

Forest Sustainability Indicator Tools for Communities

Indicator ToolKit

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It can be found on the web at

www.communitiescommittee.org/fsitool/index.html

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Forest Sustainability Indicator Tools for Communities (2003)

This document was developed as a joint project between the U.S. Forest Service, American Forests, and Sustainable Measures. It was developed as part of the *Linking Communities to the Montreal Process Criteria and Indicators* project, a three-year project, begun in 2001, to advance understanding of how local, regional, and national efforts to develop sustainability criteria and indicators can be connected. Information and lessons from the project were used to provide feedback in the preparation of the 2003 report on the sustainability of U.S. forests based on the application of the Montreal Process Criteria and Indicators (MP C&I).

This document is intended to serve as an indicator 'tool kit' for forest-based communities that are working on maintaining and enhancing their natural resources as a basis for long-term economic, social and environmental health. A key component of the tool kit is the Montreal Process Criteria and Indicators - a framework, which helps assess ecological, economic and social aspects of forest resources. Although originally developed to evaluate national progress toward sustainable forests, the framework can be adopted at local level. Three communities tested this tool kit as part of the three-year pilot project, funded by USDA Forest Service. Appendix D describes the process each community went through and some of the key lessons learned.

As with any tool kit, the tools themselves do not do the work, rather they are implements that can support communities' efforts to better manage their natural resources for present and future generations.

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Chapter 1: INTRODUCTION

Forests and forest-related natural resources are critical components of the long-term economic health and quality of life of both rural and urban communities:

- They provide key *environmental* functions such as regulation of the water and carbon cycles, purification of the air, and preservation of the biological diversity of birds, mammals and plants.
- Forests are a key element in the local *economy* because of the various business opportunities they create – from harvesting of timber and other non-timber resources to tourism and recreation.
- On the *social* side, many people live in a particular area because of their values and spiritual connection to nature and forests. Walking, hiking, biking, skiing, or hunting are just some examples of uses of forests that many people consider essential to their quality of life. In addition, forest-related jobs and activities help to form the *cultural* identity of many communities.

However, merely realizing that a community depends upon its natural resource base is not sufficient to ensure that those critical assets will continue to provide benefits to the community. Communities need a process for monitoring and evaluating the state of their natural resources, making plans to maintain and enhance those resources and assessing the effective implementation of their plans and programs. One tool that a growing number of communities around the world are finding useful in this process is sustainability indicators.

Sustainability indicators are indicators for measuring and monitoring the long-term health and vitality of the economic, social and environmental systems that are needed to maintain quality of life in a community. Many different types of communities from densely populated urban areas to sparsely populated rural areas use sustainability indicators. However, the purpose of this document is to provide information specific to forest-related communities who are interested in using indicators for measuring and monitoring the overall sustainability of their forest-related way of life. This document has been developed specifically for communities with a particular interest in forest resources to help them use sustainability indicators for

What is an indicator? An indicator is something that helps in understanding an issue or condition. Its purpose is to show you how well a system is working. If there is a problem, an indicator can help you determine what direction to take to address the issue. Indicators are typically numerical, that is, they can be measured and changes can be reported over time.

What is a sustainability indicator? A sustainability indicator is an indicator that is useful in monitoring, making decisions about or measuring progress towards becoming a sustainable community.

What is a sustainable community? Although there are many ways to define it, a simple definition of a sustainable community is a community that improves and enhances its economy, culture and environment in ways that allow both current and future inhabitants to have healthy, productive, happy lives. (*for additional definitions of sustainability and sustainable community, see Appendix A.*)

understanding, monitoring, planning for, and evaluating progress towards becoming a sustainable forest community. Such indicators are needed to ensure the long-term health and productive capacity of forests because:

- Without knowing the baseline conditions and the trends in forest resources, it is difficult to assign priorities to issues.
- Without knowing how different activities affect the resources, it is difficult to plan appropriate actions.
- Without a way to evaluate the success of implemented actions, it is difficult to assess whether programs have the desired effect.

This document has been developed to serve as an indicator ‘tool kit’ for forest-based communities that are working on maintaining and enhancing the natural resources on which their economic, social and environmental health depends. As with any tool kit, the tools themselves do not do the work, rather they are implements that communities can use in getting work done. Every community is different, just as every house is different, but as a hammer, chisel, and a saw can be used to build many different types of houses,

What is the Montréal Process? The Montréal Process is an initiative launched in 1993 in Montréal, Canada, where experts on sustainable development of boreal and temperate forests got together to discuss how they could assist in defining and measuring progress toward sustainable forest management. Currently there are twelve countries involved in the Montréal Process. Together, these countries contain 90% of all the world's temperate and boreal forests.

What are the Montréal Process Criteria and Indicators? The Montréal Process Criteria are categories of conditions and processes that are used by the Montréal Process member countries to assess their progress towards sustainable forest management. The Montréal Process Indicators are measures that can be used to assess the different criteria to determine the health and vitality of the forest resources and the communities that depend on them.

the tools in this ToolKit can be used by many different communities to help build a system for measuring and monitoring progress towards more sustainable forest management. The ToolKit does not include all the materials needed nor is each tool developed to the exact specifications of any particular community. Rather, each tool can be modified or tailored to fit the needs of each community that has chosen to use it.

A key component of this ToolKit is something called the Montréal Process Criteria and Indicators, or the MPC&I for short. The MPC&I is a framework developed to help assess ecological, economic and social aspects of forest resources. The framework has seven criteria or categories of issues that need to be considered for assessing sustainable forestry. Within the

What is a framework? A framework is a way to organize indicators and information to help make it easier to understand and interpret the information in a consistent way. The framework can also help ensure that all key issues are addressed.

criteria, the MPC&I framework has 67 indicators that can be used to measure and assess sustainable forest management. Table 1 below lists the seven criteria and the number of indicators within each of them. Appendices B and E provide additional information and specific indicators for each of the criteria.

Table 1. Montréal Process Criteria

Montréal Process Criteria	Number of Indicators
1. Conservation of biological diversity	9
2. Maintenance of productive capacity of forest ecosystem	5
3. Maintenance of forest ecosystem health	3
4. Conservation and maintenance of soil and water resources	8
5. Maintenance of forest contribution to global carbon cycles	3
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society	19
7. Legal, institutional and economic framework for forest conservation and sustainable management	20

The MPC&I is not the *only* framework for organizing information about sustainable forest communities. There are many different ways that information can be organized. The MPC&I framework is also not necessarily the *best* framework. Just as a carpenter chooses the most appropriate saw for a particular task, a community should select the framework that is most appropriate for their needs. A number of different frameworks are described in Appendix B that may also be useful for forest-based communities. However, there are a number of reasons that a community would choose to use the MPC&I. Some of the benefits include:

- It helps to develop a common language among the various people and organizations involved.
- The indicators allow establishing the baseline conditions of forests and other natural resources.
- The indicators enable tracking trends in forest health and productivity as well as other related impacts (water hydrology, air quality, employment, etc.)
- The MP C&I provide a way to measure impacts of forests on local socio-economic conditions (e.g., jobs, businesses)
- By establishing a common language and measures, the framework allows local communities to participate in national forest-related policy and decision-making affecting them.
- In many cases people value their forests for some things but don't realize the forest's many other critical functions. The MP C&I allows for a comprehensive evaluation of all forest resources (e.g., carbon cycle, water hydrology, biodiversity and genetic diversity, etc.)
- Last but not least, using indicators promotes better management. There is an old saying that “what gets measured gets managed.” Indicators allow identifying critical issues and focus a community's limited resources on addressing these issues first.

As originally developed, the MPC&I framework was intended for use at the national and international levels. However, the MP Criteria are equally relevant to the work and activities that go on in communities and many of the MP Indicators can be adapted to the local community level. This ToolKit was developed as a practical means to assist local communities in using indicators in general and the MPC&I in particular to take charge of their forests and natural resources.

It is important to realize that, by themselves, indicators do not solve problems or make a community and its forest resources sustainable. Becoming more sustainable requires an ongoing process in which the community develops a plan, acts on the plan and then evaluates the results as shown in Figure 1-1.

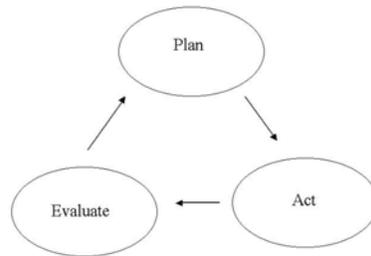


Figure 1-1. Ongoing Plan-Act-Evaluate Process

The process is represented as a circle because there is no set beginning to this community process nor is there a defined end point. Different communities might be at different stages in this process and/or might select a different path to get there. One community may have already developed a plan and be in the implementation phase. Another community may have acted on plans and be ready to evaluate progress to date.

In addition, it is important to realize that the process will change over time. While a community identifies issues, develops plans to address them, and acts on those plans, time moves on and circumstances change. As shown in Figure 1-2, after acting on plans, a community needs to evaluate where the plans and actions have taken them, revise the plans and move on.

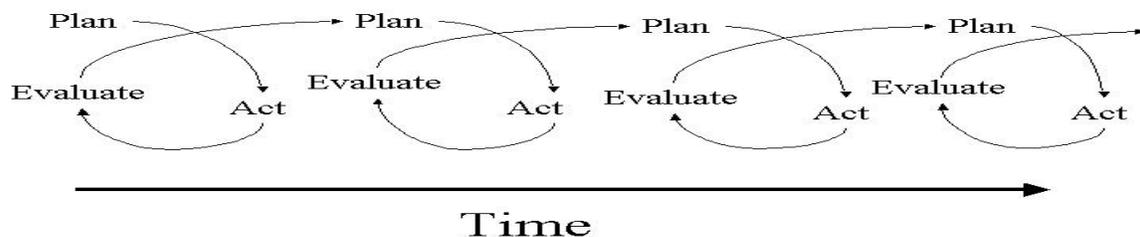


Figure 1-2. Plan-Act-Evaluate as Evolving Process

However, in order for the planning, acting and evaluating process to be successful in the long run, it is important that:

- the community as a whole is engaged in the process,
- there is a common vision and set of goals directing the process, and
- there is a commonly accepted way to measure progress towards the goals.

It is in these three areas that indicators can be very useful and for which this ToolKit has been developed as illustrated in Figure 1-3.

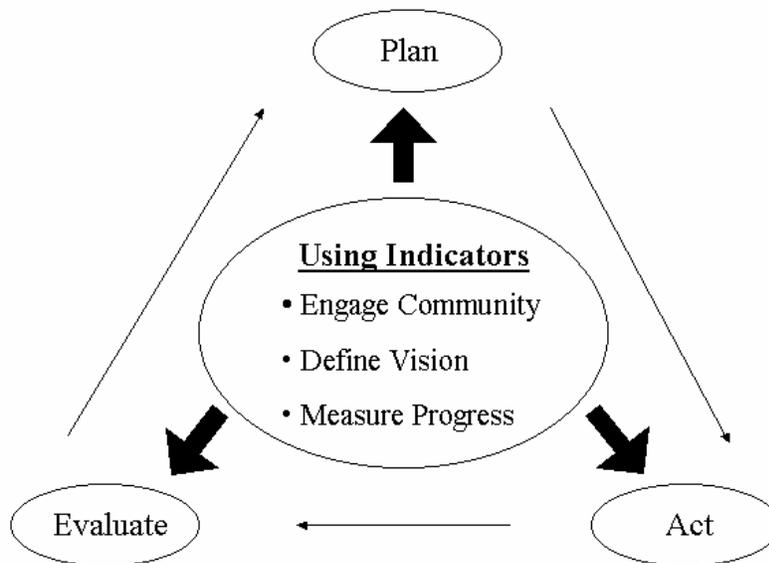


Figure 1-3. Using Indicators in a Community Process

The rest of the chapters in this document provide material for using indicators in a community process.

- **Chapter 2 – Engaging the Community** – talks about how indicators can be used as a community engages a larger group of people and includes ideas about who should be involved and how to set up a meeting and what are some additional resources to use.
- **Chapter 3 – Defining a Vision and Goals** – discusses the importance of having agreement on the critical issues and problems as well as an overall vision of where the community wants to be in 20 or 50 years.

- **Chapter 4 – Measuring Progress** – outlines the main steps in developing indicators, beginning with the purpose of the indicators, selecting the most appropriate ones, setting targets and implementing the indicators.

Each of the above chapters also refers to some ‘tools’ that a community may decide to use at each step in the process. These ‘tools’ are included in the appendices and involve skill-building exercises, case studies, list of forestry-related indicators, and list of resources. The Appendices for the ToolKit are:

- **Appendix A – Definitions** – sustainable forestry, sustainability, sustainable community, and other useful definitions for working with communities.
- **Appendix B – Frameworks for Organizing Indicators** – Ways to organize indicators and information to help address all key issues, see links and interpret the information in a more consistent way. Includes examples of several frameworks in addition to MPC&I.
- **Appendix C – Exercises** – Useful exercises involving indicators at each step.
- **Appendix D – Case Studies** – How several communities have used indicators.
- **Appendix E – Sample Indicators – Forest Sustainability** – A ‘starter’ set of indicators that provide useful examples and explanations of indicators as well as some suggestions for possible data sources.
- **Appendix F – Other Resources** – Documents, web sites, and organizations that may be useful to communities working on sustainable forestry
- **Appendix G – Examples of Sustainable Forestry-Related Goals** – Examples of goal statements related to sustainable forestry and sustainable forestry management.
- **Appendix H – Presentation Materials** – Examples of presentation material that can be used in community indicator processes.

Chapter 2: ENGAGING THE COMMUNITY

Engaging the necessary members of the local community is one of the most critical parts in the process of advancing community sustainable forestry. However, as Figure 2-1 illustrates, engaging community members does not occur at only one stage in the process. Rather, it is done in concert with all the other steps in the process. Engaging and re-engaging the community has to happen throughout the process of becoming a sustainable forest community. The broader the participation base, the greater the support for the process will be and the better the chance for long-term success.

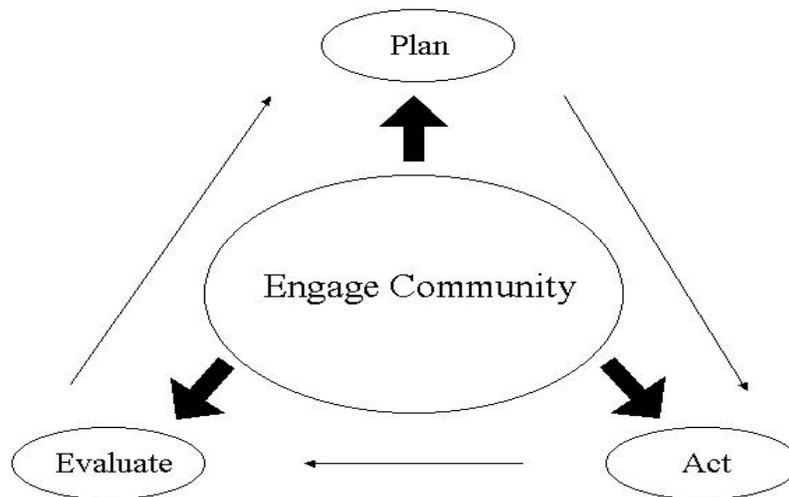


Figure 2-1. Engaging the Community in Plan-Act-Evaluate Process

The process of involving the community is often called engaging the stakeholders. There are many guides on how to engage the public or other stakeholders in a community process. There are also guides on initiating community indicator projects. A number of these documents are listed in the *Additional Resources* section at the end of this chapter and in Appendix F. Rather than attempt to duplicate what is already well documented, this chapter highlights key aspects of this step related to forestry communities and provides suggestions on how indicators can be useful tools for engaging stakeholders.

Who are the stakeholders in a forest community?

Especially in a forest community, some of the key people and organizations to include are:

- Biologists and ecologists
- Community development organizations
- Conservation groups
- Educational institutions (e.g., universities, colleges)

- Farmers
- Forest product firms (e.g., saw mills)
- Foresters
- Health care providers
- Land owners
- Local environmental authorities
- Local or regional media
- Parks and other recreational authorities
- Public officials
- Tribal authorities, etc.

Why is it important to engage all the stakeholders?

The long-term sustainability of a community's forest resources depends upon the decisions and actions of many different individuals and organizations. For example, the level of harvesting of timber, the impacts of tourism and the growth in second home ownership are all important factors in the health of forestlands. However, in most communities, there are different individuals or organizations responsible for each of these activities. If different groups are working at cross-purposes to each other, the community and its forest resources will suffer in the long run.

In addition, indicators are most useful if they are part of a decision-making process. Developing indicators of sustainable forestry for a community needs to be done in partnership with the individuals and organizations that have the decision-making authority. This includes the local government, but, depending on the community, may include state and federal government agencies (if there is state or federal forestland), and private landowners.

How to engage stakeholders

Any organization or a group of people can initiate sustainable forestry project in a community. The group can be a non-profit organization, a local government or just a group of interested or concerned individuals. Regardless of who initiates the process, it is important to take the time to involve the wider community. A sustainable forestry initiative needs to be developed collaboratively by the people who make up the community. It cannot be created by one group within the community and imposed upon the rest of the community. It cannot be designed by a consultant or implemented by outside “experts” hired specifically for the project. Sustainable forestry is a continuous process which can be successful only if implemented every day by the people who live and work in the community, because at the end of the day the experts go home and the community is left to carry on.

The most successful forestry initiatives are usually based on partnerships between people and organizations with diverse backgrounds, interests and expertise. Such partnerships help ensure that everyone’s interests and views are taken into account; they raise awareness and build community capacity.

In their *Sustainable Forest Management Community Handbook for the Great Lakes Region* McDonough et.al. (2002) point out that there are typically three levels of community participation for a successful sustainable forestry initiative:

- A core group or steering committee - a small core group, typically between five and ten members who launch the initiative, meet fairly often and provide leadership for the initiative.
- A larger working group - includes the steering committee members but also a diverse set of community members, who inform the steering committee about the community's concerns and needs. Its size can vary but typically is between 30 and 50 people.
- The entire community - everyone else who is part of the community but is not involved in the steering committee or working group. Both the steering committee and the working group have to keep the entire community informed about the initiative and its progress and provide ways for the larger community to give feedback on the initiative and possibly become involved, providing support and resources to keep the initiative alive and relevant to the community.

There are numerous ways to engage the community in terms of logistics – setting up meeting in a common community area, using the media to inform residents, inviting an inspirational speaker, providing food and drinks, etc. For more information on the logistics refer to the additional resources listed at the end of this chapter.

In summary, the process of engaging the entire community is critical because it builds trust and local ownership – keys for success of any sustainable community initiative. It is important to remember that this process is not easy and will take time. Some community indicator projects begin with this step, others begin with preliminary indicator development and then engage the wider community. There is no right or wrong way – simply choose what works best for your community.

Using Indicators to Engage the Community

Indicators of sustainable forestry are a valuable tool for a community because they help raise awareness about key issues of concern in the community and thus allow focusing efforts and resources on addressing these concerns. Whatever the role and audience of the indicators a truly effective set of sustainable forestry indicators should always lead to making better decisions and taking action to address the problems. Creating better ties to action is perhaps the most critical as well as most challenging task on the agenda for all indicator programs.

Useful Indicator-Related Exercises to Apply

There are several different ways that indicators can be used to engage stakeholders in a sustainable forestry process. The following exercises and material from this ToolKit may be useful at this stage in the indicator development process. Note that not all of these actually use ‘indicators.’ However, they are included here because they have proven useful as a first step for many communities developing indicators of sustainability.

1. ***Forest-Related Sustainability Definitions - Appendix A, Section A-1.*** One of the first challenges in engaging diverse stakeholders in a community is developing a common language with which to discuss issues. This is especially the case when the topic being discussed is *sustainable forestry* or *sustainable forest management* since these terms are used in many different, sometimes conflicting ways. The definitions in Appendix A, Section 1 can be used as a discussion tool to get people with different viewpoints to begin to understand how those viewpoints overlap. A useful exercise is to ask people to read through the definitions and discuss in a small group which definition each person agrees with and why.

2. ***Examples of Sustainable Forestry Related Goals - Appendix G.*** The list of sustainable forest management goals that have been developed by other communities and organizations can also be useful as discussion starters. Small group discussions about the goals can help participants understand each other's viewpoints.

3. ***Case Studies - Appendix D.*** The case studies in Appendix D describe how three different communities undertook indicator projects using the Montréal Process Criteria and Indicators as a foundation of the project. Reading these and discussing them as a group is a useful exercise for communities considering beginning an indicator project.

4. ***Creating Principles and Criteria for Sustainable Community Development.*** This exercise is useful for communities interested in creating economic development plans and projects that are more aligned with sustainability than traditional economic development activities.

Useful Resources

Sustainable Forest Management Community Handbook for the Great Lakes Region, by Maureen McDonough, Leigh Ann Spence, and Wendy Hinrichs Sanders, May 2002. An excellent guide to developing a community-based, sustainable forestry initiative. In addition to the section who to engage in the process, the guide includes a number of case studies of communities in the Great Lakes Region that have developed sustainable forestry initiatives and has detailed information about sources of data for indicators. Available at http://www.lsf.org/pub_SFM_handbook.html.

The Community Indicators Handbook: Measuring Progress Toward Healthy and Sustainable Communities, By Redefining Progress, Tyler Norris Associates, and Sustainable Seattle (August 1997, 15 pp.) An excellent guide to community indicator projects in general. Available from Redefining Progress: www.rprogress.org.

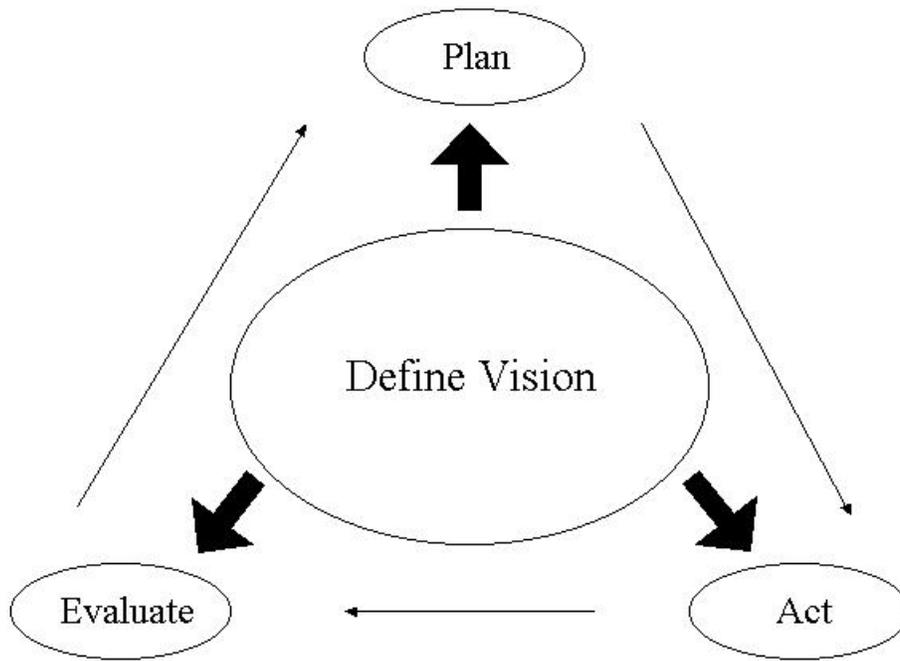
Community Culture and the Environment: A Guide to Understanding a Sense of Place, 2002, U.S. Environmental Protection Agency (EPA 842-B-01-003), Office of Water, Washington, DC. This guide focuses on the cultural and social aspects of a community and describes a number of different ways to engage community members in assessing the community and defining a future vision. Includes several case studies

relevant to forest communities. Available from the National Center for Environmental Publications and Information – email address: ncepiwo.one.net.

User's Guide to Local Level Indicators of Sustainable Forest Management, by the Canadian Model Forest Network. The guide describes 12 different 'Model Forests' where communities used the MP C&I as a basis for sustainable forest resource management. The guide documents each model forest's approach to initiating a local level indicator program, selecting indicators, gathering data, and using and reporting on indicators. There are lists of relevant publications, complete sets of each model forest's indicators, a comparison of approaches to local level indicators across the model forest network, and contacts for more information. A free copy of the Guide in English or French (specify which) is available from modelforest@nrcan.gc.ca, and the Model Forest Network web site <http://www.modelforest.net/e/home/loca/usersgue.html>.

Chapter 3: DEFINING A VISION AND GOALS

Defining a community vision is an important part of the process of becoming a sustainable community. This step allows local residents to look into the future, think creatively and ask themselves what they want their community to be in 20 or 50 years. A vision describes an ideal picture. The vision guides goal-setting, policies and actions by providing context for understanding community concerns, prioritizing issues, determining action steps and identifying indicators to measure progress.



There are many different ways to develop a community vision for a sustainable forest community. What is most important is that the vision be created by the entire community. An example of a community-developed vision from the case study of Gogebic County described in Appendix D is as follows:

“Sustainable forestry is [forest management] that contributes to the [economic health] of Gogebic County while maintaining the [ecological and social/cultural values] for the benefit of present and future generations in Gogebic County” (Gogebic County Steering Committee on Natural Resource Strategy, December 6, 1999).

The words in brackets were terms for which the participants couldn't agree on precise definitions, but there was a general agreement that these were important components of the vision. Using the bracketed terms allowed the participants to reach initial agreement and continue to work together.

Appendix A includes a number of definitions of sustainable forestry and sustainable forest management. It is important to note that all the definitions refer to the three main pillars of sustainable forestry – ecological, social and economic. As McDonough et. al. (2002) points out, these components work together and compromising any of the three for the sake of the others can not be sustainable in the long run. No community can remain viable without ecological balance, economic options and socio-cultural integrity. The three work together and need to be in balance.

Hart (1999) points out that the most successful sustainable community initiatives have three characteristics in common:

- The community created vision of its future that balances economic, environmental and social needs. The community viewed its future in the long term: not on the order of years but on the order of decades or generations.
- The vision incorporated the views of a wide cross-section of the community.
- The community figured out how to keep track of its progress in reaching the future.

Discovering the needs of the community and defining a common vision is not difficult but it does require some effort and reaching consensus among people with different interests and views. For communities that are not ready to go through this process using indicators first allows them to identify key issues and problems, which in turn help define common goals and vision.

Always think about your community as a system when defining long-term goals. These goals should link at least two of the three pillars of sustainable forestry. For example, a goal such as *“to increase overall forest cover in the community”* is not a sustainability goal, because it does not look at the community as a whole and its three key aspects – ecological, social and economic. A better goal would be *“achieve forest cover that will help preserve biological diversity while at the same time provide non-declining resource base for local economic development.”*

When defining goals always aim to involve the wider community. Defining a few system-level goals linked to your community vision will help a) inspire the community for the process, b) guide you on your journey to sustainable forestry, and c) select appropriate indicators to measure progress.

Useful Indicator-Related Exercises to Apply

The following exercises can be useful in helping diverse groups of stakeholders in a community develop a common vision and set of goals for sustainable forest resource management in their community. Exercises 1 and 2 are particularly useful for communities that have not gone through a visioning exercise. Exercise 3 is useful for

communities that have a vision statement and set of goals that was developed without explicitly addressing sustainable forestry issues.

1. Round Robin Using MPC&I to Categorize Issues – Appendix C, Section 3 and Appendix E. There are a number of different ways that this exercise can be used to define community goals and vision. Two examples using the MP C&I are described below.

*a. Using the Montréal Process **Criteria** as the stations* – set up one station for each of the seven Montréal Process Criteria. At each station, participants are asked to describe their vision of the community related to that specific Criterion. How the questions are phrased will depend upon the local culture, but possible phrasings include:

- To what extent does this criterion matter in this community?
- How important is this criterion to forest resource management in this community?
- How is this criterion important to sustainable forest resource management in this community?
- What are some of the key issues/challenges for the community within each criterion?

*b. Using the Montréal Process **Indicators** as the stations* – set up one station for each of the seven Montréal Process Criteria. List the indicators for that criterion at the station. At each station, participants are asked to write down a possible target value for each indicator that would help to explain their vision of what the community should look like in 20 or 50 years. Since the actual value for a particular indicator may not be known, participants can use phrases that relate the future value to current conditions such as ‘as much forest-related employment as we have now,’ or use relative measures such as ‘no more than X percent of the housing for second homes.’ It is important to emphasize to the participants that the object of the exercise is not to reach agreement on a particular target, rather the objective is to use the numbers to draw a picture of what each participant's vision is so that others can see it more clearly.

Another way to use the Round Robin exercise with Indicators is to list all the Montreal Process Indicators under each criterion and ask the groups to check-off those indicators most relevant to the community. Leave space for writing additional indicators within each criterion (not included in the Montreal Process but important to the community).

2. Goals for Sustainable Forestry and Sustainable Forest Management – Appendix G – In addition to using the sample goals to engage stakeholders in thinking about sustainable forestry as described in Chapter 2, the goals can also be used as a starting point for a community to develop their own vision and goals for sustainable forestry. In small groups that have been set up to include diverse viewpoints and stakeholders, have participants

use the sample goals in Appendix G as a starting point and develop a proposed vision and goals for the community's sustainable forest management.

3. *Aligning Vision and Goals to Sustainability – Appendix C, Section 5* – Many communities already have a defined vision and goals for their future. However, if the visions and goals were developed without explicit consideration of sustainable forestry issues, the community should consider how the vision and goal could be modified to incorporate sustainable forestry principles. The worksheet in Appendix C, section C-5 can be used to review a community's existing vision and goals in terms of sustainability.

Useful Resources

Sustainable Forest Management Community Handbook for the Great Lakes Region, by Maureen McDonough, Leigh Ann Spence, and Wendy Hinrichs Sanders, May 2002. An excellent guide to developing a community-based, sustainable forestry initiative. In addition to the section on who to engage in the process, the guide includes a number of case studies of communities in the Great Lakes Region that have developed sustainable forestry initiatives and has detailed information about sources of data for indicators. Available at http://www.lsf.org/pub_SFM_handbook.html.

Guide to Sustainable Community Indicators, 2nd Edition, by Maureen Hart, 1999. Although not specific to forest communities, this guide includes useful material for communities just beginning to work on sustainability and indicators. Much of the information in the guidebook is available online at www.sustainablemeasures.com. The website also includes an order form for those interested in a hardcopy version of the book.

Sustainable Community Indicators Trainer's Workshop, by Maureen Hart, 1998-2000. Available at <http://www.sustainablemeasures.com/Training/Indicators/index.html>. This online training course includes useful material for communities just beginning to work on sustainability and indicators. The material can be downloaded.

Chapter 4: MEASURING PROGRESS

An indicator is something that helps you understand where you are, which way you are going, and how far you are from where you want to be. An effective indicator alerts you to a problem before it gets too bad and helps you recognize what needs to be done to fix the problem. Indicators of sustainable forestry point to areas where the links between the forest resource, economy, and society are poorly understood. They allow you to identify issue areas and help show the way to improve those areas.

Indicators of sustainable forestry are different from traditional indicators of forest management. Traditional indicators change one part of the system if it were entirely independent of the other parts. For example, traditional forestry indicators simply measure the amount of timber harvested without linking it to the rate of growth or replenishment of this resource. Thus unsustainable practices such as overharvesting lead to decline in the forest resources (both forest cover and forest health). This in turn reduces the economic health and social benefits for the community, such as water quality and availability, recreation and enjoyment of forest beauty.

Regardless of where you are in the plan-act-evaluate process of developing sustainable forestry for your community, as depicted in Figure 4-1, developing indicators to measure progress is a useful and necessary step:

- During the planning phase, indicators can help to define the vision and goals for the community.
- During the acting phase, the indicators identify the data that should be gathered.
- During the evaluating phase, indicators are used to assess progress and determine what new programs or projects to undertake to ensure a sustainable future for the community's forest resources.

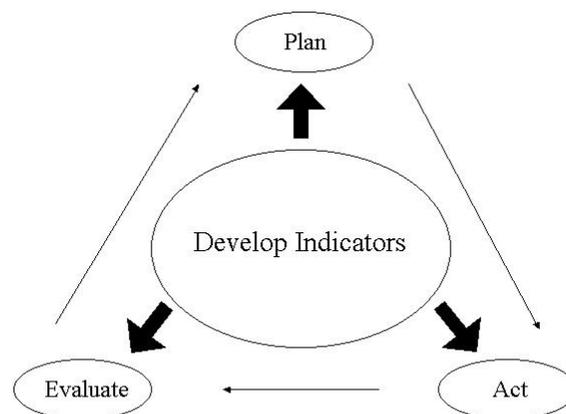
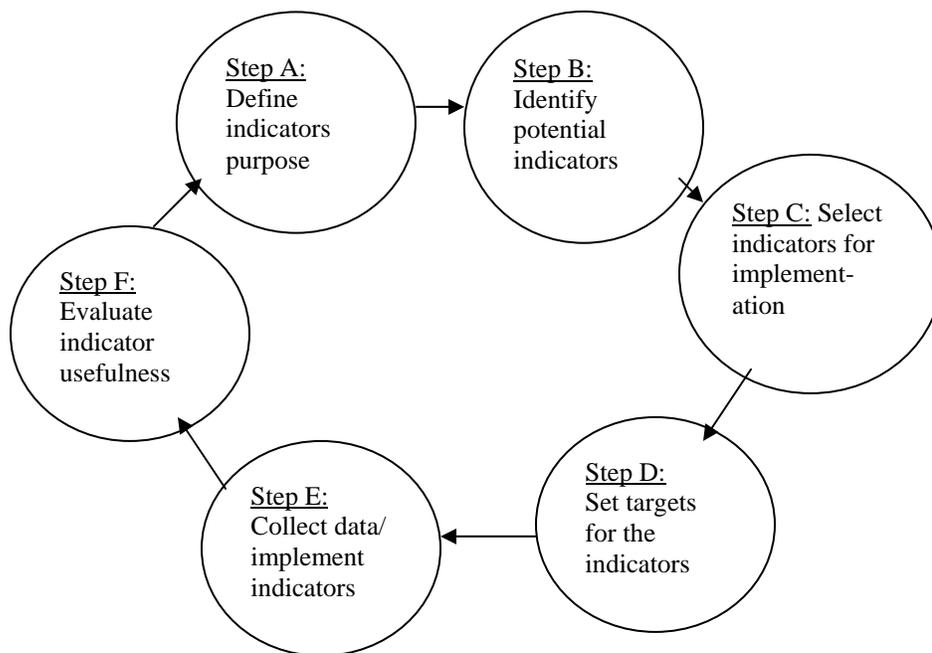


Figure 4-1. Developing Indicators as Part of Plan-Act-Evaluate Process

In some cases, a community may use indicators from the list of Montréal Process indicators provided in Appendix E. In others, the community may choose to develop their own indicators. However, to be effective, indicators need to be relevant, useful and useable for the community for which they are developed. There is no ‘one-size-fits-all’ set of indicators. In addition, the process of having diverse members of the community reach agreement on a common set of indicators for making decisions and measuring progress itself is a critical and necessary step in understanding how different aspects of the community are interrelated and how they are all needed to develop a viable long-term plan for community sustainability.

This chapter provides some general guidelines on how to develop sustainable forestry indicators. Figure 4.1 presents the main steps in this process.

Figure 4-2. Process of Developing Sustainability Indicators



Ideally, these steps should be done in conjunction with the Plan-Act-Evaluate stages where Steps A-C overlap the Plan stage, Steps C-E overlap the Act stage and Steps F-B overlap the Evaluate stage.

Step A: Agree on indicators’ purpose and focus (issue area)

Regardless of whether you have used indicators previously and have collected large amounts of data, it is always important before initiating a sustainable forestry program to:

- a) understand what indicators are and how they help achieve your goals

- b) agree what is the purpose of the indicators you are developing (e.g., raise awareness, help decision-making, measure progress)
- c) agree on the focus of the indicators – will the indicator set be used just for forestry related issues or will it look at other aspects of the community such as education or public health?

Indicators can be developed for different purposes. For example, as described in the case studies in Appendix D, Gogebic County, Michigan, wanted to have sustainable forestry indicators to measure progress toward their vision and promote better natural resource management. On the other hand, Wallowa County, Oregon, was particularly interested in measuring the baseline conditions and using indicators to participate in local, regional and national forest policy decision-making. Understanding the purpose of the indicators will help narrow down the number of possible indicators, resulting in a more manageable final set.

