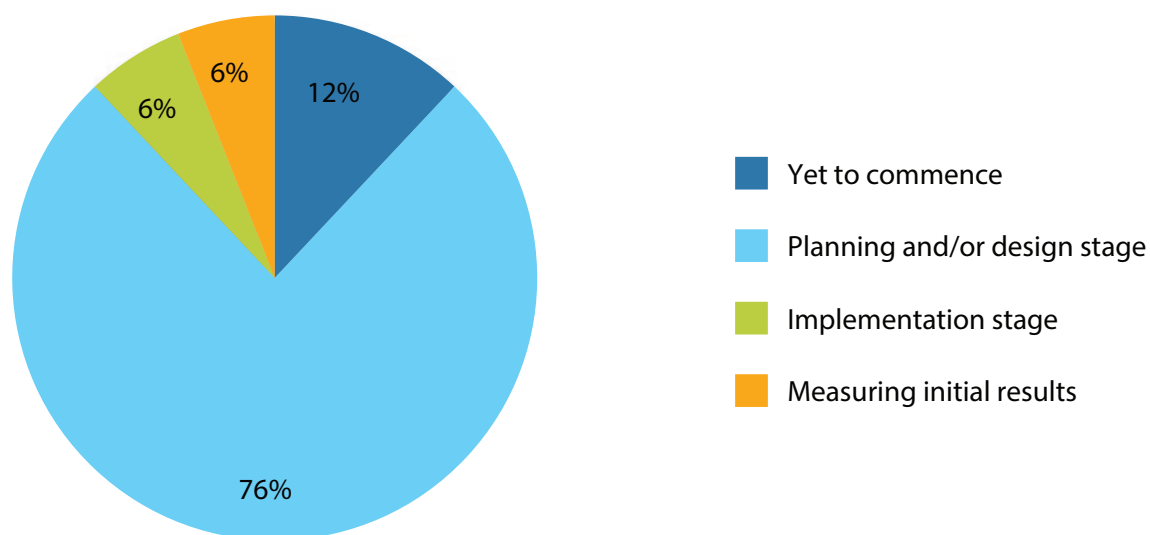
Integrating systems is the best long-term solution, but due to the differences in the types and granularity of data being collected this can be difficult to implement. An integrated approach can provide countries with a richer data set, lead to better, more country-specific emissions calculations, and provide an important means to undertake quality assurance/quality control procedures.

A significant proportion of countries (41 per cent) is developing MRV systems that cover GHG emissions but also other variables, including energy consumption, economic indicators, socio-economic indicators, finance/support, and variables under the heading of mitigation co-benefits. Interestingly, if the scale of

systems is analysed against scope there is no correlation between the two: countries with NAMA level systems are using both GHG and other variables and the same applies to national systems. In fact, those countries with a national scope were more likely than those with a project (NAMA) scope to be using both GHG emissions and other variables. This seems somewhat counter-intuitive as project/firm approaches often have drivers other than GHG emission reductions. For example, in Costa Rica, the primary driver of the livestock NAMA that was assessed as a case study as part of this research is economic benefit and productivity improvements, with GHG mitigation as more of a co-benefit. Therefore collecting non-GHG indicators is important to Costa Rica's NAMA.

2.2. GUIDANCE APPLIED

A range of different guidance is informing MRV system design as presented in Figure 2. The most frequently used guidance cited by LECB countries is the Intergovernmental Panel on Climate Change (IPCC)[2]. However, only 59 per cent of the 17 countries that responded to the survey indicated they are using IPCC guidance for MRV system design, which is rather low. It is not clear why, but it could be a result of a lack of understanding of how the IPCC guidance could be applied in the MRV context. This is particularly the case for NAMA MRV systems. Only Chile and Indonesia indicated they had an expert level of understanding. Further training for LECB countries on the fundamentals of IPCC guidance and its use in MRV system design would be beneficial.

FIGURE 2: GUIDANCE CITED BY LECB PARTNER COUNTRIES ON MRV DESIGN

2.3. LINKS TO OTHER INTERNATIONAL MECHANISMS

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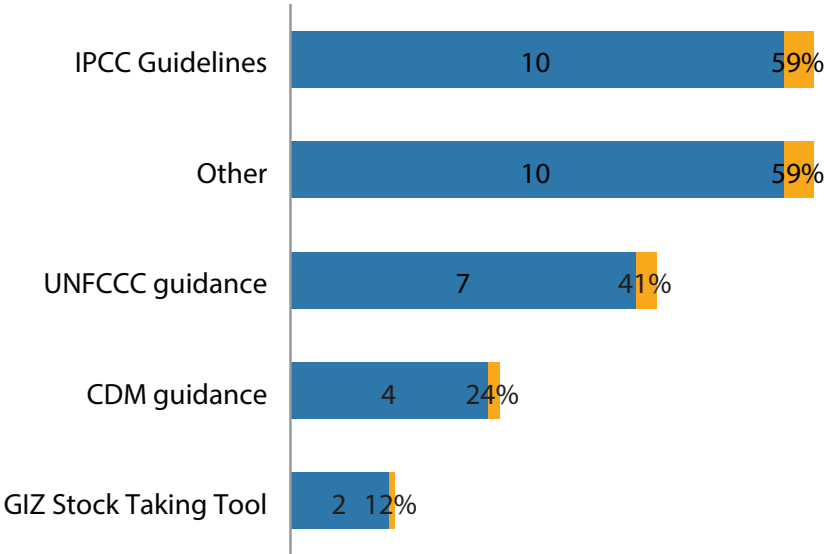
2   The list of responses in the survey included "IPCC guidance". In this paper IPCC guidance is used to refer to the series of guidelines and guidance developed by the IPCC's Task Force on National Greenhouse Gas Inventories to assist national GHG inventory compliers, including: the Revised1996 IPCC Guidelines for National Inventory Greenhouse Gas Inventories; the 2003 Good Practice Guidance for Land Use, Land-Use Change, and Forestry: and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

MRV systems are often being designed to inform multiple international mechanisms. Most countries in the survey indicated that they are using MRV systems for NAMAs, National Communications, Biennial Update Reports, National GHG inventories, and Low Emission Development Strategies (LEDS) as presented in Figure 3. This wasn't elaborated in the survey but MRV systems can provide a range of useful data for these international reporting processes. For example, some countries are developing national systems to augment or build national GHG inventories – inventories are submitted as part of National Communications. Another example is that NAMA MRV systems can be used to report progress on mitigation actions for the National Communications and Biennial Update Reports. Finally, both national and NAMA MRV systems can provide policy makers with critical data for use in developing LEDS. A number of countries are also using it for Mitigation Action Plans (MAPS) and intended Nationally Determined Contributions (iNDC).

As with the above examples, both national and NAMA MRV systems can provide valuable data to assist countries in planning MAPS and iNDCs. This shows the value of MRV systems and the value ascribed to MRV systems by LECB countries. It should also be recognised that MRV systems provide benefit beyond international reporting, as they produce valuable information that can inform broader responses to climate change and indeed broader sustainable development objectives. The case study on the Philippines illustrates how countries are linking MRV systems to achieving broader sustainable development objectives (see Annex 4).

FIGURE 3: MRV SYSTEM USAGE BY LECB PARTNER COUNTRIES

Category	Value	Percentage
NAMAs	16	94%
National Communication	12	71%
National GHG Inventory	10	59%
Biennial Update Report	10	59%
Low Emission Development Strategy	9	53%
Mitigation Action Plan	7	41%
Nationally Determined Contributions	5	29%
Other	5	29%
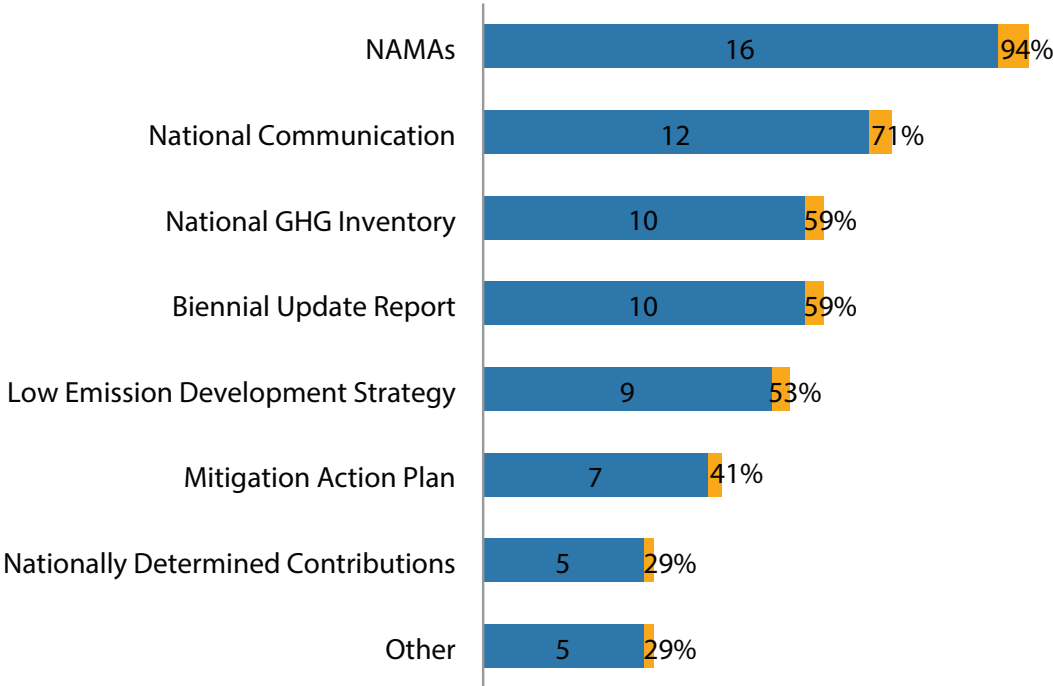
Governance

Most MRV systems in LECB countries (82 per cent of survey respondents) are not being implemented (and designed) by a single agency - only Colombia, Malaysia and Moldova indicated the system would be managed by one agency. This requires additional coordination and capacity building efforts, but can also be advantageous. National level systems in particular require technical agencies (such as ministries of agriculture, energy, industry, etc.) to provide data and technical assistance. Project/firm level MRV systems may also require, and can benefit from data from other agencies to both supplement direct measurements and for quality assurance / quality control (QA/QC) purposes. The availability of this data though can often be complicated by existing political or organisational dynamics.

Locating a national level MRV system entirely within one agency/ministry should be a deliberate design consideration. It requires building and maintaining technical expertise and systems in this agency/ministry. By comparison, a major advantage of a decentralised approach is that existing expertise in other agencies/departments/ministries can be utilized in the form of knowledge of the sector and networks/relationships. This approach can make it easier to identify and rectify errors in data, particularly in the short term.

The provision of confidential private sector data for MRV systems is often particularly complicated. There are a variety of tools to manage this legitimate concern. For example, data provided for the MRV system can be aggregated to such a degree that individual private sector actors are not identifiable. A decentralised approach can also assist with allaying possible concerns about privacy, as private sector actors may feel more comfortable providing data to an agency that they routinely deal with and have established relationships (e.g., an industry department for cement sector data) rather than to another third party department (e.g., an environment department). The agency would collect all the data, but only provide aggregated data for the MRV system.

With regards to data availability, usability, and quality of reporting, there can be value in formalising arrangements between agencies. For example, a memorandum of understanding could stipulate that certain data be provided at certain times in a certain format. Arrangements of this sort should reflect cultural and organisational norms. For example, if a good working relationship exists between two agencies it is probably not necessary to formally agree on data-sharing and working arrangements.

