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Using scenarios to make decisions about the future: anticipatory learning for the adaptive co-management of community forests☆

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Abstract

Current trends to improve the adaptiveness of community forest management focus on monitoring past actions and emphasize internal dynamics. We show how scenario methods can be used to (1) enable managers to better understand landscape and larger scale forces for change and to work with stakeholders at these levels and (2) improve adaptiveness not only by responding to changes, but also by anticipating them. We review methods related to scenario analysis and discuss how they can be adapted to community management settings to improve the responsiveness and the collaboration among stakeholders. The review is used to identify the key elements of scenario methods that CIFOR will test among communities in Bulungan Regency, East Kalimantan, Indonesia and two villages in the buffer zone of Ranomafana National Park, Madagascar. © 2000 Published by Elsevier Science B.V. All rights reserved.

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1. Introduction

Adaptive management is emerging from its origins re-shaped as an important paradigm for landscape management around the globe (Taylor et al., 1997; Maarleveld and Dangbegnon, 1998). In contrast to past work on scientific adaptive management (Holling, 1978; Walters, 1986), the new adaptive management seeks to be responsive to local demands and to facilitate collaboration among multiple stakeholders (Lessard, 1998; McLain and Lee, 1996). To highlight the bottom-up orientation and focus on stakeholders of this new approach, we use the term adaptive co-management (ACM) in this paper.

ACM relies on iterative social learning among stakeholders and the on-going adjustment of management decisions to be acceptable to relevant actors. Yet most of the attention to learning in ACM is on the monitoring of past actions. Anticipating and exchanging perspectives about the future can be an equally important source of learning. In this paper we show how scenarios can be used as a tool for adaptive co-management to enable groups of forest users to not only respond to changes, but also anticipate them.

We examine the use of scenarios for the case of community forest management. Community forest

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management refers to common pool forests where the people living near them have significant rights and responsibilities for management. Given the trend to devolve forests to local authorities in many countries, we propose that there will be an increasing need for new methods of decision-making at the level of the community. Yet community-level decision-making does not take place in isolation. It will be more effective to the extent it takes account of social and ecological processes at the scale of landscapes or larger, where multiple stakeholders are involved. In many cases, community members are not well-prepared to make decisions that take into account these wider scale influences. We believe there is a need for new methods to facilitate community-level decision-making that can account for risks and opportunities with origins at larger scales. These methods will need to enable learning among multiple stakeholders and be responsive to changing conditions.

We discuss first, what scenarios are, how they have been used and their application to community forest management. We then identify the features that make scenario analysis well suited for use within an ACM framework. We conclude by identifying the key elements of a method that the Center for International Forestry Research (CIFOR) will test among communities in Bulungan Regency, East Kalimantan, Indonesia and Ranomafana District, Fianarantsoa, Madagascar.

2. What are scenarios?

Scenarios are stories or 'snapshots' of what might be. Decision makers use them to evaluate what to do now, based on different possible futures. The options for the future reflect either an extrapolation of current trends or introduced changes, such as policies and management plans.

Although the term scenario is associated with several distinct approaches for gaining information about the future (Millett, 1988; Fischhoff, 1988; Sapio, 1995) and its meaning has shifted with different historical contexts (Van de Klundert, 1995), the scenario method refers to a general category of techniques associated with creative visioning. Fig. 1 shows how creative visioning techniques differ from other general approaches to thinking about the future such as projecting and forecasting, assessment of potential impacts and exchange (Deshler, 1987). Unlike projections, scenarios do not indicate what the future will look like. Scenarios instead stimulate creative ways of thinking that help stakeholders break out of established patterns of assessing situations and planning

Creative visioning is an approach intended "to challenge existing mental barriers to make use of creative intuition and construct visions or plans for a desirable or preferred future" (Deshler, 1987 p. 87). It is a response to the "…human tendency to be bound by what we already know" (Deshler, 1987 p. 87). Visioning is used to discover interconnections between events, especially macro-events on micro-environments. Techniques include imaging, scenarios and futures history writing.
Projection and forecasting are techniques that produce relatively precise quantitative predictions. This approach requires historical precedents, regularities of cause and effect, data availability and short time periods. Some consider forecasts appropriate for single variables: prices, population etc (Blythe and Young, 1994), rather than complex phenomenon. The method of arriving at the answer may be complex and is usually not transparent to decision makers. Methods include: Delphi techniques, trend extrapolation, computer modeling and cross-impact analysis.
Assessment of potential hazards is an approach for identifying the possible impacts of a new policy or practice. The method requires prior determination of criteria and indicators for assessment. Common techniques include environmental and social impact assessments.
Exchange and dialogue methods aim to release people from socially imposed and unexamined expectations. The method enables people to understand other group's plans and visions and stimulate dialogue. Techniques include discussions of literature, self-assessment, games and simulations.

