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STEPS IN PREPARING FORESTRY AND BIODIVERSITY SECTIONS OF CLIMATE CHANGE ACTION PLANS

DEVELOPMENT AND EVALUATION OF FORESTRY AND BIODIVERSITY MITIGATION MEASURES

Anthony DiNicola

Описана методика составления национальных планов действий по предотвращению неблагоприятных последствий изменения климата в лесном хозяйстве и по сохранению биоразнообразия. Рассматриваются подходы к разработке и оценке мероприятий в этих областях по снижению парникового эффекта.

Introduction

Forest ecosystems merit consideration in developing mitigation strategies because they can both be sources and sinks of CO_2. Currently the world's forests are estimated to be a net carbon source, primarily because of deforestation and forest degradation in the tropics. Temperate and boreal forests are a carbon sink because many are recovering from past natural and human disturbances and are actively managed.

There are basically three categories of forest management activities that can be employed to curb the rate of increase in atmospheric CO_2. They are management for conservation, management for storage, and management for substitution. Opportunities to employ these activities will vary from country to country, based on natural resource and climatic characteristics and social, economic and political characteristics [2].

It should be recognized at the outset that the primary objective of the forest management activities presented here - that is to foster carbon conservation and sequestration in forests - is but one of a variety of objectives for forest management that needs to be balanced with other objectives. Other objectives include sustainable development, industrial wood and fuel production, traditional forest uses, protection of natural resources (e.g., biodiversity, water, and soil), recreation, and rehabilitation of damaged lands. It is fortunate that most forest sector actions that promote carbon conservation and sequestration make good social, economic, and ecological sense even in the absence of climate change considerations. The purpose of this paper is to assist countries in identifying, analyzing, and selecting mitigation measures in the forestry sector for inclusion in a climate change

plan. Forestry mitigation measures are defined as policies, programs, or projects that countries can use to reduce CO_2 or enhance carbon sinks.

The steps for identifying, analyzing, and selecting forestry mitigation measures are similar to those proposed for other sectors.

Basic steps include (flow chart):

1. Setting priorities in the forestry sector;
2. Identifying and selecting measures for evaluation;
3. Evaluating selected measures;
4. Choosing measures to be included in the forestry section of the national plan;
5. Developing implementation strategies for each selected measure;
6. Writing the forestry plan.

Setting Priorities for Forestry Mitigation Measures

The goal of this planning step is to identify national policy objectives and geographic areas which represent priorities in a particular country and can guide the development of forestry mitigation measures. The process of setting priorities in the forestry sector involves three steps: examining existing priorities for this sector, considering criteria for selecting from among potential priority areas, and validating selected priorities through a scoping meeting involving decision makers and key stakeholders. The selection of priority areas should be based on the relative magnitude of the potential to reduce CO_2 emissions, the potential for other environmental and economic benefits, and political, social, and economic considerations evident in existing national plans. Examples of priority areas that might guide the identification of forestry mitigation measures include: rural development in a poverty-stricken region through fuelwood plantations or sustainable forest-management regimes; the restoration of critical watersheds through reforestation or forest-protection activities; and environmental improvement or energy-conservation in particular cities through urban tree planting. Table 1 presents a framework with examples of national policy objectives, types of forestry management activities which can be employed as mitigation measures, and some examples of mitigation measures that might be identified in a particular country.

Completed or on-going work by a country's study team on its mitigation assessment should be a basic information source for the priority setting process. In addition, the study team should attempt to integrate information from the vulnerability and adaptation assessments with the mitigation assessment. Projected changes in climate and increases in atmospheric CO_2 can have significant influence on forestry mitigation measures that aim to conserve existing carbon pools in forests or expand carbon storage by increasing the area and growth of forests. In particular, countries that are focusing on these types of measures need to carefully consider how climate change could affect future distribution and growth of forests.