The optimal arrangement is usually to establish an overarching governance arrangement in the form of legislation, regulation or some form of executive order. Such arrangements can provide formal obligations to government agencies but also industry or industry groups to supply data; however, policy reform could add an extra layer of complexity and required political will. Only Ecuador, Indonesia, Mexico, and the Philippines indicated that they have such arrangements in place at this time.
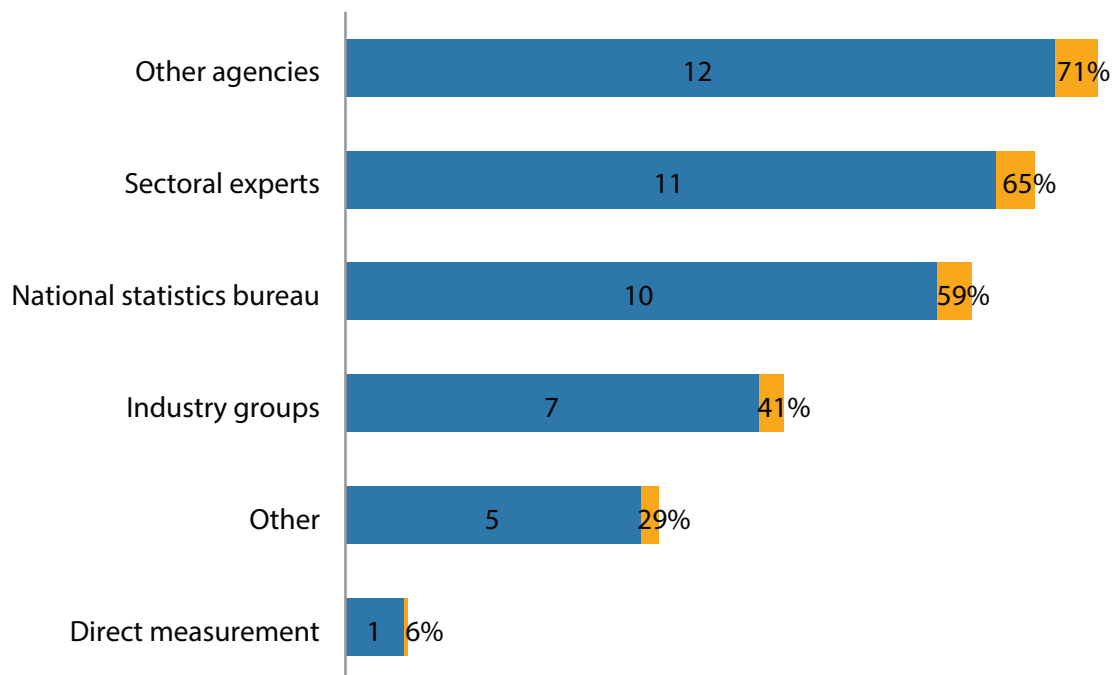
4 Data Collection and Emission Calculations

4.1 EXISTING DATA

MRV systems work best when a range of data is captured – this information can help fill information gaps from any new data collection processes, but importantly also provide the data necessary to assist in QA/QC. A further potential reason to utilize existing data sources is that they can limit costs as collection of new data would not be needed and the data may have already been subject to some QA/QC processes. QA/QC system considerations are discussed in greater detail in Section 5.

LECB countries are deploying a wide range of existing data sources, but there are further opportunities to utilise existing sources. For example, only about 60-70 per cent of countries are using data from national statistics bureaus, other agencies, and/or sector experts, as presented in Figure 4. Noting the earlier point about accessing such data, all countries should be utilising these data sources, where possible. Industry groups can also provide valuable data and LECB countries could consider opportunities to better utilise data from these groups. Only 41 per cent of countries indicated they use data from industry groups.

FIGURE 4: MRV SYSTEM DATA SOURCES IN LECB PARTNER COUNTRIES

Data source	Count	Percentage
Other agencies	12	71%
Sectoral experts	11	65%
National statistics bureau	10	59%
Industry groups	7	41%
Other	5	29%
Direct measurement	1	6%

4.2 NEW DATA

LECB countries are collecting new data as part of their MRV systems. The collection of new data can be a critical component of MRV systems. However, new data collection can be time consuming and expensive and can also require the establishment of additional data maintenance and archiving resources. It is therefore vital that data collection is well targeted.

Several LECB countries are piggybacking on existing data collection processes to accumulate relevant data. This helps to reduce upfront data collection costs, reduce the additional burden from data maintenance and archiving, and raise the level of coordination between initiatives. In addition, this approach helps to leverage where agencies or sector experts have established relationships with industry.

4.3 EMISSIONS CALCULATIONS AND METHODOLOGY

A range of information systems is being used to capture activity data and undertake emissions calculations. A significant proportion of countries (47 per cent) that responded to the LECB questionnaire are using IPCC Excel spreadsheet templates. The same percentage is also using country-specific Excel spreadsheets to undertake emissions calculations. Interestingly, almost a quarter of countries are planning to use an Access database and/or online system for collecting data and undertaking emissions calculations.
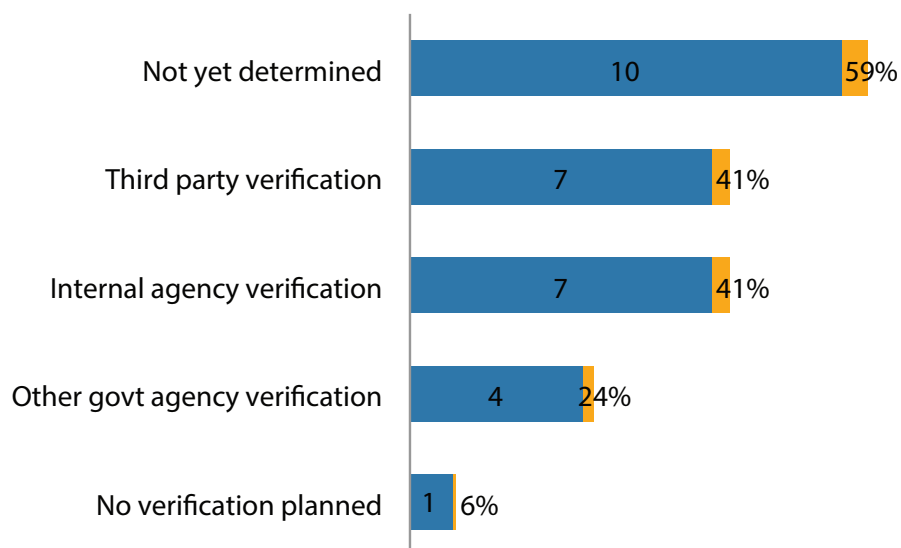
5 MRV System Support Tools

5.1. QUALITY ASSURANCE/QUALITY CONTROL

The majority of LECB countries that responded to the survey (76 per cent) indicated that they have not yet determined their QA/QC processes for MRV systems (Figure 5). The fact that so few countries have yet to consider such a fundamental element as QA/QC is an area that merits further consideration. Without QA/QC processes, there is a significant risk that the data being generated will not be of sufficient quality for its intended uses. Volume 1 of the 2006 IPCC Guidelines provides informative and accessible guidance on QA/QC processes. The Guidelines are drafted for the purpose of providing good practice guidance to national GHG inventory compilers, but the advice is equally relevant to NAMA MRV systems. Only Ghana indicated they use the IPCC Guidelines for QA/QC.

FIGURE 5: QA/QC SYSTEM STATUS FOR MRV SYSTEMS

Category	Value	Percent
Not yet determined	10	59%
Third party verification	7	41%
Internal agency verification	7	41%
Other govt agency verification	4	24%
No verification planned	1	6%

QA/QC approaches need not necessarily be complicated. For example, there are a number of basic quality control checks that can be undertaken, such as confirming formulas for emissions calculations are correct, checking for outliers in data sets, checking current data sets against historical data sets or similar external data, and recording assumptions and other estimation parameters. Only Moldova and Thailand indicated that they are currently undertaking 'basic QA/QC checks'. It should be a goal that all LECB countries include basic QA/QC checks in their MRV systems. As with other areas of MRV systems, the objective is not to start with the perfect QA/QC processes, but rather to start with what is feasible and continuously improve. Countries can start out with basic checks, but work towards developing comprehensive QA/QC processes and plans.

As with other areas of MRV, it is important to think strategically, but implementation can be incremental. It is likely that if countries are thinking about QA/QC they will identify small opportunities to apply techniques. For example, when countries are thinking about QA/QC processes they are more likely to recognise the value of simple techniques such as verifying emission calculation formulas, recording the officials who have entered and checked data, referencing data sources, etc. The opposite is true as well and can lead to missed opportunities.

QA/QC techniques are also a potentially valuable source for improving MRV systems. They provide a structured way to identify areas where data may be weaker and requires improvement. Quality assurances procedures help ensure that external expertise is utilized in the form of external reviews and audits. These processes again provide an important resource for identifying areas for improvement.

5.2. VERIFICATION

Verification is foundational for effective MRV systems. The majority of LECB countries (59 per cent) indicated in the survey that they have not yet determined their verification processes (Figure 6). The fact that so few countries have yet to consider such a fundamental element of MRV such as verification is an area that merits further consideration. As with QA/QC, the limited consideration of verification is likely driven by a lack of understanding of what verification involves, the sorts of actions that developing countries can start with, and/or the perception that a verification strategy should be developed at a later stage of NAMA or inventory development. This suggests further training in this area could be beneficial to LECB countries.

FIGURE 6: VERIFICATION PROCESSES IN MRV SYSTEMS

- Not yet determined
- IPCC
- ISO
- Basic checks
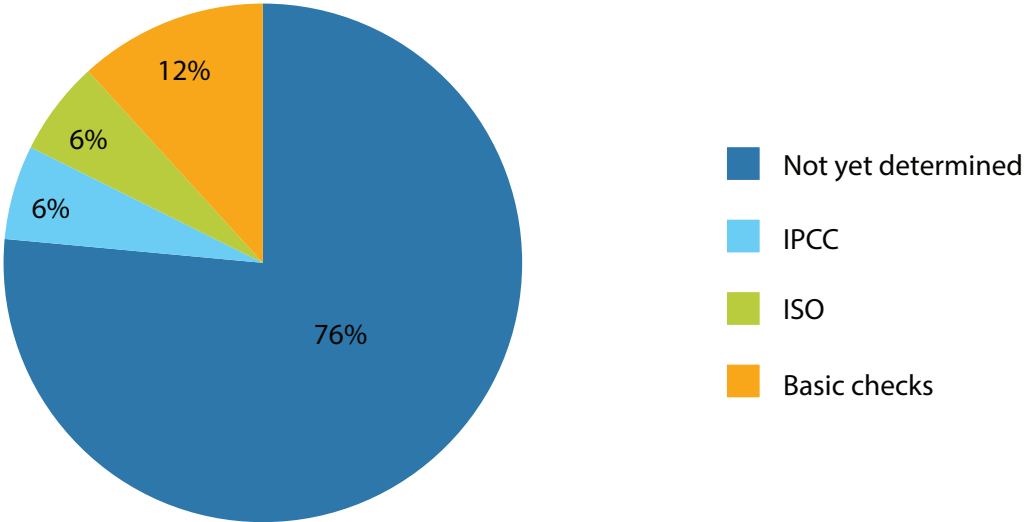
A positive indication from the survey was that 41 per cent of countries responding have identified opportunities within their own agency for verification. Technical staff not involved in the MRV system implementation can provide an excellent resource for undertaking verification and thereby maximize existing resources. This shows a good understanding in those countries planning verification of how it can be implemented. It also provides a useful example for those countries yet to consider how verification will be incorporated into their system design.

6 Lessons Learned

The countries selected for case studies work at different scopes and emphasise different elements as they develop their MRV systems, but despite this there are a number of common practical ways of working that are being successful applied. These practices or ways of thinking about MRV are presented below as eight lessons learned.

6.1 EXECUTIVE LEVEL GOVERNANCE FRAMEWORKS ARE A VALUABLE ALTERNATIVE TO LEGISLATION/REGULATION

An important component of an effective MRV system is a strong governance framework. Legislation and/or regulation provide the most comprehensive framework, but establishment requires broad political support and for that support to be available at the time the system is being developed. A valuable alternative can be to establish governance structures based on non-legislative, executive-level orders (presidential, ministerial or technical). These orders potentially do not have the full powers of legislation/regulation, such as a strong, enforceable compliance system. However, they are simpler and faster to establish and can be implemented with less political capital. Both Lebanon and the Philippines have implemented or are implementing such arrangements.

Lebanon has developed two executive-level orders for its MRV system. Ministerial Decision 99/1 provides the Ministry of Environment with powers to collect data from commercial, industrial and institutional entities. A second, more powerful order, the Decree on Environmental Compliance of Establishments, has been developed to subsume the Ministerial Decision and provide the Ministry with a stronger mandate to collect data. These orders are not backed by formal compliance mechanisms, and so to help facilitate participation, the reporting tool has been designed to also provide reporting entities with information that potentially has value for their operations (see section 6.4). The reporting process has also been designed to significantly reduce administrative burden.

Similarly, the Climate Change Commission in the Philippines has developed an executive order that will establish the framework for the national MRV system. The President issued the order in November 2014. The executive order is seen to provide a clear signal to agencies of the Government's intentions and provides increased credibility to the MRV system. The executive order will provide the overarching framework under which the Commission's work on MRV can be undertaken. Specifically, it will provide for the establishment of a national GHG inventory system, outline the high-level roles and responsibilities of agencies reporting GHG emissions in support of this system, and provide for the establishment of a national database to underpin the system.

6.2 AUGMENTING EXISTING DATA COLLECTION PROCESS CAN PROVIDE A VALUABLE MEANS TO COLLECT NEW ACTIVITY DATA

The ability to collect and maintain a comprehensive activity data set is a critical component of an effective MRV system. In collecting data for MRV systems (of all scopes and scales) there is value in commencing by augmenting existing processes. This has the advantage of not overburdening stakeholders that possess this data. It is also more sustainable if it is assumed that resources for data collection, maintenance, QA/

QC, data archiving and reporting also accompany these existing processes. Establishing entirely new data collection likely necessitates relatively significant costs and time resources to develop and train for these additional functions. Both Lebanon and the Philippines are augmenting existing data collection processes for their MRV systems.

