Environmental Information for National and International Reporting in the Forest Sector

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ABSTRACT:

Over the past decade, several different international and national reporting requirements have emerged in the forest sector. A central question for country experts is how to gather data once, and then use the information to satisfy several different national and international requirements. Initiating multiple inventories and separate estimates is not a cost-effective approach nor is it likely to provide consistent information on forest conditions and trends. Examples of the forest sector reporting requirements include processes emerging after the 1992 UN-CED meeting (e.g., the Montréal Process and the Pan-European Process); UN-FAO's reporting requirements, including *Global Forest Resource Assessment* reports, forest statistics for the UN-Economic Commission on Europe and FAO regional forestry commissions (e.g., the North American Forestry Commission); and statistics reported by the International Tropical Timber Organization. The USA has worked diligently in recent years with partner countries to find ways of meeting multiple national and international reporting requirements from a single set of forest inventory and monitoring information. A particular focus of USA activity has been on working with the other 10 countries of the Montréal Process Working Group to develop a standard set of criteria and indicators that are useful and cost-effective not only for the Montréal Process national reports, but also for satisfying FAO and ECE reporting requirements and contribute to ITTO activities. Further, the process by which the Montréal Process criteria and indicators were developed provides lessons that are applicable to other processes and activities. The paper will highlight those lessons learned and discuss cost-effective strategies for developing information and statistics useful for satisfying multiple national and international reporting requirements.

INTRODUCTION & RECENT HISTORY

The 1992 UN-CED meeting led to an outpouring of interest in developing ways to track the effects of development activities on forests. Countries around the world with similar forest types worked together to develop frameworks of criteria and indicators for tracking conditions and trends in forests.

By 2000, nine groups had emerged that were attempting to gather, report, and use information about their forests. These groups all were being generally encouraged in their individual endeavors by the United Nations Forum on Forests (UNFF) and several were receiving active technical and financial support from UN-FAO.

- *African Timber Organization* (ATO). Participants include Angola, Cameroon, Central African Republic, Congo, Cote-d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria, Sao Tome et Principe and Tanzania.
- *Dry Zone Africa Process* (DZAP). This Process covers a total of 30 countries, ranging from South Africa to Mauritania
- *Dry Forests Asia Process* (DFAP). The participating countries are Bhutan, China, Mongolia, Myanmar, Nepal, Bangladesh, Thailand, Sri Lanka and India.

- The ***Near East Process*** (NEP) includes 30 countries, extending roughly from Morocco to Pakistan.
- The ***Lepaterique Process*** (LP) is a cooperative effort by Central American countries, including Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.
- The ***Tarapoto Proposals*** (TP) are aimed at improved management of the Amazonian forest by the signatory countries of the Amazon Cooperation Treaty: Brazil, Peru, Colombia, Ecuador, Bolivia, Guyana, Suriname and Venezuela.
- The ***Montréal Process*** (MP) for the Conservation and Sustainable Management of Temperate and Boreal Forests. Members include Argentina, Australia, Canada, Chile, China, Japan, Mexico, New Zealand, Russian Federation, South Korea, United States of America, and Uruguay.
- The ***Pan-European Process*** (PEP) covers 41 countries ranging from Iceland to the Russian Federation and south to Turkey.
- The ***International Tropical Timber Organization*** (ITTO) In contrast to the preceding groups, ITTO is unique, because its members are primarily linked by market relationships (producer countries and consumer countries). There is considerable overlap between ITTO consumer countries and countries participating in the MP and PEP.