Table 1

Framework for Considering Priority Areas and Forest Mitigation Measures

Priority Areas National Policy Objectives	Forest Management activities	Mitigation Measures-Policies, Programs, Projects
Environmental Protection and Restoration		
Biological diversity Critical watersheds Air quality Urban ecosystems Marginal/degraded lands	Controlling deforestation Creating forest reserves Low impact harvesting Afforestation/reforestation Urban tree planting Fire and pest protection	Policy reform to reduce deforestation or create forest reserves Cost-sharing programs for afforestation on private lands Watershed restoration projects Training programs for low-impact harvesting Watershed restoration projects Forest protection research and application programs Community-based projects with local NGO involvement
Sustainable Economic Development		
Industrial wood production Rural development	Improved natural forest management Increased plantations Improved growth and stocking Agroforestry Improved wood product utilization Long-term wood products Recycling	Regulating forest management practices Special tax incentive programs Training and financial incentives for agroforestry Research and training for improved product utilization Education and incentive programs for recycling
Energy Production and Conservation		
Biomass fuels Wood product use	Increased use of wood fuels as fossil-fuel substitutes Improved efficiency of fuelwood burning Substitution of wood for fossil-fuel-based products	Subsidies for biomass fuel production Technology transfer for wood fuels Marketing programs for wood products as substitutes for fossil-fuel-based products

It is important to examine existing priorities documented in national forestry and to explore priorities in plans and programs from other sectors which overlap with forestry, such as agriculture, energy, and environment. More specifically, forestry mitigation measures must be considered in relation

to: national forestry and land-use plans, which would establish geographic priorities for various types of land use as well as land ownership patterns; national environmental plans, which might establish priorities such as creating a system of forest reserves for biodiversity protection or restoring forests on critical watersheds; economic development plans, which might set goals for industrial wood production through sustainable forest management activities; or national energy plans, which might identify priority opportunities for biomass energy production through fast-growing forest plantations. The priority-setting process should be led by the forestry agency, but, to the greatest degree possible, should include environmental and energy agencies and NGOs, both private industry and voluntary, non-profit organizations.

Biodiversity protection and conservation is a policy objective that is being given special emphasis in international discussions, which is why it is specifically recognized in this section on Forestry and Biodiversity. Fortunately, conservation strategies for protecting biodiversity are often consistent with forest management activities for promoting carbon storage. For example:

Protected area strategies in both mature and secondary forests conserve existing carbon pools in forests while also protecting habitat for biodiversity purposes. Reforestation can be used in landscapes with fragmented forest areas to create corridors between those areas, both creating new carbon sinks and critical habitat for certain wildlife and bird species.

Although the establishment of plantations may be less socially and politically desirable than protected area strategies, plantations can increase local biodiversity through re-establishment of native species in the understory when they are established on highly degraded lands and are subject to no further management [2].

Validating Priorities

The team developing the forestry mitigation plan should consider involving a range of national and local agencies and non-governmental organizations in a meeting process to review existing information and mitigation options, and discuss criteria for setting priorities. This can be done as part of a broader scoping meeting through which the team involves various agencies and interests in discussions of forestry mitigation measures. In the Philippines, for example, the country study team helped create an ad hoc group of agencies and nongovernmental organizations (NGOs) to focus on the identification of forestry mitigation measures. This group, called the "Forest and Climate Change Council", convened a three-day scoping meeting, developing priority areas for mitigation measures and identifying a number of possible measures. Using the priority areas as criteria, the group selected several mitigation measures for further analysis, through a consensus approach. Members of the group then held a press conference to promote public awareness of their joint activities and the forest mitigating measures that had been selected.

Identifying and Selecting Mitigation Measures in the Forestry Sector

Once priority areas for potential forestry mitigation measures are set, the team can begin the process of identifying and selecting specific measures. The process involves a review of potential forestry mitigation measures, the identification of measures which meet a country's policy objectives and fit its context, and the screening of those measures to select a several for further evaluation.

Review of Potential Measures

In order to identify possible forestry mitigation measures for a particular country, it is useful to review the basic types of forestry activities that can be used for reducing emissions and the types of policy and program tools that might be employed in implementing such activities. For clarification, once again, as the term "mitigation measure" is being used here, it will generally combine forest management activities and policy or program tools to help a country meet its policy objectives in an identified priority area. For example, in the Philippines, a scoping meeting identified critical watersheds as priority areas which required ecological restoration through a mix of forest management activities, primarily protecting existing forest reserves and reforesting degraded forestland areas.