Lebanon is currently piloting a process to collect new data by piggybacking off the process the Ministry of Industry uses to certify import/export businesses. These entities will be asked additional questions on things like their fuel consumption (for energy and transport purposes), type and quantity of industrial production, etc. While this is basic information, it is considered to provide sufficient data to undertake simple GHG emissions calculations at the business level. In making these changes, a key design consideration was to avoid overly burdening business. Importantly, the additional information will also be used by the Ministry of Industry to better calculate a number of its key indicators. These multiple benefits are important to gain buy-in from other agencies.

In the Philippines, the Environmental Management Bureau is augmenting its self-monitoring reports to include specific questions on GHG emissions. These reports are submitted quarterly by industry and currently cover water, municipal waste, toxic waste, and environmental impacts.

6.3 EXISTING DATA SOURCES ARE A VALUABLE RESOURCE FOR BOTH NATIONAL AND NAMA LEVEL MRV SYSTEMS

The effective use of a wide range of existing data sources is an important element of a successful MRV system (whether national, sectoral or at the NAMA-level). A wide range of existing sources should be considered, including national statistics agencies, government departments/agencies, industry groups, and sector experts. These data may be in aggregated form, and so are particularly useful for national level MRV systems, but they are also valuable for NAMA MRV systems as a means to supplement new, more detailed NAMA-specific data. These data also provide a valuable means to undertake QA/QC and verification of new activity data. Costa Rica and the Philippines in particular are taking steps to utilise existing data sources.

A focus of the Philippines effort to develop a national MRV system has been to utilise existing data sources. To do this a comprehensive review has been undertaken of all potentially relevant activity data. Various processes have been set up to assess what information is currently available, from which sources, and in what form. One of the first tasks conducted was to undertake a gap analysis. This was a consultative process and involved all the relevant agencies. The agencies identified a number of areas where valuable data already exists, as well as other areas that need strengthening. This is being followed up with a more detailed process that includes the classification of data as primary or secondary sources, and categorising the types of information available.

Costa Rica's NAMA MRV system is being designed to access an extensive data set being developed by the Ministry of Agriculture as part of its industry development programme. In fact, Costa Rica is taking the process one step further by integrating the NAMA MRV system with the Ministry's programme. This provides the NAMA with a wealth of existing data to either use as a primary source or for QA/QC and verification purposes. A further advantage of this approach is that it helps to gain buy-in and support from the Ministry. It also enables the NAMA to utilise the Ministry's existing framework for collecting and processing relevant data, including access to technical staff and other necessary resources such as laptop computers and motor vehicles.

Costa Rica is also looking to utilise extensive existing data sets collected by the livestock sector's industry groups. These groups have a wide range of regional and national level data collected over a number of years and maintained electronically. The data has been acquired from a number of sources, including through

ad-hoc questionnaires to members, the group's cattle auction facilities, and information provided by large commercial abattoirs. A further opportunity is the possibility of collaborating with the livestock industry groups to augment their ad-hoc process for updating member's details.

6.4 COLLECTING ACTIVITY DATA FROM INDUSTRY IS EASIER AND MORE EFFECTIVE WHEN THEY SEE VALUE AND BUY INTO THE PROCESS

The ability to acquire data directly from business/industry is important for both national and NAMA MRV systems. Business/industry can be reluctant to provide information for a variety of reasons, such as: they may be asked for the same information from different sources; it may be complicated and time consuming to provide the data; confidentiality is a concern; and no legislation/regulation exists requiring they provide the data. Addressing these issues is an important part of designing effective data collection processes.

Lebanon is working to establish buy-in from business/industry for its national level MRV system. One technique that the Ministry of Environment is applying is to develop a data-reporting tool that collects activity data needed for the GHG inventory, but also provides businesses with a calculator for company-level GHG emissions. This is achieved by an Excel spreadsheet where reporting entities provide information on indicators such as energy consumption in kWh, fuel consumption (gas/diesel oil/LPG), heavy fuel oil (for energy use), raw materials used for industrial processes, etc. The entity's GHG emissions are automatically calculated by applying IPCC default emission factors. The functionality to calculate GHG emissions provides businesses with a useful tool to identify cost reductions and efficiencies and compare their performance against competitors.

Industry support is particularly important for NAMA MRV systems where activity data supplied directly by businesses is the primary source. Costa Rica is addressing this challenge by framing their livestock NAMA in a way that makes economic benefit (productivity) one of the primary objectives. The view in Costa Rica is that by delivering productivity benefits the NAMA will also lead to reductions in GHG emissions. The focus on economic benefits is seen as a pragmatic response to engage individual, often small-scale livestock farmers. These farmers will be vital to collecting activity data and it is felt that the NAMA will need to deliver economic benefits to ensure their continued interest and participation.

Recognising the importance of effectively capturing data, Lebanon has commenced a process to ask business/industry their views. Business/industry will be surveyed on the mechanisms they prefer to use to provide data, for example, whether they prefer existing approaches such as the process of providing annual reports to ministries, or the use of online mechanisms. Their views are also being sought on whether a more centralised data collection process across government would be beneficial. A pilot phase of the survey was launched in late-October 2014.

6.5 COLLECTING ACTIVITY DATA FROM GOVERNMENT INSTITUTIONS IS EASIER AND MORE EFFECTIVE WHEN THEY SEE VALUE AND BUY INTO THE PROCESS

The ability to acquire data directly from government institutions is important for both national and NAMA MRV systems. Like business/industry, government institutions can be reluctant to provide information for a variety of reasons, including: when they see the data as belonging to them; when they are concerned about confidentiality; and when they are not required by legislation/regulation to provide the data. Addressing these issues is an important part of designing effective data collection processes.

The Philippines has focused on accessing existing data and gaining buy-in from relevant government institutions. The decentralised approach adopted makes this particularly important, as other government institutions will be required to collect, submit/process, QA/QC and verify data for their sector. Engagement with these other agencies is being undertaken at three different levels: technical, senior executive, and ministerial. The engagement comprises workshops, training sessions, etc., and includes involving agencies in key decision-making bodies such as 'The Database Keepers Committee', which is responsible for overseeing the design, build and implementation of the database system that underpins the national MRV system.

6.6 ADOPTING A SYSTEMS-BASED APPROACH INCLUDING BUSINESS PROCESS DESIGN, GOVERNANCE, AND IT DESIGN IS IMPORTANT FOR EFFECTIVE MRV

MRV can be best thought of as a system, which includes elements like business process design, governance mechanisms, and information technology (IT) support systems. Data collection, emission factor assessment and development, and emissions calculations are of central importance, but a systems approach helps to make MRV more sustainable and improves transparency, accuracy, comparability, completeness, and consistency.

In Lebanon, ministries recently agreed upon a process to share data across their IT platforms. The Memorandum of Understanding signed enables the Ministry of Environment to directly access relevant activity data from the Ministry of Industry's existing database. This agreement provides the Ministry of Environment with certainty about the type of data, the format, and the time it can be accessed. For the Ministry of Industry, it provides an efficient and consistent means to meet the data provision request. Business processes such as these become increasingly important the greater the range of agencies and data that are collected for the MRV system. The degree to which such arrangements are formalised will depend on a range of factors, such as existing government norms and protocols, organisational relationships and cultural considerations.

The Philippines is developing a new IT support system for its national MRV system. The database is being designed to assist in best utilising the broad range of data currently collected by government departments and institutions. IT systems of this type have the potential to significantly reduce the amount of manual data entry, provide standardised reporting (including to the UNFCCC), assist in effectively archiving data, and may be able to perform automated QA/QC and verification processes.

The Philippines IT support system is being designed in close collaboration with the broad range of potential system users. These agencies have been involved in determining business process design elements such as what data will be made available, when it will be collected, and in what form. Interestingly, this process has also had the effect of making agencies much more aware of the data they have (and could collect) and how it is stored and archived. In the Philippines, some agencies are still collecting and storing data in paper form, so the transition to a full IT support system may take some time.

An integral part of MRV system design in the Philippines has been to agree upon business process design elements with other agencies. The overarching MRV system design that was selected is a decentralised model, with a central co-ordinating agency that houses the database system, but with technical agencies like the Department of Energy and the Philippines Statistics Authority responsible for collecting, entering, maintaining data, as well as undertaking QA/QC functions. The process of agreeing upon this approach helps develop a more complete product, but also helps establish formal and informal networks and assists in gaining buy-in and support. The choice of MRV system design (e.g. decentralised, partially centralised, centralised, etc.) should reflect national circumstances, but business process thinking is universally important.

6.7 IT IS NOT NECESSARY TO IMMEDIATELY LOOK TO INTEGRATE DIFFERENT LEVELS OF MRV SYSTEMS, BUT THERE IS VALUE IN HAVING THE SYSTEMS INFORM EACH OTHER

A fundamental principle of MRV system development is to best utilise existing data. How this is put into practice can be complicated when multiple MRV systems are being developed simultaneously (with each system operating at quite different levels of detail). The reason that this can problematic is that the goals of national level MRV systems and NAMA level systems are quite different. For example, national-level emissions estimates do not require the same fine level of detail that a NAMA-level MRV system needs. Whereas NAMA level MRV systems do not need data from such a wide geographical area.

It is not just LECB countries that are facing the question of how or whether to integrate multiple MRV systems. Many developed countries also grappling with how to integrate data with different levels of detail. Developed countries may for example have data from offset programs or emissions trading schemes in addition to the data they collect as part of their national GHG inventory. Particularly for developing countries, rather than seeking to immediately integrate data, a more reasonable goal could be to have the different systems inform each other. For example, MRV systems operating at different levels can be used for QA/QC or verification purposes.

Chile is not integrating new activity data from their NAMA MRV systems into their national GHG inventory, although this is a long-term goal. Chile has an established inventory system that collects data from a range of existing sources, including the national statistics agency and other government agencies. This includes a continuous improvement process. The new MRV systems being built for Chile's various NAMAs are therefore able to focus on collecting the activity data required for the NAMA. Over time there will likely be opportunities for Chile to utilise activity data or emissions factors from NAMA MRV systems into the inventory.

6.8 INCREASING COMPARABILITY AND CONSISTENCY ACROSS NAMA MRV SYSTEMS IS POSSIBLE WITHOUT COMPROMISING NAMA DEVELOPMENT

Chile is developing a national NAMA MRV framework to inform MRV system design across the broad range of NAMAs currently being developed. This innovative response to MRV system development evolved as a result of a perceived need to ensure consistency and comparability across NAMAs. It also evolved as a direct response to a perceived lack of international guidance on NAMA MRV systems. The MRV framework is intended to provide NAMA proponents with guidance that is sufficiently detailed so practitioners can use it as a tool, but also to have enough flexibility to enable the development of MRV systems to address the specific NAMA needs. Processes are being developed that proponents can follow, such as how to select indicators, determine baselines and targets for indicators, and develop and approve MRV plans. Another important element of the MRV framework is the development of templates for NAMA proponents, such as for MRV plans and a national NAMA progress report template. It is understood that the Framework is already generating considerable interest amongst NAMA proponents in Chile.

Conclusion and Recommendations 7

LECB countries are undertaking a range of excellent work as they establish MRV systems. Most countries are now at the planning/design stage and are developing systems with different scales and scopes, utilising a range of different guidance, and incorporating to a greater or less degree fundamental technical elements. Although countries are making good progress, the survey results suggest that there are several fundamental areas of system design that could be better incorporated into LECB countries' MRV systems.

One broad area where such support would be valuable is guidance on the practical use of the range of tools that the IPCC provides for estimating GHG emissions and removals. This includes how the use of the IPCC Guidelines, various guidance and IPCC emissions calculations templates could be applied in the design of an MRV system.

LECB countries are also generally in need of technical assistance on QA/QC and verification, including practical tools. Incorporating QA/QC and verification into MRV systems is a good example of where countries should be encouraged to think strategically for the longer-term, but to implement incrementally. Such an approach helps ensure that simple opportunities to incorporate QA/QC and/or verification approaches into MRV systems are not missed, but also recognises specific national circumstances and capabilities. The IPCC training suggested above could target QA/QC and verification in addition to other technical areas that countries identify.

To supplement formal training opportunities, the LECB Programme could consider facilitating informal networks of technical experts related to MRV in LECB countries. These national experts could share amongst themselves how they are approaching aspects of systems design such as QA/QC and verification. Small groups could meet either in person or virtually in sessions facilitated by a leading MRV expert.

In addition, it is recommended that the LECB Programme facilitate formal opportunities for MRV system information sharing such as mutual peer reviews. Such a review would provide a country with a different technical perspective. A similar initiative has been underway in Asia for the last 12 years, where technical experts come together annually for workshops on GHG inventories[3]. The initiative includes the opportunity for countries to undertake a mutual 'review' of a sector of their inventory. The UNFCCC provides formal processes, but such a system could provide countries with an obligation-free opportunity to incorporate improvements suggested by a peer. Reviews of this type assist not just the country being reviewed, but also afford the experts undertaking the review an opportunity to learn more about how other countries undertake MRV.