Fig. 1. Four approaches to gaining information about the future (adapted from Deshler, 1987).

actions, so that they can better adapt to the future. They are most appropriate under conditions where complexity and uncertainty are high (Schoemaker, 1993), as is generally the case in tropical forests where communities are found.

Scenario methods share important characteristics with a number of Participatory Rapid Appraisal (PRA) techniques intended to elicit people's vision about the future. These include possible futures (Slocum and Klaver, 1995) and guided imagery (Borrini-Feyerabend, 1997) exercises. Scenarios, however, focus on the analysis of uncertainties, drivers of change and causal relationships associated with a potential decision to a greater extent than do these other techniques (see below). Scenarios thus, encourage critical thinking about risks and systems relationships. In the context of ACM, such critical thinking takes the form of social learning among multiple stakeholders.

As a tool for anticipation, people use the scenario method to adapt their current mental model to changing circumstances. During times of rapid change or complexity, existing mental models include assumptions that are no longer valid or habits of observation that prevent seeing new relationships (Wack, 1985b). Scenarios introduce hypothetical possibilities that spur people's imagination and enable them to adjust their mental habits. They enable stakeholders to overcome cognitive biases to (1) undervalue that which is hard to remember or imagine, (2) better remember and give more weight to recent events, (3) underestimate uncertainties, (4) deny evidence that does not support one's views, (5) overestimate their ability to influence events beyond their control, (6) be overconfident about their own judgements and (7) overestimate the probability of desirable events (Becker, 1983; Barnes, 1984; Bunn and Salo, 1993; Schoemaker, 1993). Pierre Wack, (1985b, p. 147) one of the main developers of Royal Dutch Shell Corportation's scenario approach, calls this adjustment of mental models the 'gentle art of reperceiving'. Scenarios are thus, a mechanism for learning.

The new mental model derives its power of explanation by taking a systems view. Macro-level and environmental forces are given special attention in scenario construction as sources of risk and drivers of change. Scenarios force an understanding of the outside world and how people's inside world (the household, the landscape, a local organization) interacts with it. (Wack, 1985b). This sort of analysis is crucial for effective community-level decision-makers operating in the context of larger social and environmental landscapes with many stakeholders.

> The point... is not so much to have one scenario that "gets it right," as to have a set of scenarios that illuminate the major forces driving the system, their interrelationships and the critical uncertainties. The users can then sharpen their focus on key environmental systems aided by new concepts and a richer language system through which they exchange ideas and data (Wack, 1985b, p. 146).

3. Elements of a scenario-based approach

Although the scenario method has existed for centuries in one form or another, the formalization of the method is attributed to the Manhattan Project around 1942 (Schoemaker, 1993, p. 194). Dissemination of the technique became more widespread with documentation by the Rand Corporation in the 1960s (Kahn, 1965), and development by SRI and Royal Dutch/Shell Corporation in the early 1970s. Scenario methods have since been adapted to scores of applications, including land use planning (Foran and Wardle, 1995; Yin et al., 1995) and climate change (Wolf and van Diepen, 1995). Using the term scenario loosely, Van de Klundert (1995) suggests that the application of scenarios has evolved in ways that reflect the historical context of planning. Scenarios in the 1960s emphasized prediction based on existing stable trends, while those in the 1970s and 1980s accentuated coping with uncertainty. Scenarios in the 'stakeholder' 1980s and 1990s have emphasized public discussion and shared decision-making.

A number of sources provide excellent overviews of scenario approaches (Wack, 1985a, b) and information about how to construct scenarios (Becker, 1983; Deshler, 1987; Huss and Honton, 1987; Bunn and Salo, 1993; Schoemaker, 1993; Bossel, 1998; Fahey and Randall, 1998). We draw on these sources to review the common elements of scenario construction and identify those elements suitable for community forests. We emphasize techniques related to the qualitative scenario method (Huss and Honton, 1987), in recognition of the limited technical resources available in most community forest management settings.

The four elements common to scenario analysis are:

1. Definition of the purpose of the scenarios.
2. Information about a system's structure and major drivers of change.
3. Generation of the scenarios.
4. Implications of the scenarios and use by decision makers.

The changes in policy environments, markets and alliances among interest groups that community forest managers have faced in the last two decades, and the multi-scale nature of these phenomena, indicate an urgent need for scenario-type planning suitable for community forests. Although the scenario methods literature is replete with examples of applications about forests (Foran and Wardle, 1995), there is unfortunately little available on the methods appropriate for community forestry management.