Potential forestry mitigation measures were then identified using policy and program tools based on working with local organizations through a community-based forestry approach and a policy initiative to specifically address land-tenure concerns of the local people. The IPCC [2] has identified three basic categories of forest management activities as potential means of reducing CO_2 emissions in the forestry sector. Forestry-sector teams should review these types of activities and consider which most appropriate given the unique characteristics of their country.

1. Management for conservation (prevent emissions). The goal of conservation management is mainly to conserve existing carbon pools in forests as much as possible through activities such as controlling deforestation, protecting forest in reserves, changing harvesting regimes, and controlling other anthropogenic disturbances such as fire and pest outbreaks. Urban tree planting and maintenance activities also fit into this category since the primary carbon benefit is to reduce emissions through energy conservation.

2. Management for storage (short-term measures over next 50 years or so). The goal of storage management is to expand the storage of carbon in forest ecosystems by increasing the area and/or carbon density of natural and plantation forests, and to increase storage in durable wood products.

3. Management for substitution (long-term measures). The goal of substitution management is to increase the transfer of forest biomass carbon into products (e.g., construction materials and biofuels) rather than using fossil-fuel-based energy products, cement-based products, and other building materials.

To help illustrate how forestry mitigation measures combine elements of the forest management activities and various policy and program tools. A list of existing or identified forestry mitigation measures from national action plans in various countries or other initiatives is presented below. Forestry sector teams can refer to the plans or documents in which these measures are described for further detail.

Examples of Forestry Mitigation Measures in Climate Change Plans and Forestry Plans

– Promote improved logging practices. A Malaysian logging company is practicing reduced impact logging as a means to reduce damage to residual trees and soil.

– Encourage agroforestry activities to contribute to sustainable development. Guatemala is implementing a large scale agroforestry project primarily to foster sustainable development but also provide a carbon benefit.

– Promote forest expansion through tax policy. New Zealand is implementing a new tax regime to encourage sound forest management which reflects the long term nature of forest investment.

– Promote development of policies that promote better environmental management. Mexico is developing an improved legal and policy framework to control deforestation and mitigate global climate change including technical exchange programs environmental impact assessment and mitigation and improved environmental planning.

– Substitute biomass for heating oil. Switzerland is implementing a new program to double the consumption of wood for energy generation by substituting wood for heating oil.

– Encourage use of long lived forest products. Switzerland is promoting the use of long-lived forest products in place of more energy intensive materials.

– Provide financial incentives for new afforestation activities. Germany is supporting afforestation on private land by subsidizing initial investment costs and providing compensation for income loss due to set-asides of agricultural land.

– Encourage improved forest management. Germany is encouraging improved forest management strategies that avoid clear cutting and, thus, preserve soil carbon and forest ecosystem structures.

– Promote energy conservation through urban tree-planting. The United States is promoting urban tree planting as a "heat island" mitigation strategy to reduce energy consumption.

– Reduce the depletion of private forests. The United States is implementing a policy aimed at improving the management of forests through technical forestry assistance.

– Control air pollution effects on forests. Germany is implementing wide-ranging measures for combating forest damage from air pollution.

– Encourage use of forest as building materials. Australia is promoting the use of forest products as building materials in place of products made from more energy intensive processes [1].

– Accelerate tree planting on private forest lands. The United States is implementing a policy to promote tree-planting on marginal croplands and improving existing forest land through technical assistance and financial incentive.

– Build capacity of private and public sector institutions to address forest management. The Philippines is enhancing the ecological and economic sustainability of lands managed as primary and secondary forests through policy reform, resource protection and technical assistance.

Screening Mitigation Measures

Once the team has identified a number of possible forestry mitigation measures, a list of criteria should be developed for screening the measures. This screening process will result in rejecting some measures, while others will be selected, or modified, for further evaluation. The following list of criteria could be used as a basis for screening:

1. To what degree does the measure effectively address the highest national priorities in terms of environmental, social, and economic policy?