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3   The Workshop on GHG Inventories in Asia (WGIA) is an annual event funded by the Government of Japan. For further information see - http://www-gio.nies.go.jp/wgia/wgiaindex-e.html

Annex 1. Case Study on Measurement, Reporting and Verification in Chile

ABSTRACT

This paper outlines work being undertaken on measurement, reporting and verification (MRV) in Chile under the Low Emission Capacity Building Programme (LECB Programme). The paper considers the MRV of greenhouse gas (GHG) emissions, as well as socio-economic and environmental indicators. It does not address MRV of support. The paper focuses on work being undertaken in Chile to develop a national NAMA MRV framework and to develop the NAMA MRV system for the self-supply renewable energy (SSRE) NAMA.

The paper is structured around three substantive sections. The first section outlines the political and organisational context for MRV in Chile. The second describes progress on the first of the two major MRV initiatives being undertaken in Chile – a national NAMA MRV framework. In this section the relationship to the GHG inventory, guidance used to develop the framework, and various design elements are examined and key potential areas for further consideration are identified. The third outlines work on the second major initiative - the MRV system for the SSRE NAMA. This section focuses on system design considerations, use of the existing online platform, data collection and the emissions factors used.

1. POLITICAL AND ORGANISATION CONTEXT

The 2008 National Climate Change Action Plan (NCCAP) frames Chile's response to climate change. The NCCAP sets out six broad lines of action, including identifying mitigation as a way to improve quality of economic growth, reduce overall GHG emissions and decrease adaptation costs[4].

As part of the Copenhagen Accord, in 2009 Chile pledged to take NAMAs to achieve a 20 per cent deviation from business as usual emissions growth trajectory by 2020, projected from the year 2007[5]. The pledge was premised on receiving a relevant level of international support. Energy efficiency, renewable energy and land use, land-use change, and forestry (LULUCF) measures were identified by Chile as the main focus of its NAMAs.

The promotion of renewable energy was also included as one of the six pillars of the Government's National Energy Strategy (2012) and in the National Energy Agenda (2014). Major drivers for the promotion of renewable energy supply in Chile are high energy prices and a dependence on imported fossil fuels. Addressing these issues is part of the Government's broader development objectives. There has been active support by government agencies for programmes to promote renewable energy, including through the SSRE NAMA, which was developed by the Ministry of Energy, the Centre for Renewable Energy (CER), and

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4   The Second National Communication submitted by Chile in 2011.

5   http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/chilecphaccord_app2.pdf

the Production Development Corporation (CORFO) with support from Germany and the UK through several initiatives. The CER is further developing the SSRE NAMA.

The Office of Climate Change (the Office) within the Ministry of Environment is responsible for preparing the national GHG inventory and for national oversight of NAMA development. Individual NAMAs and their associated MRV systems are being designed by technical agencies such as the CER. The LECB Programme is working with the Office to support the NAMA MRV framework and the national GHG inventory. The LECB Programme is also providing assistance to develop a voluntary carbon management system and Low Emission Development Strategy in Chile.

2. NATIONAL NAMA MRV FRAMEWORK

Chile is establishing a national NAMA MRV framework (the Framework) to provide guidance to the broad range of proponents currently developing NAMAs in Chile. The Framework is also intended to assist in developing standardised institutional arrangements for existing MRV systems. The establishment of a national NAMA MRV framework is an innovative approach. If successful, it could provide a valuable model for other countries where multiple NAMAs are being developed. The practical guidance outlined in the Framework could also potentially provide a useful additional reference for individual NAMA proponents designing MRV systems outside of Chile.

Work to develop the Framework commenced in May 2014, so the Framework is still in the early stages of development. The case study presents the situation in October 2014. The Office advises that the Framework will be finalised by early 2015.

2.1   Systems design and guidance applied

Significant efforts are being undertaken in Chile across a range of public and private organisations to develop NAMAs. There are currently five NAMAs at various stages of development that are registered in the UNFCCC NAMA registry. There are a further nine NAMAs that are actively being considered. These NAMAs cover numerous sectors. The most advanced - the SSRE NAMA - obtained funding from the NAMA Facility[6] for implementation. The other NAMAs currently at the development phase relate to: forestry, organic waste, clean production agreements, and sustainable urban transport in the Santiago metro area.

The Office advises that the decision to commence work on a national NAMA MRV framework was informed by a desire to ensure consistency and comparability across the broad range of NAMAs being developed. It is understood that there is also a view that international guidance is currently insufficient to assist NAMA developers in designing and implementing their MRV systems. The Office advises that a guiding principle for the Framework is that it provides necessary guidance, but is sufficiently flexible to enable the development of MRV systems that address the specific needs of the NAMA. In this way the Office is creating an enabling environment for NAMA MRV systems to develop, rather than to be overly prescriptive.

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6   The NAMA Facility is a joint initiative of Germany's Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and the United Kingdom's Department of Energy and Climate Change. It was set up to support developing countries and emerging economies that show leadership in tackling climate change and want to implement ambitious climate protection measures (NAMAs). For more information see: http://www.nama-facility.org/news.html

2.1.1   Alignment with GHG inventory

Chile has at this stage decided not to integrate activity data collected under NAMA MRV systems into their national GHG inventory. This is an important design choice. Chile has an established national inventory that collects data from a range of existing sources, including the national statistics agency and other government agencies. The Office advises that the focus of NAMA MRV systems should be collecting detailed activity data to meet the specific purposes of the NAMA.

Recognising this design choice, there could still be opportunities for data from the national GHG inventory to provide a valuable quality assurance/quality control (QA/QC) tool for NAMA MRV systems. Over time there may be increasing opportunities to utilise activity data or emissions factors from NAMA MRV systems into the GHG inventory. The Office advises that over the long term it will look to integrate national GHG inventory and NAMA MRV systems.

2.1.2 Guidelines informing systems design

It is understood that while the IPCC's Guidelines for National Greenhouse Gas Inventories[7] are not directly being referenced in the Framework, the principles that underpin the guidelines such as transparency, accuracy, comparability, completeness, and consistency are implicit in the design of the Framework. There may be value in making this reference more explicit to increase recognition of the role of that the IPCC Guidelines could play domestically with NAMA developers, and potentially provide increased international credibility for the Framework.

The Framework utilises the causal chain analysis set out in the draft Policy and Actions Standard 2014, which is being developed under the banner of the Greenhouse Gas Protocol[8]. The draft Framework provides guidance on how to apply the causal chain analysis to inform the selection of indicators for the MRV system. It is understood that several NAMA developers are already looking at applying the causal chain analysis to assist in identifying indicators.

2.1.3 Integrating baselines and target setting

The draft Framework integrates the process of setting baselines and targets into the NAMA MRV process. This is a different approach to that adopted internationally for national GHG inventories where targets are set independently of the national GHG inventory. For an inventory, indicators are identified and evaluated to measure actual GHG emissions and removals. These indicators are then measured and re-measured to determine any change. In this way the national GHG inventory is used to determine the baseline against which the target is formulated, and progress toward the target is measured annually by actual GHG emissions and removals.

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7   The IPCC's Task Force on National Greenhouse Gas Inventories has produced a series of guidelines and guidance for national GHG inventory compliers including: the Revised1996 IPCC Guidelines for National Inventory Greenhouse Gas Inventories; the 2003 Good Practice Guidance for Land Use, Land-Use Change, and Forestry: and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

8   The Greenhouse Gas Protocol is a partnership between the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WSCSD). The Greenhouse Gas Protocol is currently developing two new standards to cover 'mitigation accounting'. The Policy and Actions Standard is one of these standards. See http://www.ghgprotocol.org/mitigation-accounting

A similar approach has been adopted for developing countries as part of the MRV framework for REDD+ (reducing emissions from deforestation and forest degradation). Under REDD+, separate processes have been established for establishing baselines/targets and for MRV. The framework for REDD+ reference levels or reference emission levels, which are projections of emissions/removals, was developed through a separate process to the development of national forest monitoring systems and the specific MRV approach established for REDD+.

From a practical perspective, emissions calculations used for national GHG inventories are developed and can evolve to identify and measure those variables responsible for changes in emissions and removals. Importantly this includes being able to track changes in emissions and removals resulting from policy or programmes implemented by government. This logic provides valuable guidance for NAMA MRV systems where indicators should be selected to ensure that the combination of activity data and emissions factors adopted can capture the effects of the policy/programme levers that governments apply through the NAMA.

An important element of the approach adopted in the Framework is the establishment of a step-wise and iterative approach to the development of indicators, targets and policies. This enables NAMAs to be refined to ensure that they are meeting their objective. For example, if preliminary calculations under a NAMA (activity data multiplied by emissions factor) suggest that the initial policy target cannot be met, the policy can be redesigned or the target reduced. There is clearly therefore value in such an approach. However, it may be that this method is suited only where NAMAs are developed by a more 'top down' national approach, rather than at an agency/departmental level. The iterative approach applied in the Framework may be redundant if applied to agency/department level NAMAs, as targets and indicators may have already been fixed by broader government priorities and therefore are not able to be adjusted during the NAMA development process.

2.1.4   Integrating MRV into NAMA design

The issue of when to integrate MRV into NAMA design is an important design consideration. An advantage of the iterative approach set out in the Framework is that MRV is considered at an early stage in the NAMA development process, and there is flexibility to adjust the MRV system on the basis of potentially changing broader objectives of the NAMA. One of the risks of leaving MRV system design until late in the NAMA development process is that it might turn out to be not practical to implement the proposed MRV system to effectively measure the NAMA. For example, it may not be feasible (practically or financially) to collect the activity data that is required as part of the emissions calculation that underpins the NAMA. The LECB Programme officials in Chile don't consider this to be an issue in Chile.

2.1.5   MRV for non-GHG indicators

The Framework is being primarily designed to measure GHG emissions and emissions reductions, but the principles that underpin the Framework are equally applicable to non-GHG indicators. This is a fact that is underlined throughout the Framework.

2.2   QA/QC and verification

The application of QA/QC techniques is essential to an effective MRV system. It is an area that is often not fully developed in NAMA MRV systems.

The Framework provides for the establishment of an MRV plan and includes a template for the plan. This is a useful step as part of a QA/QC system. The Framework provides that the MRV plan is prepared by the NAMA developer and then validated and approved by the Ministry of Environment. Under the Framework, the

MRV plan is a valuable verification tool as it provides a reference point against which a verifier can assess whether the MRV system does what it was established to do as specified in the Plan.

There may be benefit in making more explicit how QA/QC is built into the Framework. One simple way to signal the importance of QA/QC could be to have a section or sub-section dedicated to the subject. QA/QC is best designed and implemented when it is integrated throughout the MRV system, but a dedicated section could potentially highlight to NAMA developers the importance of incorporating QA/QC techniques. For example, there may be opportunities to make NAMA proponents aware of simple quality control techniques such as checking emissions calculations formulas, using checks for inconsistency, standardizing processes, or using existing data as a quality control check for any new activity data that is being collected.

Another area where many NAMA MRV systems could be further developed is verification. It is understood that many NAMA developers are waiting for further international guidance on how to implement verification into NAMA MRV systems. This could be one reason why verification is not specifically addressed in the Framework. That said, drawing on the work of the International Panel on Climate Change's (IPCC) Task Force on National Greenhouse Gas Inventories (NGGI) there are some basic verification techniques that could be valuable for NAMA MRV systems[9]. Whilst the Guidelines are designed for national GHG inventory compilation, they provide an important reference for NAMA MRV systems. The Framework could, for example, include a process where the MRV system is assessed either by a data/statistical expert working elsewhere in the department or another government department. In addition to meeting broad verification objectives, this process could generate some valuable insight – an external perspective can often identify areas not obvious to someone dedicated to the system development.

3. MRV FOR THE SSRE NAMA

3.1 Systems design considerations

The most advanced NAMA being developed in Chile is the SSRE NAMA. The Centre for Renewable Energy (CER) developed the NAMA MRV system, which is based around an online platform that the CER uses to record a range of data for both self-supply and grid-connected renewable energy projects. The NAMA only relates to self-supply renewable energy projects. The CER is currently considering how to augment the platform to incorporate a range of additional indicators (including non-GHG metrics) and develop key additional functionality such as QA/QC and verification.

The online platform creates an excellent base for a NAMA MRV system. Interestingly, the primary driver for initially developing the system was to track and monitor renewable energy projects, rather than being a custom-made system for GHG emissions. The system was designed to enable step-by-step monitoring of progress and a complete database of projects. The system has proven to be a successful tool for tracking projects. The collection and recording of data for GHG emissions was not part of the core functionality under the initial project. That said the activity data collected by the CER in combination with the emissions factors applied are sufficient to enable CER to estimate the GHG emissions reductions associated with the self-supply projects.

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9 The NGGI has produced a series of guidelines and guidance for national GHG inventory compliers including: the Revised1996 IPCC Guidelines for National Inventory Greenhouse Gas Inventories; the 2003 Good Practice Guidance for Land Use, Land-Use Change, and Forestry: and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

The MRV system for the NAMA currently comprises the online platform and basic archiving and reporting functions. Important associated functions such as QA/QC, verification, uncertainty analysis and emission reporting functions have not yet been development. While the NAMA utilises an online platform to collect data and undertake emissions calculations, the MRV system is currently only operational within the CER. A programme of work is currently underway to further develop the MRV system for the NAMA.