Four traits distinguish community forest applications. First, attention to negotiation about preferences and aggregation of different views is especially important at several levels: (a) within the community for common pool forests, (b) with other groups that co-manage or use the forest outside of the community, and (c) with the people using or responsible for the agricultural lands, waterways or other land uses that affect the forest or are influenced by it. Information from these other interest groups needs to be included in the construction and evaluation of the scenarios. Since many community forests involve people disadvantaged by their ethnic or class background, however, care needs to be taken that stakeholders' power relationships do not bias who has a say in the scenario exercises. Scenarios need to be able to integrate planning about the uses and impacts associated with different interest groups for a given landscape, but this need not mean that all groups participate equally in every stage of scenario construction and analysis. Second, differences in sophistication among stakeholders in community forests requires designing understandable, transparent methods for each participating stakeholder group, including villagers who may not be able to read (Stewart and Scott, 1995). Third, creativity may be required to encourage villagers to express their ideas about the future, where culture and environmental conditions support a belief in fate and unwillingness to talk of what might be. Fourth, if the method is to be replicable, costs need to be minimal in terms of specialists, transaction costs of involving stakeholders, time and the collection of information.

Below we summarize the methods involved for each element and discuss their application in the context of community forests.

4. Purpose

Scenarios are more effective tools for learning to the extent their purpose is situated within a clear decision-making context. The context should be defined in terms of the issue requiring a decision and include the relevant time frame, location and actors associated with the issue. The issue might be concern about a potential disturbance to the community's harvesting plans, unexpected NTFP market opportunities, impacts of the community's forest on the larger watershed or the implications of a new national forest protection strategy. Normally, some set of stakeholders has already identified an issue that would benefit from scenario analysis. Additional relevant stakeholders may be called to assist in defining the decision context from their point of view.

The purpose should be clear as to whether the scenarios are to be applied to identify or assess decision options (Table 1). Stakeholders may use scenarios to identify feasible options in light of possible major changes, such as shifts in economic conditions or population movements (Kahane, 1992). Or, they may use the same scenarios to test the viability of an existing practice such as a policy giving tenure security to customary lands against the backdrop of the hypothesized changes. The choice depends on the problem at hand. In practice, the two purposes are often combined through iterative scenario generation.

Choosing which decision-makers should be represented in a scenario exercise for community forest management requires attention to the roles of different groups in management (forest owner, user, beneficiary, regulator, sponsor, competitor or neighbor), their positions on the decision issue and their role in society at large (Colfer, 1995; Grimble and Chan, 1995; Warner et al., 1996; Farrington, 1996; Borrini-Feyerabend, 1997). The views of these different groups become 'anchor points' that can have a sig-

Table 1
Comparison of scenario applications for identifying or assessing options (adapted from Ducot and Lubben, 1980; Bunn and Salo, 1993)

Dimensions	Purpose of scenario	
	Identify option	Assess option
Aim of scenario analysis	Identification of options based on different possible futures	Assessment of existing practices or plans based on different possible futures
Scenario application	Source of information for indicating options Environment for testing viability of options	
Decision options	Are the result of scenario analysis and are variable Are inputs to scenario analysis and fixed	

nificant impact on framing subsequent discussions and decisions (Bazerman and Neale, 1992), hence, care is needed in the selection of who participates and how they represent different interests. Creativity is required to enable people with different social status or access to power to meet and exchange ideas (Anderson et al., 1999; Edmunds, 1999). Local villagers may wish to work with a third party such as an NGO, although this raises questions about whose views are really being expressed, that of the villagers or of the NGO.

Scenario methods are themselves adaptable, and have used various forms of stakeholder input to inform the scenario process and help make it relevant to users. Many examples come from methods for land use planning scenarios. Stakeholders can be a source of information about the criteria with which to evaluate scenarios (Stewart and Scott, 1995). They can screen or assign preferences to scenarios and their impacts (Van Huylenbroeck and Coppens, 1995). Interest groups may even identify the risks, goals (Yin et al., 1995) or policies that define the scenario themes (Stewart and Scott, 1995). Given sufficient technical support, they can work with scenarios interactively, by providing the specifications, for instance, for GIS and decision support systems (Malafant and Fordham, 1997; Veldkamp and Fresco, 1997). Importantly for ACM, scenarios can also be used to develop shared perceptions of different possible futures and create platforms for joint learning and negotiation (Stewart and Scott, 1995).

5. Structure and drivers of the system

The second element common to scenario methods is the collection of information about the forces shaping the system. These include:

1. The structure of resources, actors, institutions, events and relations among them.
2. Identification of slow changing, predictable trends (such as amount of forest area, internal population growth and road infrastructure; whether these parameters are slow-changing needs to be determined on a site-by-site basis).
3. Identification of uncertainties and potential major drivers of change (such as the opening of a new market for forest products, the introduction of a new harvesting technology, a new policy supporting customary forest land ownership or rural-to-urban migration).