At the dawn of the 21ˢᵗ Century, there was a great deal of activity underway in these processes. Numerous small meetings were held around the globe. In 1993, a decade after UN-CED, representatives from 51 countries, 10 international organizations, 9 secretariats of regional processes, and non-governmental organizations and the private sector gathered in Guatemala to share views and report on progress being made by individual countries and processes. The meeting, *International Conference on Criteria and Indicators for Sustainable Forest Management,* (CICI) passed 24 recommendations.[2] The most significant one was summarized as:

> *"That countries consider using criteria and indicators as essential tools to report to UNFF on progress towards sustainable forest management to help ensure that the forum's dialogue be clearly focused on sustainable forest management and that it recognize the contribution of criteria and indicators, as well as sustainable forest management, to other sectors and to sustainable development."*

Four other recommendations are particularly germane for the FDES project:

- *In considering the potential benefits of a common set of criteria based on existing sets elaborated by regional and international processes, participants acknowledged seven common thematic areas: (1) extent of*

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[2] Proceedings of the International Conference on Criteria and Indicators for Sustainable Forest Management are on the UN-FAO web site in two volumes: http://www.fao.org/DOCREP/005/Y8694E/Y8694E00.HTM, and http://www.fao.org/DOCREP/005/J0077E/J0077E00.HTM.

> *forest resources, (2) biological diversity, (3) forest health and vitality, (4) productive functions of forest resources, (5) protective functions of forest resources, (6) socio-economic functions and (7) legal, policy and institutional framework.*
>
> - *National forest assessments and inventories are a basic source of information on indicators. Countries should incorporate the main elements of criteria and indicators into their assessments and develop cost-efficient data collection strategies.*
> - *Better cooperation is needed among national and international organizations collecting forest data. FAO should use the thematic areas common to all regional and international sets of national-level criteria in the overall framework for the Global Forest Resources Assessment (GFRA), while helping to ensure specific national aspects are incorporated. GFRA information should facilitate use of criteria and indicators nationally and internationally, including in UNFF, and improve the compatibility of information from different sources.*
> - *The FAO Committee on Forestry (COFO) should reaffirm implementation of criteria and indicators as an FAO priority, including technical assistance and capacity building through the National Forest Programme Facility, and strengthen FAO's role in facilitating collaboration among criteria and indicator processes.*

Subsequently, the UN-FAO adopted the seven thematic areas for organizing and preparing future Global Forest Resource Assessments (GFRAs). Although this recommendation was received in the latter stages of work on the 2005 Global Forest Resource Assessment, good progress was made in using the thematic areas as a framework in the 2005 report. From the beginning of the 2010 reporting process, improvements and refinements to the data requested for the 2010 report were heavily influenced by indicators being used by the several processes. In addition, the Montréal Process, Pan-European Process, and International Tropical Timber Organization held several workshops to further the recommendations from CICI. Proceedings of those meetings[3] document the progress made in "harmonizing" collective understanding of both a framework for criteria and indicators as well as specific definitions and measurement and estimation protocols.

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[3] The **Inter-Criteria and Indicators (C&I) Process Collaboration Workshop,** held on 8–10 June, 2006, in Bialowieza, Poland, was a collaborative effort by ITTO, the MCPFE, the Montreal Process, UN-FAO, UNECE and the U.S. Forest Service. http://www.foresteurope.org/filestore/foresteurope/Publications/pdf/bialowieza_2007.pdf. The **Forest Criteria and Indicators Analytical Framework and Report Workshop**, held May 19-21, 2008, in Joensuu, Finland, was a collaborative effort by METLA, the Montréal Process, ITTO, UN-FAO, the Finnish Ministry of Agriculture and Forestry, and the U.S. Forest Service. http://www.treesearch.fs.fed.us/pubs/34272

Today, 18 years after UN-CED, the global forestry community has a useful framework of thematic areas and a workable set of indicators to report on conditions and trends under each theme.   Under the leadership of UN-FAO's Forestry Department, ITTO, the Montréal Process, and the Pan-European Process, work continues on refinements to the indicators being used for reporting information on conditions and trends in forests.

LESSONS LEARNED ALONG THE WAY

As a participant in all the major meetings and workshops about criteria and indicators in the forest sector over the past decade, as the U.S. representative to the Montréal Process, and as the Forest Service official whose staff contributes significantly to ITTO and UN-FAO activities, I have developed a set of observations—call them lessons learned—about productive and efficient ways to develop and use criteria and indicators. Some of these may be applicable to the current project.