3.2   Utilising existing systems

A range of data are collected and recorded via the online platform for self-supply projects. For example, data is collected on: the renewable energy source and technology, installed capacity, state of the tender if it is needed, whether further finance is required, and a number of other indicators.

In addition to tracking projects, a key requirement of the online platform is to inform government policy-making on renewable energy, including guiding investment decisions. The tool provides policy-makers with maps illustrating where projects are located, by renewable energy source, and generation capacity at each project site. The tool also provides decision-makers with valuable information on renewable energy generation (and emission reduction) potential. To do this the system calculates on a project-by-project and aggregate basis the potential emission reductions compared against the baseline scenario. This involves comparing the actual energy source multiplied by usage with the proposed renewable energy technology multiplied by usage. It also provides decision makers with information on estimated costs of generation to aid in investment decisions. Almost 300 self-supply projects are currently included in the system.

3.3   Data collection

Data is currently entered into the MRV platform by staff in the CER. Data is gathered from a range of sources, in particular from other government agencies that promote renewable energy programmes through a range of means including subsidies. For example, the Ministry of Agriculture manages a programme that encourages renewable energy generation to support irrigation projects. Government agencies provide data (usually in the form of Excel spreadsheets) to the CER from their internal systems. Agency data is supplemented by data gathered by the CER from other public sources.

The data entry process is currently undertaken completely within the CER via a manual data entry process. This is time consuming and creates the potential for human data entry errors; particularly given a QA/QC system is yet to be developed. It is understood that CER is examining options to enable a broader group of users to enter data into the system. This could include other government agencies and potentially also project proponents.

3.4   Planned improvements

The CER is currently considering options to augment the online platform. The CER advises that it currently has sufficient information for GHG emissions calculations, but is considering adding new functionality to collect additional information such as on non-GHG indicators like job created, improvements in air quality, etc.

The CER advises that a range of stakeholders will be included in this process, in particular the private sector, which it sees as critical to shaping the range of indicators included in the NAMA MRV system. This will be the first such consultation with stakeholders. As the online platform was initially intended for internal agency purposes a consultation process with the private and public sector stakeholders was not undertaken.

A further possible augmentation to the system could be to enable a broader group of stakeholders to input data. This could include other agencies and potentially NAMA proponents. The consultation process could include canvassing views on the value of such an amendment.

3.5   Emissions factors

The online platform uses electricity system emission factors developed by the Ministry of Energy for the two main grid electricity systems in Chile – SIC and SING. These emissions factors were developed in accordance with the IPCC 2006 Guidelines for national GHG inventories. Emissions factors were developed for the two other grid systems – Aysén and Magallanes – using the methodology adopted by the Ministry of Energy. The online platform also uses fuel emissions factors for the fuel sources replaced by the SSRE NAMA. The Ministry of Energy developed the emissions factors for each of the grid systems using the IPCC 2006 Guidelines. The sources, calculation and assumptions for each emissions factor are detailed in a set of user manuals that are available via the online platform.

A study was commissioned by the LECB Programme to define country specific factors for different fuel types. The Office is currently discussing the outcomes of this work with the Ministry of Energy.

4. CONCLUSIONS

Chile is focusing on delivering a national NAMA MRV framework (the Framework) to inform MRV system design across the broad range of NAMAs currently being developed domestically.

Chile's innovative response to MRV system development evolved as a result of a perceived need to ensure consistency and comparability across NAMAs and to provide NAMA proponents with additional, detailed guidance on MRV system design. Importantly, the Framework is intended to provide practical guidance, but be sufficiently flexible to enable the development of MRV systems that address the specific needs of the NAMA. It is understood that the Framework is already generating considerable interest amongst NAMA proponents in Chile.

Two areas where additional practical guidance could be particularly valuable are quality assurance/quality control (QA/QC) and verification. It will be important that the framework highlights the importance of QA/QC and verification to NAMA proponents, and identifies concrete options for how these foundation elements of an MRV system can be integrated into NAMA from their inception.

Chile's self-supply renewable energy NAMA provides a useful example of how MRV systems can be built off existing platforms, but also how MRV is more than just a data collection and emissions calculation tool. Chile's Centre for Renewable Energy (CER) is currently investigating modifying its online platform to make the system available to a broader range of users, to incorporate a range of additional indicators (including non-GHG metrics), and develop key additional functionality such as QA/QC and verification.

Annex 2. Case Study on Measurement, Reporting and Verification in Costa Rica

ABSTRACT

This paper outlines work being undertaken on measurement, reporting and verification (MRV) in Costa Rica under the UNDP Low Emission Capacity Building Programme (LECB Programme). The paper considers the MRV of greenhouse gas emissions, as well as socio-economic and environmental indicators. It does not address the MRV of financial support. The paper focuses on the NAMA MRV system being established for a livestock NAMA, as that is the current focus of the LECB Programme.

The paper is structured around five substantive sections. The first section outlines the political and organisational context in Costa Rica. The second describes the major system design considerations, including the primary focus on economic benefits to farmers. The third outlines the practices that are incentivised under the NAMA, which are based around the concept of rotational grazing. The fourth describes data collection processes, both direct measurement and making use of other available sources. The choice of indicators, field-testing process, and assessment of indicators under the direct measurement process are examined in detail. The use of existing and new national and local data sources under the NAMA is also considered. The fifth describes the use of emissions factors for the national greenhouse gas inventory and NAMA and the relationship between the two.

1. POLITICAL AND ORGANISATIONAL CONTEXT

In 2007, Costa Rica launched an international undertaking to become carbon neutral by 2021 (the 200-year anniversary of independence). Costa Rica's new president recently reinforced this commitment at the UN Secretary General's Climate Summit in September 2014. This undertaking can be seen to frame the Government's domestic response to climate change.

The Government of Costa Rica is working to develop a domestic voluntary carbon market to support its international pledge. Companies participating in the programme undertake a process to assess their emissions profile. The market then provides a mechanism whereby companies, if necessary, can purchase emission reductions and/or sequestration in order that they be judged to be carbon neutral. To date thirteen companies have been certified. Another major initiative, which was established in the 1990s, is the national fund for financing forests (FONAFIFO). This initiative provides direct payments to owners of small natural and plantation forests to protect these forests and the ecosystem services they provide. FONAFIFO is funded from a tax on fuel of 3.5 per cent. The Government of Costa Rica, the World Bank and the private sector also provide financial support. It has resulted in the doubling of forest cover from 26 per cent of total land area in 1984 to 52 per cent in 2014[10].

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10   SINAC, 2013 - http://www.sinac.go.cr/Paginas/Inicio.aspx

The Ministry of Environment and Energy (MINAE) is the government department with primary responsibility for climate change in Costa Rica. MINAE is focused on developing a range of mitigation measures (in the form of NAMAs) to support the Government's international pledge. The UNEP DTU is currently working with MINAE and the Ministry of Agriculture to develop an overarching low carbon development strategy. In the meantime a more ad-hoc approach is being taken where individual departments are developing NAMAs in areas where they identify mitigation opportunities.

The livestock NAMA is the second NAMA to be developed for the agriculture sector. A coffee NAMA has been in development for the last three years. In December 2013 it was approved for implementation under the NAMA Facility[11]. The Ministry of Agriculture (MAG), under the umbrella of the MINAE, has undertaken work on both NAMAs. The focus on beef and dairy cattle livestock for the NAMA fits well from both an economic and mitigation perspective. The production of beef and dairy cattle in Costa Rica accounts for 30.6 per cent of Costa Rica's total emissions[12]. Beef and dairy cattle in Costa Rica are farmed in a diverse range of soil types, climatic zones and altitudes. Cattle are grazed in open pastures with minimal supplements provided, in particular for the beef sector.

The LECB Programme commenced on 1 March 2013. The primary focus of work in the first year was to build capacity and understanding in government departments and with other stakeholders of the objective of the NAMA concept. MAG is currently rolling out a pilot phase of the livestock NAMA across 100 farms nationwide. The LECB Programme is supporting a sub-component of this pilot programme in twenty farms.

2. SYSTEM DESIGN CONSIDERATIONS

The livestock NAMA is still in development. The activities being promoted under the NAMA and the MRV of the impact of these activities are currently being piloted for six months in 100 farms.

A key defining feature of the livestock NAMA in Costa Rica is the focus on delivering both economic and mitigation benefits. The focus on economics is seen as a practical response to what has been identified as the primary implementation challenge: without active and sustained engagement by the private sector (the farmers and the industry groups) it will be difficult if not impossible to implement the NAMA. It is understood that key actors in MAG and the National Chamber of Meat Producers (CORFOGA) are planning to address this challenge by promoting practices that lead to both productivity and mitigation improvements under the banner of rotational grazing.

The focus on economics is also a process related response. The NAMA is piggybacking off an existing MAG project to improve livestock productivity in beef cattle. By piggybacking off this existing process the NAMA gains buy-in from MAG, but it also importantly enables the NAMA to utilise an existing framework for collecting and processing relevant data. This includes the necessary technical staff, but also technologies (such as electronic ear tagging) and other necessary resources such as motor vehicles.

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11 The NAMA Facility is a joint initiative of Germany's Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and the United Kingdom's Department of Energy and Climate Change. It was set up to support developing countries and emerging economies that show leadership in tackling climate change and want to implement ambitious climate protection measures (NAMAs). For more information see: http://www.nama-facility.org/news.html

12 Costa Rica's Second National Communication to the UNFCCC Secretariat (October 2009).

The MAG livestock productivity project also addressed soil erosion resulting from certain grazing practices and other adaptation related areas. These elements have been included in the livestock NAMA. This holistic approach to farming systems, which focuses on promoting actions that improve productivity, mitigation and adaptive capacities fit well with what is broadly described as climate-smart agriculture (CSA). CSA is a major area of global focus for the agriculture sector, as evidenced by the recent establishment of the Global Alliance on Climate-Smart Agriculture at the UN Secretary General's Climate Summit in September 2014.

The NAMA pilot project is being run in the Brunca region of Costa Rica. This region has a strong livestock industry with farmers willing to test advanced farm management practices. The Brunca region is also home to a very strong livestock industry group - the Livestock Association of the Brunca Region (ACGUS) – which provides members with a range of technical and financial services and support. ACGUS also owns and manages the local stockyard and auction house.

A major emphasis in the development of the NAMA to date has been engaging with stakeholder groups such as ACGUS, in particular in the private sector. CORFOGA, including its regional offices, has been involved from an early stage of the work. In addition, the National Chamber of Milk Producers (CNPL) and the largest milk production cooperative in Costa Rica (Dos Pinos) have been consulted.

Taking into account these system design considerations, project-specific design components of the MRV system such as indicators, target project activities, emission factors, and quality assurance/quality control (QA/QC) are discussed in Sections 3 and 4.

3. PRACTICES INCENTIVISED UNDER THE NAMA

An initial set of practices for use in the pilot project was developed using existing information and relying on expert judgement. It is expected that this list of practices may change at the conclusion of the initial phase of the pilot programme.

The practices were agreed by a group of stakeholders comprising technical staff from CNPL, CORFOGA, Institute of Innovation and Technology Transfer in Agriculture (INTA), LECB, the Tropical Agriculture Research and Higher Education Sector (CATIE), the International Centre for Tropical Agriculture (CIAT) and MAG. The practices selected for inclusion in the NAMA are based around the concept of rotational grazing. The specific list of activities covered is: better fertilizer use; improved pastures; rotational grazing; and use of live fences. CORFOGA advises that these practices were made deliberately broad, so as to provide the farmers with flexibility to emphasise the aspects they see as working best for them. The ultimate aim of the practices is to develop precision livestock locally and adapted to local conditions.

The practices were selected from a range of actions currently promoted by MAG. Selection criteria were developed to assess the relative effectiveness of these practices for the NAMA and these criteria were then ranked. The highest priority was accorded to a hybrid criterion that included productivity, profitability and emission reductions. UNDP officials in Costa Rica advise that the rationale behind this hybrid criterion is that reducing inputs to processes (fertilizer, feed, etc.) will both increase productivity and reduce emissions. The criterion ranked second in importance was the availability of the technology and whether it was proven at the farm level. Other criteria included were an ability to produce measurable results in the short term, acceptance of the practise by farmers (social and economic acceptance), and increasing resilience to the effects of climate change.

The pilot project is expected to provide a more complete understanding of the practices being promoted and their relative benefits. UNDP advises that this could help in the development of a marginal abatement cost curve (MACC) or similar analysis that could inform which practices to prioritize under the NAMA.

4. DATA COLLECTION

4.1 Direct measurement

An extensive on-farm direct measurement process is being developed for the NAMA.

4.1.1   Choice of indicators

An initial set of indicators on which data will be collected has been developed for the pilot project. UNDP officials in Costa Rica note that the list of indicators is deliberately more comprehensive than will be applied for the next phase of the project. They see the pilot phase as a chance to test ideas and build understanding. The same stakeholder group that established the NAMA practices agreed to the indicators selected.