2. To what degree does the measure address targets of opportunity in the forestry sector by taking advantage of other high-priority forestry activities? (In cases where existing forestry programs or projects are modified to incorporate activities for reducing CO_2 emissions, significant efficiencies might be experienced.)

3. To what degree are other environmental, social, and economic benefits clearly associated with the measure?

4. To what degree will the measure be cost-effective to implement? (In particular, measures should be compared on the basis of their cost-effectiveness in terms of reducing CO_2 emissions.)

5. To what degree does the measure face significant barriers to implementation? (Barriers might include those identified earlier: technical and personnel; financial, market, and resource; and institutional and policy.)

6. To what degree is the measure consistent with mitigation measures in other sectors?

The screening of measures with these criteria could use expert judgment to develop responses to these questions and to array them in a table or matrix. Responses could be presented on a three-point scale, as shown in Table 2. Those measures with the highest scores could be selected for further evaluation.

Evaluation of Selected Measures

Having selected several measures in priority areas, the team should evaluate them in greater detail. The goal of the evaluation is to rank the measures based on their effectiveness (or cost-effectiveness) in fulfilling policy objectives and their ability to overcome key implementation barriers. The analysis of fulfilling policy goals is called effectiveness analysis.

Table 2

A Matrix of Criteria for Screening Forestry Mitigation Measures

Mitigation Measures	National Priority	Target of Opportunity	Other Benefits	Carbon Cost-Effectiveness	Implementation Barriers	Consistency with Other Sectors
Community-based initiative to restore a high-priority watershed through reforestation activities	3	3	3	2	2	2
Urban tree planting initiative to provide energy and aesthetic benefit, using local volunteer groups	1	3	2	1	1	2

Identify Policy Objectives

Team members should begin the effectiveness analysis by identifying major policy objectives related to these forestry mitigation activities. Policy objectives should include reduced CO_2 emissions, but should also recognize other environmental objectives, such as improved water quality and biodiversity protection, and economic objectives, such as increased production of wood or non-wood products.

Team members should try to identify quantitative, or at least ordinal, measures of how well these objectives are satisfied. This will allow for easier comparison of different objectives.

Select Method for Evaluating Measures

After identifying the policy objectives, team members need to select a method to examine how well the selected forestry mitigation measures would perform in fulfilling these objectives, relative to current policies and programs. Whatever analytical methods are used, the evaluation process should involve decision makers and key stakeholders in workshops and meetings to discuss the mitigation measures and results of quantitative analysis. It should be recognized that the evaluation process will consider both quantitative data and subjective judgment.

A number of different analytical approaches can be used to assess the effectiveness of mitigation measures. Team members should use approaches and tools with which they are most familiar. The approach suggested here is a decision matrix, which basically examines cost-effectiveness in achieving policy objectives and considers barriers to implementation. The analysis of cost-effectiveness will likely involve many of the screening criteria (see Table 2), but examined in greater detail. For example, the evaluation should consider discounted benefits and costs of the mitigation measure, to the degree possible.

Evaluating the effectiveness of measures will combine the use of formal analysis, such as the use of analytical tools by scientists on the forestry-sector team, and informal analysis, such as methods to determine expert and policy-maker opinion. Formal analytical methods, such as those presented in the U.S. Country Studies guidance document for mitigation assessments [3], can be used to estimate net carbon flows by comparing carbon flows with particular mitigation measures to carbon flows without the measures (i.e. the reference case.) In addition, net financial costs can be calculated by comparing costs associated with measure to those of the reference case. Expert opinion, on the other hand, might be used as the method for assessing mitigation measures with respect to less quantifiable policy objectives or criteria, such as the relative benefits of measures in terms of water quality or biodiversity protection. An advantage of using expert opinion is that it is much faster and less expensive than formal analytical techniques. A disadvantage is that it is less rigorous and not replicable.