Exercises and activities that could be useful in this step include:

1. ***Name that Indicator Exercise – Appendix C, Section C-1.*** This exercise is a useful starting place for those who are unfamiliar with indicators. It helps understand the difference between indicators and other items such as goals, issues and targets.
2. ***Trouble in River City Exercise – Appendix C, Section C-4.*** This exercise is a skill building exercise that helps community members gain experience using indicators for different purposes – to assess system conditions, make decisions and evaluate progress. It also demonstrates that different groups and organizations within a community will have different priorities and goals, highlighting the need to involve all stakeholders and respect others viewpoints.
3. ***Case Studies – Appendix D.*** Review the case studies in Appendix D to see how those communities defined the purpose of their indicators and compare to your community's needs.

Step B: Identify potential indicators and ways to organize them

Once the purpose of the indicators has been decided, the next step is to begin to identify potential indicators. Since there is, literally, an unlimited number of indicators from which to choose, it helps to have a structure or framework for organizing the indicators. The framework helps to ensure that important issue areas are not left out inadvertently and that the resulting set of indicators reflects a balanced view of the critical issue areas.

There are a number of frameworks that can be used to develop and organize indicators of sustainable forestry. This ToolKit focuses primarily on the Montréal Process but in some cases other frameworks may be more useful for a particular community. For more information on other frameworks refer to Appendix B.

Montréal Process is an example of goal-based approach for developing indicators. Its seven criteria are the basis for organizing indicators of forest sustainability. They ensure that a community looks at its forest resources in many different ways – as a source of timber and non-timber products, carbon sink, water, soil and biodiversity protection, as well as a source of social and economic benefits. The indicators developed also need to consider the institutional structure needed to deal with a community's forest resources.

The Montréal Process Criteria are as follows:

1. *Conservation of biological diversity*
2. *Maintenance of productive capacity of forest ecosystem*
3. *Maintenance of forest ecosystem health*
4. *Conservation and maintenance of soil and water resources*
5. *Maintenance of forest contribution to global carbon cycle.*
6. *Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society.*
7. *Legal, institutional and economic framework for forest conservation and sustainable management*

Criteria 1 through 5 relate to the biological functions of the forest. Criteria 6 covers the numerous socio-economic functions that forests provide, such as jobs, recreation, aesthetics and better quality of life. Criteria 7 deals with how regulations and institutions affect forest sustainability – whether they actually promote more sustainable resource use or act as impediments to sustainability practices.

For each criterion the Montréal Process has several indicators that help measure that particular aspect and function of the forest. Some of the suggested indicators are more difficult to use at community level due to the lack of data but most of the indicators can be applied at different levels – local, regional and national. Which indicators are chosen will completely depend on the community's priorities, vision and goals. A complete list of Montréal Process Criteria and Indicators is included in Appendix E.

Activities that can be useful in this step include:

1. ***Frameworks for Organizing Issues and Indicators, Appendix C, Section C-2.*** The worksheets in this section can be useful for brainstorming potential indicators.
2. ***Indicator Frameworks, Appendix B and Appendix E.*** These appendices have several tables of sample indicators organized within different frameworks. Table B-3 shows indicators organized using the Pressure-State-Response framework. Table B-4 shows indicators and goals within an Input-Output-Outcome framework. Appendix E shows indicators organized in the Montréal Process Criteria Framework.

Step C: Select indicators for implementation

In many cases the initial brainstorming of indicators will lead to a huge list of possible measures.

Collecting data and measuring all 67 indicators listed under the Montréal Process C&I can be a Herculean task. For communities with limited resources it is particularly important to be able to prioritize and select a smaller number of effective indicators to measure sustainable forestry issues.

Once you complete the selection and/or brainstorming of indicators you can evaluate each indicator using some criteria. The Guide to Sustainable Community Indicators (Hart 1999) suggests some criteria such as:

- **Relevant** – an indicator must fit the purpose you have it for – help measure progress toward a goal, raise awareness about a critical issue, or help local decision-making regarding natural resource use, etc.
- **Understandable** – an indicator must be simple and easy for everyone to understand.
- **Reliable** – people must trust the information that an indicator provides.
- Provides **timely information** – an indicator must give information while there is time to act or correct the problem.
- Looks at the **entire system** rather than at isolated part of it – indicator should try to highlight the links among ecological, economic and social aspects of sustainable forestry.
- **Clear and easy to measure** – having available data is very important for indicator to be used. However, do not fall into the trap of measuring only the things you have data for. In many cases you will need to do your own research and/or survey to collect the data. Although this can be time-consuming, it is possible to get assistance from local colleges or universities that have students who can work on projects. For example, Gogebic County was assisted by the Michigan State University Extension Program in conducting a survey on the social/cultural values that helped collect qualitative data for the indicator program.

Activities that can be useful in this step include:

1. *Worksheets for Selecting Indicators, Appendix C, Section 6a, b, and c.*

These worksheets can be used to select a small number of indicators from a long list. In small groups, have participants evaluate all the indicators that have been suggested. Worksheet C-6a uses standard indicator evaluation criteria. Worksheet C-6b uses sustainability indicator evaluation criteria. The two worksheets may be combined but will take additional time to complete since the participants will have to discuss each indicator and each evaluation criteria. (A list of 10 indicators could take an hour to evaluate using either worksheet or 1 ½ hours with the worksheets combined.) Worksheet C-6c is used to summarize the results of all the small groups. It works best when converted to a wall chart or overhead for tallying. Once a group has finished selecting a small number of indicators, they mark the selected indicators in the column for their

group number. Once all the small groups have made their selections, the results are reviewed and discussed in the large group.

2. *Evaluating Indicators in a Framework, Appendix C, Section 7.*

A worksheet like this can be useful for determining how evenly a set of indicators covers the key issues. The example given uses the Montréal Process framework although other frameworks can be substituted.

Step D: Set targets for the indicators

A target is a desirable value that you want an indicator to reach within a particular period of time. For example, if you are measuring the percent of forest-related jobs in your community and you want to increase these over time, you may set up a target of 10% increase over the next 10 years.

Santa Monica Sustainable City Program is an excellent example of indicator initiative which successfully developed indicators and set targets to evaluate progress toward their goals and vision over time (www.ci.santa-monica.ca.us/environment). For each indicator a 1990 baseline was developed and a target for the year 2000 was set. In some cases indicator targets were chosen to reflect existing adopted or mandated goals, such as the target for landfilled solid waste which is mandated by state law. In other cases targets reflected established or informal City department goals. And others were chosen by the Program Task Force as aggressive and yet, realistic and achievable. For example, having measured 14.3 million gallons per day water usage in 1990, the Task Force came up with a 2000 target of 11.2 million gallons/day. Each of the indicators and targets was re-examined in year 2000 to find out if the target was met or not. In cases when the target was met, a new target was established for the period 2000-2010. In cases where the target was not met the reasons for this were investigated and corrective action was planned. In the cases where the indicators did not seem particularly useful anymore, they were replaced with new indicators and targets.

Setting targets for the indicators is a very useful step because it allows tracking progress toward long-term goals and taking corrective action in timely manner and holding people/organizations accountable. However, not every community will be ready to set targets. Communities which have just begun to develop indicators will not have baseline data for the indicators in order to set specific targets. In other cases, reaching consensus for the targets might be difficult. If you have already collected some baseline data on the indicators, aim for setting targets as the next key step.

Step E: Collect data for the indicators

Collecting data to measure the baseline conditions (the first time when you measure an indicator) and trends is a critical step in using any indicator. In some cases the data will be readily available (e.g., Census data on population, employment, income); in others –

you will have to put a lot of time and effort into this. Finding data for a particular indicator can sometimes be a serious obstacle and yet, it is always worth to make the extra effort and collect data for the right indicator instead of falling into the trap of measuring only the indicators you have data for.

In Appendix E, the last column of the table listing the Montréal Process indicators includes suggestions for data sources for some of the indicators.

Appendix F (List of Resources) lists some possible data sources for sustainable forestry indicators. The Guide to Sustainable Community Indicators (Hart 1999) includes suggestions for federal, state and local data sources as well as how to use Internet to find some data. The Sustainable Forest Management Handbook (McDonough et. al. 2002) provides a few general thoughts on gathering information and data.

Some sources of data include:

- **U.S. Census** (www.census.gov) – provides good data at county/municipality level on population, employment, housing, etc. It is really easy to use but the data are available only once every ten years (e.g., 1970, 1980, 1990, and 2000).
- **Forest Inventory and Analysis (FIA) Data Base Retrieval System.** This is an excellent source of forest data available at state, county or geographical area. The system does not cover the entire U.S. yet but work is underway to include the Pacific Northwest FIA unit.
- **OIK/OS** (www.eco2eco.net) is an excellent online, map-based tool for getting economic trends information. It includes data on employment and income for every county in the Eastern U.S.

One way to make data searching easier is to make sure that the indicator project includes a diverse cross-section of the community. The more people involved, the more data sources will be known to the project.

Step F: Evaluate indicator usefulness

Once you have selected your indicators and collected data, you are ready to present the information in the form of a graph that should help you evaluate trends and find out whether you are moving toward achieving your targets, goals and vision. At this point it is important to evaluate the usefulness of selected indicators and drop or revise them accordingly, so you don't waste time collecting unnecessary data and tracking the wrong indicators.

In order to evaluate indicator usefulness you may ask the following questions:

- Is this indicator helping us see trends and evaluate progress toward our goals?
- Does it need to be measured with the current frequency? For example, most indicators are measured on annual basis but in some cases, changes are so small that it makes sense to track the indicator every 5 or even 10 years (e.g., forest cover, rate of fragmentation, number of rare and threatened species).

- Does the indicator provide timely information for initiating an action?

Once a community has developed and implemented a set of sustainable forestry indicators to measure its progress toward commonly agreed vision and goals, it needs to establish a mechanism to go back in order to review and revise its goals, targets and indicators if necessary. This last step in the process of using any sustainability indicators is in a way “aligning and readjusting its compass” to make sure that it points in the right direction.

In many cases an indicator’s true usefulness becomes clear only after it has been implemented. This step allows revising the initial set of goals, targets and indicators. In many ways this looks like a spring cleaning at home – you have to go through all your stuff and get rid of the items that you don’t need any more, otherwise you risk spending a lot of time looking for something. Similarly, keeping only a small number of useful indicators allows you to save time and resources for doing the actual work.

Here are some of the questions that you may want to ask when evaluating and revising the indicators, targets and goals:

- Does this indicator help evaluate progress toward a specific goal or target?
- Have we achieved the target? If the answer is "yes" you may either set up a higher target or focus on another issue of concern in the local community and therefore, select new indicators and targets to address this issue. However, if this is an important target then you may want to continue measuring it and not let the issue slip out of sight
- Have there been some major changes in the community that led to new emerging priorities, goals and issues to include?
- Did the indicators help you uncover some unexpected problems and issues that you need to address?

Useful Resources

Sustainable Forest Management Community Handbook for the Great Lakes Region, by Maureen McDonough, Leigh Ann Spence, and Wendy Hinrichs Sanders, May 2002. An excellent guide to developing a community-based, sustainable forestry initiative. In addition to the section who to engage in the process, the guide includes a number of case studies of communities in the Great Lakes Region that have developed sustainable forestry initiatives and has detailed information about sources of data for indicators. Available at http://www.lsfa.org/pub_SFM_handbook.html.

Appendix A: DEFINITIONS

This appendix contains a number of different definitions related to sustainability. No particular definition should be considered the “best” or “correct” definition since sustainability is a concept much too complex to define it with a short phrase. Rather, reviewing and reflecting on all the definitions should lead the reader to a better sense of the overall meaning of the term and how it fits within various contexts.

A.1 Forest-Related Sustainability Definitions

Sustainability

“...sustainability is ultimately about balancing resource demand with resource supply over the long term.” *Donald W. Floyd, Sarah L. Vonhof, and Heather E. Seyfang. “Forest Sustainability: A Discussion Guide for Professional Resource Manager”, Feb 2001 Journal of Forestry, p.9.*

Sustainable Forest

“The defining values of the sustainable forest vary tremendously among people. Parks or preserves, habitat or watershed mosaics, multiple-use or industrial forests, short-rotation farm plantations are all sustainable from some point of view if the conditions in which they grow balance inflows and outflows over time.” *Jeff Romm, “Sustainable Forests and Sustainable Forestry” (quoted in Floyd, Vonhof and Seyfang, Feb 2001, p9)*

“the capacity of forests, ranging from stands to ecoregions, to maintain their health, productivity, diversity, and overall integrity in the long run, in the context of human activity and use” (*Helms, 1998, “The Dictionary of Forestry” (quoted in Floyd, Vonhof and Seyfang, Feb 2001, p9)*)

Sustainable Forestry/Sustainable Forest Management

“[One type of foresters] group (A) regards the land as soil, and its function as commodity-production; [another type] group (B) regards the land as a biota, and its function as something broader...group A is quite content to grow trees as cabbages, with cellulose as the basic forest commodity. Group B, on the other hand, ... employs natural species, and manages a natural environment rather than creating an artificial one. Group B prefers natural reproduction on principle. It worries on biotic as well as economic grounds about the loss of species...It worries about a whole series of secondary forest functions: wildlife, recreation, watersheds, wilderness areas.” *Aldo Leopold, Sand County Almanac 1949, p221*

“...maintaining the forest for a long time, showing concern for the well-being of future generations, making reasonable estimates of future needs, knowing current rates of resource use and regeneration, and reaching consensus on appropriate levels of resource use.” *Donald Floyd, Sarah Vonhof, and Heather Seyfang, Forest Sustainability: A Discussion Guide for Professional Resource Managers, Journal of Forestry, February 2001, p.8.*

“...the continued existence and use of forests to meet human physical, economic, and social needs, the desire to preserve the health of forest ecosystems in perpetuity, and the ethical choice of preserving options for future generations while meeting the needs of the present.” *Sourcebook on Criteria and Indicators of Forest Sustainability in the Northeastern Area* USDA Forest Service, State and Private Forestry, Northeastern Area, May 2002, Publication # NA-TP-03-02, available online at: <http://www.na.fs.fed.us/sustainability/sourcebook.htm>

“...meet the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic which integrates the reforestation, managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, wildlife and fish habitat, and aesthetics.” *American Forest & Paper Association SUSTAINABLE FORESTRY PRINCIPLES AND IMPLEMENTATION GUIDELINES* as approved by AF&PA Board of Directors on October 14, 1994, web site: <http://www.woodcom.com/woodcom/afpa/afpabp02.html>

“... a type of management that views the forest not as the source of any one economic product (e.g., timber, paper or mushrooms) or service (e.g., recreation or water supply), but as an integrated, ecological whole encompassing countless values, products and services. ...[it] is intended to respect the full range of environmental, social and economic values of the forest, and to integrate the way those values are managed to ensure that none are lost and that the forest remains healthy and vibrant into the future.” *Roundtable on Sustainable Forests, A Partnership for the Future*, web site: <http://www.sustainableforests.net/>

“...the practice of meeting the forest resource needs and values of the present without compromising the similar capability of future generations.” Note that sustainable forest management includes practicing a land stewardship ethic that integrates the reforestation, managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, wildlife and fish habitat, and aesthetics.” *UN Conference on Environment and Development, Rio de Janeiro, 1992*

“...‘good management’ and utilization of forests and forested areas in such a way and at such intensity that their biological diversity, productivity and regenerative capacity, their vitality, and their capacity to fulfill, now and for the future, their pertinent ecological, economic and social functions at the local, national and global levels, be maintained, without thereby doing harm to other ecosystems.” *Ministerial Conference on the Protection of Forests in Europe, Helsinki, 1993*, from *International Union of Forest Research Organization*, <http://iufro.boku.ac.at/iufro/publications/occ-p9/occp9-1.htm>

“...maintain and enhance the long-term health of our forests ecosystems, for the benefit of all living things both nationally and globally, while providing environmental, economic, social and cultural opportunities for the benefit of present and future generations.” *Canadian Institute of Forestry/Institut forestier du Canada, Canada Forest Accord May 1, 1998*, <http://www.cif-ifc.org/practices/>

“Ecologically sustainable forest use implies optimizing the tangible and intangible social and economic benefits which forest can provide to the community, with the goals of maintaining the functional basis of forested land, biodiversity, and the options available

for future generations.” *The Australian National University, School of Resources, Environment and Society Source: Ecologically Sustainable Development Working Groups, 1991* <http://sres.anq.edu.au>

“Sustainable forestry may be defined as an approach to forest utilization and management that recognizes:

- that human societies and economies exist within, and are dependent on, the natural ecosystem;
- that the resources of the earth are finite;
- that all organisms have a right to exist and share in the earth's bounty; and
- that the present human generation must respect the rights and needs of future generations”

Appalachian Sustainable Forestry, <http://www.uky.edu/OtherOrgs/AppalFor/>

“...forest management that:

- maintains the forest, its ecological functions, processes and overall structure, in healthy condition, in perpetuity;
- does not degrade soil or water quality;
- does not produce any irreversible consequences or losses to biological diversity, including genes, species, ecosystems, and forest types (i.e. no extinctions);
- applies to the entire forest as an integrated, ecological whole, rather than to any single component or product of the forest;
- can be either active or passive, and does not require the extraction or harvest of a particular product from the forest;
- can be applied to any size or scale of management area, e.g. individual forest management unit or ecosystem, watershed, landscape, forest type, bio-region, nation, etc.; provided, however, that at each different scale, sustainability must be assessed entirely within the boundaries of the defined unit or region; and
- can produce a wide range of environmental, social and economic benefits to society, depending on the scale of the management area and its capabilities and carrying capacity.”

International Tropical Timber Organization (ITTO), from William E Mankin, Director, Global Forest Policy Project, <http://www.itto.or.jp/newsletter/v8n3/07.html>

Sustainable forestry is a balance of three things: maintaining ecological integrity, meeting the landowner's needs and desires, and providing societal benefits. *Appalachian Sustainable Development*, <http://www.appsusdev.org/for/whatis.html>

A.2 Agriculture-Related Sustainability Definitions

“...farmers in sustainable agriculture are concerned about feeding their families and paying their bills, but those are not their only goals in life. They set out to protect the land, improve their quality of life, and enhance the communities in which they live. Their day-to-day decisions are not guided by a single minded search for profit, but by a delicate balancing act among many goals.” (*Dick Levins, Land Stewardship Program, White Bear Lake Minnesota. Monitoring Sustainable Agriculture with Conventional Financial Data* <http://www.landstewardshipproject.org>)

A.3 Community-Related Sustainability Definitions

Webster's

“Sustain - to cause to continue (as in existence or a certain state, or in force or intensity); to keep up, especially without interruption diminution, flagging, etc.; to prolong.” *Webster's New International Dictionary*. Springfield, MA: Merriam-Webster Inc., 1986

Random House

“Develop - v.t. - to bring out the capabilities or possibilities of, to bring to a more advanced or effective state.” *Random House Dictionary of the English Language*. New York, NY: Random House, 1987

Our Common Future

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” *World Commission on Environment and Development. Our Common Future*. Oxford, Great Britain: Oxford University Press, 1987, page 8 (Frequently referred to as the Brundtland report after Gro Harlem Brundtland, Chairman of the Commission)

Caring for the Earth

“improving the quality of human life while living within the carrying capacity of supporting eco-systems.” *IUCN/UNEP/WWF. Caring for the Earth: A Strategy for Sustainable Living*. Gland, Switzerland: 1991 (IUCN - The World Conservation Union, UNEP - United Nations Environment Programme, WWF - World Wide Fund for Nature)

Sustainable Seattle

Sustainability is the “long-term, cultural, economic and environmental health and vitality” with emphasis on long-term, “together with the importance of linking our social, financial, and environmental well-being.” <http://www.sustainableseattle.org/>

Sustainable Community Roundtable Report (South Puget Sound)

“In a sustainable community, resource consumption is balanced by resources assimilated by the ecosystem. The sustainability of a community is largely determined by the web of resources providing its food, fiber, water, and energy needs and by the ability of natural systems to process its wastes. A community is unsustainable if it consumes resources faster than they can be renewed, produces more wastes than natural systems can process or relies upon distant sources for its basic needs.” <http://www.olywa.net/roundtable>

Coop America

“Sustainable society - Society whose long term prospect for continuing to exist are good. Such a society would be characterized by an emphasis on preserving the environment, developing strong peaceful relationships between people and nations, and an emphasis on equitable distribution of wealth.” *Coop America Quarterly*, No. 37: Summer 1995 <http://www.coopamerica.org/>

Northwest Policy Institute (U. of WA, Graduate School of Public Affairs)

“Sustainable communities foster commitment to place, promote vitality, build resilience to stress, act as stewards, and forge connections beyond the community.”

<http://depts.washington.edu/npc/>

Interfaith Center on Corporate Responsibility (ICCR)

“Sustainable development...[is] the process of building equitable, productive and participatory structures to increase the economic empowerment of communities and their surrounding regions.” *Interfaith Center on Corporate Responsibility, 475 Riverside Drive, New York, NY 10115, (212) 870-2295*

Mountain Association for Community Economic Development (MACED)

“Sustainable community development is the ability to make development choices which respect the relationship between the three "E's" – economy, ecology, and equity:

- Economy – Economic activity should serve the common good, be self-renewing, and build local assets and self-reliance.
- Ecology – Humans are part of nature, nature has limits, and communities are responsible for protecting and building natural assets.
- Equity – The opportunity for full participation in all activities, benefits, and decision-making of a society.”

<http://www.maced.org>

Puanani Rogers, Ho`okipa Network, Lihu`e, Kaua'i, Hawaii

“Aloha 'aina, malama' aina, ahupua'a style living... Aloha 'aina simply means to love and respect the land, make it yours and claim stewardship for it. Malama 'aina means to care for and nurture the land so it can give back all we need to sustain life for ourselves and our future generations, and, an ahupua'a is an ancient concept of resource uses and management based on families living in a division of land that connects the mountains to the reefs and the sea.”

<http://www.hawaiian.net/~cbokauai/nani/susahu.html>

Appalachian Sustainable Development

At its heart, sustainability involves the challenge of integrating human activities into the ecosystem upon which we all depend. [There are] five working principles of sustainable community development. We believe that sustainable development:

- is locally rooted, diversifying the economy and culture of communities and regions;
- fits within the ecosystem, building upon natural assets, honoring limits of absorption and regeneration;
- promotes regional self-reliance by building both individual skills and cooperative, innovative networks;
- adds value to raw materials and shortens the distance between “producers” and “consumers”; and
- lasts indefinitely by building the assets – ecological, human and financial – of particular places.

<http://www.appsusdev.org/susdev.html>

Hamilton Wentworth Regional Council

“Sustainable Development is positive change which does not undermine the environmental or social systems on which we depend. It requires a coordinated approach to planning and policy making that involves public participation. Its success depends on widespread understanding of the critical relationship between people and their environment and the will to make necessary changes.”

<http://www.vision2020.hamilton-went.on.ca/>

Mathis Wackernagel, coauthor of *Ecological Footprint*

“Satisfying lives for all, within the means of nature.” <http://www.rprogress.org>

Friends of the Earth Scotland

“Sustainability encompasses the simple principle of taking from the earth only what it can provide indefinitely, thus leaving future generations no less than we have access to ourselves.” <http://www.foe-scotland.org.uk/>

Our Common Journey

“The reconciliation of society’s developmental goals with the planet’s environmental limits over the long term.”

Board on Sustainable Development, Policy Division, National Research Council. Our Common Journey: A Transition to Sustainability. Washington, DC: National Academy Press, 1999, page 2

Thomas Jefferson Sustainability Council (Charlottesville, Virginia)

“Sustainability may be described as our responsibility to proceed in a way that will sustain life – that will allow our children, grandchildren and great-grandchildren to live comfortably in a friendly, clean, and healthy world.... that people:

- Take responsibility for life in all its forms as well as respect human work and aspirations;
- Respect individual rights and community responsibilities;
- Recognize social, environmental, economic, and political systems to be inter-dependent;
- Weigh costs and benefits of decisions fully, including long-term costs and benefits to future generations;
- Acknowledge that resources are finite and that there are limits to growth;
- Assume control of their destinies;
- Recognize that our ability to see the needs of the future is limited, and any attempt to define sustainability should remain as open and flexible as possible.”

Jerry Sturmer, Santa Barbara South Coast Community Indicators

“Sustainability is meeting the needs of all humans, being able to do so on a finite planet for generations to come while ensuring some degree of openness and flexibility to adapt to changing circumstances.”

Maureen Hart, Sustainable Measures

“Improving the quality of all human life while living off the interest of the community capital (natural, human, social and built).” <http://www.sustainablemeasures.com>

Cornelia Flora

“Sustainable community development is not based on finding the solution, but on increasing the capacity of individuals and communities to work together to respond to constant changes...”

Santa Monica Sustainable City Program

"A way of life that safeguards and enhances our resources, prevents harm to the natural environment and human health, and sustains and benefits the community and local economy – for the sake of current and future generations."

www.ci.santa-monica.ca.us/environment

A.4 Business- and Production-Related Sustainability Definitions

Paul Hawken

“Sustainable businesses:

- Replace nationally and internationally produced items with products created locally and regionally.
- Take responsibility for the effects they have on the natural world.
- Do not require exotic sources of capital in order to develop and grow.
- Engage in production processes that are human, worthy, dignified, and intrinsically satisfying.
- Create objects of durability and long-term utility whose ultimate use or disposition will not be harmful to future generations.
- Change consumers to customers through education.”

Paul Hawken. The Ecology of Commerce. New York, New York: Harper Business, 1993, page 144

Sierra Business Council

“We must put behind us, decisively and forever, the notion that our economy functions in a vacuum, sealed from society and the natural world. Our wealth is our total capital – social, natural, and financial. We must not make decisions based on narrow measurements. Instead, we must understand and track our total capital, adopt an integrated, long-term view of our region’s wealth, and keep the whole picture in focus.”

<http://www.sbcouncil.org>

Sustainable Production

“Sustainable production is the creation of goods and services using processes and systems that are: non-polluting; conserving of energy and natural resources; economically efficient; safe and healthful for workers, communities, and consumers; and, socially and creatively rewarding for all working people.”

<http://www.uml.edu/centers/LCSP/>

Principles of Sustainable Production *(adapted from Lowell Center for Sustainable Production)*

- “Products and services are
 - safe and ecologically sound throughout their life cycle
 - as appropriate, designed to be durable, repairable, readily recycled, compostable, or easily biodegradable

- produced and packaged using the minimal amount of material and energy possible
- Processes are designed and operated such that
 - wastes and ecologically incompatible byproducts are reduced, eliminated or recycled on-site
 - chemical substances or physical agents and conditions that present hazards to human health or the environment are eliminated
 - energy and materials are conserved, and the forms of energy and materials used are most appropriate for the desired ends;
 - work spaces are designed to minimize or eliminate chemical, ergonomic and physical hazard
- Workers are valued and
 - their work is organized to conserve and enhance their efficiency and creativity
 - their security and well-being is a priority
 - they are encouraged and helped to continuously develop of their talents and capacities
 - their input to and participation in the decision making process is openly accepted
- Communities related to any stage of the product lifecycle (from production of raw materials through manufacture, use and disposal of the final product) are respected and enhanced economically, socially, culturally and physically; and
- Continued economic viability does not depend on ever-increasing (i.e., unsustainable) consumption of materials and energy.” <http://www.sustainableproduction.org>

World Business Council on Sustainable Development

“Sustainable development involves the simultaneous pursuit of economic prosperity, environmental quality and social equity. Companies aiming for sustainability need to perform not against a single, financial bottom line but against the triple bottom line.”

“Over time, human and social values change. Concepts that once seemed extraordinary (e.g. emancipating slaves, enfranchising women) are now taken for granted. New concepts (e.g. responsible consumerism, environmental justice, intra- and inter-generational equity) are now coming up the curve.”

<http://www.wbcsd.ch/>

The Natural Step – Four System Conditions

1. Substances from the Earth's crust must not systematically increase in nature. *(Fossil fuels, metals, and other minerals cannot be extracted at a faster rate than their re-deposit back into the Earth's crust)*

2. Substances produced by society must not systematically increase in nature. *(Things like plastics, ozone-depleting chemicals, carbon dioxide, waste materials, etc. must not be produced at a faster rate than they can be broken down in nature. This requires a greatly decreased production of naturally occurring substances that are systematically accumulating beyond natural levels, and a phase-out of persistent human-made substances not found in nature.)*

3. The physical basis for productivity and diversity of nature must not be systematically diminished. *(We cannot harvest or manipulate ecosystems in such a way as to diminish their productive capacity, or threaten the natural diversity of life forms (biodiversity). This requires that*

we critically examine how we harvest renewable resources, and adjust our consumption and land-use practices to fall well within the regenerative capacities of ecosystems.)

4. We must be fair and efficient in meeting basic human needs. *(Basic human needs must be met with the most resource-efficient methods possible, including a just resource distribution.)*
adapted from <http://www.naturalstep.org/>

A.5 Indicator Process-Related Definitions

Some words commonly used in indicator processes are often defined differently and used to mean different things in different cases. This list below is an attempt to explain the most common meanings and how these terms are used in this toolkit. However, it is important that to avoid confusion the people using the terms clarify their meaning.

Vision: The overarching picture of where a community wants to be in 20-50 years in terms of its forest and other natural resources, social and economic development. A vision is not something that can be achieved quickly and easy but rather requires a constant commitment from all community members to work for improving various aspects of their community defined through goals, targets, and indicators.

Goal: description of a future condition that community members wish to achieve. Goals usually refer to a long-term vision and look at the entire community like a system rather than a specific area or project with limited impact.

Criterion: In the context of the Montreal Process Criteria and Indicators, a criterion is a category of conditions or processes by which sustainable forest management may be assessed. The seven Criteria in the Montreal Process are seven categories or topics that must be reviewed or assessed in order to determine if a forest is sustainable. Another common use of the term criterion is as a means of judging; a test by which something can be judged. In this toolkit, when the term Criteria or Criterion is capitalized, it refers to the MP C&I meaning of the word – one of the seven specific categories or topics that must be considered for assessing sustainable forestry. When it is not capitalized, it refers more generally to a test by which something can be judged or assessed.

Indicator: An indicator is something that provides information about a system including the condition or changes in the system or the condition or changes in forces that affect the system over time. Generally an indicator's purpose is to show you how well a system is working. If there is a problem, an indicator can help you determine what direction to take to address the issue. In this toolkit, the term “indicator” is used to refer to numerical indicators, that is, something that can be measured and for which changes can be reported over time. Another common use of the term “indicator” is as something that implies that there is a problem, however, in this toolkit, the term “indication” will be used for this meaning. For example, a large number of dead trees in a forest is an indication that there may be a problem, but it does not provide enough information to make decisions on how to solve the problem.

Data: Data are the values of indicators at particular points in time and can be thought of as the raw materials that are used to create indicators. To have a good indicator you need

good data – individual measurements, collected over a period of time. An indicator is a variable and the data are the actual measurements that this variable can take. Thus, when the data of an indicator are put together, they form a “time-series” that makes it possible to analyze trends over time.

Target: A target is a desired future value that an indicator could take. Targets are usually set for shorter periods of time – between 1-2 and 10 years – than the overall goal period (20 to 50 years). Targets serve as milestones in the process of achieving a goal or a vision and lead to initiating corrective actions.

Benchmark: Benchmark is a term used to mean several different things. One commonly used meaning is as a “target.” In this sense, a “benchmark” is a desired value for an indicator at some point in the future. Another commonly used meaning is as a “standard.” In this sense, a “benchmark” is a value that others have achieved with their indicators or have set as a worthwhile value to aim for. Related to this meaning, is the use of the term to include all of the actions required to achieve a certain value for an indicator. In this case, “benchmarks” means “best practices.”

Appendix B: FRAMEWORKS FOR ORGANIZING INDICATORS

There are hundreds if not thousands of indicators that could potentially be used to measure sustainable forestry and sustainable forest management. Deciding how many and which ones to use can be difficult. More is not always good; less is not better. The right number depends on factors including what type of audience the indicator report will have, how much time is available to research the data, the number of issues involved, and the specific needs of the community.

In addition, just as important as *how many* indicators are needed is *what type* of indicators are needed. Because there are many different stakeholders in a community, there is a need for different types of indicators and a way to balance the interests of those stakeholders. The selected indicators reflect all the key aspects of community sustainable forestry, not just a subset of the issues.

An indicator framework is a way to organize a set of indicators so that the resulting information including connections between different issues can be better understood. Much the same as the frame of a house provides support and a structure for the building, a framework for a set of indicators provides structure and support for the issues that the indicators are intended to measure. Sorting indicators into categories will quickly show which issues are being covered and which issues have been overlooked.

The Montréal Process C&I is the main framework discussed in this ToolKit. However, there are several other frameworks that can also be useful in organizing sustainability indicators. This appendix provides an overview of some of the more frequently used frameworks, some of which are listed below. Depending on where a community is in the process of developing and using indicators and what its needs are, some of these frameworks might be useful in addition to the Montréal Process Criteria and Indicators.

B-1. Montréal Process Criteria and Indicators

The Montréal Process Criteria and Indicators Framework was developed by the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. The Working Group was formed in Geneva, Switzerland, in June 1994 to develop and implement internationally agreed criteria and indicators for the conservation and sustainable management of temperate and boreal forests.

The Montréal Process Working Group developed the framework to provide its member countries with a common definition of what characterizes sustainable management of temperate and boreal forests. The framework includes seven criteria or categories of “conditions or processes by which sustainable forest management may be assessed.” Each criterion has associated indicators that can be used to measure changes in the condition or process. Table B-1 lists the criteria and shows the number of indicators that were developed by the Working Group for each criterion. Specific examples of Montréal Process Indicators are included in Appendix E.

Table B-1. Montréal Process Criteria

Montréal Process Criteria	No. of Indicators
1. Conservation of biological diversity	9
2. Maintenance of productive capacity of forest ecosystem	5
3. Maintenance of forest ecosystem health	3
4. Conservation and maintenance of soil and water resources	8
5. Maintenance of forest contribution to global carbon cycles	3
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society	19
7. Legal, institutional and economic framework for forest conservation and sustainable management	20

Using the Montréal Process C&I framework is beneficial for a community that is primarily interested in evaluating the sustainability of its forest resources. This framework helps to:

- develop a common language among the participants and organizations involved and
- develop a common understanding of the types of baseline conditions and trends in forests and other natural resources that need to be considered.

As a starting point, the criteria portion of the framework may be most useful because, although every community is different, the criteria form a common structure for discussing key issues related to forest sustainability.

More information about the Montréal Process C&I can be found on <http://www.mpci.org/>.

B-2. Community Capital Framework

Community Capital refers to those things a community has that allow its inhabitants to live and interact productively. There are three main types of community capital – natural, social, and built. These form the basis of this framework:

- 1) **Built and financial capital:** manufactured goods, equipment, buildings, roads, water supply systems, jobs, information resources, and the credit and debt of a community.
- 2) **Human and social capital:** the people in the community, their skills, education and health, as well as their ability to cooperate and work together.
- 3) **Natural capital:** the natural environment, which includes natural resources (both renewable and nonrenewable), the services that the ecosystem provides (e.g., purification of air and water), and the life-enhancing qualities of nature (e.g., aesthetics).

All three types of capital are necessary for communities to function. All three types of capital need to be managed by a community. All three types need to be cared for, nurtured and improved over time.

Community capital can be thought of as a triangle or a pyramid illustrated in Figure B-1.