Some indicators require collecting data on a daily basis, such as the volume of milk produced per cow and per farm. Other indicators will be measured every six months, annually, or only when needed (such as when they purchase new equipment). Data will be collected in paper form with the farmers working with technical experts from CORFOGA and MAG who are based in the region. A representative from CORFOGA and MAG will work on the pilot project. The LECB Programme will also hire an expert to lead and manage the NAMA process in the Brunca region. The data collection process is divided up into two parts – less technical, more frequent measurements that the farmers complete themselves and additional measurements collected by the farmer and the technical staff. Much of the responsibility for data collection will fall to the farmer.

The technical experts will be responsible for compiling the information collected into Excel spreadsheets. The volumes of data that will be gathered during the pilot phase and beyond necessitate the establishment of processes to store and archive the data. This decision should include consideration of how to build in quality control techniques. At this stage no quality control techniques have as yet been identified.

Data collection by the technical experts is likely to be time consuming. The farms, although all contained within one region, are spread over a large geographic area and the roads into the farms are often rocky, steep and difficult to access. This impacts on the technical expert resources required for collection purposes. For the pilot project this is not likely to be a factor, but it could be a design consideration when the pilot programme is scaled up.

4.1.2   Field test

A sub-set of three farms in the LECB pilot is currently collecting measurements to test the practicality of the indicators, including the impacts on farmers' time. UNDP officials in Costa Rica advise that the list of indicators could be revised before an updated indicator set is provided to the wider group of 100 pilot farms. Most beef cattle farmers in particular currently collect almost no data, so it will require a cultural shift to engage in the daily collection of data as will be required for the NAMA. This additional imposition on farmers' time suggests that they will be looking to see results in the short-term to justify the effort involved.

4.1.3   Assessment of indicators

It is planned that data will be collected against an extensive range of indicators. It will be important that the indicators selected capture any improvements that farmers are creating. It is suggested that further work could be undertaken to demonstrate how the indicators align with measuring progress under the NAMA practices. It will also be important to ensure that the data collected aligns with work being undertaken to develop Costa Rica's country-specific emissions factors. This is important so that the emissions calculations are able to reflect the emissions reductions arising from the NAMA activities. A risk is that you have good, specific activity data and a country specific emissions factor, but the two cannot be used to produce an emissions calculation.

4.2   Existing or external data

Existing data sources such as national bureaus of statistics can be used to fill gaps in direct measurement and as part of a comprehensive QA/QC process.

4.2.1   Utilising existing national data sources

The National Institute of Meteorology (IMN) currently prepares the greenhouse gas inventory for the agriculture sector, with the support of INTA. While the information used for the inventory is primarily aggregate, national level data, it may provide useful information for quality control purposes.

IMN collects national and regional data on rainfall and temperature. This information could be useful to determine whether climatic conditions are having an impact on the indicators that are being measured under the NAMA.

4.2.2   Utilising existing local data sources

Industry groups can be a useful data source for the pilot and national NAMA phases.

The regional members association of CORFOGA in the Brunca region collect a range of data that could be used for the NAMA MRV system. For example, ACGUS collects information on the sex, weight and price for all animals sold through their cattle auction facility. They have a time series of approximately five years for this data that is stored electronically. ACGUS advises that this information could be provided for the NAMA MRV system. Data is also collected on the health of animals auctioned. A random selection of thirty animals for each auction is tested for brucellosis and tuberculosis. This data is also stored electronically by ACGUS. In addition, ACGUS is working with several universities and research institutions in Costa Rica. These could provide a further source of data for the MRV system.

For the pilot phase of the NAMA, this data could be supplemented through ACGUS's existing membership. ACGUS has a database with basic information about its members. This information is updated on an ad-hoc basis via a survey. ACGUS informally indicated it could possibly ask members some further questions in the next survey for use in the NAMA MRV system. Examples of the type of information that could be collected is the farm use (cattle, dairy, dual purpose), size of farms in hectares, and number of cattle.

CORFOGA advises that it collates regional level data such as that collected by ACGUS. In addition to collecting regional data from cattle auctions, CORFOGA also collects data from the larger abattoirs operating across Costa Rica.

4.2.3   Utilising new local and national data sets

The MAG programme on which the NAMA is piggybacking will provide a comprehensive data set that could be used for quality control purposes for the NAMA MRV system. As part of this programme, MAG will electronically tag all animals. The electronic tags will record information such as gender, breed, lineage, date of birth, chain of ownership from birth to death, name of the owner and location of the farm, and the weight of the cattle. It will also include basic information on the health of the cattle, such as whether it has been tested for brucellosis and tuberculosis.

5. EMISSIONS FACTORS

Research to develop a country-specific emission factor for beef cattle has been underway in Costa Rica for several years. The NAMA will leverage off this research.

5.1   National GHG inventory emissions calculations

INTA advises that it has used an IPCC tier 2 approach for methane emissions from beef and dairy cattle for Costa Rica's most recent national GHG inventory. The estimate was developed using survey information collected by CORFOGA from which a modelled time series of cattle populations was derived (disaggregating by sex and breed).

5.2   Emissions factor development

INTA is continuing its work to develop country-specific emissions factors for beef and dairy cattle. INTA advises that the focus of this work is on developing emissions factors for the different kind of forage, including native grass and brachiaria brizantha. This involves a detailed research programme being run in collaboration with the National Technical University (UTN). The research involves directly measuring methane emissions from cattle using the SF6 tracer technique and gas chromatography.

The work was only commenced after preliminary analysis suggested that the IPCC default emissions factor might not be a good approximation for the conditions in Costa Rica. This is an important first step, as much time and energy can be invested developing country specific emissions factors where IPCC defaults already provide a good estimate. Another important consideration is whether the emission source is a key category[13]. As noted above, methane emissions from beef cattle is a significant contributor to total emissions.

Initial research undertaken at Costa Rica's National University of Technology (UTN) indicates that as suspected the IPCC default does not provide a good approximation for methane emissions for beef and dairy cattle in Costa Rica. The IPCC factor is less well suited to the environmental and climatic conditions in Costa Rica. Further work is required, but the intention is for the research to culminate in a peer-reviewed journal article and for the emissions factor to be used for both the livestock NAMA and the national GHG inventory.

The LECB Programme recently funded an expert from the University of Florida to undertake a peer review of the research being undertaken at UNTN. The findings were positive. LECB Programme officials in Costa Rica advise the peer review concluded the study should enable Costa Rica to have a better understanding of emissions from livestock in tropical conditions based on different diets.

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13   As per the IPCC Guidelines for national inventory compilation

5.2.1 Emissions factors for the NAMA

The primary practice improvement under the NAMA is rotational grazing. UNDP officials in Costa Rica have not yet assessed how the change in practice and the activity data being collected under the NAMA would then utilise the emissions factor work being undertaken measuring emissions from cattle eating native grasses and brachiaria brizantha. As noted above, it is important to ensure that the detailed activity data and country specific emissions factors can be used to measure emissions reductions resulting from the NAMA practice (rotational grazing).

6. CONCLUSIONS

Costa Rica is focusing on establishing a NAMA MRV system for its livestock NAMA. UNDP officials in Costa Rica are working closely with the Ministry of Agriculture and a range of other stakeholders to pilot a data collection process that should provide a valuable and comprehensive set of activity data. It is intended that the NAMA MRV system will combine these data with country specific emissions factors that are being developed as part of an ongoing program for the national GHG inventory.

A defining feature of the NAMA being developed in Costa Rica is the focus on delivering economic benefits as well as GHG emission reductions. The delivery of these economic benefits through productivity improvements is in some ways the primary driver of the NAMA.

The view in Costa Rica is that by delivering productivity benefits, the NAMA will also lead to reductions in GHG emissions. The focus on economic benefits can be seen as a pragmatic decision in order to best engage individual, often small-scale livestock farmers. These farmers will be vital to collecting activity data and it is felt that the NAMA will need to deliver economic benefits to ensure their continued interest and participation. An economic focus is also helping to engage a range of institutional stakeholders, including the Ministry of Agriculture and a range of industry groups, and create synergies with existing work. Focusing on productivity improvements provides a valuable tool to engage industry, but it remains important that the NAMA MRV system is able to calculate accurately, cost effectively, and reliably the emissions and changes in emissions associated with the practices being encouraged under the NAMA. This requires collecting activity data and emissions factors that, when combined, demonstrate the effect of the practices being implemented under the NAMA.

Costa Rica, like a number of other LECB countries, is seeking to piggyback off existing processes to collect activity data under its NAMA MRV system. This has several important benefits including reducing costs of data collection and potentially dovetailing with existing systems to process, maintain and archive data. For example, the NAMA is linked to a livestock productivity programme being established by the Ministry of Agriculture.

Engagement with industry is a further defining feature of the NAMA MRV system being built in Costa Rica. This offers potential to again piggyback existing data collection processes and provide access to vital data. For example, the LECB Programme is looking to utilise the wide range of data collected at a regional and national level by industry groups. These industry groups have valuable data that has been collected over an extended time series and maintained electronically. This can provide an important resource for the NAMA MRV system to assist in filling gaps in the new data collection processes but also provide a means to undertake quality assurance and quality control (QA/QC) checks. The engagement with industry is also important to build and maintain the support and trust of the many small-scale farmers that will ultimately participate under the NAMA.

Annex 3. Case Study on Measurement, Reporting and Verification in Lebanon

ABSTRACT

This paper outlines elements of work being undertaken on measurement, reporting and verification (MRV) in Lebanon under the Low Emission Capacity Building Programme (LECB Programme). The paper considers the MRV of greenhouse gas (GHG) emissions, as well as socio-economic and environmental indicators. It does not address MRV of support. The paper focuses on the range of data collection processes being deployed in Lebanon to collect activity data necessary for GHG emissions calculations.

The paper is structured around four substantive sections. The first section outlines the context for MRV system development in Lebanon. The second describes work to augment existing processes to collect GHG activity data. The third outlines a number of new initiatives to collect activity data, two of which are being implemented through non-legislative executive type orders. The fourth examines arrangements for sharing data and quality assurance/quality control (QA/QC) procedures.

1. MRV CONTEXT

Lebanon has submitted two National Communications and associated national GHG inventories to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). The first was submitted in 1999 (with a 1994 inventory base year) and the second in 2011 (with a 2000 inventory base year). Lebanon is currently preparing its third National Communication and its first Biennial Update Report (BUR). The BUR will include information on existing and planned mitigation actions as well as information on MRV and institutional arrangements for the GHG inventory. LECB Programme officials in Lebanon cite the lack of institutional memory from compiling previous inventories, the need to establish institutional arrangements for sharing data between agencies, and greater involvement from the private sector as the major challenges facing the government on MRV.

The LECB Programme in Lebanon, which was launched in March 2013, is currently focused on designing a national-level MRV system that will provide more sustainable and structured data collection, maintenance, archiving, and reporting processes. The LECB Programme is also prioritising and developing NAMAs in a range of sectors.

2 AUGMENTING EXISTING PROCESSES

2.1　Industrial Certification Programme

The LECB Programme is currently piloting a process to collect new GHG activity data by piggybacking off an existing process. The Ministry of Industry is responsible for certifying businesses to import and export products. Businesses apply annually to the Ministry to register and to renew their 'industrial certificate'. The application involves responding to certain basic questions about the business' operations.

The pilot process involves adding several questions to this application, such as fuel use and consumption for energy and transport purposes, type and quantity of industrial production, lubricant use, wastewater production, etc. While this is basic information, Programme officials in Lebanon suggest it provides sufficient data at the business level to undertake simple GHG emissions calculations. To encourage participation, it is important that businesses not see the reporting process as being overly onerous. Thus, businesses are required to fill out a short form of one or two pages only. The practice of adding to existing formal processes as being piloted assists to mainstream the collection of information relevant to GHG emissions calculations. This is a potentially significant development for a national MRV system.

Importantly, the additional information that is being collected will assist the Ministry of Industry to better calculate a number of indicators they use. This dual purpose is essential to gain buy in and support from the Ministry.

The LECB Programme has employed staff to assist the Ministry of Industry to input the additional information collected from the expanded industrial certification process into their database. As a result, the Ministry of Industry's database will contain much of the information required by the Ministry of the Environment for GHG emissions calculations.

3. NEW DATA COLLECTION PROCESSES

3.1   Ministerial Decision 99/1

The Ministry of Environment is also pursuing measures to directly collect activity data for emissions calculations. The LECB Programme provided support to the development of Ministerial Decision 99/1 (April 2013), which provides for direct reporting of GHG emissions to the Ministry by commercial, institutional and industrial enterprises. While Ministerial Decisions do not have the same power as a decree or a law, they still provide the Ministry with a valuable mechanism for collecting necessary data. Therefore, the Ministry needs to rely on methods other than formal compliance measures to facilitate participation. This increases the importance of developing associated processes that businesses value and can buy into and support.