Countries may want to use a decision matrix to analyze the cost effectiveness of forestry mitigation measures by comparing the costs of mitigation measures with their benefits estimated in a common metric (not necessarily dollars). For example, Table 3 illustrates the use of a decision matrix to examine hypothetical mitigation measures in two forested watersheds. A priority area in this hypothetical country is the restoration of critical watersheds. Major policy objectives related mitigation measures in this priority area are identified as effectiveness in reducing atmospheric carbon, biodiversity protection, water quality, and wood production. The decision matrix allows for a comparison between a community-based forestry approach and the current policy in two different watersheds. In the hypothetical example, Watershed 1 has substantial existing forest area threatened by land clearing and forest exploitation. The community-based forestry measures in this watershed are primarily based on creating protected forest reserves, while including some limited sustainable forest management activities. Watershed 2, in contrast, has largely been cleared and only contains remnant forest fragments. The community-based forestry measures in this watershed are primarily focused on reforestation activities to create secondary forest plantations for practicing sustainable forest management, while also creating reserves in environmentally sensitive areas. In the example, expert judgment is used to apply an ordinal ranking (e.g., on a 1 to 5 scale) of how well objectives are fulfilled.

Note that in this example, the community-based forestry mitigation measures in Watershed 1 have a higher score, but the forest-protection measures cost more, due to limited revenues from forest-management activities, and are less cost effective than mitigation measures in Watershed 2 (i.e., $.13 million cost per unit of benefit compared to $.07 million cost per unit of benefit). Cost effectiveness is determined by comparing the marginal improvement in score with forestry mitigation measures, over the current policy in each watershed, with the cost of the mitigation measures.

Analysis of the effectiveness of forestry mitigation measures in meeting policy objectives should also identify barriers to implementing the measures and evaluate how difficult or easy it will be to overcome he barriers. This process should be done in cooperation with a range of national agencies, non-governmental organizations, and local institutions to understand the barriers and potential opportunities to address them from variety of perspectives. Team members might develop a matrix like the one shown in Table 4 to track the analysis. The actual entries will be different in each country, based on unique country characteristics.

Forestry sector teams might use the lists of common barriers to implementing forest management activities and policy and program tools to overcome implementation barriers as references in developing their matrices. In the hypothetical example (see Table 4), the matrix identifies key barriers to implementing mitigation measures for restoration of a critical watershed through community-based forestry, policy tools or measures to overcome the

Table 3

Sample Decision Matrix for Forestry Mitigation Measures (1-5* Scale)

Measures	Objectives (weights)				Score	Marginal Cost, $M	Cost Effectiveness (cost/incremental unit of benefit), $M
	Carbon effect (4)	Biodivestry Protection (3)	Water Quality (3)	Wood Production (2)			
Watershed 1: Current Policy	2	2	2	1	22	NA	NA
Watershed 1: Community-based forestry	3	4	4	1	38	2	0,13
Watershed 2: Current Policy	1	1	2	1	15	NA	NA
Watershed 2: Community-based forestry	4	2	3	3	37	1,5	0,07

*The 1-5 scale in this matrix is an arbitrary ranking of how well objectives are met under different scenarios and policies. Five is the highest score and one is the lowest score.

Table 4

Identifying and Assessing Implementation Barriers (critical watershed restoration through community-based forestry)

Barriers	Policy Tools	Responsible Organization	Time, year	Cost	Difficulty
Technical/Personnel					
Scientific Understanding	Research on regeneration	Research Institute	3	$50,000	X
Data and Information					
Technical Expertise	Extension and education	Forestry, Extension	2	$200,000	X
Financial/Market					
Project Funding					
Financial Incentives					
Market	Marketing assistance	Forestry, Economic development	5	$30,000	XX
Infrastructure					
Trained Workers					
Institutional/Policy					
Local Institutional Framework	Institutional training	NGOs USAID	2	$50,000	XX
Land Tenure System	Stronger assurance of local rights	Forestry, Ministry, Parliament	3	$100,000	XXX
Laws and Policies Enforcement Capacity	Training for protection	Forestry, NGOs	2	$25,000	XX

barriers, the agency or organization responsible for the measures, the time and financial resources required, and the degree of difficulty associated with overcoming each barrier. A three-point rating system can be used to indicate the degree of difficulty in overcoming barriers, with one X being easiest and three X's being hardest. The example shows only the results of the analysis for on watershed.