Community Capital

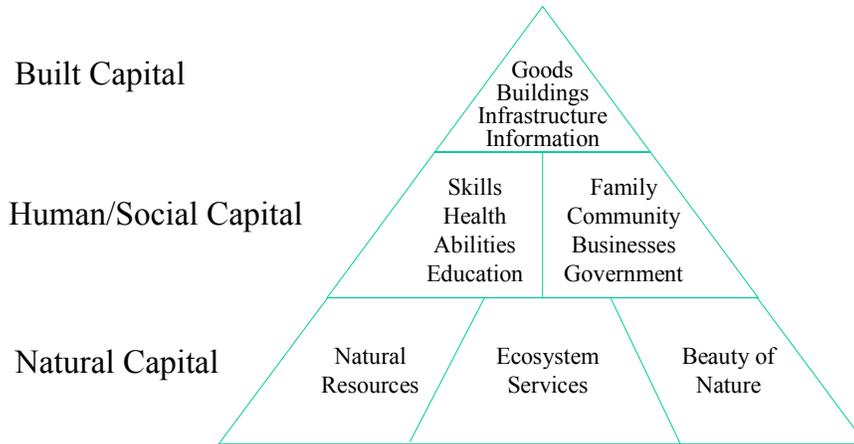


Figure B-1. Community capital framework

The community capital framework helps to identify indicators that may be immediately useful to decision-makers. It is most often used and more appealing than the other general frameworks as it is simpler and deals with the relevant issues directly. However, it does not necessarily show the linkages between the different issue areas and does not explicitly include goals (although a community may decide to come up with goals for each issue area).

For more information on this framework and specific examples see “*Guide to Sustainable Community Indicators*”, Second Edition, 1999, by Maureen Hart.

B-3. Goal-based Framework

Use this framework when you have clearly set vision and goals and you want to find out what you can measure to determine whether you are getting closer or further away from these goals. This framework helps develop indicators using the sustainability objectives taken from a stated vision or set of goals, such as maintenance of forest contribution to global carbon cycles, sustaining natural resources. Its main disadvantage is that the set of goals may not be comprehensive covering all important issue areas within a community.

Furthermore, coming to a consensus about a common vision or a set of goals may be difficult in some cases.

One example of applying the goal-based framework for developing indicators is the Alberta matrix. Although no longer active, the Alberta Round Table on the Environment and Economy produced a report, *Creating Alberta's Sustainable Development Indicators* (September 1994), which provides an excellent description of the process of developing indicators. The indicators themselves are published in the *Report of the Alberta Round Table on Environment and Economy* (May 1993). The Report provides very clear descriptions of the indicators chosen and a goal-indicator matrix that shows the interconnections between the different issues of concern in Alberta. The work of this group has been taken over by the Alberta Treasury Department, in Edmonton, Alberta. The Treasury produces an annual report *Measuring Up*, which includes a number of indicators developed by the Round Table (for more information see <http://www.finance.gov.ab.ca/measuring/index.html>).

The government of Alberta has an ongoing three-year business plan that focuses government's efforts on three core businesses: *People, Prosperity and Preservation*. The plan sets out **goals** for each of the core businesses with key strategies for achieving each goal, and **core measures** to track performance results. For example, the 2000-2003 Government Business Plan has 19 goals and 27 core performance measures. Specific **targets** are set for each of the government's core performance measures. Each year in *Measuring Up*, results are reported for each measure relative to the target that has been set. These results are used as **indicators** of the government's progress towards achieving its goals.

Table B-2 is an excerpt from the 2000-01 performance results (for more information see <http://www.finance.gov.ab.ca/publications/measuring/measup01/intro.html>):

Table B-2: Alberta 2001 Performance indicators (an excerpt)
PRESERVATION

#	Goals	Measures	Changes	Results
14	Alberta will be a safe place to live and raise family.	Crime Rate	↔	In 1999, the gap between the national property crime rate and the Alberta rate increased by 3.4%, while the gap in violent crime rate decreased by 1.1%.
15	Alberta's natural resources will be sustained.	Resource Sustainability	↔	Alberta's timber harvest remained below the annual allowable cut. Farm crop yield decreased to 0.86 tons per acre.
16	The high quality of Alberta's environment will be maintained	Air Quality	↔	In 2000, there was no change from 1999 in the number of days rated as "poor" or "very poor".
		Water Quality	↑	Water quality downstream of Edmonton, Calgary and Lethbridge is improving due to upgraded wastewater treatment facilities in each of these cities.
		Land Quality	↓	Farm crop yield decreased 0.16 tons per acre to 0.86 tons per acre in 2000.
17	Albertans will have the opportunity to enjoy the providence's natural, historical and cultural resources.	Heritage Appreciation	↔	Visitations to provincial parks and recreation areas and to provincially owned historic sites, museums and interpretive centers remained relatively constant.
18	Alberta will work with other governments and maintain its strong position in Canada.	Intergovernmental Relations	↓	In 2000, the Alberta government's approval ratings in federal-provincial relations was 15% higher than the four-province average, down from 1999.
19	The well-being and self-reliance of Aboriginal people will be comparable to that of other Albertans.	Under Development	New	Measure under development.

Legend:

- “↔”: No significant change from previous year
- “↑”: Improved performance (5% higher)
- “↓”: Declining performance (5% lower)
- “New”: New goal/measure

B-4. Pressure-State-Response Framework

Developed by the OECD (Organization for Economic Cooperation and Development) in 1994 this framework has been widely used when developing and using environmental and sustainability indicators.

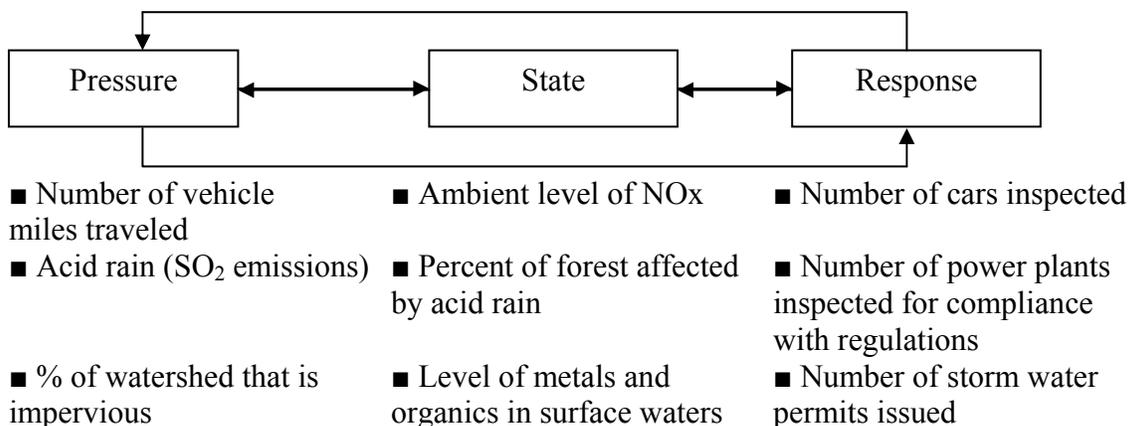
The **pressure** variable describes the underlying cause of the problem. The pressure may be an existing problem (for example, soil erosion in cultivated uplands, air pollution from buses) or it may be the result of a new project or investment (for example, loss of mangrove forest from port development). Whatever the cause, pressures affect the state of the environment and then may elicit responses to address these issues (see Figure B-2).

The **state** variable usually describes some physical, measurable characteristic of the environment. Ambient pollution levels of air or water are common state variables (e.g., PM₁₀ in mkg/m³ or BOD loads to measure water pollution). For renewable resources such as forests, the measures used include: the extent of forest cover, the area under protected status, the size of an animal population, or grazing density.

The **response** variables are those policies, investments, or other actions that are introduced to solve the problems. Some examples include: providing incentives for sustainable forest management, introducing certification system for timber products, restricting hunting and fishing to some areas and times of the year, etc.

Below are provided some examples of indicators within the PSR framework.

Figure B-2. P-S-R framework



For additional information on the Pressure-State-Response framework (and the Driving Force-State-Response, which is a modification of it) see <http://lead.virtualcentre.org/en/dec/toolbox/Refer/EnvIndi.htm>.

Table B-3 Sample Sustainable Forestry Indicators
Preliminary work from Baltimore County
Organized using Pressure-State-Response Framework

Goals	Pressure Indicators	State Indicators	Response Indicators
<p>Issue: Loss of forest and tree cover</p> <ul style="list-style-type: none"> • Increase overall forest and tree cover in the county for multiple benefits • Identify the most significant forests for biological diversity and provide long-term protection through public ownership, protective easements, and appropriate management. 	<ul style="list-style-type: none"> • % of total forest and tree cover lost annually due to development 	<ul style="list-style-type: none"> • Acres of forest and tree cover • % of total area that is forest and tree cover 	<ul style="list-style-type: none"> • % of large forest blocks in public ownership or protected through conservation easements
<p>Issue: Increasing forest fragmentation and impacts on biodiversity</p> <ul style="list-style-type: none"> • To reduce forest fragmentation due to changes in land use. • To expand and connect existing forest patches through reforestation • To maintain forest areas most critical for survival of forest dependent species. 	<ul style="list-style-type: none"> • Ratio of forests protected vs. cleared for implementation of the Forest Conservation Act 	<ul style="list-style-type: none"> • Acres or % of forest in large forest blocks, or other block/patch size indicators. • Number or % of threatened, rare, vulnerable, endangered or extinct species 	<ul style="list-style-type: none"> • Acres of interior and exterior forest gaps reduced through reforestation • Forest acres managed as State wildlands
<p>Issue: Impacts of forest harvesting</p> <ul style="list-style-type: none"> • Assess the condition and quality of existing private forests • Complete forest management plans for all large forest block/patches, especially those targeted for timber harvesting 		<ul style="list-style-type: none"> • Acres harvested by type of silvicultural practice (acres managed for timber production or with potential for timber production) • Acres of forest by soil woodland classes 	<ul style="list-style-type: none"> • Acres managed for potential timber production as determined from range of silvicultural practices as determined in forest management plans
<p>Issue: Large deer population</p> <ul style="list-style-type: none"> • Protect forest health from the impacts of deer over-population 	<ul style="list-style-type: none"> • Acres of deer habitat lost to development 	<ul style="list-style-type: none"> • Car accidents/ incidents involving deer • Vegetation assessment results 	<ul style="list-style-type: none"> • Number of deer harvested • Acres of habitat protected
<p>Issue: Decline in soil and water resources</p> <ul style="list-style-type: none"> • Increase forest cover at the watershed and sub-watershed levels in accordance with forest cover thresholds for each land management area (rural-source water protection, rural –working lands, rural residential, developing suburban) and in 	<ul style="list-style-type: none"> • Percent or acres of forest cover lost annually 	<ul style="list-style-type: none"> • Status of forest cover by watershed according to management type and thresholds • Average level of phosphorous in the reservoirs. 	<ul style="list-style-type: none"> • Acres of agricultural and conservation zoning

Goals	Pressure Indicators	State Indicators	Response Indicators
accordance with thresholds associated with high levels of source water protection.		<ul style="list-style-type: none"> % of forest cover threshold by subwatershed for each of the three metropolitan drinking water reservoirs 	
Issue: Decline in soil and water resources <ul style="list-style-type: none"> Protect and increase riparian forest cover, especially 100-foot and greater forest buffers for headwater (1st and 2nd order) streams. 		<ul style="list-style-type: none"> % of 1st and 2nd order streams with 100-foot or greater forest buffers 	<ul style="list-style-type: none"> Stream miles protected during the land development process
Issue: Maintaining watershed hydrology <ul style="list-style-type: none"> Determine the relationship between forest cover and groundwater recharge 	<ul style="list-style-type: none"> Total water use in county and/or gallons of water per resident 	<ul style="list-style-type: none"> Number of replacement wells by sub-watershed in relation to forest cover. 	
Issue: Soil erosion <ul style="list-style-type: none"> Stabilize eroding shorelines using vegetative and structural measures. Encourage reforestation of steep and erodible upland soils. 		<ul style="list-style-type: none"> Number/% of shoreline and stream banks affected by erosion. Acres of steep and erodible soils not in protective forest cover and acres reforested 	<ul style="list-style-type: none"> Number of feet/miles of shoreline stabilized
Issue: Reducing Global Warming <ul style="list-style-type: none"> Understand County Forest land contribution to the global carbon cycle 		<ul style="list-style-type: none"> County's global warming potential (CO2 equivalent). 	<ul style="list-style-type: none"> Rate of reforestation % of energy from renewables and clean fuel

Table B-4 Sample Sustainable Forestry Indicators
Organized using Input-Output-Outcome Framework

Agency Goals (i.e., Intermediate goals that build toward Criteria from the MP C&I's)	High-level Outcomes – How will you measure progress towards the goal (i.e., indicators from MP C&I's)?	Intermediate Outcomes – (Portion of high-level outcome under your control) What impact do your products and service have on achieving the goal?	Outputs – What products and services are the inputs/strategies producing to achieve the goal (i.e., Measure of agency products and services)?	Inputs – The resources and programs your agency is using to strive for this goal (i.e., Time and \$).
Provide essential habitat elements for endangered species	Status of rare, threatened, endangered species	% of operations w/ threatened and endangered species present that follow best management practices	# of Operation contacts / written plans w/ threatened and endangered present	FTE (number of Full-Time Equivalent employees)
In working landscapes, provide adequate levels of key habitat elements needed by wildlife	Population levels of representative species	Percent of units inspected that meet standards for habitat elements	# of operations inspected for best management practices (i.e., snags, green trees, special sites)	FTE (number of Full-Time Equivalent employees)

B-5. Input-Output-Outcome-Impact Framework

This framework allows linking indicators to the project cycle by defining indicators for every stage in it. For example, a program to reduce the PM₁₀ (particulate matter size 10 microns) emissions from diesel buses may specify the following indicators:

- *input*: financial and/or technical assistance for PM₁₀ reduction (measured in \$)
- *output*: number or percent of new engines installed (cleaner buses)
- *outcome*: PM₁₀ emissions from buses
- *impact*: ambient concentration of PM₁₀ in the area; or incidence of respiratory diseases/lost workdays due to respiratory illness

Input indicators can be specified in terms of overall funds earmarked, specific tasks to be funded (e.g., new equipment, training). **Output** indicators relate to specific actions taken (such as hectares of forest designated as protected, introduction of substances with low or zero ozone depleting potential) and these would evolve from the design phase of the project.

Formulating **outcome** and **impact** indicators, however, is a greater challenge. Here is important to look both at the immediate and long-term impacts that a project is going to have on causal factors (pressures) and the condition (state) of the environmental/social problem.

This framework has been widely used by the World Bank to evaluate the effectiveness of environmental projects. It has also found significant application for evaluation of educational projects as well as some medical projects and programs (e.g., AIDS/HIV prevention).

The State of Oregon has used a different variation of the Input-Output-Outcome model that communities might find more useful, since it helps identify *intermediate outcomes* (i.e., a limited part of the high-level outcome) to track items that a community can directly influence. Table B-4 provides an example of this modified framework.

For additional information on this framework check <http://www.worldbank.org/html/opr/pmi/envindi4.html>.

B-6. Lowell Center Indicator Hierarchy

This framework was originally developed by the Lowell Center for Sustainable Production, University of Massachusetts Lowell, as a tool to enable companies to evaluate the effectiveness of sustainability indicator systems. However, it can be used by communities as well. The framework consists of five levels for categorizing existing indicators relative to the basic principles of sustainability. The purpose of the framework is not to rank indicators as better or worse, but rather to provide a method to evaluate the ability of a set of indicators to inform decision-making and measure progress toward more sustainable systems of production or community development.

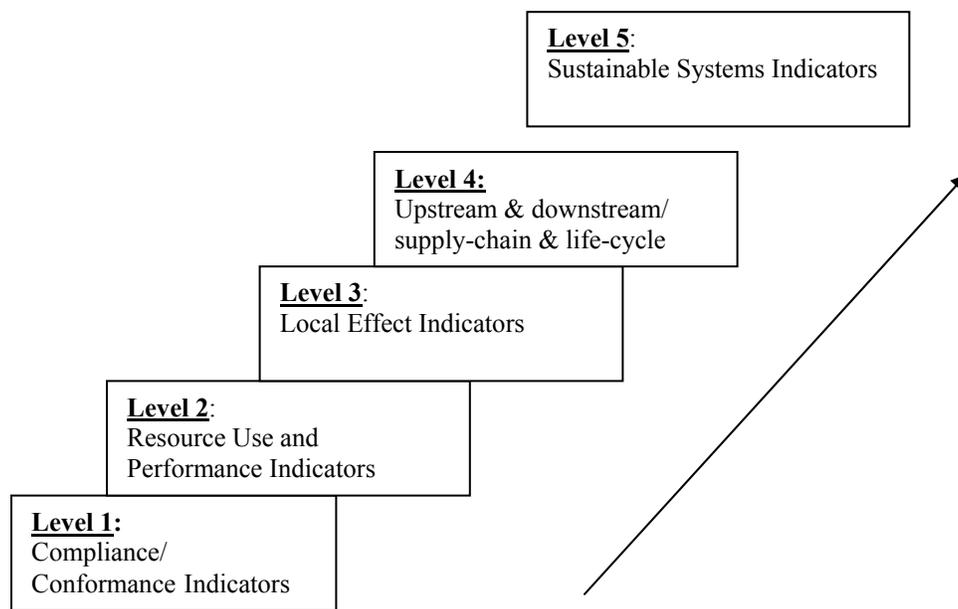


Figure B-3. Lowell Center Indicator Hierarchy

Underlying the LCSP framework are *three basic assumptions*:

- developing sustainable systems of production is a continuous, evolutionary process of setting goals and measuring performance;
- different companies and communities are starting at different places in the evolutionary process; and
- developing truly sustainable systems of production cannot be achieved by communities or companies alone but rather requires cooperation and coordination among them, government and NGOs at many different levels – local, regional, national and international.

These assumptions are reflected in the five levels of the hierarchy (see Figure B-3):

- Level 1: Compliance/Conformance
- Level 2: Resource Use and Performance
- Level 3: Local Effect Indicators
- Level 4: Upstream and Downstream/ Supply-chain and life-cycle Indicators
- Level 5: Sustainable Systems Indicators

Note that the levels are evolutionary, not exclusive. Many communities and organizations already have indicators that measure compliance or performance (Levels 1 and 2). As a community begins to consider and measure sustainable development, it will begin to develop indicators at higher levels, however this does not mean that indicators at the lower levels are no longer needed. It is necessary for communities to monitor compliance with regulations and standards (Level One) and the efficiency of their resource use (Level Two). However, in order to develop sustainably, a community needs to look beyond its boundaries at the impacts of suppliers, distributors and products (Levels Three and Four)

as well as its contribution and connection to the overall sustainable economic, social and environmental system (Level Five).

For more information and examples of indicators within each of the five levels see: Veleva V., Hart M., Greiner T., and C. Crumbley, "Indicators of sustainable production," *Journal of Cleaner Production*, Vol. 9 (5), October 2001, pp. 447-452.

B-7. USFS Local Unit Criteria and Indicator Development (LUCID) framework

The purpose of LUCID was to:

- conduct a pilot study that would appraise the feasibility of monitoring sustainable systems at the forest management unit scale;
- provide forest managers and collaborators with feedback that can be used to improve Forest Land Management Plans;
- enhance collaboration between National Forests and other governmental agencies; and
- relate forest plan outcomes with regional and national C&I trends.

Six interdisciplinary teams working on eight National Forests were active in the LUCID Project and ranged from 500,000 acres to 17 million acres and from a single National Forest to three National Forests working within one ecoregional province. In keeping with ecological, social, and economic systems, the study areas were not just limited to National Forest System lands.

The monitoring approach for the LUCID Project was framed within a systems context. Systems-based frameworks draw from the three main components of sustainability – ecological, social, and economic – and indicators are organized within these domains based on systems theory. Systems theory suggests that systems are a group of interrelated, interacting, or interdependent constituents forming a complex whole. A systems-based framework uses the structures and functions of the systems as the organizing tools. It focuses on the contexts that allow for the production of goods, services, and opportunities to meet different values. Within a system framework the focus is on the outcomes or states of systems and not on inputs or outputs. This is particularly applicable to forests since they are joint production systems that simultaneously, not independently, produce soil, water, air, plants and animal material. This framework is most effective for ensuring coverage of the three systems from which sustainability emerges and for examining interactions within and among the three main components of sustainability.

The systems framework was hypothesized to be useful in two primary ways: first, it would better define the items for inventorying and monitoring; and second, it would provide an integrative model for synthesis and analysis of the inventory data. A systems framework establishes a logical link from sustainability to monitoring as it helps place the monitoring component in context. From a process perspective the systems framework

is very useful because it provides a common starting point for collaborators and a means of building a common language about sustainability.

The frameworks used for selecting and developing C&I establish the logical relationship between the criteria and indicators and their measures. In the context of the LUCID Project, the social, economic, and ecological systems-based frameworks have a hierarchical architecture that is defined by principles and criteria. It is at the level of the measures or data for indicators where a more thorough examination of system interactions can be made. The use of this systems-based framework guided the development of indicators. For landscape systems they might include structure indicators that describe the size and shape of landscapes and process indicators that describe the causes or sources of change that result in the pattern within and between landscapes. Likewise, population systems might include structure indicators such as density, age class, and sex ratios and process indicators such as reproduction, mortality, and immigration/emigration rates.

Final systems frameworks developed, tested and revised through the LUCID process are characterized by components assessing structural or stock components and functional or processes components of a variety of different types of system types across a range of scales. Graphic representation of the three systems frameworks are included in figures B-4 through B-6. Each of the cells in the frameworks represents criteria for which indicators were developed.

Details on the development, application and testing of systems frameworks in the LUCID process can be found in the final report at www.fs.fed.us/institute/lucid/final_report.

Figure B-4. Ecological Systems Framework

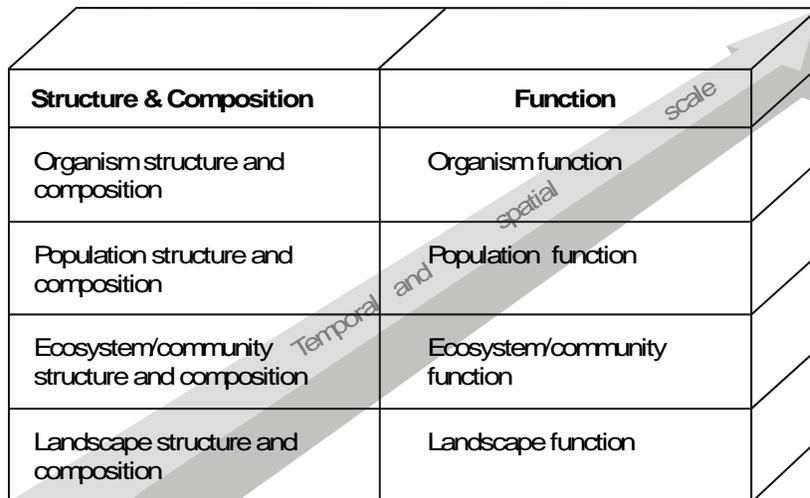


Figure B-5. Social Systems Framework

Kinds of Social Systems	Social Criterion			
	Collaborative Stewardship	Institutional and Community Capacity	Social Equity	Social and Cultural Values (Opportunities)
Individuals Families Communities ↗ of Place Neighborhoods ↘ of Interest Counties				

Temporal and spatial scale

Figure B-6. Economic Systems Framework

Kinds of Economic Systems	Economic Criterion			
	<i>Structures (stocks)</i>		<i>Function (flows)</i>	
	Capital and wealth	Flow of products and services	Trade and distributional equity	Efficiency
Individual Firm Industry Community				

Appendix C: EXERCISES

This appendix contains a number of exercises that may be useful for communities developing indicators for sustainable forestry and sustainable forestry management. Each exercise is described briefly and instructions are included as necessary. Where appropriate, worksheets are included that can be tailored to the specific circumstances of a particular community.

Exercise	Page
C-1. Name that Indicator.....	C-2
C-2. Frameworks for Organizing Issues and Indicators	C-4
C-3. Round Robin Discussion Exercises	C-9
C-4. Trouble in River City (Selecting/Using Indicators for Different Purposes).....	C-12
C-5. Aligning Visions and Goals for Sustainability.....	C-19
C-6. Selecting Indicators.....	C-20
C-7. Evaluating Indicators in a Framework Worksheet.....	C-23
C-8. Creating Principles and Criteria for Sustainable Community Development ...	C-25

C.1 Name That Indicator

This exercise helps participants distinguish between indicators and other items (e.g., goals, issues, and targets) and is particularly useful for communities which are just beginning to develop indicators.

Some of the items below are indicators – a measurement, something to which a numeric value can be attached and for which changes can be reported over time. Some of the items are not indicators but rather issues or problems. Still others are indicators but they have been stated as a goal or target. For each of the items, if it is an indicator, put a check in the box. Otherwise, restate it as an indicator (leaving off the goal).

	Item	Check if ok or reword if not an indicator
1	Percent of land that is forested	
2	Number of private owners in the County	
3	Growing trees	
4	Size of average forest block	
5	Species diversity	
6	Retaining the current forest cover/acreage	
7	Best management practices	
8	Poverty rate	
9	Number of wood processors with state-of-art mills	
10	Education and training	
11	Crime rate	
12	Quality of life	

Name that Indicator! (Answers)

Here are answers with some possible rewordings for non-indicators or indicators that were stated as a goal. A checkmark (√) means that, as worded, the item is a measurable indicator. If the item is not an indicator as worded, one or more possible indicators have been given that could be used as indicators for the item as originally written. Note that your suggested rewordings may be different. It is important that participants realize that none of the items or the reworded indicators listed are the only 'correct' indicators. They are only suggested here to help participants understand what is meant by the term 'indicator.'

	Item	Check if ok or reword if not an indicator
1	Percent of land that is forested	√
2	Number of private owners in the County	√
3	Growing trees	% increase in forest cover % forest harvested at sustainable yield rate
4	Size of average forest block	√
5	Species diversity	Number of forest dependent species Forest dependent species as % of all species.
6	Retaining the current forest cover/acreage	% of land covered with forest (as stated, it was a goal where the % of forest cover stays the same from year to year)
7	Best management practices	% of forest land certified or registered under best management practices
8	Poverty rate	√
9	Number of wood processors with state-of-art mills	√
10	Education and training	Percent of population with college degree or higher. Percent of population with training in forestry related professions
11	Crime rate	√
12	Quality of life	Percent of local residents reporting high quality of life (based on a survey).

C-2. Frameworks for Organizing Issues and Indicators

As discussed in Appendix B, an indicator framework is a way to organize or categories issues, concerns and indicators to better understand complex systems and to ensure that a project is adequately addressing all aspects of the system, not focusing inappropriately on a subset of the system. A useful exercise using frameworks is to have participants write down all the issues or concerns that they have about their community or the forest resources, and then organize these issues or concerns within a particular framework. The following worksheets can be used in small group exercises or can be done as stations in the Round Robin exercise format described in C-3. The worksheets as written would be used to identify issues, but the column headings can be modified to identify indicators rather than issues.

C-2a. Montréal Process Framework

In the table below, identify the critical issues or concerns related to your community's forest resources for each of the criteria. If an issue or concern seems to fit into multiple categories, try to identify the specific aspect of the issue that relates to a particular criterion.

Montréal Process Criteria		Issue or Concern
1	Conservation of biological diversity	
2	Maintenance of productive capacity of forest ecosystem	
3	Maintenance of forest ecosystem health	
4	Conservation and maintenance of soil and water resources	
5	Maintenance of forest contribution to global carbon cycles	
6	Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society	
7	Legal, institutional and economic framework for forest conservation and sustainable management	

C-2b. Community Capital Framework

In the table below, identify the critical components of community capital for your community's forest resources. First identify those components that are local to your community, then identify those that are either imported or used from a distance – i.e., oil is imported energy, exporting waste to a landfill in another community is using that community's capital from a distance (an ecosystem service – the ability of land to contain waste), customers in other communities are social capital.

Type of Capital	Local	Non-Local
Built Capital		
Social Capital		
Human Capital		
Natural Resources		
Ecosystem Services		
Beauty of Nature		

C-2c. Montréal Process and Pressure-State-Response Framework

Using the table below, list issues that are of concern for your community's forest resources, categorizing the issues for each criterion as to whether they are a pressure, state or response issue.

1. Conservation of biological diversity		
Pressure	State	Response
2. Maintenance of productive capacity of forest ecosystem		
Pressure	State	Response
3. Maintenance of forest ecosystem health		
Pressure	State	Response

4. Conservation and maintenance of soil and water resources		
Pressure	State	Response
5. Maintenance of forest contribution to global carbon cycles		
Pressure	State	Response
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society		
Pressure	State	Response
7. Legal, institutional and economic framework for forest conservation and sustainable management		
Pressure	State	Response

C-3. Round Robin Discussion Exercise

C-3a. General Description

The Round Robin Discussion Exercise is a useful process when there are a large number of participants and a relatively short amount of time for brainstorming ideas or generating a list of issues or indicators and reporting back in an organized fashion. The basic structure of the exercise is as follows:

1. Participants are divided into 5 to 12 small groups of 5-7 people depending on the number of participants and number of stations.
2. Each group is assigned to a station where there is a topic, question or issue to be addressed and an easel with flipchart pages and markers for writing down responses. The stations are set up around the room with adequate space in between each station to allow groups to converse quietly without distracting other groups.
3. After a certain amount of time (see below for timing), each small group is asked to move clockwise to the next station. (Group 1 moves to Station 2, Group 2 moves to Station 3, ... the last group moves to Station 1.) At their next station, the group spends a few minutes reading what the prior group wrote and then adds their own ideas or makes additions or comments on the prior ideas. Again, after a certain amount of time, each group moves clockwise. (Group 1 now goes to Station 3, Group 2 goes to Station 4, etc). This continues until every group is back to their original station.
4. Once all groups are back to their original station, each group reads all the material that has been written by all the participants and summarizes it to report back to the larger group.

Timing

This is generally a fast-paced exercise and works well with 7-9 stations with about 5-10 minutes per stations. For calculating the amount of time needed for the entire exercise, it is important to add 1-2 minutes per station for moving from one station to the next and to add in time for summarizing the work once a group gets back to their original station. The report back time also needs to be added into the final schedule.

Things to consider

- It helps to have one person who is responsible for keeping track of the time with a stopwatch (or watch with a second hand) and some audible device (a whistle, chime, bell, etc.) for signaling when it is time to move. This person should not be part of any group.
- Although there is no facilitator at each station, it is useful to have one person who is a roving facilitator to answer questions and to make sure that the groups are staying on task and moving along to the next station when time is up.
- There is a tendency in some groups for 'the person with the pen to wield the power' – that is, if one person is the recorder for a group, that person's ideas tend to take

priority. It is important to emphasize to the large group that everyone has the right and responsibility to get their ideas down on the paper.

- Neatness counts! Since many people are writing their ideas down but one group will be summarizing the results, anyone with unreadable handwriting will not have their ideas included in the final result.
- The timing for this exercise will depend upon the topics being discussed, the number of participants and the number of stations. If the purpose is a brainstorming session, 5 minutes may be plenty for each station. If in-depth discussion is desired, 20 minutes per station may be necessary.
- It is important that the amount of work to be accomplished at each station be similar across all the stations (i.e., it will not work if Station 1 can be completed in 5 minutes but Station 2 takes 20 minutes since the people at Station 1 will want to move on while the people at Station 2 will still be working).
- However, it is generally the case that the amount of time needed per station decreases as groups move through each station since many ideas will have already been written down by preceding groups. For example, if the process starts with 20 minutes per station, towards the end groups may only need 10 minutes per station to read what is there and add a few more comments.
- This exercise is a useful icebreaker exercise if the small groups are organized so that people are not with others who they already know.

C-3b. Round Robin Indicator Selection Exercise

The purpose of this exercise is to help select a small number of indicators from a larger list of sustainable community/sustainable forestry indicators that reflect community goals, issues and priorities.

Participants are divided into small groups of 5-6 persons. The long list of indicators (community indicators or forestry-related indicators) is divided into several smaller lists of about 10-20 indicators. Each group goes through each worksheet list of indicators and picks up relevant indicators for their community by putting a checkmark in the relevant column (you may decide to pick up about 2-3 indicators from each group or 5-6 from one group and none from another). If Montréal Process Criteria and Indicators are used, it is recommended that participants are divided into 7 groups and there are 7 lists of indicators, each corresponding to one of the seven Montréal Process criteria.

When the groups have gone through all lists, they go back and re-evaluate selected indicators to choose max 10 best/most appropriate indicators (based on the criteria agreed on by the group) and circle these on the worksheet. When each group is ready, one person goes to the lists on the wall and puts a checkmark next to the selected best indicators.

Finally, as a large group the participants review each list of indicators to see what indicators were selected by most of the groups. Large group discussion time allows each group to report back on their selection process as appropriate.

C-4 Trouble in River City (Selecting and Using Indicators for Different Purpose)

Objective

The purpose of this exercise is to provide participants with experience using indicators for different purposes – assessing system conditions, policy/program evaluation, determining whether projects or activities are on track.

This exercise can be used as is or it can be tailored to a specific community or organization by modifying the material to be more specific to the group's circumstances. Tailoring this exercise would involve the following steps:

1. Identify a key problem for your community (in this case it is water, but it may be forest health, unemployment, loss of farmland, etc.) and write a brief (one paragraph) description of the local community and the specific problem.
2. Identify existing information and construct a few indicators related to the key issue/problem.
3. Come up with several different groups that represent local interests (e.g., environmental group, economic development group, city council, etc.) Briefly describe each group's position and activities related to the main problem/issue.
4. Create a table similar to the one below, where the columns correspond to the indicators (A, B, ...) and the rows represent the different interest groups.
5. Remember that the objective is the same as in the sample exercise: to gain experience using indicators for different purposes – to assess system conditions, policy/program evaluation, determine whether projects or activities are on track.
6. As the groups go through the exercise they choose relevant indicators from the list that will help them make better decisions. Each group puts a checkmark in the cell that corresponds to the selected indicators in the table.

Group	A	B	C	D	E
1.							
2.							
3.							
4.							
...							

Objective:

Have experience using indicators for different purposes – assessing system conditions, policy/program evaluation, determining whether projects or activities are on track.

Scenario – Trouble in the River City

Trouble is brewing in River City. The river that runs through the town, for which the town is named, has been getting lower and lower. The river is the source of water for the town's residents and businesses. It is also home to a number of rare fish and mussels. Last year it looked like the river was about to run dry but there was a rainy spell and tragedy was narrowly averted. Attached are some graphs that provide information about various aspects of the water situation.

This exercise will be done in small groups: each group will be given the same set of indicators but each group will be assigned different tasks to accomplish with those indicators. The purpose of the exercise is to see how effective different types of indicators are for different tasks. The groups and their assigned tasks are:

- **Group 1: Save Our River (SOR)** – the local environmental coalition that is concerned about the condition of the river. Some members are primarily concerned about protecting rare species, while others are primarily concerned with the supply of drinking water. This group is developing a campaign to raise awareness and inspire action. Pick three indicators that will be useful in the campaign. Be prepared to state why you have selected these indicators, and to state whether they are system, program/policy, or activity indicators.
- **Group 2: City Council** – most of the town council members have been convinced by SOR that there is a serious problem. This group is trying to decide what policy changes to make. Pick three indicators that will be useful in determining what policy changes to make. Be prepared to state why you have selected these indicators, and to state whether they are system, program/policy, or activity indicators.
- **Group 3: A neighborhood group** that meets on a monthly basis to discuss issues of concern. This month the group is talking about water because one person in the group is also a member of SOR. Pick three indicators that could help households identify actions that they can take to be part of the solution, not part of the problem. Be prepared to state why you have selected these indicators, and to state whether they are system, program/policy, or activity indicators.
- **Group 4: The River City Economic Development Committee** – River City has an unemployment problem in addition to a water problem. This group is making recommendations to the Town Council on a program to attract businesses to the River City Industrial Park. Pick three indicators that are useful in selecting the type of development that will best fit the town's circumstances. Be prepared to state why you have selected these indicators, and to state whether they are system, program/policy, or activity indicators.