Under the LECB Programme, one means by which the Ministry is seeking this buy-in is through applying a tool that enables complying entities to generate information that can be useful to their business. An Excel spreadsheet has been developed where reporting entities provide information on activity data used for calculation of GHG inventories. This data includes kWh of electricity used, private generator specifications, gas/diesel oil consumption, liquid petroleum gas and heavy fuel oil consumption (for energy use), gasoline and diesel (for transport) consumption, and raw materials used for industrial processes as well as quantity of industrial production. The entity's GHG emissions are then calculated by applying IPCC default emission factors. The functionality to calculate GHG emissions (carbon footprint) at a firm level provides businesses with a useful external metric against which to compare against other businesses, and to measure their performance over time and identify cost reduction potential or gained efficiency. The Ministry issues certificates of reporting to entities meeting the reporting requirements to acknowledge their cooperation. There has been a five-fold increase in the number of entities reporting under Ministerial Decision 99/1 in 2014 compared to 2013.

The Ministry uses the information collected through the process in several ways. It is used to assist in verifying aggregate data for use in the national GHG inventory. It is also used to estimate energy consumption by the residential sector. The new data should enable the Ministry to separately report energy consumption for manufacturing industries and construction (MIC) and residential, as encouraged under the IPCC guidelines. In addition, partner institutions like the Lebanese Petroleum Authority (LPA), the Ministry of Energy and

Water (MoEW), Electricite du Liban (EDL), and others are interested in this breaking down of energy consumption (which has never been calculated) to better plan national policies (i.e., tariff applications, allocation of natural gas use, quantification of each sectors' needs). Importantly, the Ministerial Decision also establishes a mechanism to provide the necessary continuous flow of information for GHG emissions reporting by replacing the existing more ad hoc and sector specific processes.

The Decision stipulates that entities should have the submitted data certified by an auditor or accountant prior to it being provided to the Ministry. This is an interesting and important component of the process and something that other countries could consider as part of a broader quality assurance process for new data collection processes. In addition, this data is then subject to internal quality control assessment by Ministry officials who review the completeness of the activity data and the assess whether the conversion of the activity data to GHG emissions is correct. This is another simple but important quality control process. Once the data has been cleared, the Ministry then issues the certificate of reporting. The list of certified companies is shared with the Central Administration of Statistics, the Ministry of Economy and Trade, and the Ministry of Industry. As a way to address potential confidentiality concerns, the data provided by reporting entities is not shared with these other government agencies.

Programme officials in Lebanon advise that entities have traditionally been reluctant to provide information directly to the Ministry of Environment. If this attitude prevails it could impact on the effectiveness of the Ministerial Decision. A further complication is that the process of collecting, maintaining and archiving data on a regular basis requires dedicated resources. Ideally this would be in the form of permanent staff and functions. The LECB Programme is providing the resources currently dedicated to implementing the Decision to the Ministry. However, it is not clear that the Ministry can provide these resources on an ongoing basis in the future.

3.2   Environmental Compliance Decree

The Ministry of Environment is also implementing another process that could provide valuable activity data - the Decree on Environmental Compliance of Establishments (8471-2012). The Decree comes into force in 2015. The Decree defines the responsibilities of the private and public sectors in complying with national emissions standards. It stipulates regular environmental audits, the establishment of associated environmental action plans, and reporting to the Ministry of Environment. The Decree also provides for the Ministry to undertake periodic reviews to evaluate ongoing compliance. A Decree is higher in the legislative ranking than a Ministerial Decision. The plan is that the Ministerial Decision be subsumed under the Decree and provide particular support for the audit processes. This also provides the Ministry with another important tool to assist in and/or unify the data collection. A certificate of compliance will be issued to entities complying with the requirements of the Decree.

3.3   Nationwide survey on commercial, industrial and institutional sectors

The Ministry of Environment has also launched a nationwide survey to collect activity data and information on mitigation action from the commercial, industrial and institutional sectors. The survey is intended to augment existing data sources. It is also intended to assist with verification of existing aggregate data used in the GHG inventory and to complete work to assess possible and existing mitigation actions. This will assist the Ministry to: identify high emission sources where significant mitigation actions could be planned; assess mitigation actions that are taking place (especially those from private initiatives which are not being documented); and calculate the quantity of GHG reduced by those mitigation actions. The survey targets around 180 industries and 250 commercial and institutional entities. The final results from the survey are expected by early-2015.

3.4 Processes/mechanisms for collecting data

The LECB Programme is also assisting the Ministry of Environment to assess the best mechanisms for collecting data from commercial, industrial, and institutional entities. Views will be sought by the same entities polled under the nationwide survey on activity data collection (see 3.3) on the mechanisms they prefer for providing data to Government. Entities will be surveyed on whether existing approaches such as providing annual reports to ministries or online mechanisms are preferred. In addition, views will be sought on whether a more centralised data collection process across government would be beneficial. A pilot phase was launched in late-October 2014.

4 SYSTEMS DESIGN CONSIDERATION

4.1 Arrangements to better use and share data

An important component of effective national MRV systems is the establishment of arrangements for sharing data between agencies. As noted above, this has been identified as an area for improvement in Lebanon.

The LECB Programme has assisted in facilitating a process between the Ministries of Environment and Industry to determine how they can better share data, including whether and how Environment could periodically access Industry's database. A Memorandum of Understanding was recently successfully finalised between the Ministries.

4.2 Quality assurance and quality control

New data brings with it additional challenges for not just the collection, but also the maintenance and archiving of data. This is particularly the case where new mechanisms/processes are established. A time series with consistent assumptions that is regularly collected is a vital quality of robust GHG activity data and lends itself to long-term sustainability of the MRV systems.

It is important therefore that MRV system design include fundamental elements of QA/QC and verification. The Ministry of Environment currently conducts a range of quality control procedures for GHG activity data and emissions calculations for information used in the national GHG inventory. This includes checking formulae, checking for outlier numbers, comparing against industry average, comparing bottom up data collected to aggregated data available at national level, and undertaking expert consultations to validate data. These processes are undertaken manually. In addition, expert judgement (experts in departments and academics) is deployed to quality control activity data and emissions estimates. The need to apply sound QA/QC techniques, such as those currently employed, will only increase as the quantity of data increases through the new collection processes being established and as the Ministry begins to better access data from other sources. Automating QA/QC processes will also become increasingly important.

5. CONCLUSIONS

Lebanon is focusing on establishing a national-level MRV system. The Ministry of Environment is actively working to address weaknesses it has identified in data collection processes in its existing MRV systems. A number of new approaches are being employed to collect new GHG activity data and better utilise existing data.

Lebanon is making use of formal executive-level orders to collect data from commercial, industrial and institutional entities. Ministerial Decision 99/1 and the Decree on Environmental Compliance of Establishments do not have the full power of law, but they are faster to develop and implement and provide vital tools to request and collect GHG activity data. In recognition that the orders are not backed by a formal compliance regime, the LECB Programme and Ministry of Environment are working to develop tools that minimise the administrative burden on reporting entities and that are structured so as to provide the relevant commercial, industrial and institutional entities with information that they can also potentially usefully apply as part of their operations. This pragmatic approach provides valuable insight for other countries.

The LECB Programme is also working with the Ministries of Environment and Industry to augment existing data collection processes with a small number of supplementary questions to elicit important GHG activity data. As with the executive-level orders, the focus has been on minimising the administrative burden on reporting entities and creating tools that potentially have some added value for these entities. An attempt is also planned to engage the Ministry of Finance and try to incorporate the GHG activity data collection as part of the industrial/commercial tax declaration forms.

The Ministry of Environment currently employs a range of quality assurance/quality control (QA/QC) procedures in its national GHG inventory. Importantly, as it develops new data collection processes, it is identifying practical opportunities to build in new QA/QC procedures. These will be increasingly important as the volume of data increases from the new data collection processes and as the Ministry of Environment better accesses data from other sources. This pragmatic approach that recognises the importance of QA/QC and incrementally implements practical measures provides a useful example for other developing countries developing MRV systems. It will be important that the arrangements being implemented are practically and financially sustainable.

Annex 4. Case Study on Measurement, Reporting and Verification in Philippines

ABSTRACT

This paper outlines work being undertaken on measurement, reporting and verification (MRV) in the Philippines under the UNDP Low Emission Capacity Building (LECB) Programme (the Programme). The paper considers the MRV of greenhouse gas (GHG) emissions, as well as socio-economic and environmental indicators. It does not address MRV of financial support. The paper focuses on the Philippines' priority area of developing a national MRV system; however, work is also planned for an MRV system for NAMAs and the Programme's broader work includes NAMA development and Low Emission Development Strategies.

The paper is structured around five substantive sections. The first section outlines the political context for MRV in the Philippines. The second section describes progress on the first of the two major initiatives to date for the national MRV system – an executive governance arrangement. The third section describes work on the second major initiative – the national MRV database system, with a focus on capacity building, consultation, coordination, and data assessment. The fourth section examines potential key areas for further consideration as the national MRV database system is established, including system design, build and sustainability. The fifth section of the paper briefly considers two other areas of work – data collection and emissions factors.

1. CONTEXT

The focus of the Philippines response to climate change has been, and continues to be, on adaptation. The Climate Change Commission (the Commission) emphasizes that the Philippines views mitigation actions as a function of adaptation to the impacts of climate change. Reflecting this prioritization, a database system and associated monitoring and evaluation system have already been established to track adaptation actions. The Commission advises that the Philippines' approach to addressing both adaptation and mitigation is to integrate responses to climate change into broader policy making. The need to ensure consistency with broader economic development objectives is a further defining factor of the Philippines response to climate change. The work of the LECB Programme on MRV, NAMAs, and 'sectoral mitigation road maps', which is implemented through the Commission, is consistent with these philosophies.

The Commission's MRV work is currently focused on the establishment of a national MRV database system. The system will initially capture GHG emissions. However, by adopting a national scale, and through the Commission's stated intention to collect data on a broader range of socio-economic and environmental indicators, the system should evolve to increasingly support the Government's broad sustainable development objectives. The narrower initial focus reflects a pragmatic decision to ensure that the scope of the work is manageable.

The MRV programme is being built from a low data and knowledge base. The first and second National Communications and the associated GHG inventories were developed to meet the objective of complying with international reporting requirements as defined under the United Nations Framework Convention on Climate Change. While the inventories meet this objective, they are not sufficiently detailed to guide broader climate change policy as is now desired. As a result, the process for creating a national MRV system essentially requires starting over with collection of new data and building in-house experience and expertise. The Commission has emphasised that addressing this situation is a key driver for their current approach.

2. POLITICAL FRAMEWORK – CURRENT WORK

An important component of an effective MRV system is a strong governance framework and/or a legislative/regulatory mandate. These tools secure the necessary support and buy-in of relevant agencies and institutions.

The first major area of the Commission's work on a national MRV system is the development of an Executive Order on Climate Change – "Institutionalising the Philippine Greenhouse Gas Inventory System" (the Order), which will be issued by the President. While it does not have the same authority as legislation/regulation or a Presidential decree, an Order provides a clear signal to agencies of the Government's intentions and increases credibility of the initiative. Now at the final approval stage, the Order will provide the overarching framework under which the Commission's work on MRV can be undertaken. Specifically, it will provide for the establishment of a national GHG inventory system, outline the high-level roles and responsibilities of agencies reporting GHG emissions in support of this system, and provide for the establishment of a national database to underpin the system.

The Order will be elaborated through a set of Implementing Rules and Regulations. These will detail the roles, duties and responsibilities of relevant agencies and organisations. The Commission advises that it will then further elaborate these rules into a comprehensive manual that will provide practical guidance on detailed matters such as how to conduct quality assurance/quality control (QA/QC), archiving of data, and procedures and formats for transferring data.

3. NATIONAL DATABASE SYSTEM – CURRENT WORK

The second major area of the Commission's work on MRV is the development of a national MRV database system. The mandate for the National Integrated Climate Change Database and Information Exchange System (NICCDIES) is specified under the draft Order. The NICCDIES is intended to support the three central elements of the Philippines mitigation strategy: a national GHG inventory system; development of mitigation actions (or NAMAS); and MRV of support. The Commission has focused on building capacity and planning for the development of the NICCDIES.

There is a strong technical rationale for prioritising the development of a national MRV database system. While data quality and depth is variable across the various agencies, several key institutions have data of sufficient quality based on interviews with local experts. It would appear that the Bureau of Agricultural Statistics (BAS) in particular has excellent data, a good time series, and thorough QA/QC procedures. Additionally, the recent decision to combine the four statistical agencies as part of the Philippines Statistics Authority could be beneficial if, as expected, such a professional approach is replicated throughout the new agency.

The Department of Energy (DoE) and the Forest Management Bureau (FMB) also appear to have good activity data. DoE collects data on the country's energy balance that they then use to project future demand

and supply. The DoE also collects data on household energy consumption. The FMB, which is the primary source of forest statistics, recently completed work to stratify forest types at a national level and is working on developing associated emissions factors. The product of this work is a REDD+ reference emission level. The Commission advised that while GHG emission data is not specifically being collected, many other agencies are collecting data that would be valuable for emissions calculations – they may just not be aware of it. An important component of the NICCDIES will be utilising this data.