These results could be used to compare barriers in this watershed to those in another. The results could also be used to adjust the rankings of mitigation measures from the decision matrix.

Preparing a Workplan

A critical step in the evaluation is the preparation of a workplan describing in detail the forestry mitigation measures that have been selected and the methods that will be used for the analysis. The workplan should include a discussion of the analytical tools and products to be generated; a schedule of activities in the analysis and the role of key personnel; and a process for presenting results to the full interagency team, key decision-makers, and stakeholders.

Conducting Evaluations

The team members should conduct the evaluations in a way that includes the interagency team, key decision makers, and stakeholders, or allows for a high degree of consultation with them. This not only increases the likelihood of the results of the evaluation being accepted, but also helps ensure that the ranking of mitigation measures across different sectors is consistent.

Choosing Measures to be Included in the Forestry Mitigation Plan

The process of choosing measures for inclusion in the forestry mitigation plan involves combining the results from the evaluation of effectiveness and the analysis of barriers to implementation. There is no easy way to combine the two, although it is clear that the cost of measures to overcome barriers must be factored into quantitative approaches used for evaluating the effectiveness of measures in the decision matrix. The result of the overall evaluation should be a ranking of mitigation measures (or at least a discussion of the measures) based on the policy objectives and criteria developed by the team. Team members should present the results of the evaluations to the interagency team, key decision makers, and stakeholders.

Developing Implementation Strategies for Each Measure

After selecting several measures for the forestry mitigation plan, team members should develop an implementation plan for each measure. The implementation plan should be built on the analysis of barriers to implementation and include the following components:

Identify lead and cooperating agents. It is critical that some organizational body and certain individuals be identified as the lead agents in implementing selected measures. In most cases, this will be the forestry ministry or agency, which has primary authority for most types of measures in

the forestry sector. However, the lead agency for certain forestry mitigation measures might also be other ministries or agencies, such as agriculture, energy, or environment. It is also important to identify cooperating organizations, which often play critical roles at the local level, such as provincial, regional, or municipal governments. Non-governmental and private organizations such as citizens and business groups can be very helpful designing the implementation plan and overcoming barriers.

Describe key steps to implementation and schedule. The lead agent should work with cooperators to identify key steps in the implementation process and to set up a schedule.

Identify human and financial resources. The implementation plan needs to clearly identify which organization or individual is responsible for each step in the process and the human and financial resources necessary.

Outreach activities. The plan should clearly address outreach activities, such as public meetings to solicit support and comment on the measures, educational campaigns, and media events. If the implementation process is a long one, as forestry measures may be, a number of outreach events and activities can be helpful to keep attention focused on the measures.

Monitoring and evaluation. The implementation plan should also include a section on how the results of the measure will be monitored after implementation to determine how well anticipated benefits are actually achieved.

Writing the Forestry Mitigation Plan

The final step is to write up the results of the activities described above in a mitigation plan for the forestry sector. The mitigation plan should be brief, written in an understandable style for the public, and include the following components:

Summary of the national priorities. This section should describe the policy objectives and national priorities that were established through the process and used to identify and select forestry mitigation measures.

Analysis of selected measures. This section should summarize the identification and selection of forestry measures, the methods by which these measures were evaluated, and results from the evaluation of effectiveness and barriers to implementation.

Summary of recommended measures. This section should summarize the recommended measures, describing why they were chosen and how they will help mitigate the potential effects of climate change.

Implementation plan. This section should summarize the implementation plan, identifying the lead agency and cooperators, as well as key steps and activities.

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ҰЛТТЫҚ ІС-ӘРЕКЕТ ЖОСПАРЫНА БИОТҮРЛЕР МЕН ОРМАН ШАРУАШЫЛЫҒЫ БӨЛІМДЕРІН ДАЙЫНДАУ

БИОТҮРЛЕР МЕН ОРМАН ШАРУАШЫЛЫҒЫНДА ПАРНИК ӘСЕРІН ТӨМЕНДЕТУ ШАРАЛАРЫН БАҒАЛАУ ЖӘНЕ ЗЕРТТЕУ

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