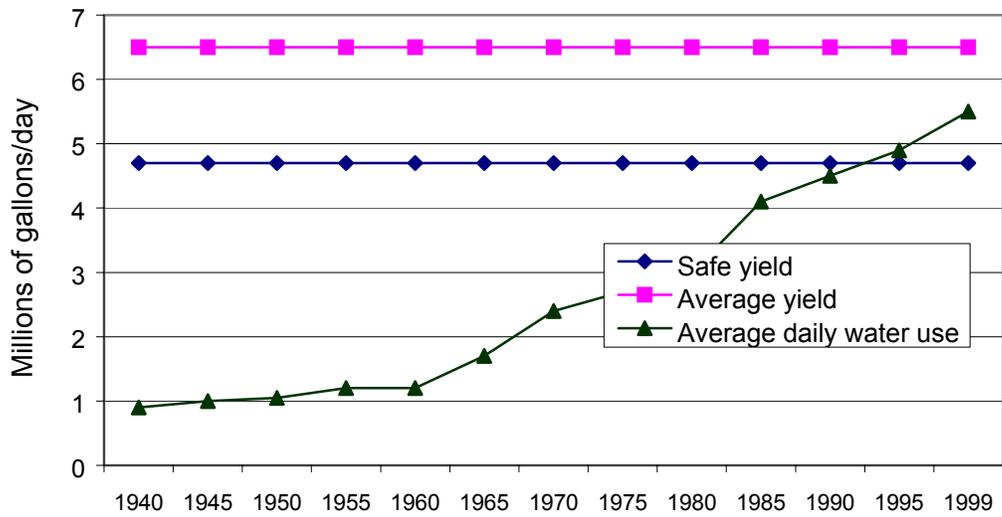
- **Group 5: River City News (one year later)** – the local newspaper is reporting on the success of actions proposed or taken by City Council and the other groups. Pick three indicators that will be useful in showing progress or lack of progress. Be prepared to state why you have selected these indicators, and to state whether they are system, program/policy, or activity indicators.

Instructions:

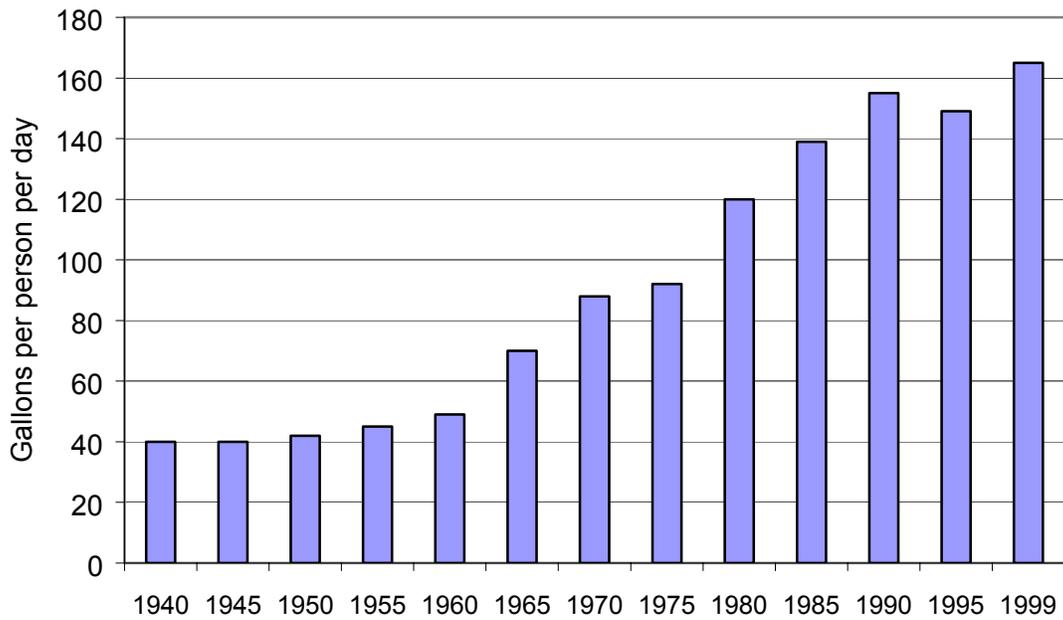
- You have 15 minutes to look over the different graphs and decide which three will be most useful for your group to accomplish its task. For each indicator, be prepared to say which level it is at: system, program, or action indicator. Use the matrix below to record which graphs your group selected. Use “S” to show that the indicator selected is a system level indicator, “P” to show that it is a program level indicator, and “A” to show action level indicator.
- If there is information that would be more useful than the indicators provided, feel free to make up your own charts and graphs using the flip chart. For any new indicator, try to describe where the data would come from, how it would be collected, and who would be responsible for managing it.
- When you are done, send someone up to record your group’s selection on the flip chart page at the front of the room.

Group	Indicators selected							
	A	B	C	D	E	F	G	H
1. Save Our River								
2. City Council								
3. Neighbors								
4. Economic Development Committee								
5. River City News								

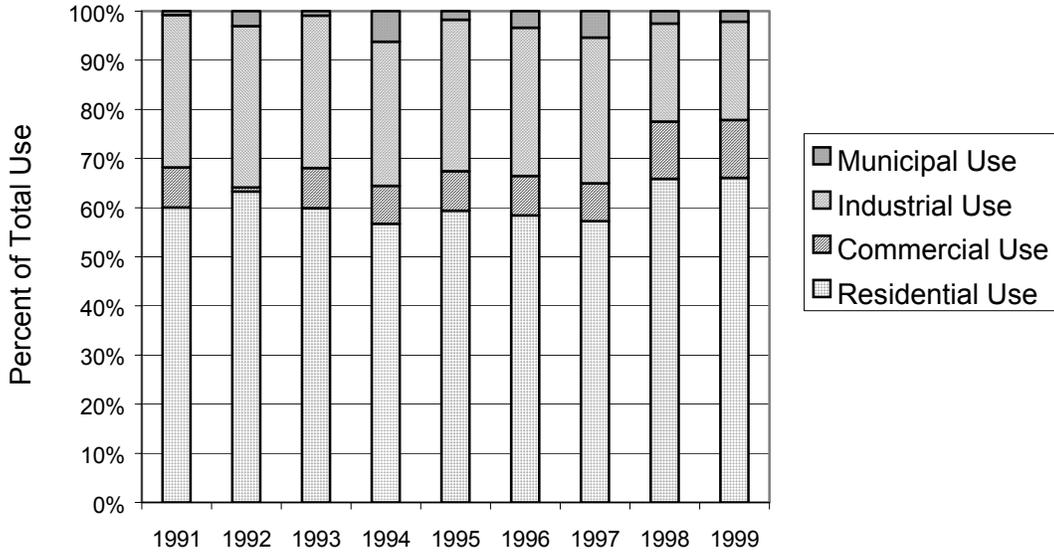
A - River City Water Use 1940-1999



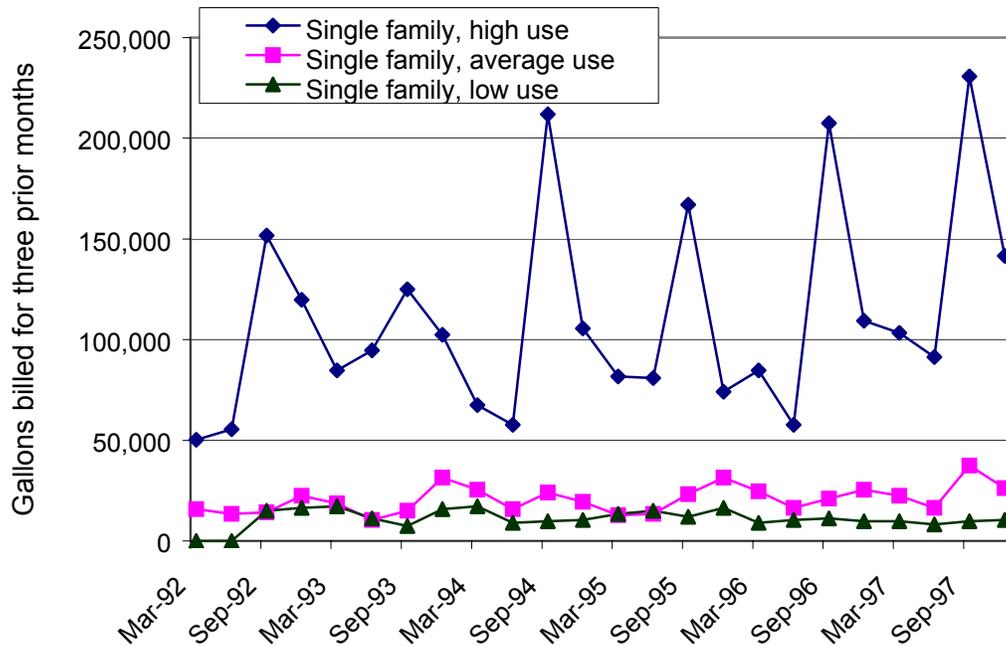
B - Per Capita Water Use



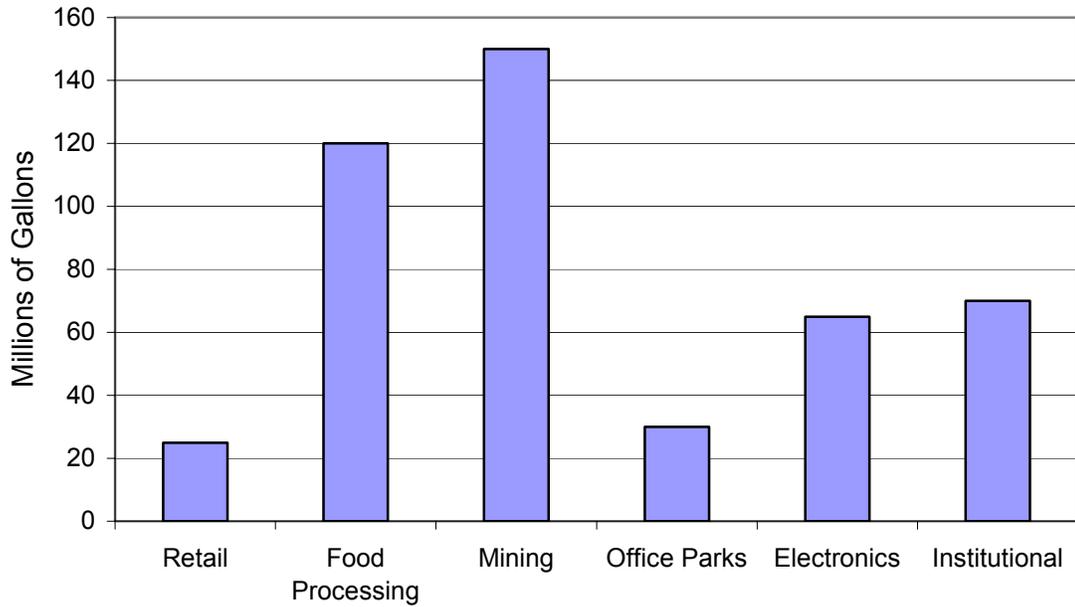
C - River City Water Use



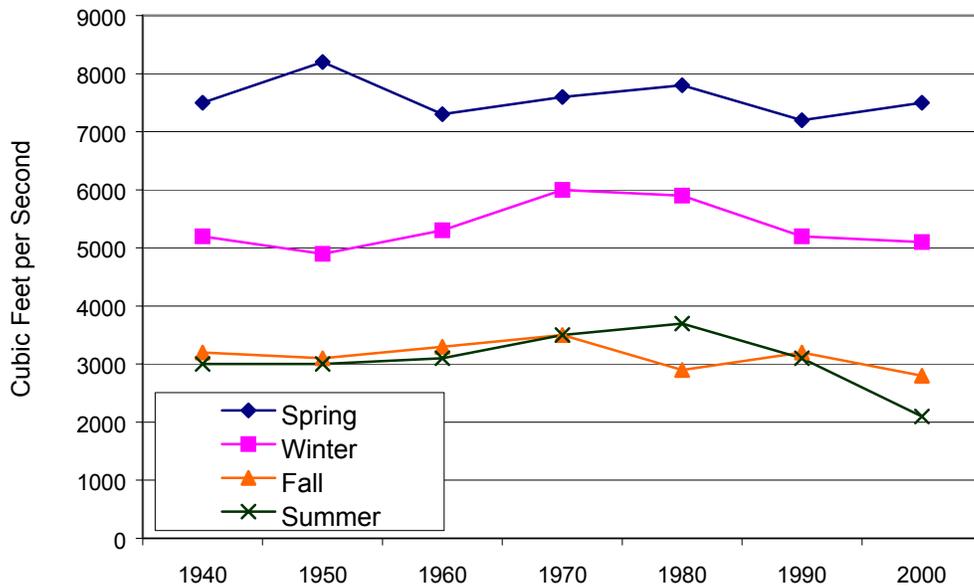
D - Quarterly water bills for sample households



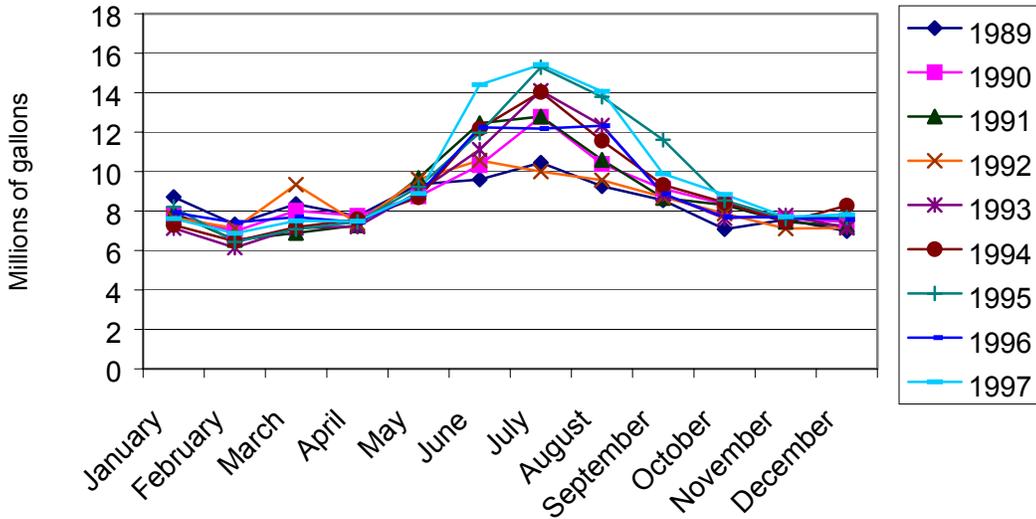
E - Water Use by Industry (1999)



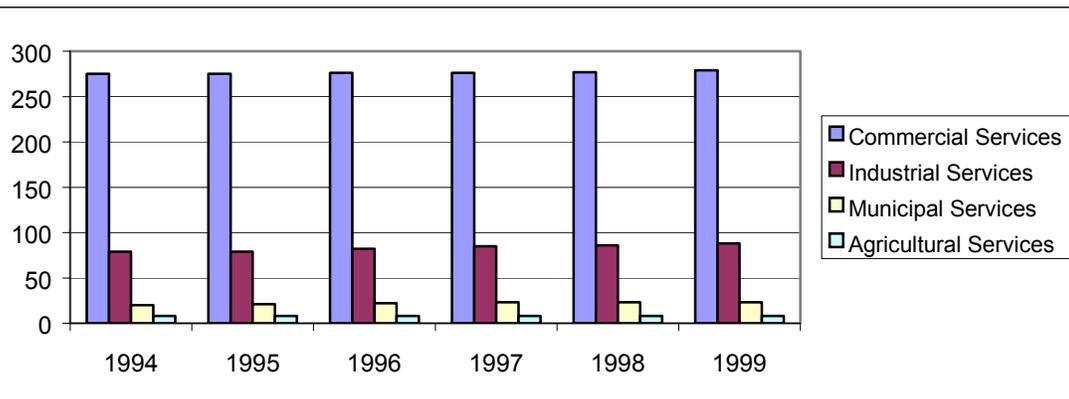
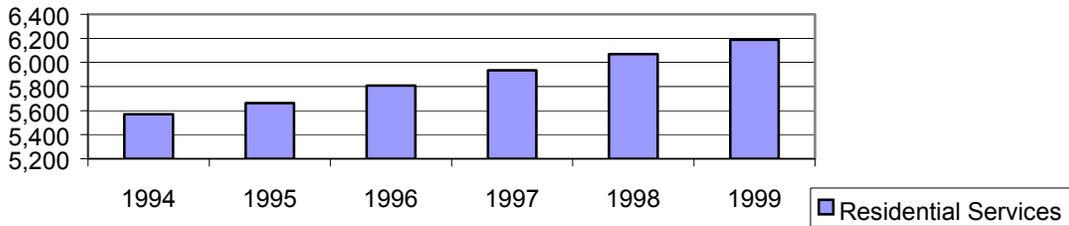
F - Deep River Seasonal Average Flow Rate



G - Monthly water withdrawals



H - Number of water service customers



C-5 Aligning Vision and Goals to Sustainability

The worksheet can be used for reviewing the extent to which existing vision and goals incorporate sustainability concepts.

Vision:									
In the right hand column below write the potential changes to the vision so that it reflects the sustainability concept in the left hand column.									
Sustainability Concepts									
Long-term balance between economic, social and environmental goals (<i>look ahead 20-50 years, understand the connections</i>)									
Limits to natural, social, and built systems (<i>live off the interest of community capital, don't degrade or use it up</i>)									
Inter- and intra- generational equity (<i>share with future generations and current inhabitants, local sustainability in harmony with global sustainability rather than at expense of others</i>)									
Goal	Criteria for 'Good' Goal					Addresses key concepts of sustainability:			Select?
	Looks to the future	Potentially measurable	Potentially achievable but not automatically	Reflects broad agreement & community values	Represents desired outcomes or community conditions	Link-ages	Limits	Equity	Yes/No

C-6 Selecting Indicators

C-6a Useful, meaningful indicators

The worksheet below can be used to select a few indicators for a specific goal based on standard indicator evaluation criteria. Review each indicator and consider it in relation to the specific goal – is it a meaningful measure that is relevant to the goal? Is the indicator understandable and reliable to its audience? Does it provide a systems view rather than look at an isolated part? Can it be measured and is it verifiable?

Goal:	Evaluation of 'Good' Indicator						Select?
Indicators	Relevant	Understandable	Reliable	Timely	System View	Measurable	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							

C-6b Sustainability indicators

The worksheet below can be used to evaluate indicators relative to the three key sustainability concepts.

Goal:	Addresses key concepts of sustainability – relative to goal			Is this sustainability indicator?	Select?
Indicators	Long-term linkages	Limits	Equity		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

C-6c Report Back Summary Sheet

This worksheet can be used to summarize the results of the indicator selection by the small groups. List all the indicators and have each group (A, B, C, etc.) put a check mark in their column for those indicators they selected. Once all the groups have made their selection, discuss the results. (Which indicators were chosen by most groups or not chosen by most groups? For which indicators was there a lack of consensus? – discuss why.)

Goal:	Groups					
Indicators	A	B	C	D	E	F
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						

C-7 Evaluating Indicators in Framework

This worksheet is useful for examining a set of indicators within a particular framework, in this case, the Montréal Process Criteria framework. List all the indicators and then check off which criteria the indicator relates to. It is possible for an indicator to relate to multiple criteria. Once all the indicators have been reviewed, check to see that all the criteria have sufficient indicators. In the example below, there are no indicators for Criteria 7 and Criteria 5 and 6 only have one indicator. This set is somewhat biased towards the first four criteria.

Indicator	Criteria						
	1	2	3	4	5	6	7
Tons of CO ₂ released as result of burning wood					X		
Acres of forest in protected area categories	X						
Number of forest species occupying smaller portion of range	X						
Ratio of net growth to removal for wood products		X	X				
Percent of forest damaged by fires		X	X				
Percent of forest area with significant soil erosion				X			
Percent of water bodies with low dissolved oxygen				X			
Percent of GDP from forest-related products						X	

Montréal Process Criteria

1. Conservation of biological diversity
2. Maintenance of productive capacity of forest ecosystem
3. Maintenance of forest ecosystem health
4. Conservation and maintenance of soil and water resources
5. Maintenance of forest contribution to global carbon cycle.
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society.
7. Legal, institutional and economic framework for forest conservation and sustainable management

C-7 Evaluating Indicators in Framework

Indicator	Criteria 1	2	3	4	5	6	7

Montréal Process Criteria

1. Conservation of biological diversity
2. Maintenance of productive capacity of forest ecosystem
3. Maintenance of forest ecosystem health
4. Conservation and maintenance of soil and water resources
5. Maintenance of forest contribution to global carbon cycle.
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society.
7. Legal, institutional and economic framework for forest conversation and sustainable management

C-8. Creating Principles and Criteria for Sustainable Community Development¹

This exercise introduces participants to principles and criteria – what they are and how are they developed. The exercise is particularly useful to communities which would like to develop their own principles and criteria for sustainable forestry. For communities that have chosen to use the Montréal Process Criteria the exercise can still be useful because it raises awareness about principles and discusses a slightly different type of criteria than the ones presented in the Montréal process framework. The latter uses criteria more like core principles for sustainable forestry, which identify specific conditions to be achieved for meeting the community's broader goals. This exercise defines criteria in a more general way – as a means of judging or a test by which something can be judged (see below).

principle *n.* – a rule of conduct, esp. of right conduct

Sustainable Development principles are rules that a community uses to guide its choices. These principles reflect the key components of sustainable development: living within the limits of community capital; finding the long-term balance between economic, social, and environmental goals; and achieving inter- and intra-generational equity. These principles also provide a foundation for the community's values concerning social, economic and environmental health and well-being.

criterion *n.* – a means of judging; a test by which something can be judged

Criteria can be designed to provide means of judging whether a particular choice, action or strategy is compatible with the community's principles for sustainable development. They also may be used to identify ways to revise a choice, action or strategy to make it more compatible with the community's principles. Often, criteria are stated in the form of questions.

When pursuing sustainable development strategies, criteria can help determine which businesses (or types of business) and projects or activities to promote or assist. They also may be used to set standards that businesses and community projects may strive toward to become more compatible.

Examples

The following examples below are specifically related to business development but could be modified to relate to other community development activities such as infrastructure development.

¹ This exercise was adapted from the Center for Compatible Economic Development's Workshop on Compatible Business Development

Principle: Projects enhance (or do not diminish) the size and condition of key species, natural communities or habitat types

Criteria:

- Does the business, industry or project help enhance the size or condition of the local population of key species?
- Does it help decrease the flow of sediment or chemical pollution into the local rivers, lakes and streams?
- Does it help enhance the size and condition of mature forest within the local watershed?

Principle: Businesses enhance the long-term viability of the local economy and provide economic benefit fairly to community members

Criteria:

- Does the business or industry add value to local resources?
- Does the business or industry use local resources at a renewable rate?
- Does the business or industry create jobs with living wages and benefits?
- Can the business or industry use the skills and abilities of available labor or will labor need to be imported?
- Does the business or industry produce goods or services that benefit community members?
- Does the business or industry purchase supplies or other inputs substantially from individuals or other businesses in the community?
- Does the business or industry contribute to diversification of the local economy?
- Does the business reduce waste generation in the community?

Principle: Projects enhance the rural character of community

Criteria:

- Does the physical facility (appearance, noise, etc.) complement or enhance the character of the community?
- Does the location of the business and its operation fit well with neighboring land uses?
- Does the business use land that is not prime agricultural or resource land (such as habitat, natural area or timber land)?
- Is the business (owners, management or employees) actively involved in the civic life of the community?
- Does the long-term economic viability of the business require growth or change that is in harmony with the rural character of the community?

Principles for Sustainable Development

Consider the following statements of principles for business development. Which statements reflect the principles of sustainable development? Which do not? For those that do not, how could they be modified to incorporate some sustainable development principles? For those that do reflect sustainable development principles, which of the three basic concepts do they reflect? How can they be improved on? Write your answers below the statements.

- Businesses do not diminish the size and condition of key species, natural communities or habitat types.
- Businesses enhance local retail economy for the community's benefit.
- Businesses can thrive with existing local infrastructure.
- Businesses provide a substantial number of well-paying jobs.
- Business activities are consistent with a healthy environment.
- Businesses use the Internet and are in one of the high growth industries.
- Businesses provide opportunities for local young adults to stay.
- Businesses use local resources in a sustainable fashion to provide high quality products for the global economy.
- Businesses are technology savvy and are proactive about change.

Criteria for Sustainable Development

A community has selected the following statement as one of its principles for sustainable business development:

Businesses will be compatible with and enhance the rural character of the community.

Which of the following criteria are relevant tests for judging if a new business idea is compatible with the principle? Why or why not?

- Does the business require additional infrastructure (roads, sewer or water lines, large buildings)?
- Will the business generate additional traffic?
- Is the business in a high growth industry?
- Does the business use existing natural resources in a sustainable manner?
- Does the business create new jobs?
- Does the business incorporate new technology in its employee development?

Note that a criterion may be good to use even if it is not relevant to a particular principle. In this case an additional principle may be necessary.

Exercise – Sustainable Business Criteria

This exercise introduces an approach that can be used by a community-based group to develop sustainable business criteria. Through the exercise you can practice developing one principle and several related criteria, and can “test” the criteria by using them to assess a business or industry. Based on this practice, you can work with your local team or group to develop a set of principles and criteria to guide your business development efforts.

Instructions

The larger group will be divided into three small groups for this exercise. For all three groups the instructions are the same, however, in Step 3, each group will be asked to apply the criteria developed to different types of businesses – manufacturing, services, and natural resource-based.

Step 1 – Develop Principles

1.A. List ideas for principles. Working individually, have each member review the definition and examples of principles and write one or more ideas for principles below. Think of these principles as operating rules that would determine the types of business that the community would try to grow or develop. Feel free to borrow from the examples.

My ideas for principles:

1.B. Record proposed principles. After each member of the group has had time to write at least one principle, have each member report one of their proposed principles at a time. Record the proposed principles on a flip chart. Continue the reporting until each member has reported all of his or her ideas.

1.C. Discuss proposed principles. Take a few minutes to discuss the proposed principles as a group. Ask clarifying questions to ensure you understand each of the ideas. You may consolidate proposed principles that represent the same idea.

1.D. Select one principle. Try to reach a consensus within your group concerning one principle to use for the next part of the exercise. Write the principle clearly on a flip chart.

Step 2 – Develop Criteria

2.A. List ideas for criteria. Working individually, have each member of the group review the definition and examples of criteria and write one or more ideas below. Think of these criteria as questions you could use to judge compatibility with the selected principle.

My ideas for criteria:

2.B. Report criteria ideas. After each member of the group has had time to write at least one criterion, have each member report one of their proposed criteria at a time. Record the proposed criteria on a flip chart. Continue the reporting until each member has reported all of his or her ideas.

2.C. Discuss proposed criteria. Take a few minutes to discuss the proposed criteria as a group. Ask clarifying questions to ensure you understand each of the ideas. You may consolidate proposed criteria that represent the same idea.

2.D. Select three or four criteria to test. Try to reach a consensus within your group concerning which criteria to select. Circle the selected criteria.

Step 3 – Use and Refine Criteria

3.A. Select business to assess for compatibility. Brainstorm examples of actual businesses that are operating, or trying to start up or to locate, in your communities. As a group, select one to consider against your draft criteria.

3.B. Evaluate selected business. As a group, discuss how well the selected business (or type of business) satisfies your criteria. What ideas do you have for ways the business might improve its standing against the criteria?

3.C. Evaluate criteria. Did the criteria help you in considering the compatibility of the selected business? What ideas do you have for improving your initial criteria?

Appendix D: CASE STUDIES

This appendix includes three case studies – one for each of the three pilot communities that used this Indicator Toolkit: Gogebic County (Michigan), Wallowa County (Oregon), and Baltimore County (Maryland). The case studies provide information on the community, how the project started and how the Montreal Process Criteria and Indicators were used to advance forest sustainability efforts. Included is also information on the selected indicators, next steps in the projects, and the key lessons learned from each community.

Case Study 1: Gogebic County, Michigan

1-1. The Community

Gogebic County is a rural community of 1,112 square miles or 712,032 acres located in the Upper Peninsula of Michigan. It is the westernmost county in Michigan, bounded on the west and south by the state of Wisconsin and on the northwest by Lake Superior. Eighty percent of the County is forested. The forests are largely comprised of aspen, birch, maple, and softwoods. The Ottawa National Forest occupies 311,493 acres in the County or 43.7% of the land area. Of the remaining forest, 47.5% is private and the remaining 8.8% is under state and county control. Mining and timber production have traditionally been the main industrial sectors but they have been in decline, since the mid-1960's. Roughly 30 miles of Lake Superior shoreline is a prime recreational attraction. The combination of climate, forests, and terrain produces ideal natural conditions for nature or sport activities such as downhill or cross-country skiing, snowmobiling, ATV trails and mountain biking.

Gogebic County's population is currently 17,370 people. The County is struggling with high unemployment, low wages, aging population and a growth in second home ownership. The County has been very active in trying to address these issues and attract new industries. Some of the recently established businesses include the Watersmeet mill, Wakefield mill, FiberSpec mill, Bessemer Plywood, and Burton industries. The calculated tax benefits of these industries to the municipalities and the school system is estimated at about \$245,000 annually.

1-2. How the project started

In the course of developing a multi-year strategic plan in 1998, the Gogebic County Economic Development Commission brought together a group of 29 county residents representing a broad cross section of the community to define a vision for the county. The group was challenged to identify strategic goals and related specific projects to move the community closer to realizing these goals. One goal identified was *to coordinate uses and users of the county's natural resources*. A project adopted to move toward that goal was *to define sustainable forestry for Gogebic County*. The initiative was driven by a desire

on the side of community planners to own the process and to enfranchise local voices regarding local forestland issues.

As a first step a steering committee on Natural Resources was established in February 1999 to serve primarily as the data gathering and coordinating group. The Committee agreed that economic, ecological and social aspects of sustainable forestry were to be considered within the scope of sustainability. The need for assembling economic data was paramount. It was acknowledged that some data on forest resources are readily available, but others such as social and cultural data, are not. The Group agreed that the economic aspect of forestry was the priority area but at the same time it was important to harmonize it with the ecological and social aspects to promote sustainable resource use over the long term.

The steering committee agreed that there was a need for a “large, diverse community based organization.” As a result, a community group was formed to provide continuous input and feedback from the larger community. The group was called the Forest Advisory Coordinating Team (FACT) and was charged with helping to identify and address forest-related issues in Gogebic County.

FACT was made up of approximately twenty-five people from diverse segments of the County, including:

- foresters
- land owners
- forest products firms
- public officials
- educators
- retailers
- tribal authorities
- service companies
- health care providers
- public safety providers
- conservation groups
- representatives of the faith community
- the soil conservation district board
- community development organizations
- regional media, and
- resource educators from Michigan State University Extension.

FACT’s mission was to agree upon a vision for sustainable forestry in Gogebic County in the long run, based on data for past and present trends. The group was also charged with mediating and advocating for the County in forest issues using recognized factual basis for its positions. A key responsibility of FACT was to educate the public about the role of forestry and inform the community about the need to sustain the value of forests for the future of the County.

The Forest Advisory Coordinating Team first met in June 1999. As a first step, the group developed a draft definition for sustainable forestry in the County. This was not a simple task given the diversity of views represented by FACT members. The definition that they reached consensus on was:

Sustainable forestry in Gogebic County is [*forest management*] that contributes to the [*economic health*] of Gogebic County while maintaining the [*ecological and social/cultural values*] for the benefit of present and future generations in Gogebic County.

To reach this consensus, they made the strategic decision to put several phrases in brackets. These were phrases that would need further refining but that they could all agree on initially without spending too much time debating their actual definition.

In order to get even wider community involvement in the process, FACT members took the draft definition to a large number of organizations to get buy-in to the idea. As a result, the definition was supported via formal resolution by every municipality in the county, the Tribal government of the Lac Vieux Desert Band of the Lake Superior Chippewa, the Gogebic County Board of Commissioners, and a number of development and civic organizations in the county such as the County Economic Development Commission, the County Forestry Commission and several civic organizations.

Even with this success, the members of FACT realized that their job had just begun. The next step was to continue to refine the definition and develop a consensus on the parenthetical elements:

- forest management
- economic health
- ecological and
- social/cultural values

In order to further refine these four terms, FACT decided to use the Montreal Process Criteria and Indicators (MP C&I). Initially the group focused on developing socio-economic indicators assisted by the Michigan State University Extension Program. The next step was to expand the focus and include some ecological indicators to evaluate the health and productive capacity of local forests. This led to the idea of being a pilot in the “Linking Communities to the Montreal Process” project.

1-3. Using the Montreal Process Criteria and Indicators (MP C&I)

Gogebic County was particularly interested in using the MP C&I for two main reasons:

- a) to refine their definition and the four bracketed terms by selecting criteria and indicators;
- b) to use these indicators to measure their progress toward the vision of sustainable forestry in the County.

The intent was to either adopt existing criteria and indicators or develop local criteria and indicators that would help accomplish the above two tasks.

In a series of two workshops in November 2001, organized by FACT, participants from Gogebic County developed a draft list of principles and sustainability indicators for measuring economic, environmental and social conditions, pressures and activities as they relate to sustainable forestry efforts.

This draft list of indicators was a result of two approaches. First, workshop participants brainstormed sustainability indicators within each of the three key areas (forest management, economic health, and ecological and social/cultural values). The next step was to select indicators from a long list of sustainable community/sustainable forestry indicators that was organized within the MP C&I framework. A round robin exercise was used to help select draft indicators for the County. The workshop concluded with a brief discussion of possible data sources for the indicators and how to move the project ahead.

1-4. Next steps

In early 2002 two key FACT members left the community and although this slowed down the process, the project did not stop because the remaining FACT members, including Dick Bolen, Director of Forestry and Parks for Gogebic County, were firmly committed to the project. The steering committee met twice in January and April 2002 and finalized the list of indicators for Gogebic County. It also developed recommendations on how to proceed with the work. The definition of sustainable forestry in Gogebic County was finally agreed upon by selecting a small set of indicators for each of the four bracketed terms (economic health – 4 indicators, ecological health – 4 indicators, ecological values – 5 indicators, and social/cultural values – 6 indicators) (see Table D-1).

The County's main challenge was to obtain funding for the data crunching. The FACT submitted a grant proposal to the USDA Forest Service but due to budget cuts to pay for the forest fires in the West, there was no available funding. The FACT will submit another proposal for the next fiscal year. Meanwhile, the group focused on doing more education and outreach to different sectors to get final support from the community. In addition, FACT was involved in some outreach beyond the local community. This effort began in 2002 with a presentation of the Gogebic model to a multi-state group called ANSWERS (Alliance of Northern States Working to Ensure Regional Stability). This group was interested in exploring how the model used in Gogebic County could be applied in surrounding counties and/or at the region-multi state level such as the border counties of Michigan and Wisconsin.

1-5. Lessons learned

The Gogebic County initiative for sustainable forestry provided some key lessons that other communities may find valuable:

- It is over-ambitious to try to do both sustainable community and sustainable forestry indicators at the same time under the MP C&I. The latter is specifically designed to address forest issues and leaves very little space for other social and economic issues, such as education, civic engagement, public health, etc. While these are important aspects of any community, trying to develop indicators to cover each of them leads to a long list that is extremely difficult to manage. Moreover, because it is focused primarily on forest resources, the MP C&I is not the most suitable approach to use for general community development. Other approaches such as the community capital or pressure-state-response may be more useful in developing indicators for these areas. The MP C&I is most suited for communities with a strong interest in or concern for forest-related issues.
- Some of the indicators in the Montreal Process C&I set are not meaningful at the local level. There is clearly a need for upscaling and downscaling the indicators, or identifying which indicators at the national level can be used locally and which ones at the local level can be integrated up to the national scale. Creating a tiered system of indicators at different scales (local, regional, multi-state, and national) is particularly important both for improving data collection and decision-making at all these levels in order to promote sustainable forestry.
- Although the MP C&I framework is useful as an organizational tool during a community's indicator development process, a community may find other frameworks more useful for final presentation of an indicator set. In the case of Gogebic County, the categories “Forest Management,” “Economic Health,” “Ecological Values,” and “Social and Cultural Values” were used.
- There is no one set of indicators that will apply to every community (one-size-fits-all). Depending on their resources and key issues, communities need to select the most relevant indicators to measure their sustainable forestry efforts.
- The workshops in Gogebic County demonstrated that community indicator projects are processes and not endpoints. A community cannot expect that in one meeting it will get all the answers and develop the perfect set of sustainable forestry indicators. First, involving a diverse community representation often involves a series of discussions to reach a consensus. Second, public education and raising awareness about the importance of preserving forest resources is more important than simply coming up with a sophisticated set of indicators. Third, as a community changes over time, its key issues may also change. This requires continuous revisiting of the goals and indicators for sustainable forest management.
- Indicator projects should include a wide group of people representing diverse interests in the community. This helps build ownership within the community and helps to overcome the institutional and policy fragmentation that results from multiple land ownership, mandates, legislation, and policies. Moreover, diverse community support for the project helps to ensure that the initiative will continue even in the case of a loss of critical members.