<u>Choosing criteria or thematic areas for monitoring and reporting is inherently a political choice, not a scientific one, and best made through broad-based dialogue</u>

Because forests are very complex ecological systems, providing a wide variety of ecological services (e.g., clean water; habitats for wildlife, fish, and pollinators; sequestration of atmospheric carbon) and useful products (e.g., medicinal plants; wood for fuel and construction materials; food; tourism), scientists are often strongly tempted to use a large number of criteria and indicators in an attempt to monitor every aspect of the ecological, economic, and social dimensions of forests. Simply put, even if it were possible to identify all the services and goods forests provide, all their production processes, and all the inter-relationships amongst the production processes, the monitoring system spawned would be so expensive that no country could afford to implement it.   Rather, what is needed is a simple set of a vital few dimensions of the forest and its associated economic and social systems that are economical to monitor well and regularly over time. Although good science is needed to design and implement the monitoring system, the choice of what to focus on and what to monitor is a political, not a scientific one.

In all the successful processes that I have participated in both internationally--the Montréal Process, UN-FAO, ITTO—domestically—the *State of the Nation's Ecosystems*[4]--the most important attribute of the process for choosing criteria and indicators was open and candid face-to-face dialogue amongst individuals representing a broad range of interests about what are the most important values derived from forests. Building trust and understanding of the diverse views and values held by participants was an essential precursor to making choices about what the most important and useful dimensions were for monitoring and reporting. Further, the trust and understanding created was important to having a broad-based coalition of interests to advocate for funding and implementing environmental monitoring and reporting. In the Montréal

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[4] H. John Heinz III Center for Science, Economics, and the Environment. 2008. State of the Nation's Ecosystems. Washington, DC.: Island Press. http://heinzctr.org/publications/index.shtml#majorreports

Process, it took two iterations of dialogue, each five years long, among representatives from the 12 countries to arrive at a set of 7 criteria[5] that each speaks to a very important dimension of the values that forests provide. Similarly, to develop the indicators for the *State of the Nation's Ecosystems* project, carefully facilitated dialogue amongst representatives from academia, federal and state government, industry, and environmental groups took five years to develop and test a workable set of indicators for six sectors--forests, croplands, rangelands, urban areas, freshwater, and coasts and oceans.

There are two implications of this observation for the current project:
1. Because of the extended and effective dialogue within the forest community since UN-CED, endorsing the global thematic areas for forests that have already been chosen and being used in the UN-FAO GFRA process would take advantage of the excellent dialogue that created the reporting foundation already built.
2. The importance of open and candid dialogue to the success of environmental indicator processes in the forest sector and cross-sectorially within the USA suggests that building opportunities for dialogue into choices about environmental statistics would enhance the likelihood that they will be selected, implemented, and used in national decision-making.

<u>The best indicators are ones that are relatively simple to explain and whose protocols are implementable by many countries</u>

The word "indicator" is used here, and in the Montréal Process, as a measure of an important aspect or dimension of a thematic area or criterion. It is a quantitative or qualitative variable that can be measured or described consistently through time to report on the current condition and compared to previous reports to display a trend through time.

Ideally, environmental indicators should be chosen that have several key attributes:
- Simple to explain to policy-makers and the populace;
- Relevant to important values;
- Easy to implement consistently, both spatially (across a country or a region) and temporally (over time);
- Affordable, given the country's budget and technical capacity;
- A substantial existing body of science exists that provides a rationale for why the indicator itself is important and, if a reference range is needed, why the reference range is important;
- Useful screening tool, with additional monitoring investments able to be made and more complicated techniques deployed when the indicator identifies a higher than acceptable environmental, economic, or social risk.