3.1   Capacity Building, Consultation and Coordination

A primary element of the NICCDIES work has been on planning, capacity building and developing understanding of the importance of a national MRV system in other agencies. The Commission has engaged in this task at the technical level (through workshops, training sessions etc.), through the senior executives of the Commission, and through the Secretary of Environment and Natural Resources. In addition, the President of the Philippines has included climate change as one of five primary organisational groups in his Cabinet. This high-level engagement has facilitated engagement in the Commission's work, including the development of the NICCDIES.

As a result, there appears to be increasing recognition of the importance of a national MRV system and the role it will play. The BAS, for example, is proactively preparing for their new responsibilities and has independently organized and funded workshops on the use of Colorado State University's Agriculture and Land Use (ALU) National GHG inventory software, so as to be better prepared. Whilst some agencies such as BAS actively engage with their new responsibilities, it is important to recognize that a possible issue exists with the ability of other agencies to absorb potentially significant new functions without funds being specifically allocated.

The Commission has established an inter-agency committee entitled the Database Keepers Committee to assist in building buy-in and to coordinate development of the NICCDIES. The Database Keepers Committee has representatives from all relevant agencies and includes senior technical, policy and IT staff. Importantly, the Database Keepers Committee is a decision-making body with overarching responsibility for the development of the NICCDIES, and it acts as the secretariat. Its functions include: defining the scope of the NICCDIES; considering and agreeing the system design, overseeing the design of guidelines on data sharing protocols, and overseeing the implementation of the NICCDIES. The functioning of the Database Keepers Committee will be established under a memorandum of understanding between the member organisations.

The Commission is also actively coordinating donor engagement and three key initiatives that are actively engaging in MRV activities in the Philippines: the LECB Programme is assisting with the development of the overarching NICCDIES system as well as data for the agriculture, industrial processes, transport, and waste sectors. On the sector specific work, the Programme is focusing on structural elements such as analysis of the data management platforms and organisational structures; USAID is working in a similar fashion to LECB on the energy and forestry sectors through its Enhancing Capacity-LEDS programme; GIZ is providing broad capacity building support spanning the whole of MRV through its Information Matters project, funded by the government of Germany. The central role that the Commission plays in response to climate change means that it is well placed to coordinate the work for all donor programmes. This approach has strong benefits in tailoring donor programmes to country needs and avoiding duplication of effort.

3.2   Data assessment

A second element of work on NICCDIES has been assessing data availability and quality. The Commission has undertaken various processes to assess what information is currently available, from which sources,

and in which forms. One of the first tasks conducted was to undertake a gap analysis (funded by USAID). This was a consultative process and involved all the relevant agencies. The agencies identified a number of areas where good data already exists, as well as other areas that need strengthening.

The Commission is now conducting a more detailed follow-up survey of government agencies. This includes the classification of data as primary or secondary sources, and categorising the types of information available such as data, maps, tables, etc. The survey findings will be incorporated into the NICCDIES system design. As with the gap analysis, the relevant agencies are an essential part of this process.

4. NATIONAL DATABASE SYSTEM - AREAS OF FUTURE WORK/ CONSIDERATION

4.1   Design considerations

The Commission advises that the NICCDIES system will be structured on a decentralised model. This would see the Commission nominally house the system, but with agencies wholly responsible for collecting and 'entering' data into the system. The detail on how agencies would enter data is to be determined, but the Commission has indicated that this could be through automatic extraction from existing databases, where available. The Commission is still identifying its primary functions beyond housing the NICCDIES system, e.g. QA/QC, report generation, etc.

 An alternative model that could be applied, and is used in countries such as Australia, is a centralised model where the Commission or some other agency would be wholly responsible for entering data, performing emissions calculations, QA/QC, etc. A hybrid of these two approaches is also possible. Under such an approach, agencies with greater capacity would be responsible for entering activity data, determining relevant emissions factors and undertaking QA/QC, with the Commission or another agency responsible for undertaking these functions for agencies with fewer resources or less capacity.

As noted above, in developing the NICCDIES, the Commission has initially prioritised assessing data and capacity building. It has decided to defer consideration of systems design and choice of IT platform until it has a good picture of available data, methods and governance structures. This is a prudent, particularly given the limited activity data and experience with emissions calculations within agencies besides the Commission. It does mean though that systems development will progress more slowly.

There are broadly two fundamental elements that will need to be considered as part of the systems design. First, whether the NICCDIES will capture activity data, emissions estimates, or both? In a decentralised model, essentially this is a question of what functions to decentralise to agencies. It could be that this decision varies depending on the capacity of individual agencies. The BAS is already adopting the ALU system to undertake emissions calculations. This involves the BAS extracting relevant information from its existing databases. Other agencies are using IPCC spreadsheets to undertake emissions calculations, and a third group of agencies are not currently undertaking any emissions calculations.

A second fundamental design consideration is whether to build IT infrastructure that integrates any existing system/databases or whether an entirely new IT system would be built. This latter question in particular will involve specialist IT knowledge and advice.

Existing systems, particularly those for emissions calculations, are often developed on an ad-hoc basis by individuals or teams responding to short term needs. These systems may not be suitable over the medium

term for integration into a broader MRV IT system, as amongst other things these systems may struggle to deal with increasing volumes of data. Some agencies are also still predominantly relying on hard copy (paper) processes and archiving. These agencies would then also require the establishment of computerised systems that would be linked to the national MRV system.

The Commission advises that the NICCDIES system should be introduced economy-wide, rather than phased in on a sector-by-sector basis. There are advantages and disadvantages with this approach. From a practical level, a phased roll out provides the opportunity to test the system first with a smaller number of users but in a working environment. Any adjustments or improvements can be incorporated prior to operationalization. Given the systematic approach being taken elsewhere, there is probably a good case for a phased introduction.

4.2   Systems build

The development of IT systems requires a significant investment in both time and resources. Careful consideration should be given prior to adopting this approach to ensure it matches the country's needs and capabilities. The Philippines approach suggests such consideration has been given. In addition, it is important that specialist IT expertise is deployed for project planning and development of systems requirements, and systems build. This helps ensure, amongst other things, that the development specifications and timeframes are realistic.

The Commission has advised that work is currently being undertaken on a terms of reference to develop the system requirements, to build the IT system, and to conduct training on the use of the system.

4.3   Systems approach

A key factor in developing a database system is to address supplementary areas such as governance (internal and external), business processes, and future funding arrangements. A systems approach also includes consideration of elements such as QA/QC, verification, data archiving, and reporting tools and functions.

The Commission has adopted a systems approach to the development of NICCDIES. Importantly, as elsewhere, they are developing the national database system in a highly consultative manner. A four-day meeting is being planned as a forum for all agencies to discuss and agree on the broader systems approach, priorities and implementation schedule. The Commission advised that these decisions and supplementary material to support them will be comprehensively documented in a 'user manual' to be distributed to all relevant agencies. The agencies under the Philippines Statistics Authority have good experience in this area and their expertise and experience will be an important resource.

4.4   System Sustainability

A key factor in systems development, particularly where donor assistance is provided, is ensuring sustainability so work can continue once the donor funding ends.

The Commission has been working to ensure the sustainability of the NICCDIES system and more broadly the Philippines' response to climate change. An important element of this is financial sustainability. The Commission developed a joint memo with the Department of Budget and Management that requires agencies to allocate funds to addressing climate change. The Commission of Audit has recognized this requirement in the most recent Budget cycle and requested those non-compliant organisations to adjust their budgets to include a climate change component. Importantly, the financial sustainability of climate change work is also recognised at Ministerial level.

The Commission's focus on building capacity and understanding in relevant agencies should also help contribute to system sustainability. Systems sustainability also includes making data collection and emissions calculations routine. Annual or biennial inventories enable the building and maintaining of institutional capability – human resources, systems and data. This is critical, particularly for non-automated QA/QC functions. Over the long run this is likely to lead to better inventories and lower costs per inventory cycle. Importantly, it also helps facilitate a continuous improvement cycle where small incremental changes are implemented slowly but routinely.

5. FURTHER AREAS OF WORK

5.1   Data collection

The collection of activity data for emissions calculations is fundamental to any national MRV system.

The Commission has chosen not to specifically focus on improving the quality of activity data at this time, but rather to build a national database system and increase institutional understanding and capacity. The quality of data across relevant agencies is mixed, as are QA/QC processes, data maintenance, data storage/archiving, and reporting. Currently there are no specific systems or processes for collecting GHG inventory data. This is not surprising and is in fact common in developing countries. The use of other relevant data is reasonable and appropriate. A perceived need for specific GHG activity data should not be seen as an impediment for a national MRV system and compiling a national GHG inventory. In fact, waiting for the collection of such data can be counterproductive and lead to perverse outcomes if that slows or stops the establishment of a functioning national MRV system.

It is usual for data to be of varying quality and depth across all sectors. For example, the BAS has excellent data; with time series stretching back to the 1970s in some sub-sectors. Countries will, and should, choose to focus on those areas that are the greatest source of emissions and have the greatest overall mitigation potential.

In collecting activity data for GHG inventories, it is sensible to commence by augmenting existing processes. This has the advantage of not overburdening key data providers but is also more sustainable if you assume that resources for data collection, maintenance, QA/QC, data archiving and reporting also accompany these existing processes. Establishing entirely new data collection processes? This will also likely necessitate the establishment of these additional functions.

The Environmental Management Bureau is adopting this approach with its self-monitoring reports, where it is now adding specific questions on GHG emissions. These reports are submitted quarterly by industry and currently cover water, municipal waste, toxic waste, and environmental impacts. The EMB currently has a legislated role to collect these data, although there is no associated compliance mechanism. A new Administrative Order that provides a basis to request additional information will assist the EMB in this task.

When establishing national MRV systems it can be best to start by collecting national level data, rather than aggregating finer level regional, local government area, or facility level data. This may not always be possible where agencies are set up to aggregate data collected at this lower level. The EMB is an organisation with this structure - it has assigned responsibility for collecting data to teams within regional offices. These regional offices are in turn working with Local Government Units (LGUs) and individual companies. An advantage of collecting less aggregated data is that it is a better tool for evaluating progress of mitigation actions. A disadvantage is that it can increase uncertainty.

It will be important to decide how to sequence data collection. A useful first step could be to identify some high-level national indicators that could be used for the purposes of compiling the national inventory. The Commission is already contemplating such an approach. For example, it is investigating the use of DoE data to calculate GHG emissions from transport as an interim measure while the Department of Transport and Communications develop their data collection processes.

Collecting data directly from industry requires building trust and confidence of industry. One way that this can be achieved is through the establishment of a sound systems approach that includes good governance, data sharing protocols, and data security procedures. It can also be useful to demonstrate how the collection and provision of data can be useful to industry – essentially what's in it for them. Notwithstanding this, unless the provision of data is compulsory it will always be difficult to get the sort of participation that is necessary to have a sufficiently complete data set. That is why high-level support from government and associated legislation and regulations are usually necessary. This though should not prohibit efforts to voluntarily collect data. Industry groups can be a valuable source of data and again this can be an excellent interim or even permanent step.

5.2   Emissions Factors

The Commission advises that in the short term it will continue to use IPCC default emission factors for emissions calculations. For the last inventory, all but one of the emission factors (methane emissions from rice cultivation) were IPCC defaults. Since this time, studies have been undertaken on what emissions factors should be used and developed. The Commission advises that it is investigating hosting a conference where all relevant agencies can come together to address this question. A key category analysis14 will be important to informing any decisions on emissions factor development. The last key category analysis undertaken was prior to the last inventory. It is understood that the USAID EC-LEDS programme is considering future support for emissions factors for the energy and forestry sectors. The EMB advised that it is also investigating establishing a country-specific emissions factor for municipal solid waste.

6. CONCLUSIONS

The Philippines is focusing on national level MRV as its first priority. Excellent progress has been made on the two major initiatives - the development of an overarching governance framework and a national database system (the NICCDIES).

The Climate Change Commission is taking a methodical and consultative approach to building the national MRV system. Significant time and energy has been invested in developing capacity and gaining buy-in from relevant agencies. The decentralised database system will be operated by these agencies, so their understanding, expertise and support is critical.

The NICCDIES system will utilise existing data primarily from government agencies and the new combined Philippines Statistics Authority. These data are likely to be sufficient for the purposes of a national MRV system, but the Commission recognises that further detailed data will need to be collected over time to best evaluate mitigation actions.

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14   Key category analysis is a process set out in the IPCC guidance to national GHG inventory compilers as a means to focus their work on emissions sources with the greatest impact for the country – for more see Chapter 4 of the 2006 IPCC Guidelines - http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_4_Ch4_MethodChoice.pdf

The development of the database system will involve significant time and resources. This may mean that the collection of new data is a secondary priority in the short-term. The development of detailed specifications for the database in consultation with agencies will be critical, as will the selection of a specialised IT firm and the allocation of project management resources in the Commission.

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