- There is a clear need to identify data and information sources that communities can use in measuring and tracking the indicators. Data collection can be time-consuming and expensive as some of the information is place specific. For example, to measure some of the social and cultural values in the community, Gogebic County initiated a comprehensive residents survey designed and conducted by the Department of Forestry and MSU Extension, Michigan State University. However this was an expensive one-time effort that cannot be replicated without continuing funding.

Gogebic County was clearly an example of a community that did not have outside resources but managed to engage the entire community and come up with a common vision for a sustainable forestry. It demonstrates that even small communities with limited resources can do a lot by taking charge in defining a common vision and goals, initiating action and measuring progress.

Table D-1: List of indicators selected by Gogebic County FACT

Category	Indicator	Data
Forest Management	1. Number of acres of forest in Gogebic County in each category.	FIA (Forest Inventory Assessment data)
	2. Number of forest acres in Gogebic County with written forest management plan.	
	3. Percent of forested land in Gogebic County that is certified by a third party.	
	4. Percent of volume of forest harvested relative to volume growth in Gogebic County.	FIA
Economic Health	1. Acres of forest that allow timber harvest (a.k.a., working forest) in Gogebic County.	Measurements are not known but FIA data can be used for trends.
	2. State Equalized Value of land in Gogebic County.	SEV is readily available at the County offices.
	3. Changes in labor statistics and employment patterns in Gogebic County.	Readily available from labor market analyst of State of Michigan.
	4. Value and volume of value-added products of forest industries in Gogebic County.	
Ecological Value	1. Change in water quality in Gogebic County.	
	2. Changes in forest structure and composition in Gogebic County.	FIA and MSU Extension
	3. Proportion of forests in Gogebic County that are affected by disturbance and damaging agents.	FIA
	4. Number of forest species in Gogebic County that are classified as threatened, rare, vulnerable, endangered, or extinct.	
	5. Average parcel size in Gogebic County.	FIA and plat book.
Social and	1. Change in ownership of land in Gogebic County.	

Cultural Value	2. Changes in quality of life in Gogebic County.	Primary data collected through interviews of county residents.
	3. Changes in population in Gogebic County.	
	4. Percent of Gogebic County population under the poverty level.	Census data available.
	5. Changes of infrastructure of Gogebic County.	
	6. Changes in acreage of forest land converted to development in Gogebic County.	

Case Study 2: Wallowa County, Oregon

2-1. The Community

Wallowa County consists of 3,153 square miles located in Northeastern Oregon in the beautiful Wallowa-Whitman National Forest area. The county is about 52 % forestland and 56% of the forests are owned by the federal government. Wallowa County has a population of about 7,200 people. Forest and watershed management activities in the county suffer from declining financial and human resources. This decline can be seen in the high unemployment rate (10.7% in the County compared to 6.3% in Oregon and 4.8% in U.S. in year 2001); the declining school enrollment; and the emigration of working families. The average annual pay per job in the year 2000 in the county was \$22,546 compared to \$35,296 in the U.S. In a recent statewide assessment the Oregon Progress Board ranked Wallowa County’s economy as the 35th out of 36 counties in the state. Over the past several years, 14.3% of the county residents have had income below the federal poverty level. In addition, there is a clear trend toward increasing retiree and second homeownership.

The traditional forest-related industry sector in Wallowa has experienced significant decline over the past decade as a result of increased tree mortality, severe fire and pest impacts, a downturn in the market price for lumber, and increasing federal-level restrictions on wood and other natural resources such as anadromous salmonids (under the Endangered Species Act of 1992). All three of the remaining timber mills closed by 1995 – including the large Boise Cascade mill in Joseph, which had the highest (union) wage jobs. While the two smaller mills in Joseph and Wallowa reopened in 1996, supplies to these mills remains tenuous. As a result, the 123 jobs provided by these mills – and the over 100 other jobs linked to the lumber and wood products industry (contractors and workers, truckers, etc.) – are at risk. Over the past 10 years, the forest-related sector of the local economy lost over 220 jobs, which is greater than the jobs gained over the same period by all other sectors combined.

Despite the losses, the lumber and wood products sector remains the second largest employer in the County in terms of both job count and total payroll. Local government is the leading sector in both of these categories due in large part to the county hospital, while federal government places third in both categories.

2-2. How the project started

Several representatives from local, county, state, and federal agencies met in November 2000 in La Grande, Oregon to discuss current and ongoing assessments primarily related to social and economic conditions. The group was brought together by LUCID (Local Unit Criteria and Indicator Development Project) and shared a wide range of goals and objectives related to monitoring and reporting needs based on county, state and federal laws and policy initiatives. As a first step the group developed a list of current initiatives working in the field of sustainable forestry at different levels – local, regional, multi-state and national.

Following the meeting, the Northeast Oregon Community Assessment Workgroup (NEOCAW) was formed to design and implement a social and economic assessment framework and process for Union and Wallowa Counties. The Core Group of NEOCAW included:

- ◆ Regional Services Institute, Eastern Oregon University
- ◆ Grande Ronde Model Watershed (an intergovernmental agency covering Wallowa and Union counties)
- ◆ Wallowa Resources, a small local NGO
- ◆ USFS Wallowa-Whitman National Forest

Other parties who participated in this work included representatives of:

- ◆ Wallowa and Union Counties' Board of Commissioners
- ◆ Wallowa and Union Counties' School Districts
- ◆ Oregon Department of Forestry
- ◆ Oregon Economic and Community Development Department
- ◆ Oregon Progress Board
- ◆ Northeast Oregon Economic Development District
- ◆ Oregon Department of Employment
- ◆ USFS Pacific Northwest Research Station (INLAS)
- ◆ USFS Malheur, Umatilla and Wallowa-Whitman National Forests
- ◆ Blue Mountains Demonstration Area
- ◆ Ecosystem Workforce Program

The group recognized the need to do additional outreach to assess interest in participation amongst the tribes with ceded lands and treaty rights within the analysis area including the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation of Oregon. Participation from each County's Workforce Investment Boards and/or Economic Development Committees, and other parties was also considered important.

The key objectives for NEOCAW were:

- to provide an overall framework for assessing social and economic baseline conditions with common indicators, protocols and standards and to monitor meaningful and measurable changes over time.
- to facilitate and focus the project partners' limited resources on collaborative data collection and combined assessment efforts.
- to provide an effective feedback from the public of how the groups are progressing toward achieving the various goals and objectives.

The participants agreed that they needed to focus on key questions to guide the development of a *Collaborative Assessment Framework*. As a result, the following six key questions were developed to guide NEOCAW's work in the first year (2001):

1. What is the baseline condition of the economy, social well-being, and the quality of life in Union and Wallowa Counties, and what factors and trends (natural resource management, economic development, agricultural production, etc.) are affecting these conditions?
2. What key assets and business and workforce capacity are available for ecologically sustainable natural resource management, economic development, agriculture production, etc.?
3. What opportunities exist or are forthcoming to utilize local skills, businesses, and resources to address ecosystem restoration needs and create by-products or value-added opportunities?
4. How can investments in community-based watershed restoration lead to improvement in the natural resource management of landscapes, generate economically viable local employment and income, or improve the socio-economic conditions?
5. Where and how can investments in high priority watersheds for conservation and restoration be most effective in providing a high probability of benefits to local communities?
6. What are the tradeoffs between alternative choices for ecosystem restoration management activities and what is the distribution of impacts to local communities, other individuals and future users of the area?

Although most of these questions focus on the socio-economic aspects of natural resource management, the Group acknowledged that the framework developed should be based on the concept that social, ecological and economic systems interact with each other as elements of the ecosystem. Moreover, multiple temporal and spatial scales are important to linking changes in the system, therefore identifying indicators that assess such changes at different scales would be critical.

The first draft of the *Collaborative Assessment Framework* focused on the relationships between the forested landscapes and the resulting community conditions. The Montreal Process Criteria and Indicators and the Oregon Department of Forestry's Core Indicator Data Matrix were used as the initial basis for developing the local draft framework. The

main objective of the Core Group was to focus on indicators that were already being assessed at the state and national levels to maximize efficiency in data collection and assessment efforts.

The Core Group screened a partial list of useful resources and frameworks identified at the November 28, 2000. Criteria and indicators were modified to provide a meaningful and measurable set of local criteria and indicators.

The first fundamental change was to expand the framework to capture information and provide for the analysis of community conditions with the entire landscape of both counties, including forested, agricultural and urban lands. The Group agreed to retain the criteria and indicators from the Montreal set at this time, and noted that the State of Oregon set is based on a narrower range of Montreal Criteria and Indicators that help to focus the discussion.

NEOCAW agreed that incorporating standards for assessing progress of the indicators was necessary, but deferred the discussion and development of standards until the core criteria and indicators framework was finalized.

Due to funding limitations, the participants agreed that each entity conducting an assessment would be responsible for archiving the information gathered and sharing it with the others whenever it becomes available. Several different groups have been collecting various elements of the data but no collaborative data gathering and analysis had been undertaken. The short-term objective of the group was to establish a collaborative effort for identifying multiple plans and policies, criteria and indicators, collect multiple data sets among the various entities and produce analysis of results in comprehensive format using the framework for communicating to the public.

2-3. Using the Montreal Process Criteria and Indicators (MP C&I)

NEOCAW was particularly interested in using the MP C&I to help expand their indicator set beyond the socio-economic indicators to include some ecological indicators for assessing baseline conditions and trends in local natural resources.

In a workshop held in May 2002 NEOCAW brought together representatives from Wallowa, Union and Grant Counties to introduce them to the concept of sustainability, Montreal Process C&I, and the work done so far. The main objective of the workshop was to refine and expand Wallowa County's indicators for sustainable forest management and sustainable community, and develop a common vision of what natural resource management can or should mean in the context of community-based needs, desires, and economic well-being.

During the first day of the workshop Wallowa County participants were first introduced to the work done by NEOCAW. Then, using Round Robin exercise the group selected indicators from a long list of sustainable community/sustainable forestry indicators organized within the MP C&I framework.

The second day of the workshop brought together NEOCAW, Blue Mountains group and the Tech Team to address specific challenges to indicator development, such as data availability, issues of scale, data interpretation, etc. Participants further discussed the six key Wallowa County questions.

2-4. Next steps

The workshop faced some skepticism toward the process and a real fear of loss of local control over the natural resources. However, this problem was resolved in the following months. The Natural Resource Advisory Committee (NRAC) was charged with the task of moving the process ahead. People wanted to meet and brainstorm indicators. Over 70 people were involved in setting the community values. NEOCAW members presented their work and the larger group liked it. This work naturally built on a previous effort in the County called “Future Search” – a process that involved a wide group of people from Wallowa County who got together and developed a common vision and agreed on key initiatives to move toward this vision.

As a next step the larger community group charged NEOCAW and NRAC to develop some county specific criteria and indicators that focus on the unique attributes of the County. The goal was to come up with indicators which are highly valued by the residents. A final list of indicators has been developed but due to the pressures of other projects, the final report is not expected to become available until 2004.

2-5. Lessons learned

NEOCAW project provided the following key lessons that other communities may find valuable:

- The MP C&I approach focuses primarily on forest sustainability and leaves out other important natural resources such as agricultural and range land. Other important community issues such as education, public health, safety, etc. are also left out of the framework. Therefore, the MP C&I is best suited as a framework for communities particularly interested in forest-related issues.
- Having long lists of indicators to choose from can be overwhelming and frustrating for the participants. It might be better to take a few key issues and have participants develop their own indicators.
- It is overly ambitious to try to develop a final list of indicators in one day-long meeting. It takes a long time to review and discuss each indicator; therefore a better approach would be to have a series of one-day meetings to finalize the indicators.
- Before beginning a process to develop sustainability indicators it is very important that there be clarity about a) the purpose that the indicators will serve; and b) the common vision and set of goals that will guide indicator development and related

action. The indicators are only a tool and they cannot help promote sustainable forest management unless they are part of a process of goal-setting, decision-making and acting upon results.

- There is no one set of indicators that will apply to every community (one-size-fits-all). Depending on their resources and key issues, communities should be able to select the most relevant indicators to measure their sustainable forestry efforts.
- There is a strong interest in developing sustainable resource management indicators because indicators are information and information is power. In a community like Wallowa County, the greatest fear is the loss of local control over the local resources. Having comprehensive information on the baseline of natural resources and trends would allow the community to participate in national-level discussions and help change national policies. An example of such participation is the NEOCAW's recent involvement in revising the National Fire Plan.
- Related to the fear of loss of control mentioned above, the MP C&I framework can initially be seen in a negative light by community members because it was developed by an international group to address national level forest management. This can cause misunderstanding that using the MP C&I will result in decisions that reflect national or international concerns rather than local concerns. This is not the case, since the MP C&I is only a framework for organizing information and addressing issues. Therefore, if the process is locally driven, the results will reflect local concerns and solutions. However, organizers of a community process should be aware of this potential concern and be careful how the MP C&I is introduced to the community.
- Involving a wide group of community members is critical for gaining credibility, building consensus and creating ownership of the indicators, which paves the way for moving ahead. It further helps raise awareness and educate the public about key community issues related to natural resource management. The Wallowa case demonstrated the importance of preparing the larger group before the actual launching of the indicators project in order to avoid some difficulties related to local cultural and political issues.
- The Wallowa County pilot demonstrated that the process of developing indicators is not an easy one. Frustration at some points is natural; it should not discourage the participants. Developing goals and indicators for sustainable resource management is a cyclical, evolving process. Even if a community decides to go back and start from a blank sheet, it has benefited from the cumulative learning. The process of indicator development is as important as the actual indicators because it promotes understanding of and buy-in to the overall objectives.
- Involving more than one community can be challenging when developing vision, goals and indicators for sustainable resource management. Even though Wallowa and

Union Counties are very similar they have enough differences to approach the process and the indicators differently.

- Some of the Montreal Process C&I are not meaningful at local level. There is clearly a need for upscaling and downscaling the indicators, or identifying which indicators at national level can be used locally and which ones at local level can be integrated up to the national scale (this was a common finding from all three pilots). Creating a tiered system of indicators at different scales (local, regional, multi-state, and national) is particularly important both for improving data collection and decision-making at all these levels in order to promote sustainable forestry.
- In some cases using the Montreal Process Criteria appears to be more useful than the Montreal Process Indicators themselves because the Criteria ensure a comprehensive coverage of forest issues but leave more freedom to communities in selecting the most appropriate measures for their circumstances. Other frameworks for developing the actual indicators may turn out to be more useful (e.g., Community Capital Framework, Input-Output-Outcome, Pressure-State-Response).
- It is very difficult for a community with limited resources to attempt to use all 67 indicators laid out in the MP C&I. A better approach might be to select and use a small number of core indicators covering key issues of concern (e.g., 10-20).

Case Study 3: Baltimore County - A Case of Urban Forest Sustainability

3.1 The Community

Baltimore County is Maryland's third largest county in both area and population, consisting of 610 sq. miles (about 389,000 acres) surrounding, but not including, the independent City of Baltimore. The City and County were legally separated in 1851. In 2000 the County had a population of 754,300 people. This was an increase of 21% since 1970 and an increase of 9% since 1990. By comparison, the 2000 population of the City of Baltimore was about 650,000, representing a decline of 11.5% since 1990. Despite its sizeable population, 33.9% (or 130,258 acres) of Baltimore County's land area is in forest and tree cover. Of the total 130,258 acres of forests, 75% are in private ownership and 25% in public ownership. Nearly 14,000 acres (10.7% of total forest acres) are in protective conservation easements. Large amounts of the Baltimore County forests are concentrated around three City-owned reservoirs, which serve 1.8 million people in the region, including the City of Baltimore.

Unique for Baltimore County is its strong emphasis on concentrating development in the current urban centers in order to preserve the rural agricultural economy, to protect the region's drinking water reservoirs, and to conserve forests and open space. Eighty-five percent of Baltimore County's residents live within the urban growth boundary, established in 1967, on 1/3 of the land. Overall, land cover is approximately one third each urban, agriculture and forests. Due to suitability of soils for farming, the County's

forests are highly fragmented, with only about a dozen patches greater than 1,000 acres. About 62% (or 80,300 acres) of the County's total forest is in 100-acre or larger forest patches. About 44% of the County's forest cover is in patches greater than 200 acres.

Unlike the other two case studies where a coalition representing private and public interests was involved in developing indicators for sustainable forests, in Baltimore County, a county agency, the Department of Environmental Protection and Resource Management (DEPRM) took the lead on the project. DEPRM's mission is to:

“administer and enforce environmental laws, regulations, programs, and activities for the purpose of conserving, enhancing, and perpetuating the natural resources of the county and to preserve and protect the environmental health of its citizens”.

DEPRM performs a diverse set of resource protection and management functions including land preservation, resource protection (regulatory programs such as stormwater management, forest buffers, forest conservation, and groundwater protection), environmental restoration (stream restoration, stormwater best management practices, shoreline erosion control), watershed planning and water quality monitoring, urban stormwater facility maintenance, watershed-based ecosystem research, education and citizen participation, and protection of environmental health.

Some of the key issues that the County has been facing in relation to forests include:

- Loss of forest cover due to development
- Conflict between farming and forestry
- Forest fragmentation
- Increasing deer population affecting significantly forest health
- Drought (water shortage) and the impacts on forest health
- Air pollutants and the impacts on forest health
- Managing Baltimore County's watersheds (protecting the reservoirs)
- Lack of knowledge regarding the health of large forest holdings
- Lack of knowledge about the needs of, and communication with, the forest products industry

There have been numerous initiatives and organizations working on forestry issues in the County and the region. One example of a regional effort is *Revitalizing Baltimore* – a national model community forestry and watershed restoration project funded by the USDA Forest Service, which involved partnership between the Maryland Department of Natural Resources Forest Service, Baltimore County and Baltimore City, non-profit organizations, three community-based watershed associations, businesses and academic institutions. In addition, one of the first of two US “urban” Long-Term Ecological Research (LTER) projects funded by the National Science Foundation is focused on rural-to-urban watersheds in Baltimore County and City.

Baltimore County has also established itself for aggressive and innovative resource management programs. Stream and forest resources have particularly been the focus of the County's efforts. For example, in order to better address protection of forest and

stream system resources during land development, DEPRM enacted comprehensive *Regulations for the Protection of Water Quality, Streams, Wetlands, and Floodplains* in 1990, which expanded County policies first developed in 1986 to require retention of forested stream buffers. This regulatory effort pre-dated the Chesapeake Bay Program's Riparian Buffer initiatives. With the passage of the Maryland Forest Conservation Act in 1991, DEPRM's field assessment procedures that implemented local forest conservation were subsequently adopted by the State for the Act's Technical Manual.

DEPRM also became involved in Green Infrastructure network research in 1995, and in 1996 produced a methodology for the MD Department of Natural Resources under contract. The project's report, *A GIS-based Methodology for Establishing A Greenway Corridor System in a Fragmented Forest Landscape*, established DEPRM's interest in assessing forest resources on a landscape level and in identifying large-scale priority sites for protection and reforestation. Through this work, DEPRM's programs became known to officials with the USDA Forest Service.

Finally, Baltimore County's Master Plans have acknowledged the importance of protecting valuable natural resources, including forests, streams, and reservoirs, for more than 20 years.

DEPRM has extensive large-scale GIS (Geographic Information System) data on urban, herbaceous, and forest land cover; streams; conservation zoning; soils and geology; property parcels; etc. Although large amounts of data have been collected, these have not been systematically organized and linked to overall forest resource management goals and vision, thus making it difficult to determine what is important and what is not, and how to use data to make better decisions.

3-2. How the project started

In August 2002 key DEPRM staff met with "this ToolKit" project team members to discuss the involvement in the project and Baltimore County's needs. Two objectives were identified that the "Linking Communities to the MP C&I" Toolkit could help achieve:

- Incorporate sustainability indicators into DEPRM's existing natural resource management efforts (e.g., development of a process for identifying critical issues and relevant goals, identification of indicators, data sources, thresholds, and targets, organizing existing data, and interpreting results); and
- Raise awareness among other Baltimore County agencies and organizations about the usefulness of sustainability indicators to the County's mission, goals and initiatives including:
 - Understanding of the connection between existing initiatives and sustainable forests;
 - Building cross-agency/cross-organizational understanding, engagement and support for sustainable forests;

- Identifying possible sustainability goals and indicators for Baltimore County to raise awareness and measure progress in key areas (e.g., forest cover, fragmentation, water availability, impacts of deer population)

The initial task involved identifying work already done to address key forest management issues in Baltimore County. Information about critical issues, goals/targets, indicators, and available data sources was compiled into a table organized within the Montreal Process Framework. Initially, DEPRM staff attempted to develop “the ultimate” list of indicators but soon it came to realize that such an effort requires an input from a larger and more diverse group. Also, while DEPRM has an understanding of some County-wide resource issues, those for management of privately-owned and managed forests are largely unknown.

Therefore as next step DEPRM sponsored a one-day forum in June 2003 to help identify system-level issues and indicators that would allow tracking progress and making better decisions for forest sustainability in the County.

3-3. Using the Montreal Process Criteria and Indicators (MP C&I)

Baltimore County was interested in using the MP C&I, since it saw its potential as a tool for making better decisions in managing forest resources and growth in the County. The scope of the C&I, including both technical and institutional aspects, and including ecosystem and human components, was particularly appealing. DEPRM also viewed that the Montreal Process provided a framework for supporting a broader management role for sustainability of the County’s forest resources.

Baltimore County Forest Sustainability Issues and Indicators Forum was held on June 10, 2003. Over 60 participants attended the forum, including local, state and federal government, NGOs, citizens groups, businesses, and academia. Private sector interests included forest products users, and consulting ecologists and foresters, in addition to a variety of agencies that provide technical and financial assistance to landowners. The groups and organizations represented included:

- Baltimore City Department of Planning
- Baltimore City Department of Public Works
- Baltimore County Department of Public Works
- Baltimore County DEPRM
- Baltimore County Forest Conservancy District Board
- Baltimore County Office of Planning
- Baltimore County Soil Conservation District
- Biohabitats, Inc.
- Charles A. Davis, Inc.
- Edrich Lumber Co.
- Friends of Patapsco Valley and Heritage Greenway
- Gaylord Brooks Realty Company

- Glatfelter Pulpwood Company
- Gunpowder Valley Conservancy
- KCI Technologies, Inc.
- MAR-LEN Forestry, Inc.
- MD Department of Agriculture
- MD Department of Natural Resources
- Parks and People Foundation, Inc.
- Parkton Woodland Service, Inc.
- The John Hopkins University
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- USDA Forest Service
- USDA Natural Resources Conservation Service
- University of Maryland Cooperative Extension Service
- Watershed Protection Coalition, Inc.

The main objectives of the Forum were to:

- Review forest sustainability and the Montreal Process Criteria and Indicators as relevant to Baltimore County;
- Introduce participants to sustainability goals and indicators (system, program and action level);
- Identify and prioritize key issues related to forest sustainability in Baltimore County
- Select key indicators to measure forest sustainability in Baltimore County.

During the first part of the workshop participants were introduced to the DEPRM work to date and why DEPRM decided to get involved in the project. A brief introduction of the MP C&I was made, followed by a “round-robin” (carousel) exercise for identifying key issues and challenges for Baltimore County for each of the seven Montreal Process criteria. Participants were randomly assigned to groups in order to preclude people from the same organization working in the same group. After brainstorming numerous issues and challenges, participants prioritized them using their knowledge and best judgment. The result was a smaller list of most important (key) issues and challenges. Additional issues/challenges to the ones identified by the DEPRM staff in the preliminary phase included education, inventory of species, funding for acquisition and forest management, and public and private ability and willingness to manage forest lands, among others.

Some of the important issues identified by the participants did not fit into the seven Montreal Process Criteria. These included:

- “Financing” sustainable forests – who benefits, who pays and how to measure values in order to establish incentives
- Education and decision-making for “Stewardship”
- Regulatory authority and enforcement within an ecosystem management framework
- Linkage of process, information, measures and decisions across political boundaries and landscape scales

Once the key issues and challenges to sustainable forest management in Baltimore County were identified, participants defined some broad sustainability goals and selected indicators to measure progress. For this activity, small groups were formed based on participants’ interests. Each group worked on one of the seven Montreal Process Criteria by first reviewing the list of Montreal Process Indicators to select most relevant ones, then suggesting additional measures, and finally prioritizing the list of indicators. The result was a shorter list of four-to-five key indicators for each criterion. Participants were encouraged not to be limited by data availability while selecting the key indicators. During the report back session, each group briefly talked about data availability for the identified indicators, allowing the larger audience to provide additional ideas and suggestions.

A list of identified key issues/challenges, goals and indicators is included in Table D-3.

3-4. Next steps

Using the information from this first meeting, DEPRM intends to form a committee including all participants interested in helping to move the process ahead by finalizing the list of indicators and beginning data collection. It was acknowledged that this is expected to be a long process of continuous improvement, aiming to involve an even wider group of organizations in order to share resources, define common goals and vision and measure progress toward sustainable forest resource management in Baltimore County.

As a first step DEPRM plans to call for volunteers to be on a Steering Committee, which would take a lead on drafting a strategy for moving the process ahead.

DEPRM is also finalizing a proposal and application to use indicators for other management programs, an effort that can potentially interface well with the Montreal Process project. DEPRM is working with the U.S. Environmental Protection Agency’s National Exposure Research Laboratory to demonstrate the application, at a local scale, of analytic tools developed for the EPA’s Regional Vulnerability Assessment (ReVA) program. The ReVA application will allow Baltimore County to evaluate resource stressors and effects for existing and future conditions.

3-5. Lessons learned

A key lesson from this pilot community was that the MP C&I is useful for initial review of forest-related issues to ensure that all key aspects of forests are considered. The seven criteria in particular provide a simple framework to identify key issues and challenges to sustainable forests in local communities. In its current state, however, the framework does not address the issues of farming, loss of forest cover to development, and air quality impacts, which are critical in Baltimore County.

Participants pointed out that the Montreal Process C&I are a better fit for large publicly-owned forests. In east coast areas such as Baltimore County, private land ownership has always been the predominant pattern. Forest management approaches used nationally for large publicly-owned areas do not necessarily work well for small, fragmented privately-owned forest lands. Forest resource management issues are exacerbated as a result of increasing fragmentation of ownership as well as fragmentation of actual forest blocks. Conflicts have also increased over the balance between protection of forests from harvesting and their management for sustainable production. There needs to be more work under the MP and particularly Criterion 7 to address funding and availability of incentives for private owners to adopt sustainable forest practices.

Some participants noted that, as it currently stands, the Montreal Process C&I does not adequately address engaging the users of forests. Education and public involvement with emphasis on ethnic and class representation is a key, if the goal is to advance forest sustainability. This is an important future issue as the population of Baltimore County becomes more diverse in its socioeconomic composition. The growing deer population in Baltimore County was another of the key identified challenges. The deer have significantly affected the forests serving as buffer around the regional drinking water reservoirs. Many deer are causing car accidents. Many people, however, are still opposed to deer hunting and this perception can only be changed if the public is better educated about the issue.

Educating the public on forest sustainability issues can further help change public perception by emphasizing that forest management is a positive and not a detrimental activity, when properly planned and conducted. Overall, the challenge is essentially whether Baltimore County can “have its cut and ecology too.”

The Forum participants had some specific comments on the Montreal Process criteria, including the following:

- Under Criterion 1 (Biological Diversity) some of the indicators seem to have too large a focus and thus are not relevant at the community level. Participants emphasized the importance of measuring all forest dependent species, not just the large patch species. There was also a concern that ‘the number of forest dependent species’ may be misleading, since it is not directly linked to biodiversity.

- The main issue with Criterion 2 (Productive capacity of forest ecosystems) was the lack of clarity on what is meant by ‘a forest product’. Does it mean trees, hydro geologic capacity or providing food for other species? This needs to be defined and followed by establishment of timeframe for forest management plans.
- The main problem with Criterion 6 (Long term multiple socio-economic benefits) was that most of the Montreal Process indicators measured forest production, therefore were not particularly relevant for Baltimore County. Participants pointed out the need to find a way to value the forests for other uses than timber production. For example, it is well known that housing prices go up as the number of trees in a neighborhood increase. In addition, forests are highly valued for recreation and they provide protection of water resources (both quality and quantity).

A key lesson from the workshop was that Montreal Process Criteria and Indicators work can only be useful when it is part of the community development process, i.e. when a wide range of groups and organizations are brought to work together on sustainable forest issues. MP C&I helps link organizations and people working on different aspects of sustainable forests, and thus ensures a better communication and collaboration between groups with conflicting interests, promotes data sharing and work towards a common vision and goals. For Baltimore County, MP C&I are also a demonstration of using indicators themselves as important tools to measure change and progress toward goals.

Table D-3: List of issues, goals and indicators selected by Baltimore County Forum participants

Criterion	Key Issues/Challenges	Goal(s)	Indicators
1. Biological Diversity	<ul style="list-style-type: none"> • Inventory of species • Impact of non-native, native, domestic species on ecosystems • Forest fragmentation 	<ul style="list-style-type: none"> • Maintain or increase biological diversity of native forest- “dependent” species in Baltimore County to improve the quality of life. 	<ol style="list-style-type: none"> 1. Extent of forest fragmentation 2. Number of rare elements in Baltimore County forests 3. Number of forest ‘dependent’ species 4. Extent of area by forest type and by age class or succession state 5. Number and extent of non-native organisms in County’s forests
2. Productive capacity of forest ecosystems	<ul style="list-style-type: none"> • Education • Conversion of land use and land cover to non-forest • <u>Sustainable</u> management plan 	<ul style="list-style-type: none"> • Enhancing and maintaining the capacity of existing forest ecosystems • Generating new and productive forested areas using sustainable management plans • Promoting education and awareness of the 	<ol style="list-style-type: none"> 1. Area of forest land and net area of forest land available for timber production 2. Annual removal of wood products compared to the volume determined to be sustainable 3. Total growing stock of both merchantable and non-merchantable tree species on forest land available for timber

		productive capacity of forest ecosystems	production 4. Area of public forest land with a sustainable management plan and 5. Area of private forest land with a sustainable management plan 6. Annual removal of non-timber forest compared to the level determined to be sustainable 7. Number of acres of timber productive land harvested from natural forest ecosystems vs. tree plantations
3. Maintenance of forest ecosystem health and vitality	<ul style="list-style-type: none"> Exotic invasive species 	<ul style="list-style-type: none"> Invasive/exotic/native species will be managed to limit impacts on sustainability. 	<ol style="list-style-type: none"> List of exotic/invasive species Area and percent of forest impacted beyond a [threshold] of damage Monitor spread of invasives/exotics
	<ul style="list-style-type: none"> Management for ecosystem values 	<ul style="list-style-type: none"> Increase implementation of management plans that maintain forest health. 	<ol style="list-style-type: none"> Percent (or acres) of forests with a sustainable forest management plan Percent (or acres) of <u>implemented</u> management plans
	<ul style="list-style-type: none"> Expand forest cover 	<ul style="list-style-type: none"> Develop and implement a plan for decreasing fragmentation and increasing forested area. 	<ol style="list-style-type: none"> Area of forest in County Size of forested patches
4. Soil and water resources	<ul style="list-style-type: none"> Loss of forest land affecting water quality, quantity, and stream function Maintaining and increasing forest in key sensitive areas (buffer, recharge, reservoirs) 	<ul style="list-style-type: none"> Manage Baltimore County Forest for protection and improvement of soil and water resources 	<ol style="list-style-type: none"> Percent of forest land under permanent protection (through easements, etc.) Percent of streams (miles) protected by forest buffers/miles restored Percent of forest land by watershed Percent of stream miles/waters meeting “good” IBI – Index of Biological Integrity Percent of streams supporting trout populations (or some measure of percent natural species) Acres of potential recharge areas in forest cover Percent/miles of unstable streams (deviate from historic

			or stable flow and timing)
5. Global carbon cycle	<ul style="list-style-type: none"> Lack of inventory/information on present condition \$\$ for acquisition and management Inability to respond to existing market demand due to lack of resources/infrastructure 	<ul style="list-style-type: none"> Increase opportunities for participation in carbon markets 	<ol style="list-style-type: none"> Quantity and quality of ecosystem and carbon pool, by forest type, age, class, successional stage, land use, region \$\$ expended buying credits (acquisition and maintenance) Number of acres afforested and reforested under program Number and geographic location of buyers and sellers of credits
6. Long term multiple socio-economic benefits	<ul style="list-style-type: none"> Timber harvest is not a major economic factor in Baltimore County but management, including cutting, may be important for forest health 	<ul style="list-style-type: none"> Expand forest land base and manage for: recreation, forest health, aesthetic, and water supply purposes, with minor income/revenue enhancement from selective cutting. 	<ol style="list-style-type: none"> \$ value of forest setting for residences Economic value of protected water supply \$ value of selective cuts on managed forests Area and percent of forest land managed for recreation, as percent of total forest Area (total acres) maintained for residential aesthetic values Local budget for forest assessment, inventory, research, planning, regulation and education.
7. Legal, institutional, economic framework	<ul style="list-style-type: none"> Public and private ability and willingness to manage forest lands Protection for upland forest Capacity for planning, regulating and assessing forest Paradigm shift 	<ul style="list-style-type: none"> Establish laws, regulations, policies and incentives to value, protect and increase sustainable forest. 	<ol style="list-style-type: none"> Percent of forest that is protected and sustainable compared to Y2K Number of sustainable new builds and retrofits Number of schools that include sustainable forest in their curriculum Amount of funding sustainable forest compared to Y2K Number of Baltimore county and state agencies which include sustainable forest objective Number of acres covered by a new tax code Number of developers and architects building sustainable buildings Number of economic and social incentives focus on sustainable forest

Appendix E: SAMPLE INDICATORS LIST - FOREST SUSTAINABILITY¹

The sample indicators below can be used as a “starter set” for a community thinking about how to develop sustainable forest indicators using the Montreal Process Criteria and Indicators in order to raise awareness, make better decisions and monitor progress toward its goals and vision. The purpose of the list is not to dictate what indicators a community should use, rather to provide a starting point for discussion about what is valued and therefore needs to be measured, monitored and cared for. The indicators are categorized by the Montreal Process Criteria and Subcriteria and possible data sources are listed, along with an explanation of the indicator and its significance.

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
Criterion 1. Conservation of biological diversity				
Subcriterion 1.1 Ecosystem diversity				
1	Extent of area by forest type relative to total forest area	Each forest type supports different mixtures of species, so maintaining the ratio is important for biodiversity conservation.	<ul style="list-style-type: none"> • % of forest area by forest type 	USDA FS, FIA & ECOMAP
2	Extent of area by forest type and by age class or successional stage	Each state of succession supports different communities of plants and animals; maintaining adequate area is important for species retention. It is important to look at forest land relative to the entire community land as well as forest land only.	<ul style="list-style-type: none"> • Acres of forest area by forest type (SAF forest types); • Size class by forest type (acres by size class) • Age class by forest type (acres by years). 	USDA FS, FIA & ECOMAP
3	Extent of area by forest type in protected area categories as defined by IUCN or other classification systems	The World Conservation Union (IUCN) has developed an approach for classifying reserves based on the level of protection; this provides a useful and credible basis for tracking reserve areas.	<ul style="list-style-type: none"> • Acres of forest in protected area categories. • % of forest in protected area categories as defined by IUCN or other classification system. 	

¹ This appendix contains information from the following sources: (1) Montreal Process Criteria and Indicators, The Santiago Declaration; (2) The Great Lakes Forest Alliance “Assessing progress in Sustainable Forest Management: Proposed Criteria and Indicators for the Upper Great Lakes Region”, June 1998; (3) Northeastern Forest Resource Planners Association – “Sourcebook on Criteria and Indicators of Forest Sustainability in the Northeastern Area, July 13, 2001.