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[5] Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. 4th Edition. October 2009. http://www.rinya.maff.go.jp/mpci/2009p_4.pdf

It is challenging to find indicators that have all six of these attributes. Common problems encountered when discussing potential forest indicators the following:
- Indexes that reduce a suite of conditions to a single number are rarely easy to explain to policy-makers or the populace.
- Measures chosen by technical experts often lack broad-based support from the many interests having diverse views. Diverse interests need the opportunity for dialogue to better understand how an indicator serves their interests and the interests of others.
- Consistency requires clear definitions, well-trained practitioners, and a solid quality assurance/quality control (QA/QC) program to assure comparability spatially and temporally. There is a cost associated with training and QA/QC that needs to be carefully considered.
- What is affordable and technically feasible for some countries will not be so for many others. Further, depending on the wealthy and technically advanced to do the work for others carries substantial risks. Building internal capacity to implement monitoring and reporting reduces those risks.
- Although choices of indicators is necessarily a political decision, there must be an existing body of science that provides a foundation for why particular indicators are meaningful in terms of the values they inform and the methodologies used.
- To be a useful screening tool, an indicator's measurement and estimation protocols must be sufficiently sensitive to detect meaningful changes over time. A "flat line" indicator will eventually be ignored, as will one that fluctuates excessively for little apparent reason. Finding the "sweet spot" of sensitivity combined with relevance is more difficult than it appears.

Of these six key attributes, my experience has shown me that two are most important—simple to explain to policy-makers and the populace, and affordable given a country's budget and technical capacity. Having the other four attributes without those two endangers success. So finding indicators that have those two attributes first, and then some or all of the other four has been the best approach.

Of all the forest indicators, "Forest Area" is probably the simplest to explain to policy-makers and populace. It's difficult to make the case for sustainable forest management and a sustainable flow of the services and goods that forests provide if the area of forest is declining. Further, there is a substantial body of science regarding the effects of forest area on the levels of services and goods that forests provide. But because it has been difficult to identify an affordable sampling procedure to estimate forest area, country estimates of area submitted to UN-FAO for GFRAs have sometimes had questionable accuracy or low precision.

Remote sensing offers promise for improving the consistency of forest area estimates around the world, but only if the remote sensing is accompanied by enough field validation to confirm the accuracy of the image classification algorithms. Remote sensing alone is insufficient. The U.S. Forest Service is working with UN-FAO's Forestry Department specialists on a global remote sensing project that includes ground validation plots.

<u>Building three suites of indicators—core, core-optional, and optional—can allow countries to tailor their environmental monitoring and reporting to the issues they face and the investment levels they can afford.</u>

Although 64 indicators are now defined by the Montréal Process for use in preparing the 2015 country reports, the members all recognize that not every country will report on each of the 64 indicators. In the U.S.A., for example, we will know that we have information gaps for certain indicators. From the extensive dialogue we have had with our partner countries, we understand the rationale for identifying these indicators as important ones. As we build future budgets for forest monitoring, we will do our best to add some of the information needed to fill the gaps we have. But the point is we are not able to meet every indicator reporting expectation. It is unrealistic to expect that every country will.

There is merit to defining a set of indicators that set expectations, even when countries cannot report on everything right now. An old story popular in the U.S. environmental monitoring community tells of the man who was downtown one evening and lost his car keys. The policeman who saw him searching for something stopped to help him and asked, "Are you sure that you lost your keys right here? Could you have lost them somewhere else?" The man responded, "No, I'm looking for them here because this is where the street light is and I can see well right here." If we only define indicators for which everyone already has data, then we are guilty of only monitoring environmental conditions under the existing street light. Indicators should be chosen because they are relevant to important values—whether there is currently light shining on them or not. If no data yet exist, then by choosing the indicator outside the realm of current data, support and momentum are built for getting the necessary data to report on it in the future.

In the U.S., it has proven helpful to define some indicators as "national core", some as "core-optional" and some as simply "optional."
- *National core indicators* are ones that are measured the same way in all parts of the country, analyzed using nationally-consistent equations, and then reported out for all 50 States. These national core indicators are the ones that ***must*** be done in exactly the same way.
- *Core-optional indicators* are ones that regional inventory and monitoring program managers or State/Provincial Foresters can choose not to collect in their area. But if they do choose to collect the information, then they must use the approved national data collection and analysis protocols. This assures consistency in comparisons among States or regions where the indicators are used.
- *Optional indicators* are ones where there is both a choice about whether or not to collect and report, and no national protocol for how to go about doing so.