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
4	Extent of areas by forest type in protected areas defined by age class or succession stage.	Protected areas are of high significance with their biodiversity. Each state of succession or age class support different mixtures of species.	<ul style="list-style-type: none"> Acres of forest in protected areas by age class. % of forest in protected area by age class. 	
5	Fragmentation of forest types.	Forest fragmentation may be assessed from average patch size, road density, or other indices. Less fragmented forest provides opportunities for species and wildlife movement and interchange, and thus is more resilient over time.	<ul style="list-style-type: none"> Average patch size in acres. Fragmentation index Connectivity index Road density 	GIS (geographic information system) (remotely-sensed analysis)
Subcriterion 1.2 Species diversity				
6	The number of forest dependent species.	Forest dependent species are at a greater risk of extinction with reduced quantity or quality of forests. Thus their number provides a measure of risk of biodiversity loss.	<ul style="list-style-type: none"> Number of forest dependent species. Forest dependent species as % of all species. 	Threatened and endangered species lists from state agencies
7	The status (threatened, rare, vulnerable, endangered, or extinct) of forest dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment.	Species, which are classified as rare, threatened or endangered are at some relatively significant risk of extinction and the status of such species provides a measure of risk of loss of biodiversity.	<ul style="list-style-type: none"> % of forest species that are classified as threatened, rare, vulnerable, endangered or extinct. Health of sensitive species (use a scale to evaluate it based on mortality, fecundity, and population structure). Acres/% of habitat enhancement. 	State T and E species lists
Subcriterion 1.3 Genetic diversity				
8	Number of forest dependent species that occupy a small portion of their former range.	Species whose range is shrinking are likely to have less within-species genetic variation.	<ul style="list-style-type: none"> % or number of forest dependent species that occupy a smaller forest area than they used to. 	
9	Population levels of representative species from diverse habitats monitored across their range.	The number of representative species needs to be considered in the light of what a viable population is.	<ul style="list-style-type: none"> Number of members of representative species. 	

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
Criterion 2. Maintenance of productive capacity of forest ecosystems				
10	Area of forest land and net area of forest land available for timber production.	This indicator is a measure of human pressures on forests.	<ul style="list-style-type: none"> Acres of timberland area 	USDA FS, FIA
11	Total growing stock of both merchantable and non-merchantable tree species on forest land available for timber production	Growing mixed species makes a forest more resilient to different outside pressures (diseases, storms, fires, etc.)	<ul style="list-style-type: none"> Percent or acres of forest area with merchantable and non-merchantable tree species for timber production. 	
12	The area and growing stock of plantations of native and exotic species.	Native ecosystems can be disrupted by exotic species. The disruptive effects may include the local extirpation of species, which are outcompeted or preyed on by the exotic species, and a shift in the distribution of remaining species.	<ul style="list-style-type: none"> Ratio of number of exotic species to native species Acres/% of area for growing native vs. exotic species. 	
13	Annual removal of wood products compared to the volume determined to be sustainable.	Maintaining a sustainable ratio of removal to growth ensures the long-term health of a forest and its ability to provide future generations with all necessary resources, including timber.	<ul style="list-style-type: none"> Ratio of net growth to removal for wood products. 	
14	Annual removal of non-timber forest products (e.g. fur bearers, berries, mushrooms, game), compared to the level determined to be sustainable.	Higher rate of removal than the regeneration for non-timber species would compromise the long-term health and resource availability.	<ul style="list-style-type: none"> Ratio of net growth to removal for non-timber forest products. 	
Criterion 3. Maintenance of forest ecosystem health and vitality				
15	Area and percent of forest affected by processes or agents beyond the range of historic variation, e.g. by insects, disease, competition from exotic species, fire, storm, land clearance, permanent flooding, salinisation, and domestic animals.	This indicator measures the extent of each main type of natural and human disturbance. In some cases, such as insect infestation, a further breakdown by severity class is required to provide a measure of the stress faced by the forest.	<ul style="list-style-type: none"> Acres/percent of forest affected by insects and diseases (including exotics). Rate of mortality (per acre) Acres/percent of forest burned in fires. Acres or % of forest damaged by storms, animal browsing, drought/flooding. 	USDA FS, FHM, FIA, National Interagency Fire Management Integrated Database (NIFMID)

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
16	Area and percent of forest land subjected to levels of specific air pollutants (e.g. sulfates, nitrate, ozone) or ultraviolet light that may cause negative impacts on the forest ecosystem.	This indicator measures the impacts of human development and air pollution on the health of forests.	<ul style="list-style-type: none"> Acres or percent of forest damaged by acid rain. 	
17	Area and percent of forest land with diminished biological components indicative of changes in fundamental ecological processes (e.g. soil nutrient cycling, seed dispersion, pollination) and/or ecological continuity (monitoring of functionally important species such as fungi, arboreal epiphytes, nematodes, beetles, wasps, etc)	This indicator measures forest health as result of human or natural disturbance.	<ul style="list-style-type: none"> Acres or percent of forest with diminished beetles populations. 	
Criterion 4. Conservation and maintenance of soil and water resources				
18	Area and percent of forest land with significant soil erosion.	Soil condition is directly linked to forest health.	<ul style="list-style-type: none"> Acres or % of forest area affected by significant soil erosion. 	USDA FS
19	Area and percent of forest land managed primarily for protective functions, e.g. watersheds, flood protection, avalanche protection, riparian zones.			
20	Percent of stream kilometers in forested catchments in which stream flow and timing has significantly deviated from the historic range of variation.	This indicator attempts to report on the extent to which water flow relations have been disrupted; flow and timing exercise a strong influence on the habitat characteristics of streams.	<ul style="list-style-type: none"> Kilometers (or %) of forested catchments, where stream flow and timing has significantly changed over time. 	
21	Area and percent of forest land with significantly diminished soil organic matter and/or changes in other soil chemical properties.	Soil health is directly linked to the health of the forest ecosystem.	<ul style="list-style-type: none"> Acres or % of forest area with diminished soil organic matter and/or change in other soil chemical properties. 	USDA FS, FHM

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
			<ul style="list-style-type: none"> Acres or % of forest with soil pH that has diverted significantly from the normal value. 	
22	Area and percent of forest land with significant compaction or change in soil physical properties resulting from human activities.	Compaction, puddling and loss of organic matter are key causes of soil degradation and productivity losses.	<ul style="list-style-type: none"> Acres or % of forest area with significant compaction and/or change in other soil physical properties, resulting from human activities. 	
23	Percent of water bodies in forest areas (e.g. stream kilometers, lake hectares) with significant variance of biological diversity from the historic range of variability.	This indicator measures disturbances of the water bodies in a forest area over time.	<ul style="list-style-type: none"> Index of Watershed Indicators (IWI) 	U.S. EPA, Office of Water Resources
24	Percent of water bodies in forest areas (e.g. stream kilometers, lake hectares) with significant variation from the historic range of variability in pH, dissolved oxygen, levels of chemicals, electrical conductivity, sedimentation or temperature change.	Water conductivity is one of the single best measures of overall water quality. Dissolved oxygen, pH, temperature are additional indicators. For example, the growth of organic matter reduces dissolved oxygen and thus – the ability of a water body to support life. Removal of tree cover over streams and other water bodies contributes to higher water temperatures, which affects growth rates and habitat – cool water species are particularly vulnerable to spikes in water t°.	<ul style="list-style-type: none"> % of water bodies with low dissolved oxygen % of water bodies with deviation in pH level % of water bodies with higher temperature than normal. Average daily discharge of dioxins and furans from selected pulp and paper mills. Phosphorous levels. 	
25	Area and percent of forest land experiencing an accumulation of persistent toxic substances.	Persistent toxic substances usually have both acute and chronic effects. They can bioaccumulate in fish and then through the food chain can reach humans and lead to serious diseases such as mental retardation, cancer, etc.	<ul style="list-style-type: none"> Area and % of forest land that has higher levels of mercury, lead or other persistent, bioaccumulative and toxic chemicals. 	

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
Criterion 5. Maintenance of forest contribution to global carbon cycles				
26	Total forest ecosystem biomass and carbon pool, and if appropriate, by forest type, age class, and successional stages.		<ul style="list-style-type: none"> Tons of ecosystem biomass Metric tons of carbon pool 	USDA FS, U.S., Global Change Research Program
27	Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon (standing biomass, coarse woody debris, peat and soil carbon).	Sequestering of carbon mitigates carbon emissions into the atmosphere.	<ul style="list-style-type: none"> Metric tons of carbon flux per year 	USDA FS, U.S., Global Change Research Program
28	Contribution of forest products to the global carbon budget.	Burning wood releases carbon into the atmosphere and human fuel use may be an important contributor to atmospheric carbon in some areas.	<ul style="list-style-type: none"> Tons of CO2 released as result of burning wood. 	USDA FS, U.S., Global Change Research Program
Criterion 6. Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies				
Subcriterion 6.1 Production and Consumption				
29	Value and volume of wood and wood products production, including value added through downstream processing.	The choice of products, and to a lesser extent, the efficiency of manufacturing indicate how much value a firm can add to the inputs during the manufacturing process.	<ul style="list-style-type: none"> Value and volume by industry of wood production and products value added. Value and volume of imports and exports. 	
30	Value and quantities of production of non-wood forest products.	A measure that helps determine sustainability of production of other forest products, such as berries, furs, and mushrooms.	<ul style="list-style-type: none"> Value and tons of other forest products – mushrooms, berries, furs. 	
31	Supply and consumption of wood and wood products, including consumption per capita.		<ul style="list-style-type: none"> Value and volume of wood products consumed. 	RPA Assessment (USDA FS, FIA)
32	Value of wood and non-wood products production as percentage of GDP.	Proportion of GDP generated by forest products is a measure of their importance, and, indirectly, their competitiveness.	<ul style="list-style-type: none"> % of GDP coming from forest-related products. 	

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
33	Degree of recycling of forest products.	This is a measure of sustainable resource use. Use of recycled wood will reduce the demand for virgin wood.	<ul style="list-style-type: none"> % of forest products that are recycled. 	
34	Supply and consumption/use of non-wood products.	This is a measure of the importance of forests in meeting other needs than wood consumption.	<ul style="list-style-type: none"> Amount and % of income from supply/consumption of non-wood products. 	
Subcriterion 6.2 Recreation and tourism				
35	Area and percent of forest land managed for general recreation and tourism, in relation to the total area of forest land.	Recreation usage, and its value, is a complement to timber harvest revenues. It's also an important element of quality of life.	<ul style="list-style-type: none"> % or area of forest land managed for recreation and tourism. 	
36	Number and type of facilities available for general re-creation and tourism, in relation to population and forest area.	Recreation and tourism are important forest services that contribute to both GDP and quality of life of people.	<ul style="list-style-type: none"> Miles of trails by type Number of campgrounds Number of visitors trips/days 	USDIF & WS, National Survey of Fishing, Hunting and Wildlife Associated Recreation,; USDA FS NFS or Other Existing Recreation Data
37	Number of visitor days attributed to recreation and tourism, in relation to population and forest area.	Recreation and tourism are important forest services that contribute to both GDP and quality of life of people.	<ul style="list-style-type: none"> Number of visitor days per acre per year. 	
Subcriterion 6.3 Investment in forest sectors				
38	Value of investment, including investment in forest growing, forest health and management, planted forests, wood processing, recreation and tourism.	Investment in such activities is the key to long-term sustainability and profitability of forest-related industries.	<ul style="list-style-type: none"> Dollar value of manufacturing/processing investment (lumber, wood products, paper products) Dollar value of forestry program budgets. 	AF&PA, U.S. Census, NASF State Data
39	Level of expenditure on research and development, and education.	This is another measure of industry competitiveness.	<ul style="list-style-type: none"> % of forest-related income that goes for R&D and education. 	
40	Extension and use of new and improved technologies.	Such technologies may reduce waste and thus lower the demand of virgin products.	<ul style="list-style-type: none"> % of forest-related income invested in new and improved technologies. 	

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
41	Rates of return on investment.	Some private landowners view their holdings as investments. For those who do, rate of return is a critical measure of the attractiveness of the investment, as well as of the affordability of land.	<ul style="list-style-type: none"> • Rate of return on investment in timber industries • Rate of return on investment in tourism and recreation. 	
Subcriterion 6.4 Cultural, social and spiritual needs and values				
42	Area and percent of forest land managed in relation to the total area of forest land to protect the range of cultural, social and spiritual needs and values	Measurement of the area with special cultural, social and spiritual needs and values is the first step in promoting its proper management.	<ul style="list-style-type: none"> • Percent of forest that is considered historically valuable. • Acres or % of forest land which have cultural value to community. 	
43	Non-consumptive use forest values.	These include tourism and recreation, education, and others and are important for achieving higher quality of life.	<ul style="list-style-type: none"> • Number or % of local people who rank non-consumptive uses of forest as critical for achieving personal and spiritual development. 	
Subcriterion 6.5 Employment and community needs				
44	Direct and indirect employment in the forest sector and forest sector employment as a proportion of total employment.	Providing employment for local people is critical for the long-term sustainability of a community.	<ul style="list-style-type: none"> • % of local residents employed in forest-related industries. • Direct employment in the forest sector, measured as % of people working in such industries. • Indirect employment in the forest sector, measured as % of people working in retail, insurance, transportation, and other related industries. 	
45	Average wage rates and injury rates in major employment categories within the forest sector.	People tend to move where wages are higher. The average can also be compared to economy-wide averages to gain a sense of the relative prosperity of a region. Rates of injuries in the forest sector are indicator of the relative safety of these kinds of jobs.	<ul style="list-style-type: none"> • Average wage rate in major employment categories in the forest sector. • Ratio of average wage rate in the forest sector versus average wage rate in the area (state, county, etc.). 	U.S. Census Bureau USDA FS (IMI) IMPLAN NASF Forestry Statistics Bureau of Labor Statistics (BLS)

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
			<ul style="list-style-type: none"> Lost workday injuries and illness rate (LWDII) 	
46	Viability and adaptability to changing economic conditions, of forest dependent communities, including indigenous communities.	This indicator measures the ability of forest dependent communities to adjust to quickly changing economic conditions that lead to reduced/increased demand for forest products and thus affect employment and income.	<ul style="list-style-type: none"> % change in forest-related employment over the past several years. 	
47	Area and percent of forest land used for subsistence purposes.	Poverty (subsistence uses of forest resources) can exert high pressures on forest resources and lead to their fast depletion and degradation.	<ul style="list-style-type: none"> Area or % of forest land significantly degraded as result of subsistence uses. 	
Criterion 7. Legal, institutional and economic framework for forest conservation and sustainable management				
Subcriterion 7.1 Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests, including the extent to which it:				
48	Clarifies property rights, provides for appropriate land tenure arrangements, recognizes customary and traditional rights of indigenous people, and provides means of resolving property disputes by due process.			
49	Provides for periodic forest-related planning, assessment, and policy review that recognizes the range of forest values, including coordination with relevant sectors.			
50	Provides opportunities for public participation in public policy and decision making related to forests and public access to information.			
51	Encourages best practice codes for forest management.			

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
52	Provides for the management of forests to conserve special environmental, cultural, social and/or scientific values.			
Subcriterion 7.2 Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to:				
53	Provide for public involvement activities and public education, awareness and extension programs, and make available forest-related information.			
54	Undertake and implement periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination.			
55	Develop and maintain human resource skills across relevant disciplines.			
56	Develop and maintain efficient physical infrastructure to facilitate the supply of forest products and services and support forest management.			
57	Enforce laws, regulations and guidelines.			
Subcriterion 7.3 Extent to which the economic framework (economic policies and measures) supports the conservation and sustainable management of forests through:				
58	Investment and taxation policies and a regulatory environment which recognize the long-term nature of investments and permit the flow of capital in and out of the forest sector in response to market signals, non-market economic valuations, and public			

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
	policy decisions in order to meet long-term demands for forest products and services.			
59	Nondiscriminatory trade policies for forest products.			
Subcriterion 7.4 Capacity to measure and monitor changes in the conservation and sustainable management of forests, including:				
60	Availability and extent of up-to-date data, statistics and other information important to measuring or describing indicators associated with criteria 1-7.			
61	Scope, frequency and statistical reliability of forest inventories, assessments, monitoring and other relevant information.			
62	Compatibility with other countries in measuring, monitoring and reporting on indicators.			
Subcriterion 7.5 Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services, including:				
63	Development of scientific understanding of forest ecosystem characteristics and functions.			
64	Development of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies, and to reflect forest-related resource depletion or replenishment in national accounting systems.			

#	Montreal Process Indicator	Explanation/ Significance	Detailed Measure	Data Source
65	New technologies and the capacity to assess the socioeconomic consequences associated with the introduction of new technologies.			
66	Enhancement of ability to predict impacts of human intervention on forests.			
67	Ability to predict impacts on forests of possible climate change.			

Appendix F: OTHER RESOURCES

This appendix contains a number of difference resources that may be of use to communities interested in sustainable forest management and ways to measure it.

F.1 Handbooks on Community and Sustainability Indicators

This section lists handbooks and guides which provide step-by-step information on how to initiate and carry out a community-wide indicator projects.

Community Culture and the Environment: A Guide to Understanding a Sense of Place, Environmental Protection Agency, EPA 842-B-01-003, www.epa.gov

This Guide addresses the social and cultural aspects of community-based environmental protection. It includes technical tools for more effectively working with the public on environmental protection efforts. The tools include assessment methods, case studies, worksheets and checklists to define goals, identify community characteristics, analyze results and select and implement best strategies.

The Guide is available from the National Center for Environmental Publications and Information: ncepiwo@one.net.

The Community Indicators Handbook: Measuring Progress Toward Healthy and Sustainable Communities, by Redefining Progress, Tyler Norris Associates, and Sustainable Seattle (August 1997, 15 pp.)

This is a comprehensive, user-friendly, step-by-step guide to aid communities of all kinds in developing new measures of their overall health and well-being. The *Handbook* is designed to support the growing indicators movement as local government and business and grassroots leaders seek better ways to assess progress. It draws on the experience of dozens of projects around the United States, and presents how-to's and resources for tailoring an indicators project to the specific needs of a community. A wealth of information is included in numerous appendices, including a directory of indicators projects nationwide, data sources, and organizational resource listings.

The Handbook is available from Redefining Progress at info@rprogress.org, website: www.rprogress.org.

Guide to Sustainable Community Indicators, Second Edition, 1999, by Maureen Hart.

This is a useful tool for any community that has decided to develop and implement sustainability indicators. The Guide defines sustainability and indicators of sustainable community. It introduces a few key organizing frameworks for developing indicators and outlines the advantages and disadvantages of each one. The Guide provides specific examples of sustainability indicators and explains the difference between them and traditional measures. A list of community sustainability indicators, existing community indicator projects, data sources and other useful resources are included at the end.

To order the Guide send an email to admin@sustainablemeasures.com or see the order form at www.sustainablemeasures.com.

Measuring Community Success and Sustainability: An Interactive Workbook, by Flora C., M. Kinsley, V. Luther, M. Wall, S. Odell, S. Ratner, J. Toposky, North Central Regional Center for Rural Development, Iowa State University.

This workbook describes a process to help communities learn how to measure the local or regional impacts of economic and community development processes that enhance rural community sustainability. The approach used is inputs-activities-outputs-outcomes. Five main outcomes are discussed, including specific measures, sources of information and advice on implementation. These outcomes were chosen using results of a rural communities' survey, conducted by the North Central Regional Center, and include:

- increased use of skills, knowledge and ability of local people;
- strengthened relationships and communication, improved community initiative, responsibility and adaptability;
- sustainable, healthy ecosystems with multiple community benefits; and
- appropriately diverse and healthy economies.

The Workbook is available online at

http://www.ncrcrd.iastate.edu/Community_Success/about.html.

Multiparty Monitoring for Sustainable Natural Resource Management,

by Cassandra Moseley and Lisa Wilson, December 2002, available at

<http://ewp.uoregon.edu/guidebook> or <http://thewatershedcenter.org>.

This handbook is designed to help communities and their agency partners monitor activities related to ecosystem management and community forestry, especially implementation of the National Forest Plan. It is primarily focused on public-lands issues, especially in the West but many of the indicators could be adapted in different contexts. The Handbook offers suggestions about how to develop a multiparty monitoring program for four areas: employment results (quality jobs) of restoration and maintenance of public lands; utilization of by-products of ecosystem management; grants and other investments; ecological effects of fire restoration efforts.

Sustainable Forest Management Community Handbook for the Great Lakes Region, by Maureen McDonough, Leigh Ann Spence, and Wendy Hinrichs Sanders, May 2002, available at http://www.lsfpa.org/pub_SFM_handbook.html

This is a planning tool developed through a collaborative process including forest resource professionals and community leaders, and designed to help communities throughout the Great Lakes area. It offers step-by-step guidelines for communities on how to plan and evaluate their progress toward sustainable forest management. The handbook discusses the birth of criteria and indicators and provides a list of indicators for the Great Lakes area. Each indicator is supplemented with detailed guidance on how to find the necessary data and what additional resources to use. The handbook includes a series of case studies from the Great Lakes area.

User's Guide to Local Level Indicators of Sustainable Forest Management, by the Canadian Model Forest Network.

The guide describes 12 different 'Model Forests' where communities used the MP C&I as a basis for sustainable forest resource management. The guide documents' each model forest's approach to initiating a local level indicator program, selecting indicators,

gathering data, and using and reporting on indicators. There are lists of relevant publications, complete sets of each model forest's indicators, a comparison of approaches to local level indicators across the model forest network, and contacts for more information.

A free copy of the Guide in English or French (specify which) is available from modelforest@nrcan.gc.ca,
web site: http://www.modelforest.net/e/home/_/loc/_/usersgue.html

F.2 Organizations Working on Sustainable Forestry Issues

This section lists various organizations working on sustainable forestry issues as well as some plans and reports on sustainable forest development.

American Forests

<http://www.americanforests.org/>

American Forests is the nation's oldest nonprofit citizens' conservation organization. It was founded in 1875 by citizens concerned about the waste and abuse of the nation's forests. Its goals focus on assisting communities in planning and implementing tree and forest actions to restore and maintain healthy ecosystems and communities. AF also works with community-based forestry partners in both urban and rural areas to help them participate in national forest policy discussions.

Canadian Forest Service (CFS)

http://www.nrcan-rncan.gc.ca/cfs-scf/index_e.html

The Forestry Act of 1988 in Canada mandated the Canadian Ministry of Forestry to promote sustainable development. This was also the first federal statute to incorporate the concept of sustainable development. This Statute is the cornerstone of Canada's 1992 National Forest Strategy: "Sustainable Forests: A Canadian Commitment." Canada participated in the development of criteria and indicators under the Montreal Process but it also has its own framework of criteria and indicators for sustainable development.

Canadian Forest Service Strategic Plan 1998-2003

<http://nrcan.gc.ca/cfs/mandat/plan/pt10.shtml>

The plan addresses issues such as global stewardship, industry competitiveness and market access, forest land-use pressures, involving the public in decision-making, and increasing complexity and responsibilities. It emphasizes the challenges in balancing economic, environmental and social needs and benefits. The Plan lays out the CFS strategic direction and goals. Concrete action items are included under each goal. The Plan has 9 strategic priorities and 96 commitments to help implement Canada's sustainable forest development policies and programs. No indicators are included in the plan.

Forest Stewardship Council

<http://fscus.org>

This is a non-profit, international accrediting organization that evaluates and monitors product certifiers and encourages creation of national and regional initiatives. FSC

certifies through the organizations SmartWood (Rainforest Alliance) and Scientific Certification Systems. There are ten certification criteria applied by FSC such as: meet all applicable laws, respect indigenous rights, maintain community well-being, conserve economic resources, protect biological diversity, maintain high conservation value forests, etc.

Fraser Basin, British Columbia: *'A Preliminary Framework for the Development of Sustainability Indicators for the Fraser Basin'*, Revised June 12, 2000, web site:

http://www.fraserbasin.bc.ca/documents/indicators_document.pdf

Provides good examples of sustainability goals and indicators organized in four categories:

- Understanding sustainability
- Caring for ecosystems
- Strengthening communities
- Improving decision-making

This is initial, theoretical work – no practical results are available yet. The draft framework includes 26 goals and numerous indicators. The report provides list of data sources, relevant publications and web sites.

The Great Lakes Forest Alliance, *"Assessing Progress in Sustainable Forest Management: Proposed Criteria and Indicators for the upper Great Lakes Region"*, June 4, 1998, web site: http://www.lsf.org/pub_GLFA_rep2.html

This is an excellent example of both theoretical and practical work to develop sustainable forest management (SFM) indicators. The work was carried out by a consulting team, which first organized two workshops to involve all interested stakeholders, reviewed a wide range of publications on SFM, and developed a set of indicators for three different scales:

- state/province;
- county/forest management unit; and
- woodlot.

At the end, the GLFA scored the indicators for their value and utility. Using six criteria for good indicators for SFM (relevance to the value, measurability, sensitivity to change, practicality, understandability, and response oriented), the indicators were scored and organized in 5 tables (one for each criterion) with separate columns for each scale. More than 150 indicators are included – the number is too large but the consultants did not want to use their subjective judgment to screen out some of them. Resulting score can be a good indication of the usefulness of suggested indicators.

International Network of Forests and Communities

<http://www.forestsandcommunities.org/country.html>

Although it does not provide specific information on indicators, this web site gives extensive information about the U.S. forestry laws and initiatives, lists various forest-related networks, briefly describes the efforts of different forest community projects, and outlines the main challenges to community forestry. The site provides information on forestry issues in different countries as well.

The Inventory and Monitoring Institute (IMI) <http://www.fs.fed.us/institute/>

IMI is a Forest Service nationally chartered organization, guided by a Board of Directors. The IMI provides technical consultation to Forest Service units with responsibilities for on-the-ground inventory, monitoring and planning activities. The Institute's work focuses the application of knowledge and technology to these areas of the information environment:

- Data collection with sound inventory design and quality assurance;
- Land classification using Bailey's world class Eco-region Principles;
- Information management using leading edge Forest Service information technology;
- Information analysis to answer questions and address issues;
- Knowledge sharing through technical assistance to other countries.

Of particular interest to users of the indicator toolkit, IMI provides resources, ideas and tools to assist groups in developing monitoring programs. Two particular initiatives, the CIFOR North American test of C&I and the LUCID tests of sustainability indicators at the forest management unit scale are mentioned in this toolkit.

Manomet Center for Conservation Science <http://www.manometmaine.com>

The Center is a non-profit organization in Maine that is involved in study for integration of forest industry economic goals with ecological health. Their main project, Shifting Mosaic Project, is a multi-year evaluation of ways in which sustainable forestry can meet the needs of Maine's human communities while helping to conserve its biodiversity.

Montreal Process Criteria and Indicators, by the Montreal Process Working Group, http://www.mpci.org/home_e.html

This web site provides general information about the Montreal Process and lists all seven criteria and 67 indicators. Additional information is provided for selected criteria and indicators.

North American Test of Criteria and Indicators of Sustainable Forestry http://www.fs.fed.us/institute/cifor/cifor_3.html

This report includes an independent review of various sets of criteria and indicators for sustainable forestry. It identifies some key problems with the standard indicators. Some problems include: no supporting or explanatory material; absent theoretical rationale for indicator selection; and indicators applicable at national level that do not translate well to the community level. At the end of the report is a table "Amalgamation of C&I appropriate for the North American Test," which presents interesting form of organization: principle – criterion – indicator. It also lists some specific indicators.

Roundtable on Sustainable Forests, <http://www.sustainableforests.net/>

The Roundtable is an inclusive partnership of public and private organizations and individuals, promoting the national goal of sustainable forests through implementation of a set of criteria and indicators for sustainable forest management that will lead to increased understanding and better decision-making. The Roundtable sponsored a series of workshops in spring 2000 to assess the state of knowledge and available data in the United States related to Montreal Process C&I.

SmartWood (Rainforest Alliance) <http://isf-sw.org/tenelem.htm>

This is a certification program for forests based on ten elements of sustainability that relate to: maintaining vitality, structure and functioning of the natural processes; protecting and restoring groundwater quality and quantity; and encouraging a natural regeneration of native species to protect valuable native gene pools, among others. (for the full list of ten criteria refer to the web site above).

Sonoran Institute http://www.sonoran.org/programs/si_se_program_main.html

One of the Sonoran Institute's five thematic programs is the SocioEconomics Program (SEP) designed to help rural communities and land managers in the West find practical ways to link community well being and environmental health to economic prosperity. The SocioEconomics Program operates across the geographic range of the Institute's work, including Canada, and is a great program to help communities get socioeconomic data.

Sustainable Resource Management, www.fs.fed.us/sustained/siteindex.html

This is a web site that lists (and provides links) in alphabetical order various initiatives related to sustainable resource management. Examples include: American Forest and Paper Association, FGDI – Sustainable Forest Data Working Group, Forest Health Monitoring, Forest Stewardship Council, International Forestry, etc.

Sustainability of the Northeastern Area, Database of Sustainability/Criteria and Indicators Efforts, <http://www.na.fs.fed.us/sustainability/database.htm>, by Sherri Wormstead, USDA Forest Service, Northeastern Area, phone: (603) 868-7737.

Excellent list of initiatives/projects that address criteria and indicators of forest sustainability, including efforts internationally, nationally, and across the 20 states served by the USDA Forest Service's Northeastern Area. Provides links to many of the initiatives/projects. Classifies the sustainability efforts into the following main categories:

- Forest sustainability efforts
- Environmental/ecological indicator efforts
- Sustainable Community/sustainable development efforts
- Other efforts.

F-3. Forest Sustainability Initiatives and Efforts

This section lists some initiatives for sustainable forestry and indicators for sustainable forest management at different levels – national, state, county or company.

Canadian Council of Forest Ministers (CCFM), Technical Report, Criteria and Indicators of sustainable forest management in Canada, 2000, web site: http://www.nrcan.gc.ca/cfs/proj/ppiab/ci/tech_e.html

Example of national level implementation of C&I for sustainable forestry. Describes the CCFM Framework C&I for sustainable forest management. Includes five criteria

somewhat similar to the Montreal Process C&I. Within each criterion there are several elements. For example, under Criterion 1 – Conservation of biological diversity – there are three elements: ecosystem diversity, species diversity, and genetic diversity. This report provides some useful examples of indicators at national and province levels in Canada.

Canadian Forest Service report “*Sustainable Forest Development: The Mark of a Society*”, report delivered by Dr. Yvan Hardy.

http://nrcan.gc.ca/cfs/mandat/adm/admcontrol_e.html

This report provides a historic overview of the condition and use of the Canadian forests, beginning from the colonization times. Issues such as conservation, timber management, and regulation for revenue are receiving particular attention. The report ends with a discussion of what sustainable forest management means for Canadian forests and what the future holds in terms of aboriginal involvement and global challenges.

Canadian Model Forest Network

<http://www.modelforest.net/>

The Canadian Model Forest Network web site provides extensive information including a searchable database of tips on how to develop an indicator initiative based on the work done in 10 different forests throughout Canada. Each model forest serves as a demonstration of partners representing a diversity of forest values, working together to achieve sustainable forest management.

Collins Wood

<http://www.collinswood.com/>

Collins Wood is the first privately-owned forest products company in the United States to be comprehensively evaluated and independently certified by Scientific Certification Systems through the Forest Stewardship Council. It has also introduced the principles of The Natural Step into its operations.

Community Economic Development (CED) for Forest-Based Communities,

<http://www.sfu.ca/cedc/forestcomm/index.htm>

Featured here is the work of a three-year research project funded by Forest Renewal BC, 1997-2000. The research project identifies the most promising and appropriate Community Economic Development strategies and tools for strengthening local economic capacity in forest-based communities. Four communities in British Columbia partnered with Simon Fraser University’s CED Center to identify and develop CED strategies and tools best suited to their own situations:

- 100 Mile House (South Cariboo)
- Nuxalk Band (Bella Coola)
- Salmon Arm
- The Lillooet Tribal Council

For each of the four communities there is a detailed case study that includes background information on the community, describes the process of community involvement and presents some results including indicators and trends (e.g., unemployment, forest-related industries and income, wildlife measures, water resources). This is not a project for

developing and using sustainable forestry C&I but the case studies could be useful to some communities particularly interested in the social and economic aspects of sustainable forestry.

Franklin County Indicators of Sustainable Development, Franklin County (Maine), 1998, web site: <http://www.mainewest.com>

This work was commissioned by the Western Mountains Alliance and Sustain Western Maine. It was compiled and prepared by David Olson of MaineWest Business Technology and Craig Freshley of the Maine Development Foundation. It will be updated as time and funds permit. Franklin County has 12 indicators classified under three topic areas:

- Sustainable environment
- Sustainable economy
- Sustainable community.

Selected indicators are measured over a long period of time to identify a trend. However, many of these indicators are not a true measure of sustainability (e.g., percent of land in agricultural production, volume of sawtimber trees, and percent of minor arterial roads needing repair).

Gogebic County, Michigan, Contact information for Gogebic County Forestry Office: <http://www.gogebic.org/forestry.htm>

The sustainable forestry work in this county began in 1999 with the establishment of Forest Advisory Coordinating Team – a coalition of residents from all over the county, representing a wide range of professional backgrounds and interests. The Group first agreed upon a vision for sustainable forestry in the County and then developed indicators within the four key elements of this vision: forest management, economic health, ecological values and social/cultural values. The work is underway to collect data and implement the indicators to evaluate baseline conditions and trends, and promote sustainable resource use in the County.

Jackson Demonstration State Forest

<http://www.dharmacloud.com/JSFtop.htm>

This is 50,000-acre forest in Mendocino County, California, purchased by the State of California for the purpose of “demonstration of economical forest management.” A Citizens’ Plan was developed to help decide management activities and to incorporate good science and innovative forest management together with full citizen input. The Plan outlines 14 key elements, such as full citizen participation and oversight of management, full protection of streams, watercourses and aquatic habitat, complete protection of old-growth stands and development of interconnected mature forest, elimination of clearcutting, and enhanced recreational potential.

Northeast Oregon Community Assessment Workgroup (NEOCAW), Union and Wallowa Counties, Oregon

This initiative began when several organizations in Northeast Oregon decided to form a group to design and implement *social and economic assessment framework and process* for Union and Wallowa Counties. The Montreal Process Criteria and Indicators were

used as organizing framework. Later the group decided to expand their initial list of indicators to include some ecological measures. In a series of meetings with the local community residents, NEOCAW finalized the indicators and prepared a draft report.

For more information contact:

Elaine Kohrman, Natural Resource Planner
Wallowa-Whitman National Forest
P.O. Box 907, Baker City, OR 97814
Phone: 541-523-1331, Fax: 541-523-1315
Email: ekohrman@fs.fed.us

The Nova Scotia Genuine Progress Index Forest Accounts (466 pages including charts; November 14, 2001; 2 volumes, \$55; \$35 per volume if purchased separately), http://www.gpiatlantic.org/ab_forest.shtml

Volume 1 of the Nova Scotia GPI Forest Accounts indicates that Nova Scotia's forests are at a watershed juncture. Clearcutting and the liquidation of the province's forest wealth are occurring at unprecedented rates in the interests of immediate economic gain. The second Volume of the GPI Forest Accounts portrays "the new story." It describes a way forward, by presenting actual, viable, working examples of efforts to maintain and restore forest natural capital. It describes the harvest methods and economics of these operations in considerable detail, in order to provide practical, concrete information to interested wood lot owners and forest industries, and to governments willing to play a leadership role in supporting such efforts through appropriate incentives.

Report of the United States on the Criteria and Indicators for the sustainable management of temperate and boreal forests, 6-6-97,

web site: <http://www.fs.fed.us/global/pub/links/report/contents.html>

This report provides excellent information about the implementation of the Montreal Process C&I at national level. In most cases, however, the information and data may not be useful at community level. The report is organized by strictly following the Montreal Process seven criteria and the sixty-seven indicators.

The Vermont Forest Resources Plan 1999-2008, Assessment Report and Key Indicators, web site: <http://www.state.vt.us/anr/fpr/forestry/forplan/keyforest.htm>

The section on indicators includes a matrix with 26 key forest indicators, historical conditions, present conditions, and the projected trend in conditions. Trends are indicated as remaining relatively constant (=), showing some increase from past to present (+), or showing a decrease (-). Examples of listed indicators include: percent of forest area and change over time, percent and number of acres of non-industrial private ownership; percent of lakes and streams affected by acidic atmospheric deposition; volume of wood harvested per year; sawlog import; and number of educators trained.

F-4. Theoretical/Conceptual Work on Indicators and Sustainability

Communicating Ecological Indicators to Decision Makers and the Public, by Schiller, A., C. T. Hunsaker, M. A. Kane, A. K. Wolfe, V. H. Dale, G. W. Suter, C. S.

Russell, G. Pion, M. H. Jensen, and V. C. Konar. 2001. *Conservation Ecology* 5(1): 19. [online] URL: <http://www.consecol.org/vol5/iss1/art19/index.html>

This article discusses the difficulties in communicating scientific information (in this case EPA's EMAP indicators) to non-scientists. It promotes the idea of using Common-Language Indicators (CLIs) and provides a list of EMAP and CLIs while explaining their relationship. For example, the general public is more interested in knowing "the level of contamination of forest plants by air pollution" instead of "foliar chemistry, lichen chemistry, dendrochemistry, and branch evaluations". The study discovered that the best approach is to describe the kinds of information that various *combinations* of indicators could provide about environmental conditions, rather than to describe what in particular has been measured or how measurements have been performed. The authors suggest five possible CLIs for forests:

1. Contamination of forest plants by air pollution.
2. The health of forest plants.
3. Habitat quality for birds and deer
4. Woodland productivity for forest products.
5. Forest structure scenic rating.

Guidelines for Developing, Testing and Selecting Criteria and Indicators for Sustainable Forest Management, The CIFOR Criteria and Indicators Generic Template, 2000, by Prabhu, R., Colfer, C.J.P., Dudley, R.G., <http://www.cifor.cgiar.org/acm/methods/toolbox1.html>

This manual provides methods for the development and evaluation of criteria and indicators (C&I) that can be used to assess the sustainability of forest management. The manual is written primarily for researchers, people or groups interested in evaluating C&I for assessments of forests in new areas, etc. The methods presented are aimed at the development of sets of C&I for natural forest at the forest management unit (FMU) level, especially in the tropics, but they can be used for any other type of forest. The final chapter (9) provides possible baseline sets of C&I, available to users for evaluation and testing in their own contexts.

LUCID (Local Unit Criteria and Indicator Development project), Frameworks for Criteria and Indicator Development, LUCID Update, Issue 5, April 2001, web site: http://www.fs.fed.us/institute/lucid/LUCID_Newsletter_5.pdf

This publication provides a way to classify various frameworks for developing indicators into six main types:

- Issues-based
- Goal-based
- Sectoral-based
- Ecosystem component-based
- Causal-based
- Systems-based.

According to this classification the Montreal Process uses *a hybrid framework* that consists of some aspects of an ecological systems approach in conjunction with some aspects of issues and goal-based frameworks. LUCID has adopted a *systems approach*.

Lowell Center for Sustainable Production, Hierarchy for indicators of sustainable production and sustainable community development: Veleva V., Hart M., Greiner T., and C. Crumbley, "Indicators of sustainable production," *Journal of Cleaner Production*, Vol. 9 (5), October 2001, pp. 447-452.

Monitoring for forest management unit scale sustainability: The local unit criteria and indicators development (LUCID) test (Technical Edition). Fort Collins, CO: USDA Forest Service Inventory and Monitoring Report No. 4. Wright, P. A., Alward, G., Hoesktra, T. W., Tegler, B., & Turner, M. G. (2002).

Monitoring for forest management unit scale sustainability: The local unit criteria and indicators development (LUCID) test (Management Edition). Fort Collins, CO: USDA Forest Service Inventory and Monitoring Report No. 5. Wright, P. A., Alward, G., Colby, J. L., Hoesktra, T. W., Tegler, B., & Turner, M. G. (2002).

F-5. Data Sources

This section lists some databases and other sources of information for obtaining data at local (county) level for implementing indicators on sustainable forests.

Bureau of the Census (www.census.gov) – provides good data at county/municipality level on population, employment, housing, etc. It is very easy to use but most of the data are available only for every ten years (e.g., 1970, 1980, 1990, 2000) so yearly changes are difficult to track.

Forest Inventory and Analysis (FIA) Data Base Retrieval System, Southern Research Station, North Central Forest Experiment Station, Rocky Mountain Research Station, Northeastern Forest Experiment Station, Pacific Northwest Research Station, <http://www.srsfia.usfs.msstate.edu/scripts/ew.htm>

Forest Inventory and Analysis (FIA) research units have participated in establishing a National Data Base Retrieval System (DBRS). This cooperative database is comprised of common forest resource attributes using compatible formats and represented by a standard set of inventory tables. It allows an interactive dialog that will produce a set of user-defined tables for any state, county, or geographical area within the NC/RMT/NE/SRS regional boundaries. FIA research units also have made the Eastwide/Westwide data available for downloading (tree, plot, county). Work is underway to include data for the Pacific Northwest (PNW) FIA unit. Ultimately, all contiguous states within the Nation will be represented in the FIA Data Base Retrieval System. This database is an excellent source of information for implementing some indicators at community level. Getting historic data, however, is somewhat problematic.

OIK/OS Web-based Tool, developed by the Wilderness Society.

This is an on-line, map-based tool for getting economic trends information. Located at <http://www.eco2eco.net> OIK/OS offers point-and-click creation of custom economic

profiles for use in conservation, sustainable development and other planning efforts. OIK/OS includes income and employment data for every county in the Eastern U.S. Using an active mapping interface, you select the county, counties, state or states of interest and, with another click or two, OIK/OS generates tables, graphs, charts and thematic maps on the fly for the geographic area you have selected.

Sustainable Community Indicator Program (SCIP) by Environment Canada

http://www.ec.gc.ca/scip-pidd/English/scip_intro.cfm, 12/2002.

SCIP Version 2.0 was introduced as a stand-alone software package designed to assist in the development of indicator programs and represents:

- An all-in-one starting point for creating, selecting, analyzing and reporting indicators
- Comprehensive help and guidance on indicator development
- a means to consistently document indicators and data
- a set of “core” indicators that are periodically updated
- a place to exchange indicators and collaborate with others.

Environment Canada is currently working on making SCIP an interactive web site to make it more flexible and easy to use. Users will be able to visit the SCIP web site with any Internet browser and access the core indicators data and other indicator data submitted by participating clients. These data will be stored on a central server maintained by the SCIP team. Data will be viewed in tables from your Internet browser or downloaded to your local computer. The web site will also offer tips, tutorials and links to assist users in performing analyses and generating reports.

F-6 Sources Of Funding

FAO Database- www.fao.org/forestry/finance-sources. Includes sources of funding for activities in support of sustainable forest management. The database contains links to the web pages of agencies that present clear guidelines and procedures for applying for their funds. The database can be queried by type of activity, country, type of applicant and the amount of funding required.

Appendix G - EXAMPLES OF SUSTAINABLE FORESTRY-RELATED GOALS

American Forest and Paper Association

“Our goal is to sustain and expand a renewable resource that will meet future consumer demand at competitive prices while, at the same time, respecting the diverse demands imposed by society, including the rational protection of sanctuary and habitat.”

(Source: <http://www.woodcom.com/woodcom/afpa/afpabp02.html>)

Oregon Department of Forestry

Recreation goals as identified in the *Northwest Oregon State Forests Management Plan* that guides the recreation planning process.

- Goal 1: Provide diverse forest recreation opportunities that supplement, rather than duplicate, opportunities available in the region.
- Goal 2: Provide opportunities for interpretation and outdoor education on state forest lands.
- Goal 3: Manage recreational use of the forests to minimize adverse impacts to other resources and adjacent ownership.
- Goal 4: Minimize conflict among user groups.
- Goal 5: Maintain compatibility with Oregon’s Statewide Planning Goal 8 (Recreational Needs).

(Source: Oregon Department of Forestry, <http://www.odf.state.or.us/>)

Maine Audubon Sustainable Forestry Goals and Objectives

Overall Forestry Goal: Ensure that forestry is compatible with maintaining forest ecosystem integrity, is economically sustainable, and socially beneficial.

State-level Sustainable Forestry Objectives:

1. Maintain ecological integrity of managed forest:
 - Habitat is capable of supporting full range of local fauna and flora. Especially critical is adequate mature forest.
 - Biological integrity of aquatic ecosystems is maintained.
 - Large forest blocks and habitat connectivity are maintained in the Southern Maine landscape
2. Ensure continued benefits to society
 - Long-term harvest levels are sustainable, with a focus on growing quality sawtimber. Pulpwood production does not dominate management decisions and rotation lengths.
 - Maine's forests sustain economically-healthy communities while providing clean water and air as well as diverse recreation opportunities.

(Source: <http://www.maineaudubon.org/conservation/habitat/forestry.html>)

Fraser Basin, British Columbia, Directions and Goals of the Charter for Sustainability

Direction 1: Understanding Sustainability	
Goal 1	Lifestyle choices that consider and enhance Basin sustainability
Goal 2	Encourage leadership promoting sustainable lifestyles
Goal 3	Sharing ideas to help others contribute to sustainability
Goal 4	Life-long learning that enables residents to achieve sustainability targets
Direction 2: Caring for Ecosystems	
Goal 5	Management of water resources to protect and maintain water quality
Goal 6	Diverse and abundant fish stocks, supported by healthy habitat to provide for the needs of all users
Goal 7	Diversity and abundance of natural species and habitat in the Basin
Goal 8	Forest lands for economic, recreational and aesthetic use are managed to respect ecological systems
Goal 9	Agricultural lands to balance opportunities with the protection of ecological systems
Goal 10	Outdoor recreation opportunities to enhance social and economic well-being, connect us with natural systems and minimize our impacts on the environment
Goal 11	Mining activities to support the social and economic diversity of the Basin's communities and the integrity of the Basin's ecosystems
Goal 12	An energy system to provide for social and economic needs, reduce our reliance on non-renewable energy sources and support the well-being of ecosystems
Goal 13	Air quality to allow for vibrant and healthy communities and healthy ecosystems
Direction 3: Strengthening Communities	
Goal 14	Community well-being to enable residents to meet their economic, social and environmental needs
Goal 15	Community stewardship to enable residents to take action to protect, restore and enhance the local natural environment.
Goal 16	Aboriginal communities to enable residents to preserve their culture, develop strong economies and interrelate with non-aboriginal communities.
Goal 17	Growth management to protect clean air and water, provide for affordable housing, and conserve farmland, wilderness and unique natural areas.
Goal 18	Transportation to enable the efficient movement of people and goods without contributing to pollution.
Goal 19	Adequate infrastructure to support community needs
Goal 20	A diverse economy to provide jobs in all communities while protecting environmental and social values.
Direction 4: Improving Decision Making	
Goal 21	Adoption of common boundaries based on natural watershed boundaries
Goal 22	Collective and cooperative decision-making that promotes the use of partnerships to achieve sustainability.
Goal 23	Participation of aboriginal people in decision-making to ensure that decisions respect their culture and rights.
Goal 24	Local decision-making to allow residents to be involved in making decisions that affect them directly
Goal 25	Inclusive decision-making to incorporate input from a wide variety of groups and individuals.
Goal 26	Transparent and accountable decision-making to allow residents easy access to all decision-making processes and ensure that decisions, once made, are followed up by action.

(Source: 'A Preliminary Framework for the Development of Sustainability Indicators for the Fraser Basin', Revised June 12, 2000, web site: http://www.fraserbasin.bc.ca/documents/indicators_document.pdf)

Pennsylvania forestry mission, 1992

Pennsylvania original forest goals were defined in its 1838 constitution. In 1992 the state rewrote its forestry mission statement to shift from multiple use to ecosystem management, to protect the forests and plant life from damage, and to increase forest and ecosystem knowledge. The new goals focus on biodiversity, clean water, recreation, timber, wildlife habitat, and mineral utilization.

(Source: Donald Floyd, Sarah Vonhof, and Heather Seyfang, Forest Sustainability: A Discussion Guide for Professional Resource Managers, Journal of Forestry, February 2001, p.8)

Greenworks, Rough Terrain

Sustainable forestry means managing our forest resources to meet the needs we have today without interfering with our future generations' needs. Any management of the forest resource must include inventory and planning to provide the basis for evaluating and implementing the goals of the landowner.

(Source: http://www.greenworks.tv/rough_terrain/sustainableforests/whatis.htm)

Sustainable Forestry Initiative of the American Forest & Paper Association

Sustainable Forest Principles:

- Meet the needs of the present without compromising the ability of future generations to use the forest for products as well as for ecological and other uses.
- Promote both environmentally and economically responsible practices on AF&PA member's and all other forestlands.
- Improve long-term forest health and productivity by protecting forests against wildfire, pests, and disease.
- Manage forests of biological, geological, or historical significance to protect their special qualities.
- Continuously improve forest management and regularly track progress toward achieving the goal of sustainable forestry.

(Source: <http://www.owensforestproducts.com/sfi.html>)

Appendix H: PRESENTATION MATERIALS

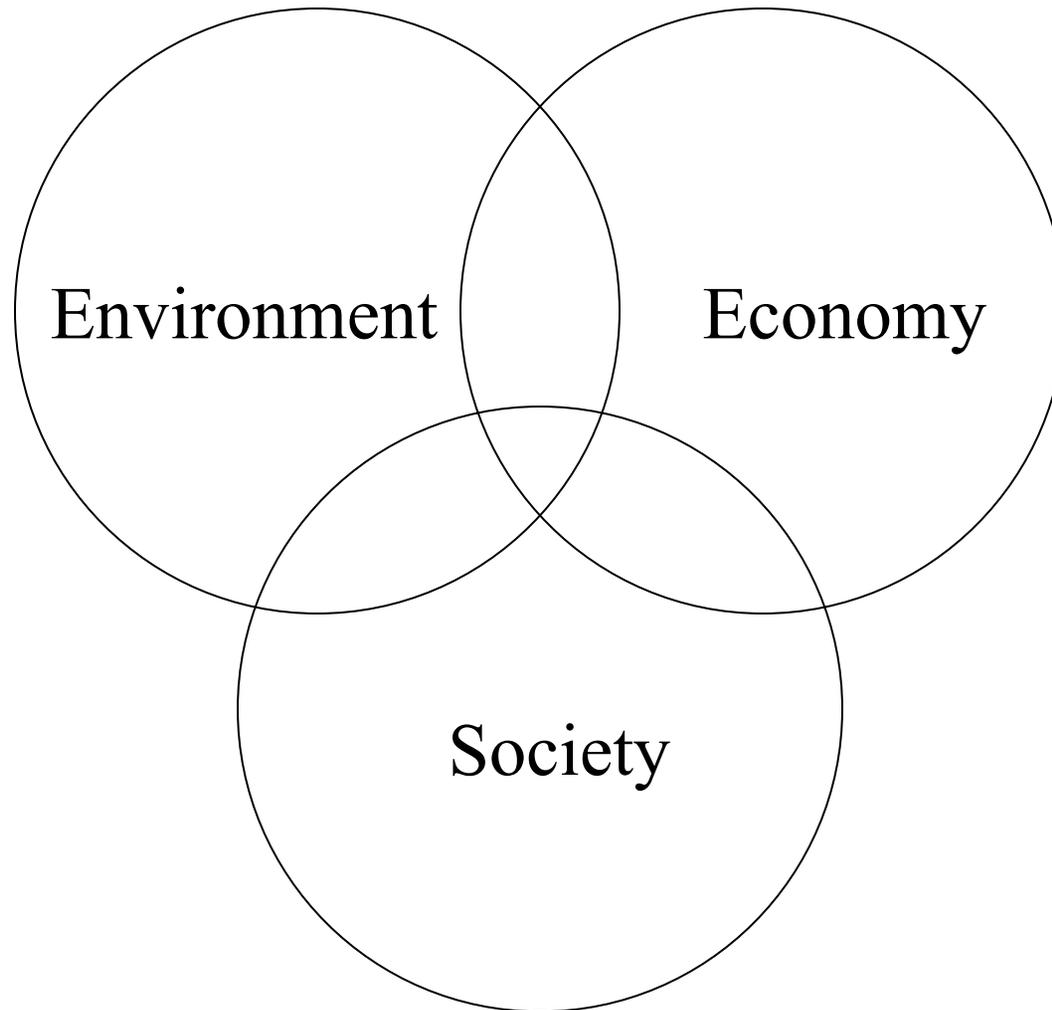
This appendix contains copies of presentation materials that can be used as is or tailored to meet the needs of communities working on indicators for sustainable forest management.

The overheads are organized in the following sections:

Introduction to Sustainability.....	H-1
Goals and Indicators.....	H-3
Montréal Process Criteria and Indicators.....	H-8
Indicator Frameworks.....	H-11
Material from Gogebic County.....	H-13

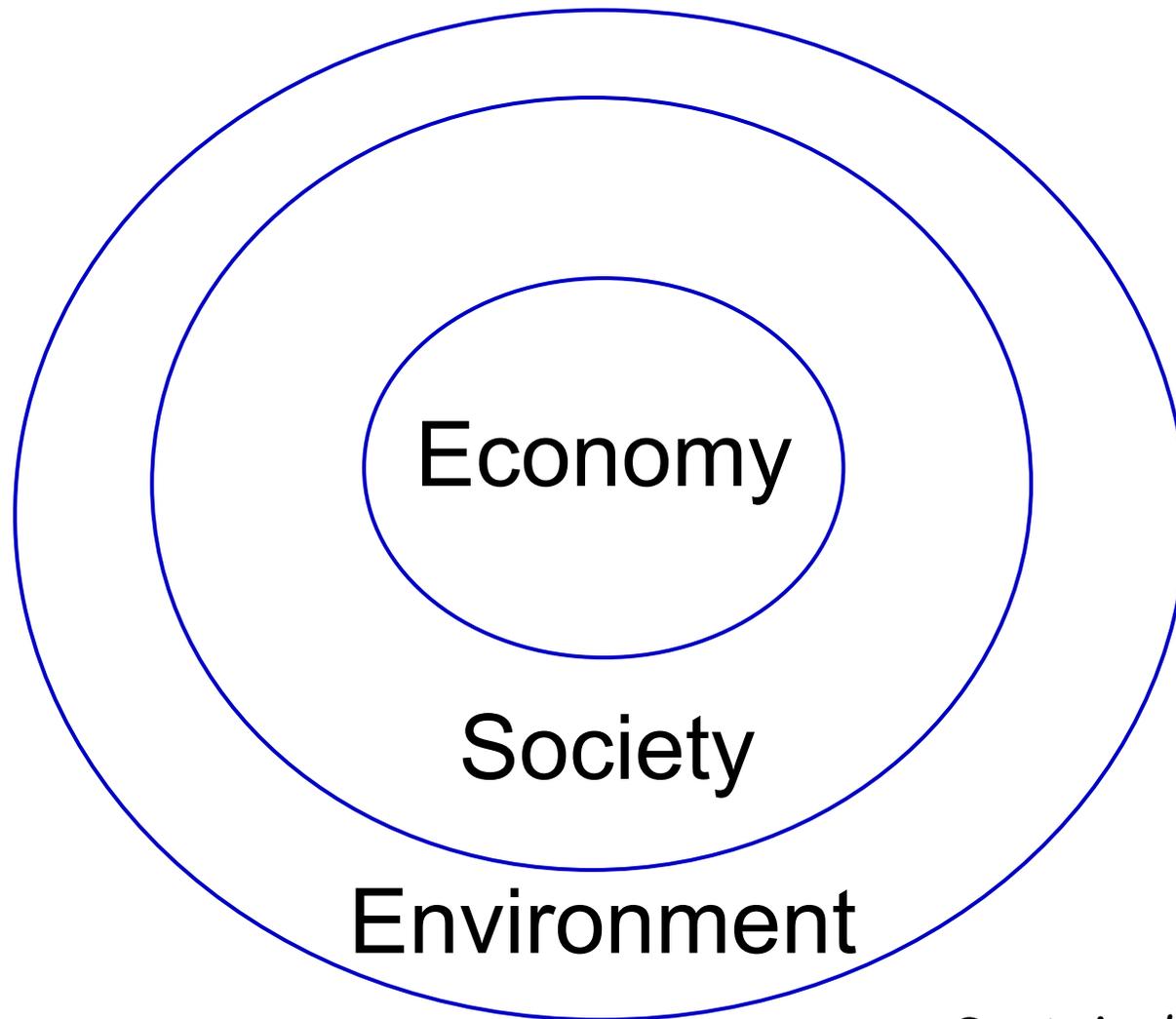
Introduction to Sustainability

Traditional View of Community



Sustainable Measures

Sustainable View of Community



Sustainable Measures

Traditional Thinking

Environment

Economy

Society

Water Quality

Air Quality

Natural
Resources

Stockholder
Profits

Materials for
Production

Jobs

Education

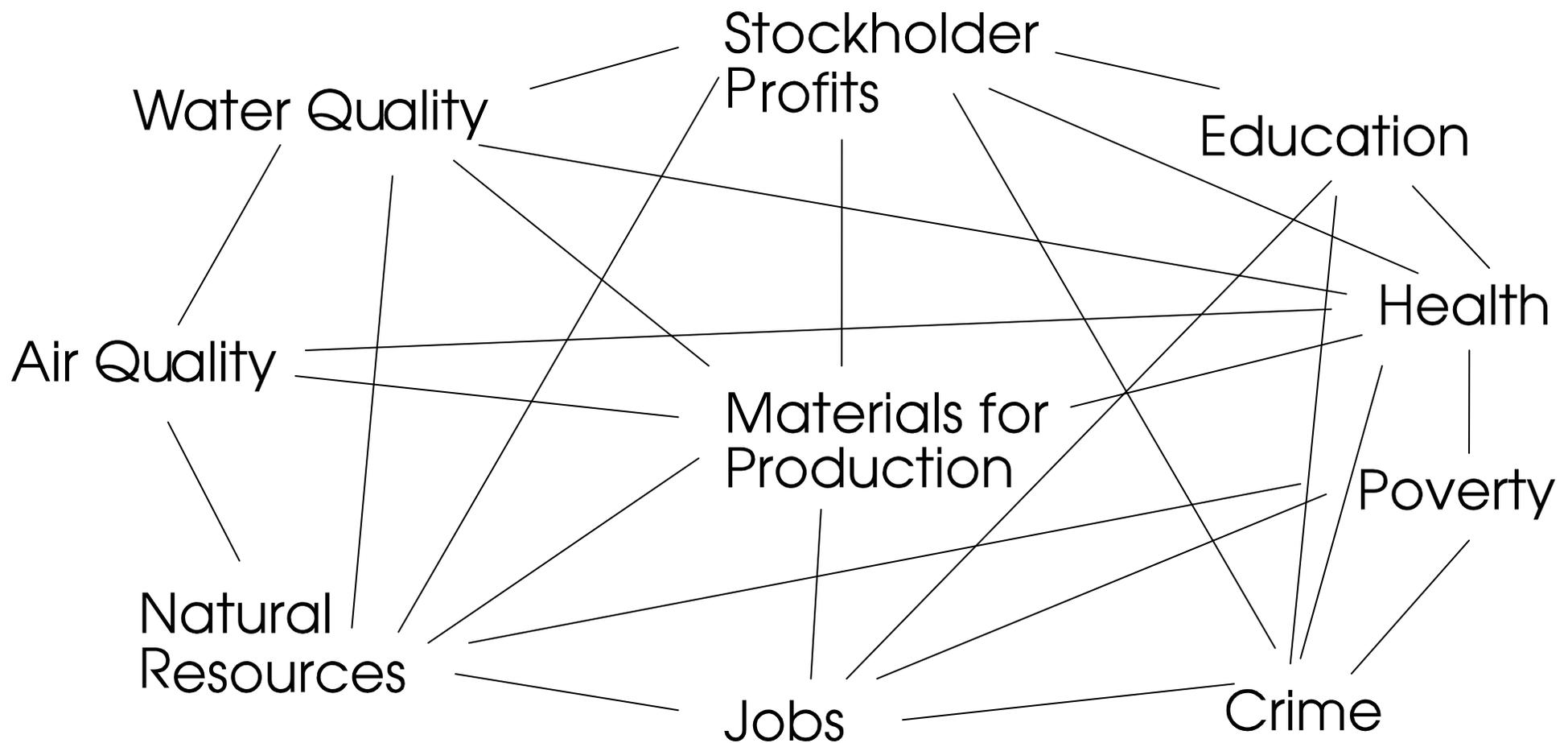
Health

Poverty

Crime

Sustainable Measures

Interconnected Thinking



Sustainable Measures

Basic Definitions

- **Sustain** - to keep in existence without diminishing, to provide sustenance and nourishment
- **Develop** - to bring out the capabilities or possibilities of, to bring to a more advanced or effective state
- **Community** - a group of any size whose members reside in a specific locality and share resources needed to survive

Carrying Capacity

Carrying capacity - the population that can be supported indefinitely by the resources of its surrounding ecosystem without degrading or destroying that ecosystem

f(population, resource use, technology)

Sustainability is:

"..development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

Brundtland Commission

Sustainability is:

“A way of life that safeguards and enhances our resources, prevents harm to the natural environment and human health, and sustains and benefits the community and local economy – for the sake of current and future generations.”

Santa Monica Sustainable City Program

Sustainability:

“...farmers in sustainable agriculture are concerned about feeding their families and paying their bills, but those are not their only goals in life. They set out to protect the land, improve their quality of life, and enhance the communities in which they live. Their day-to-day decisions are not guided by a single minded search for profit, but by a delicate balancing act among many goals”

Dick Levins, Land Stewardship Program, White Bear Lake, Minnesota

Sustainability Concepts

- Long-term balance between economic, social and environmental goals (*look ahead 20-50 years, understand the connections*)
- Limits to natural, social, and built systems (*live off the interest of community capital, don't degrade or use it up*)
- Inter- and intra- generational equity (*share with future generations and current inhabitants, local sustainability in harmony with global sustainability rather than at expense of others*)

Goals and Indicators

Goals, Principles, Criteria, and Indicators

- **Goal** – a description of future condition community members wish to achieve
- **Principle** – a rule of conduct, esp. of right conduct
- **Criterion** – a means of judging; a test by which something can be judged
- **Indicator** – a numeric measure that provides key information about a system's condition

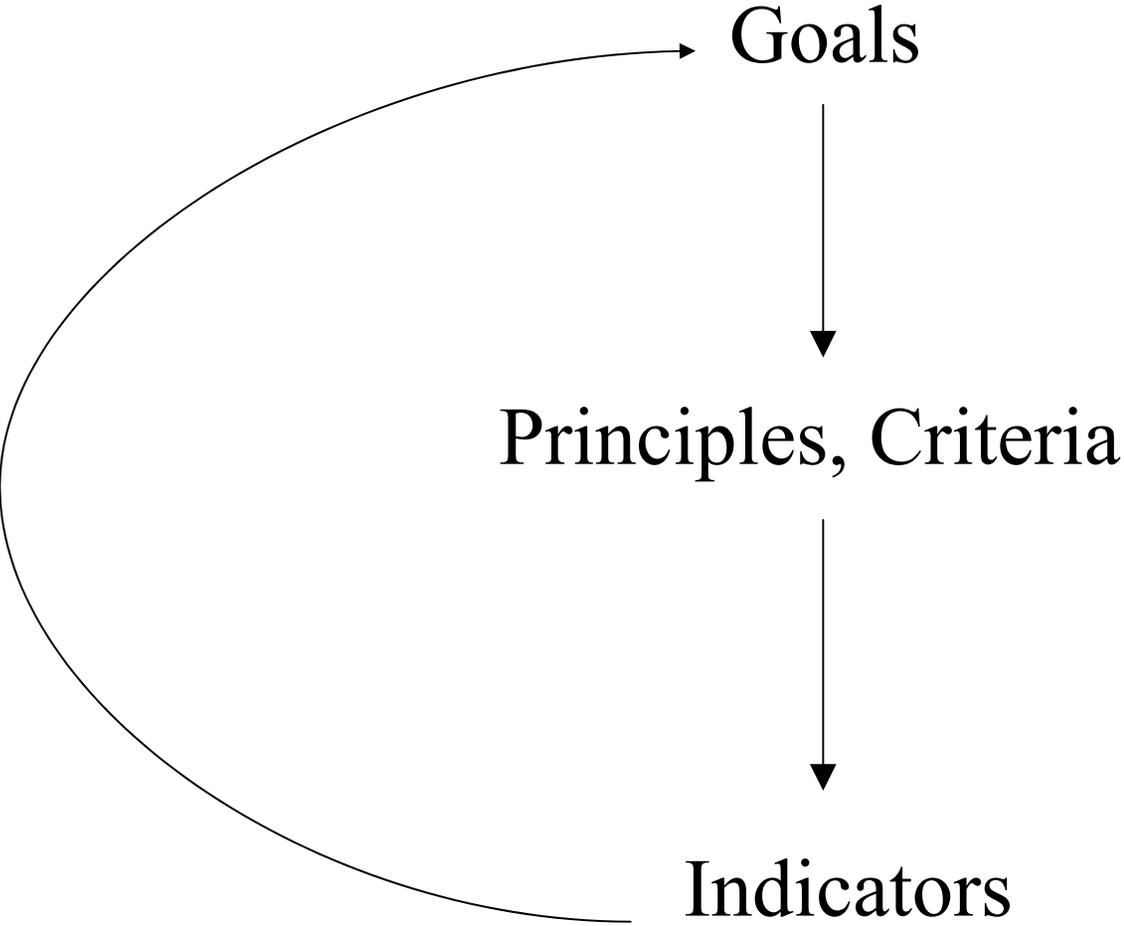
Goals or Indicators Which Comes First?

Goals:

- provide a framework for developing indicators
- provide an impetus and context for tracking, reporting, and discussing the indicators

Indicators:

- clarify and specify what a goal means
- track movement towards or away from the goal



Aligning to sustainability

Goals and indicators are like a compass:

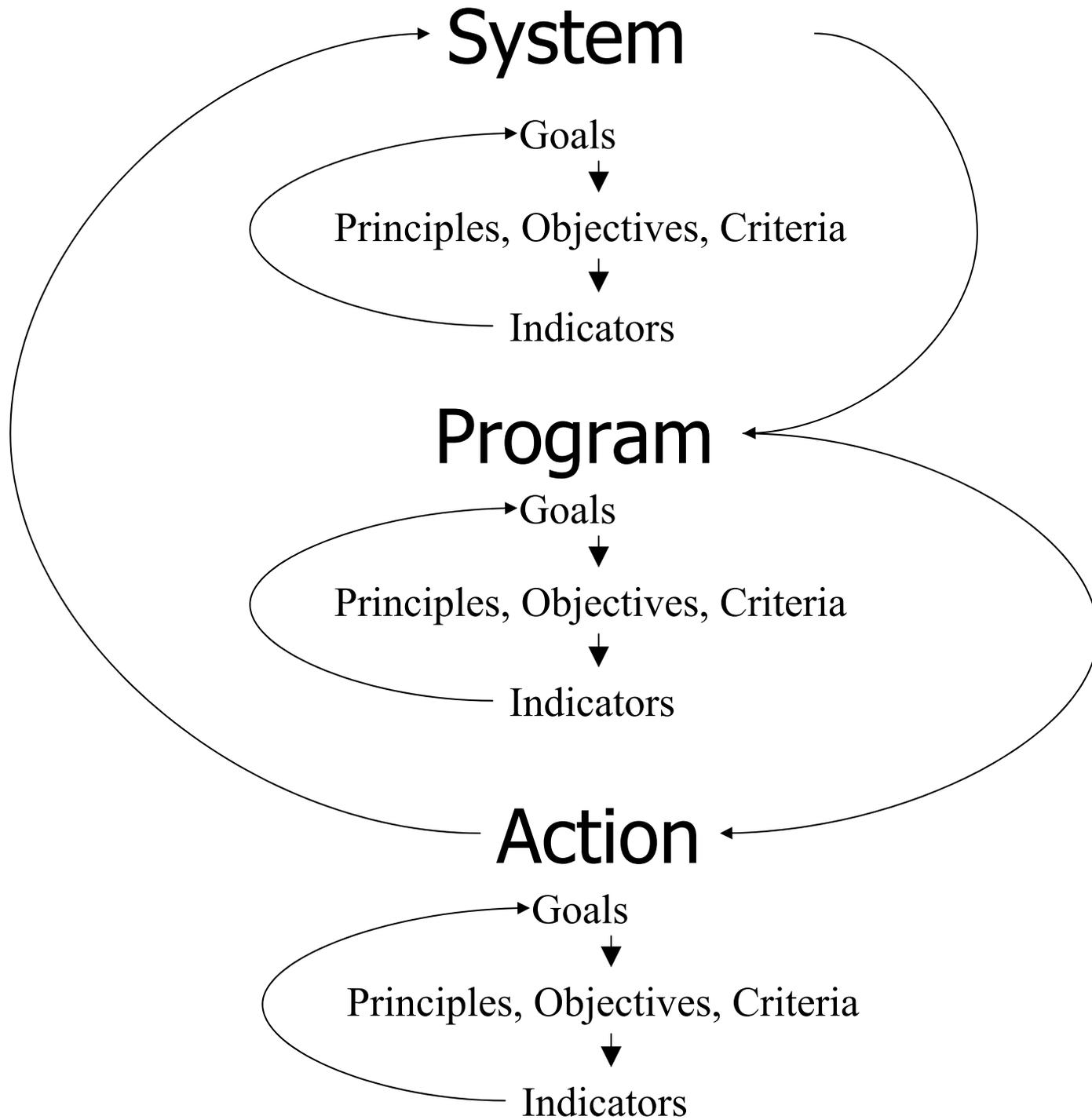
If they aren't aligned with sustainability, there is no telling where you will end up

What Makes A “Good” Goal?

- Looks to the future
- Potentially measurable
- Potentially achievable, but not easily or automatically
- Reflects a broad understanding and agreement among community members of what is important to and valued by the community
- Represents desired *outcomes* or community *conditions*, not the specific actions or programs that may be necessary to achieve those conditions

What Makes It A “Sustainability” Goal?