There are two key benefits to having these three suites of indicators. First, the really important indicators are part of the "national core" and standardization assures consistency and comparability. Secondly, regional leaders are provided some flexibility to choose from the other two suites of indicators, based on the nature of the issues in their

geographic area and their importance to them and their stakeholders. Through the "core-optional" suite, some national guidance is provided that promotes consistency, but if an indicator is of little relevance locally or unaffordable based on local budgets, it may be skipped. In our forest inventory program, the "core" and "core-optional" variables typically receive some federal financial support. The "optional" indicators are funded wholly at the local level.

<u>Protocols are needed for each indicator chosen that describe the measurements to be taken, the estimation models used, and the analysis methods used to arrive at the final quantitative or qualitative description of current condition.</u>

An indicator may be a quantitative piece of information (a "statistic") or a qualitative description of a current condition. The typical indicator is composed of several different things. In simple terms, there are several things that are combined: data, models, and analysis. Consider an indicator named Total Volume per Acre and the components of a per-acre volume estimate:

- Data measured and recorded at a field plot include: number of trees and the species of each; the diameter of each tree, and the height of each tree.
- The models used convert the tree diameter and height into a volume estimate, using a volume equation specific to each tree species because each tree species grows with a different form. A considerable body of science and a large dataset of very detailed tree measurements underlay these volume equations.
- The analysis sums the individual tree volumes on each plot, converts the total volume into a per-acre number, and assesses how the per-acre volumes differ across a landscape, reflecting topography, soils, management activities, and other factors.

Protocols for the indicator, total volume per acre, should specify a number of things. The data protocols should begin by describing the sampling frame to be used, and then on individual sample points describe how to measure tree diameters and estimate tree height, including the types of instruments to be used and the acceptable QA/QC standards for data collection (e.g., diameter measurements $\pm 1/10^{th}$ of an inch or ± 2 mm). Protocols for the volume equations should identify what the approved volume equations are, by species, their input variables, and the requirement that the equations have been published in the peer-reviewed literature. Protocols for analysis for this indicator should include the method for estimating forest area used to compute the per-area estimates.

It is one thing for an inclusive public dialogue to reach consensus on the importance of an indicator. It is something different to have the technical specialists reach consensus on the protocols to be used to report on the indicator. But that's an absolutely essential part of indicator reporting to assure consistency, comparability across space and time, and ultimately, create credibility for the reports and the policy decisions made based upon them.

SUMMARY

Forests cover 30 percent of the globe's lands. The ecosystem services and the goods that forests provide are vital to the health and prosperity of people locally and globally. Criteria and indicators that monitor the effects of land use choices and land management activities on the health and productivity of forests make important contributions to understanding the risks to human health and prosperity, both locally and globally.

Extensive experience exists within the forest sector on monitoring and reporting current conditions and recent trends in forests. The several processes that emerged after UN-CED, the leadership provided by UN-FAO and ITTO, and the outcomes of the CICI meeting several multi-process workshops since then have all contributed to laying a sturdy foundation for reporting on environmental statistics relevant to forests. Indeed, the forest sector may be substantially ahead of other important natural resource sectors because of the heightened global attention on the linkages between sustainable economic development and sustainable forests that emerged at and after UN-CED.

The forest sector's framework of seven thematic areas, also known as criteria, is workable. Successes with the 2005 and 2010 Global Forest Resource Assessments, and two cycles of individual country reports for the Montréal Process and the Pan-European Process over the past decade demonstrate the utility of this framework. The blend of ecological, economic, and social indicators used by the forest sector to address the thematic areas is also an important intellectual contribution to environmental reporting. A key decision for the FDES project is how to incorporate what has been learned in the forest sector the past 18 years and apply it to other sectors.

The most important lessons learned from engagement of diverse interests within the forest sector are:
(1) Recognize that choices of criteria are inherently political choices, best made through an open and transparent dialogue with policy makers and the populace;
(2) The best indicators are both simple to explain and affordable to implement; and
(3) Well-defined protocols are essential to establishing the credibility of the indicators chosen and assure their utility over time.

Applying these lessons learned from the forest sector to other sectors covered by the FDES project will help achieve success in the FDES project.