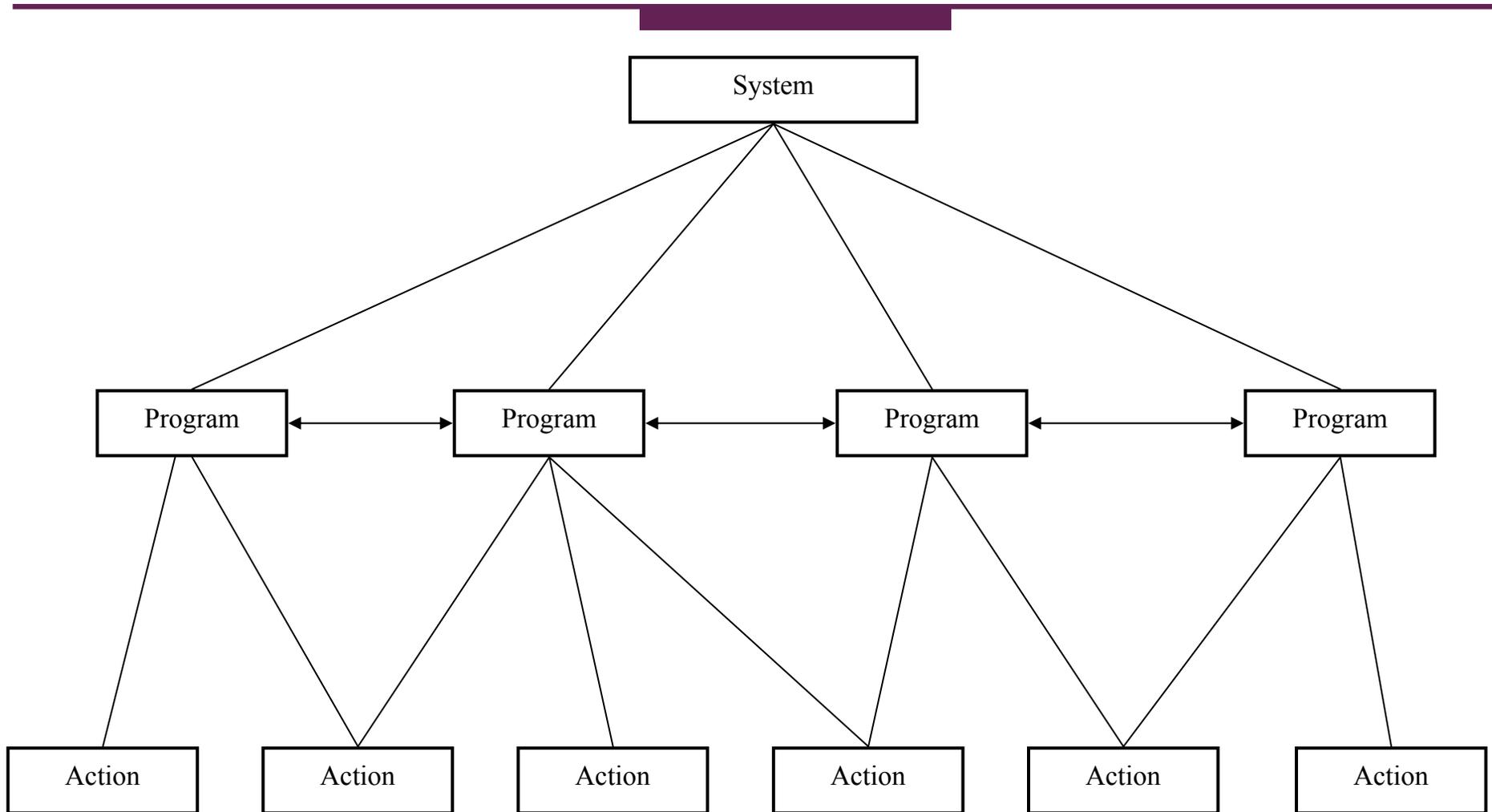
- Reflects a balance between economic, social, and environmental conditions
- Recognizes and accounts for long-term limits of natural, social, and built systems
- Promotes inter- and intra-generational equity
- Reflects a ‘big picture’ system view



Different Levels

- **System** – long-term – desired conditions at the community level (*Selectboard/ Town Manager/ Community*)
- **Program** – medium term – changes that occur through the development and/or implementation of programs or sets of activities (*Town Committees/ Department Heads/ Local Organizations*)
- **Action** – short-term – desired effect of specific action or actions of individuals (*Committee members/ Town Staff/ Community Members*)

System-Program-Action



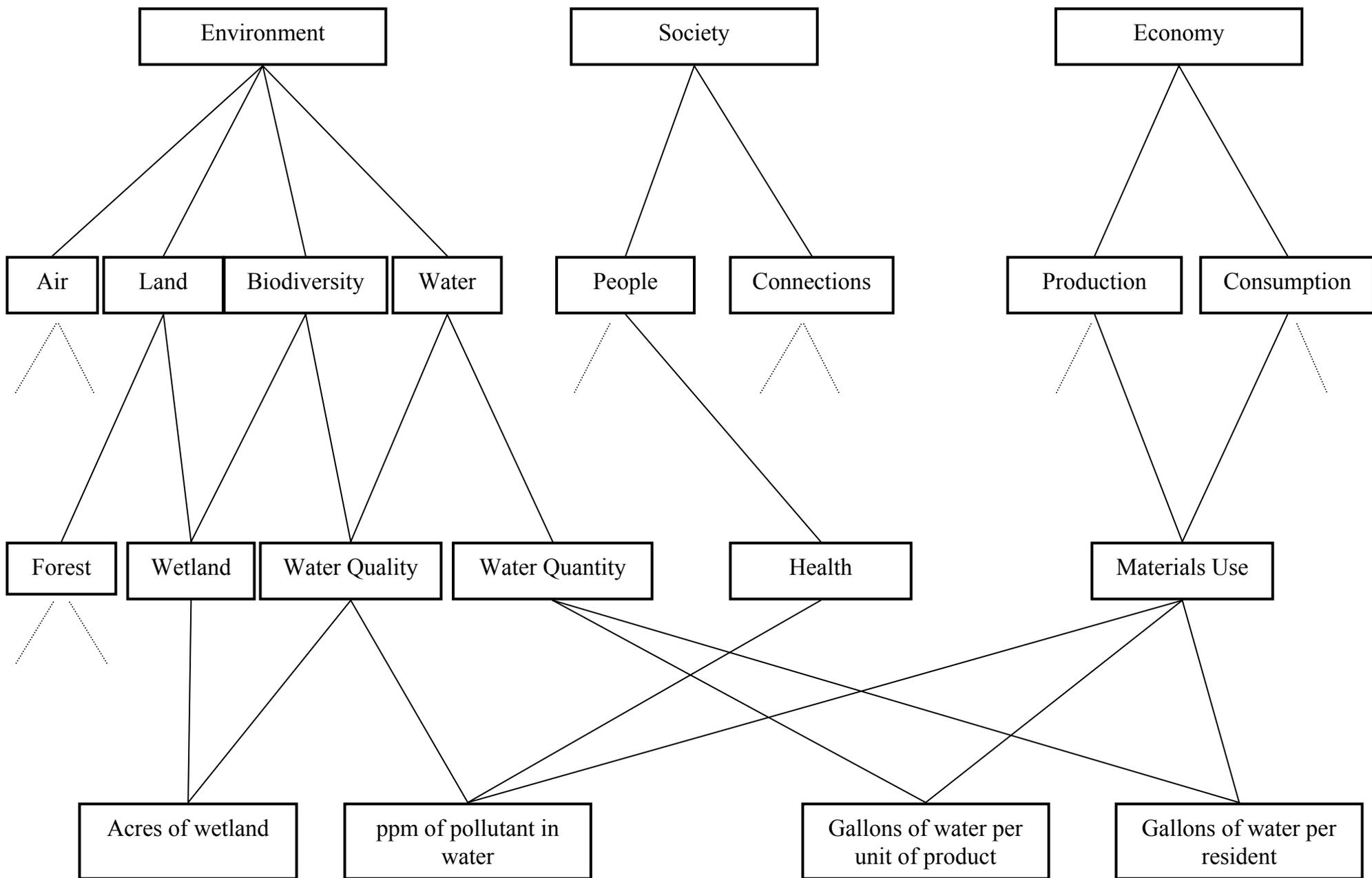
Sustainable Measures

Examples of Goals at Different Levels

- **System:** Maximize utilization of alternative forms of transportation (walking, bicycling, public transit, and carpools/rideshare).

Program: Develop traffic policies to reduce negative impacts from vehicles and limit pavement area to the minimum necessary.

- **Action:** Implement work schedules which reduce the number of employee commute days.



Sustainable System Components

Environment	Society	Economy
Air Land Water Habitat	Health Education Cooperation	Production Consumption

Sustainable Measures

What is an indicator?

- A way to measure, point out, or point to with more or less exactness
- Something that is a sign, symptom or index of the condition of a system
- A measure, typically numeric, that provides key information about a system's condition

Indicators

- Numerical measures that provide key information about a physical, social or economic system
- Indicators are variables; data are the actual measurements or observations; targets are expected or desired indicators values

Indicators are for:

- Raising Awareness
- Informing Decisions
- Measuring Progress

A Good Sustainability Indicator

Is a Valid Indicator That:

- Measures a key sustainability issue:
 - Carrying capacity of community capital
 - Equity (inter- and intra-generational)
 - Long-term balance between economic, social, and environmental goals
- Is relevant, understandable and useful to the community decision-making process
- Generally focuses on system level rather than program or action level

Sustainable System Indicators

Examples:

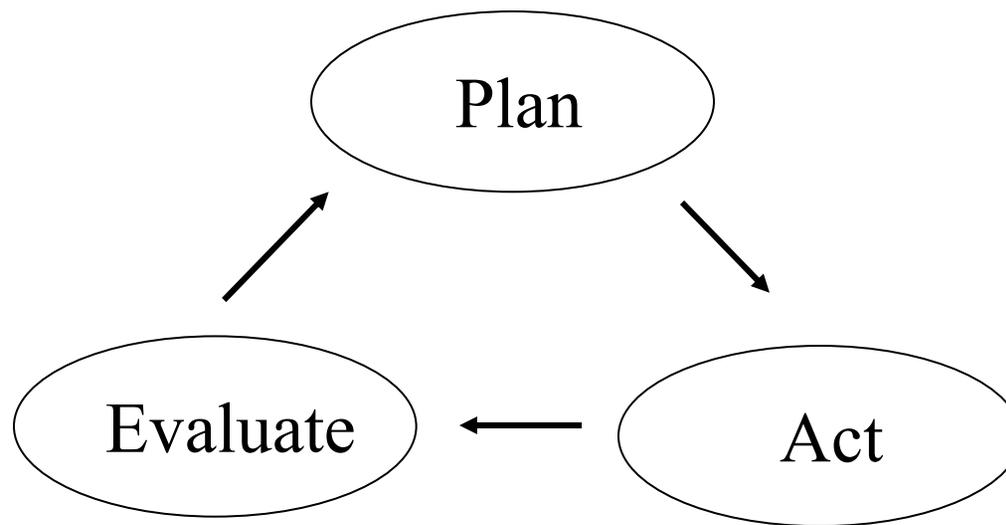
- Number of days per year that federal standards are met for ozone, carbon monoxide and particulate matter
- Volume of water in key water bodies compared to historic levels
- Percent of watershed that is impervious
- Percent of critical resource lands still available

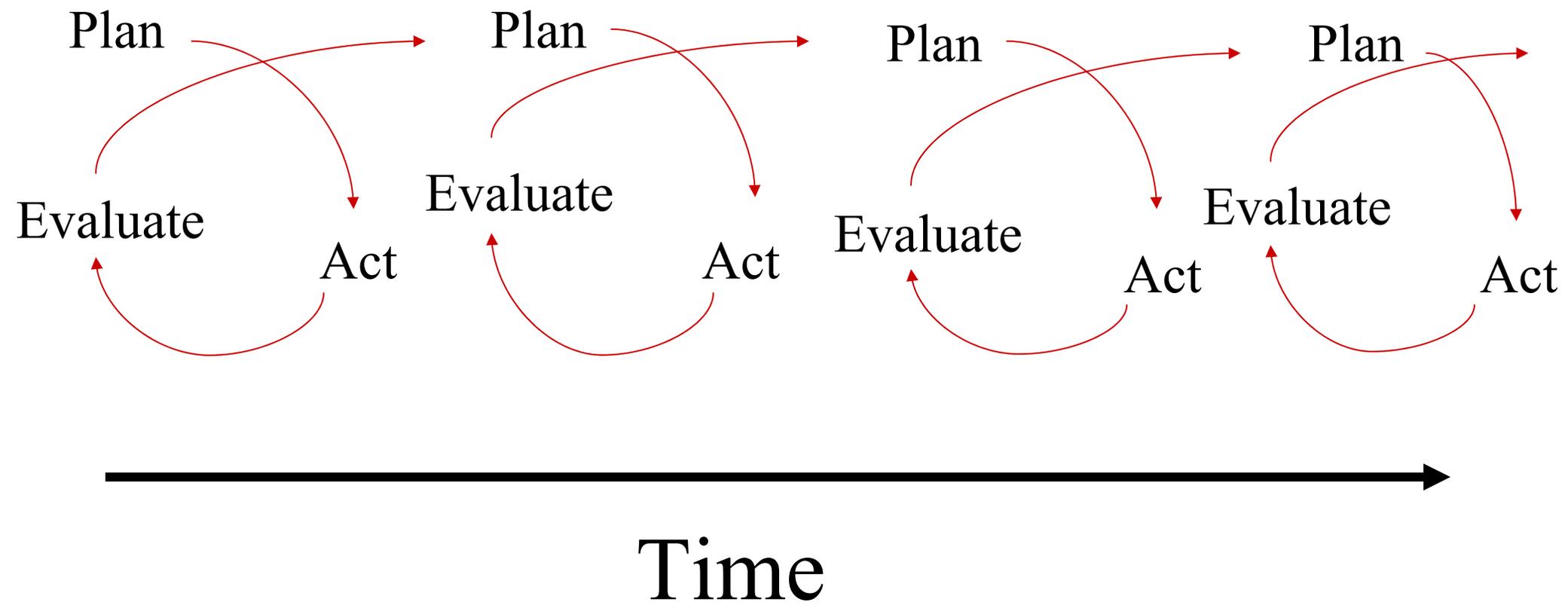
Criteria for Selecting Indicators

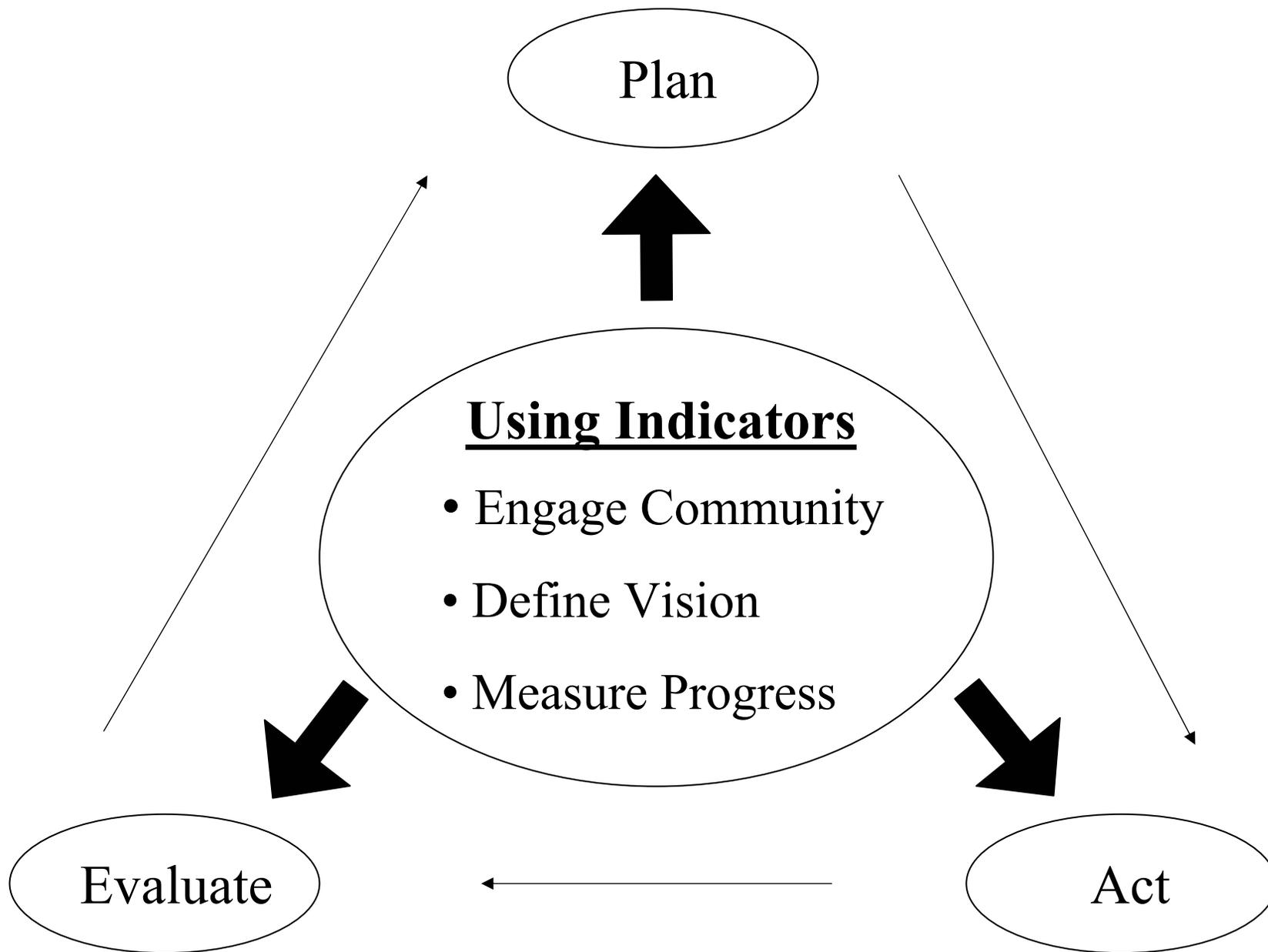
- Is the indicator relevant to your community's vision, issues and goals?
- Is it a *system* indicator that reflects sustainability concepts?
- Is it clear and easy to measure?
- Is there data to track it?

Developing Sustainability Indicators

- Part of the decision-making process
- Continuous-loop process to relate indicators to mission, goals and targets
- Need to involve everyone in the process
- Aim is to promote continuous improvement in overall system







Developing an Indicator System: Key Tasks

- Decide on purpose, audience, and scope of indicators
- Identify and review for relevance
 - Existing indicator projects and products
 - Available data sets
 - Potential indicator users and data owners
- Generate set of potential indicators (ideal)
- Evaluate relative to purpose, audience and scope
- Select proposed set
- Develop indicators (gather data, develop graphic and text)
- Implement, evaluate effectiveness and redo as needed

Key Questions to Consider:

- What is the purpose of the indicator system (raise awareness, inform decisions, monitor progress)?
- Who is the audience and how will they use the indicators?
- Who needs to be involved (including intended audience and keepers of the data)?
- What will be the scope and boundaries of the indicator system (geographic area, topic areas)?
- What will the balance be between ideal and do-able?

The Process Matters!

- The process by which indicators are developed is as important as the final product
- Collaboration is the key because indicators must:
 - measure something that is publicly valued
 - be understood by those who will use them
 - be seen as credible and meaningful
 - be linked (conceptually and practically) to policies and actions
- Process must include the decision makers and the data managers
 - There must be a common expectation that the indicators will be reported, discussed and linked to action on a regular basis

Montreal Process Criteria and Indicators

Montreal Process Background

- Evolved from meeting in Montreal, (hence the name, *Montreal Process*)
- Working group of twelve nations – Argentina, Australia, Canada, Chile, China, Japan, Mexico, New Zealand, the Republic of Korea, Russian Federation, the United States, and Uruguay.
- Account for
 - 90% of the world's temperate and boreal forests and
 - 60% of all forests on the globe

Montreal Process

Santiago Declaration (1995)

- Forests are essential to the long-term well being of local populations, national economies, and the earth's biosphere as a whole.
- Criteria and indicators needed for:
 - Common understanding of sustainable forest management
 - Framework for evaluating progress
 - Informing decision-makers and public
- Criteria and indicators must reflect
 - Changes over time
 - Different contexts in different places
 - Qualitative as well as quantitative

Montreal Process Criteria & Indicators

- Developed for assessment of sustainable management of forests at the national level
 - Includes 7 criteria (categories) and 67 indicators
 - Addresses ecological, economic, social and institutional factors
- Ultimately success depends on sustainable local management of natural resources

Montreal Process Criteria & Indicators

- **Criterion:** A category of conditions or processes by which sustainable forest management may be assessed. A criterion is characterized by a set of related indicators which are monitored periodically to assess change.
- **Indicator:** A measure (measurement) of an aspect of the criterion. A quantitative or qualitative variable which can be measured or described and which when observed periodically demonstrates trends.

Montreal Process

Criteria (Condition or Process to Assess)

1. Conservation of biological diversity
2. Maintenance of productive capacity of forest ecosystems
3. Maintenance of forest ecosystem health and vitality
4. Conservation and maintenance of soil and water resources
5. Maintenance of forest contribution to global carbon cycle
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies
7. Legal, institutional and economic framework for forest conservation and sustainable management.

Sustainable Measures

Montreal Process

Criterion 1 Indicator Examples

Criterion 1: Conservation of biological diversity

Ecological diversity indicators:

- Percent of forest by forest type

Species diversity indicators:

- Number of forest dependent species
- Status of forest-dependent species at risk of not maintaining viable breeding populations

Montreal Process

Criterion 2 Indicator Examples

Criterion 2: Maintenance of Productive Capacity of Forest Ecosystems

Indicators:

- Area and growing stock of plantations of native and exotic species
- Annual removal of wood products compared to the volume determined to be sustainable
- Annual removal of non-timber forest products (e.g. fur bearers, berries, mushrooms, game), compared to the level determined to be sustainable

Montreal Process

Criterion 3 Indicator Examples

Criterion 3: Maintenance of Forest Ecosystem Health and Vitality

Indicators:

- Area and percent of forest affected by processes or agents beyond the range of historic variation, e.g. by insects, disease, competition from exotic species, fire, storm, land clearance, permanent flooding, salinisation, and domestic animals
- Area and percent of forest land subjected to levels of specific air pollutants (e.g. sulfates, nitrate, ozone) or ultraviolet B that may cause negative impacts on the forest ecosystem

Montreal Process

Criterion 4 Indicator Examples

Criterion 4: Conservation and maintenance of soil and water resources

Indicators:

- Area and percent of forest land with significant soil erosion
- Percent of water bodies in forest areas (e.g., stream kilometers, lake hectares) with significant variance of biological diversity from the historic range or variation
- Area and percent of forest land experiencing an accumulation of persistent toxic substances

Montreal Process

Criterion 5 Indicator Examples

Criterion 5: Maintenance of Forest Contribution to Global Carbon Cycles

Indicator:

- Total forest ecosystem biomass and carbon pool, and if appropriate, by forest type, age class, and successional stages
- Contribution of forest ecosystem to the global carbon budget; including absorption and release of carbon (standing biomass, coarse woody debris, peat and soil carbon)

Montreal Process

Criterion 6 Indicator Examples

Criterion 6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

Production indicators:

- Volume of wood and wood products production
- Volume of nonwood forest products

Recreation indicators:

- Percent of forest managed for recreation/tourism

Employment indicators:

- Direct and indirect employment in forest sector
- Average wage rates within the forest sector

Montreal Process

Criterion 7 Indicator Examples

Criterion 7: Legal, institutional and economic framework for forest conservation and sustainable management

Indicators:

- Extent to which legal framework encourages best practice codes for forest management
- Extent to which institutional framework develops and maintains human resource skills across relevant disciplines
- Availability and extent of up-to-date data, statistics and other information important to measuring or describing indicators associated with criteria 1-7

Montreal Process - Indicators

Examples from Communities

- Number of board feet harvested per year (Gogebic County, MI)
- Percent or acres of forest area by forest type (Gogebic County, MI)
- Percent of wetlands, agricultural land, and forests in 1990 still preserved (Gogebic County, MI)
- Total acres burned in fire (Great Lakes Forest Association)
- Wood products average employee earning in dollars/year (Great Lakes Forest Association)

Indicator Frameworks

Indicator Frameworks

- Montreal Process Criteria and Indicators
- Community Capital
- Driving force-State-Response
- Input-Output-Outcome-Impact
- Lowell Center Indicator Hierarchy
- Local Unit Criteria and Indicator Development (LUCID)

Community Capital

Built Capital

Goods
Buildings
Infrastructure
Information

Human/Social Capital

Skills
Health
Abilities
Education

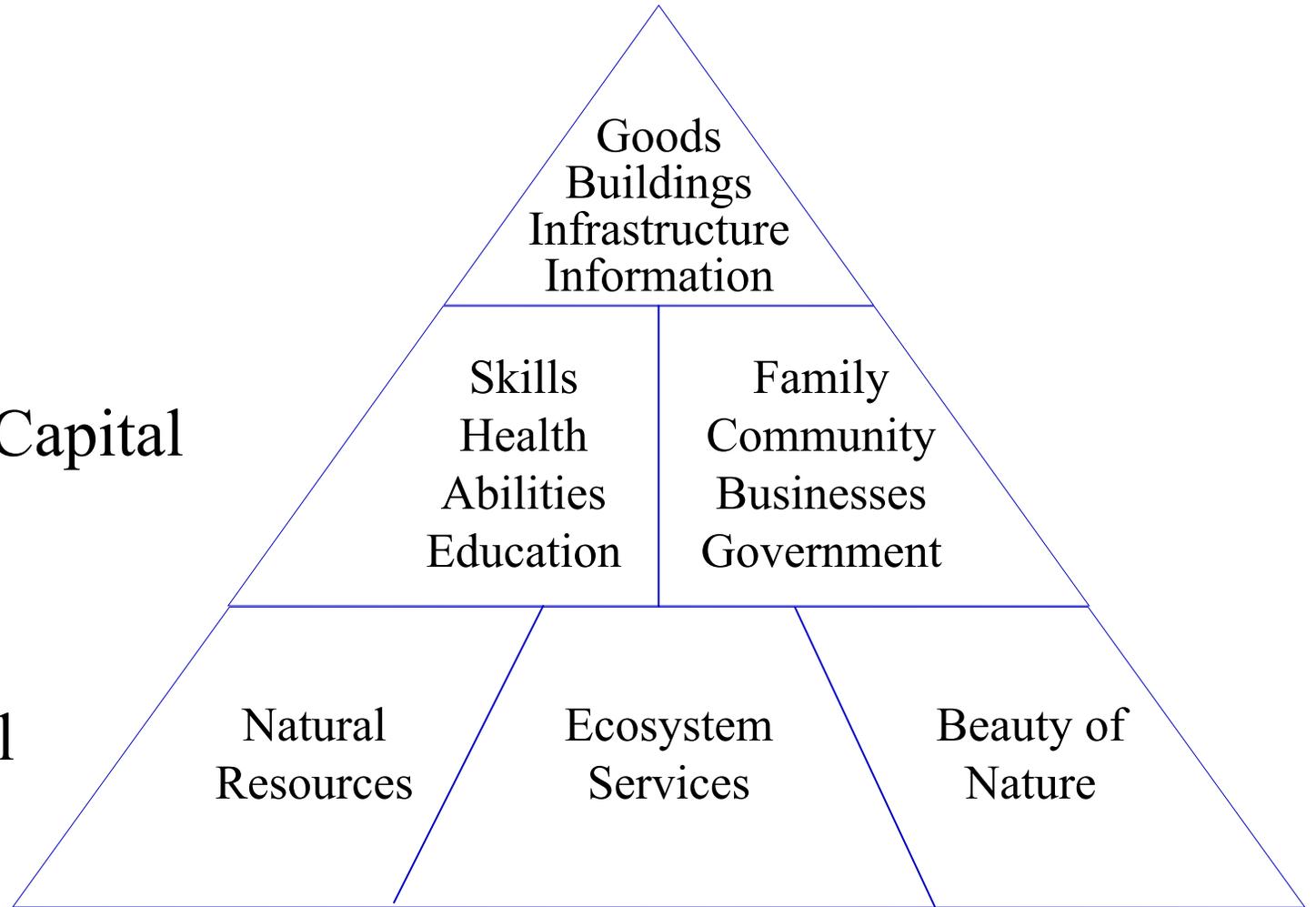
Family
Community
Businesses
Government

Natural Capital

Natural
Resources

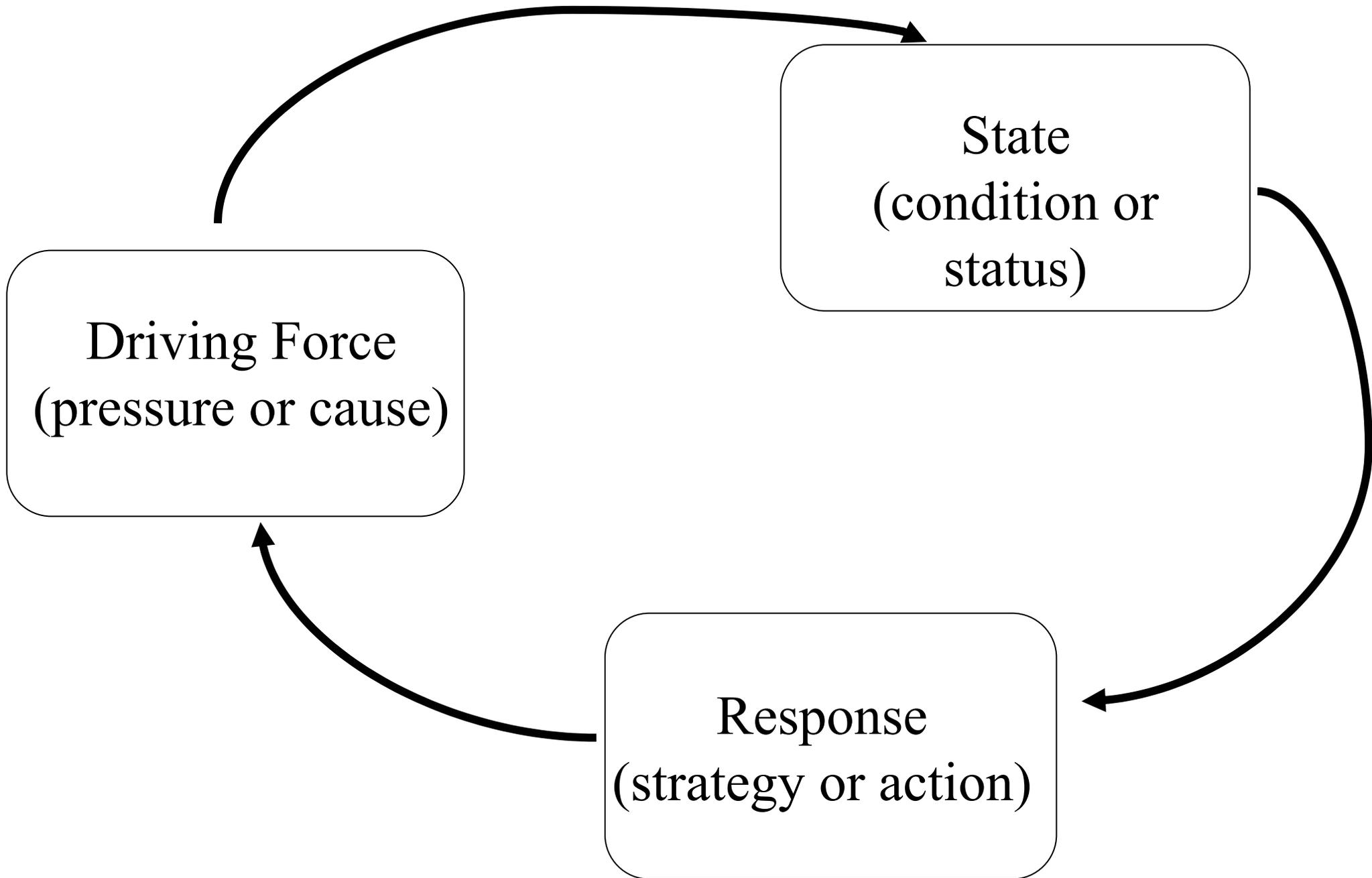
Ecosystem
Services

Beauty of
Nature



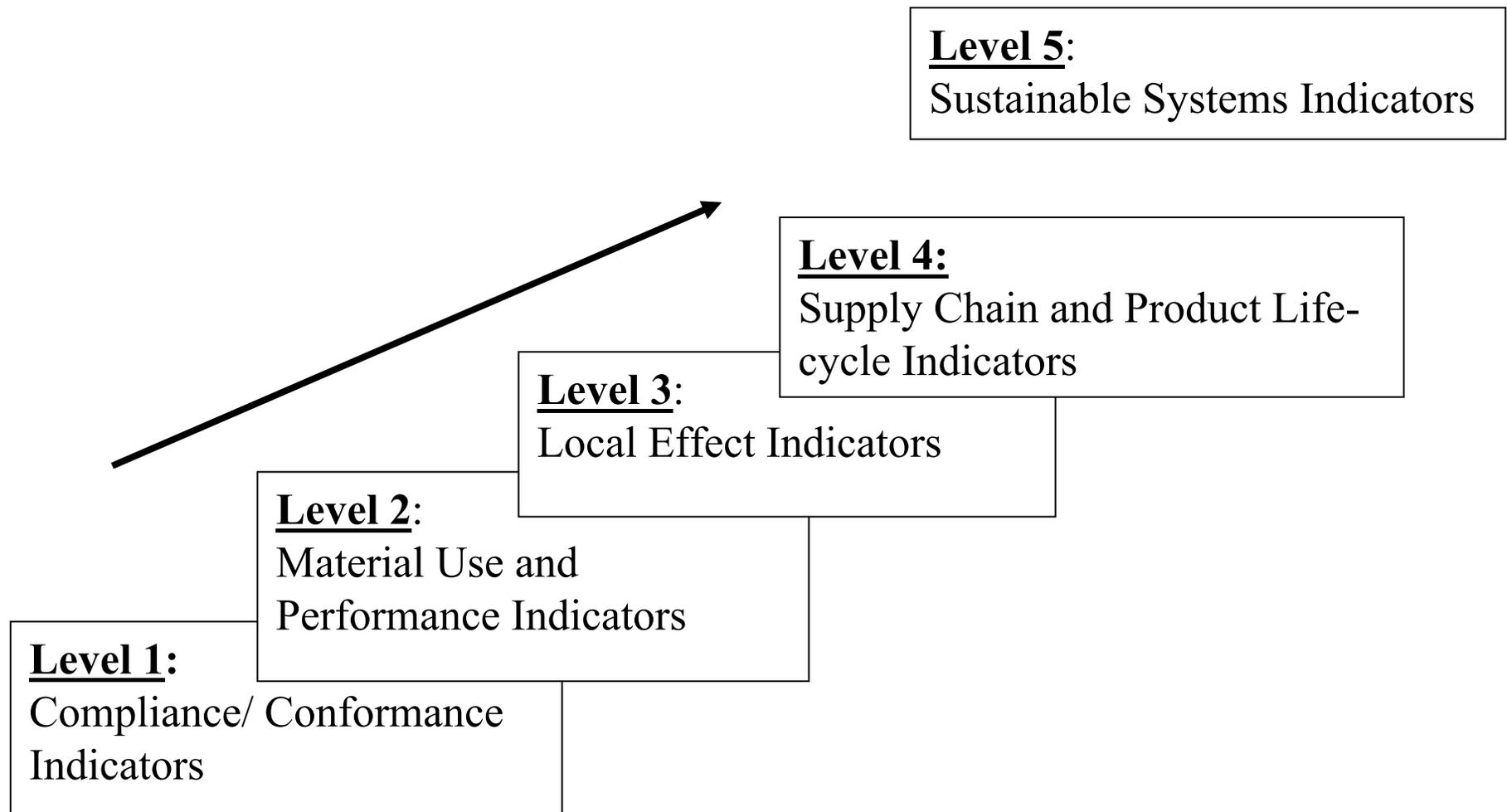
Driving Force/State/Response

- **Driving force** (pressure, source) - activity that is causing a certain state or condition to exist
- **State** (condition) - the condition that exists
- **Response** (strategy, activities) - what is being done about it



Driving Force	State	Response
Number of vehicle miles driven	NOx concentration in mg/m ³	Percent inspected cars with high NOx emissions
Number of single use/disposable goods purchased	Acres of land for waste disposal/landfill.	Tons municipal solid waste recycled.
Percent of watershed that is impervious	Level of metals and organics in water supply reservoirs	Number of storm water permits issued
Pounds of toxics used	Contaminant level of shellfish	Number of shellfish beds closed

Lowell Center for Sustainable Production Indicator Hierarchy



Sustainability Hierarchy

Water Use Examples

- Level of water in stream compared to historic levels
- Annual water use by residents and industry
- Gallons of water used to take a shower

Sustainability Hierarchy

Housing Examples

- Number of building sites with permits
- Number of housing starts
- Number of units by type (single/multifamily) and price range
- Percent of community land by usage type (residential, commercial, industrial, wetlands, working forest, agriculture, wilderness)

Material Developed and Used by Gogebic County FACT

Gogebic County Forest Advisory Coordinating Team (FACT) Project Objectives

- Common understanding of sustainable forestry in the context of community-based needs, desires, and economic well-being in Gogebic County
- Criteria and indicators of sustainable forest management and overall community sustainability in Gogebic County :
 - condition of and pressures on economic, environmental, and social systems
 - outcomes of sustainable forest management and sustainable community development strategies and initiatives
 - extent to which activities are being carried out as planned
- Process to:
 - collect and maintain necessary data,
 - report and use criteria & indicators, and
 - involve stakeholders in reviewing and learning from results

A definition of “SUSTAINABLE FORESTRY” for Gogebic County.

“Sustainable Forestry is [forest management] that contributes to the [economic health] of Gogebic County while maintaining the [ecological and social/cultural values] for the benefit of present and future generations in Gogebic County.”

The words and concepts in red need to be defined in order to give meaning to the statement.

Present the definition to communities, agencies, and organizations.

Decided which tools to use? Are there tools not already mentioned that can be used?

If the tools aren't available, work to develop them . . . and how much it will cost.

Is a tool a standard or an index?

The Easy Stuff

With community support, decide where to go and how to get there!

Learn the facts about an issue. Maintain your objectivity before forming your opinion.

Effectively advocate the facts, and your opinions on the issues.

Take the time and patience to maintain this group as a grassroots representative of Gogebic County interests.

The Hard Stuff