The intent here is to provide enough information to community-level decision-makers and other relevant stakeholders to allow them to construct plausible, distinct scenarios, not to achieve a comprehensive understanding of how each hypothetical future works. Indeed, one of the functions of scenario analysis is to simplify complexity about the future. Structural elements of the system and slow changing phenomena are singled out for their relative predictability. For community forest systems, a minimum set of factors might include identification of forest uses, users, relations among users, rules about forest use, and relationship of the forest to local households' economic needs, to agriculture or livestock and to water quality. The dynamics of the system originate from locally relevant uncertainties and slow changing phenomena. Uncertainties and drivers of change form the nucleus around which each of a set of multiple scenarios is then constructed. Uncertainties may revolve around anticipated drivers of change, not only those that have been strong influences in the past. In community forest systems, key uncertainties often include natural calamities (flood, winds), land conversion, market fluctuations, the policy environment and actions of competing users of the forest.

The basis for each trend and uncertainty (and its assumed impacts) can be carefully discussed among stakeholders to identify the arguments for and against the likely occurrence of these phenomena (Schoemaker, 1991). This step is crucial if scenarios are to play a useful role in making forest management both more adaptive and collaborative. It helps to build up a partially shared, negotiated perception or working agreement among stakeholders of the values and assumptions underlying the construction of the scenarios. At the same time, it highlights potential alliances and areas of conflict among community-level decision-makers, and between them and other stakeholders. This step can also result in the exchange of substantial new knowledge between community and outsiders about, for example, legal trends or environmental degradation. Each of these functions is critical to adaptive and collaborative management.

Identifying trends and uncertainties constitutes the first important part of the learning process. Once agreement about these trends has been reached, the relationships among trends can be mapped (Fig. 2).

6. Generating the scenarios

Scenarios are generated based on an understanding of the system. The selection of the scenario themes may be based on any one of a combination

		Impact
T_1:	Increased global demand for green market NTFPs	?
T_2:	UN convention support for community forest management	+
T_3:	GATT trade requirements	-
T_4:	World Bank loan conditions delaying devolution of forest management	-
T_5:	NTFP export values rise with fall in value of local currency	+
T_6:	Increased support for mining	-
T_7:	Policy to promote oil palm plantations	-
T_8:	Declining regional tax base	-
T_9:	Designation of nearby national park	?
T_{10}:	Weakening of local customary law	-
T_{11}:	Increased destructive use of forest by outsiders	-

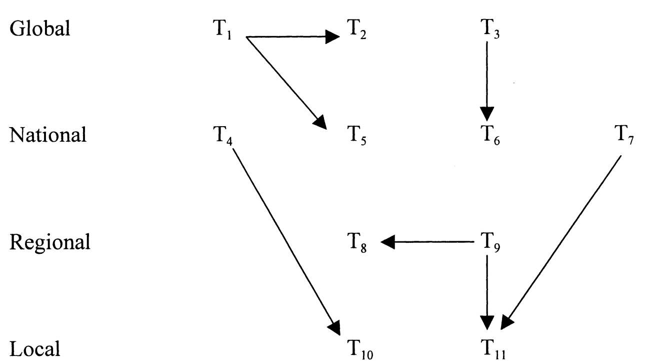

Fig. 2. Multi-level relationships among trends on community forest management (adapted from Schoemaker, 1991, p. 553).

of underlying logics, including cases demonstrating the implications of key uncertainties, desirable and undesirable cases or likely and unlikely cases. The array of scenarios to be compared should be directly linked to the decision issue and purpose of analysis.

For the purpose of adaptive management, we assume that the logic of greatest interest is exploring uncertainties and forces for change. This logic requires identifying two to three plausible values for the uncertainties or change agents. The scenarios are then constructed using these values or realistic combinations of them. Scenario analysis specifies "uncertainty across, rather than within scenarios. . .[the scenarios thereby] bound the uncertainty range" (Schoemaker, 1993, p. 196). Scenarios help stakeholders to cope with uncertainty, not by eliminating it, but rather by framing it and understanding the range of associated implications.

Scenarios could be based on different sources of risk or levels of risk, or a comparison of desirable and undesirable situations from which risks can be extrapolated. If the purpose is to explore unexpected risks, the scenarios could be set up to explore the opportunities across drivers of change, i.e. (1) possible changes in markets and pricing, (2) possible tenure policy changes or (3) competition with external agents for forest benefits. For each driver of change, it may be desirable to specify a further set of scenarios showing a range of possible values. These ranges would be selected based on assumptions or principles about what it is that is important to compare, especially in terms of risk (Huss and Honton, 1987). As an example, community members might feel it important to compare scenarios showing the influence of increased transportation availability, a new taxation scheme, or logging by a neighboring concession. Alternatively, they could construct scenarios showing different transport options, a pair of scenarios comparing the convergence of favorable and unfavorable trends in taxation, or a range of scenarios showing the possible impacts of different logging plans.

Stakeholders should select scenario themes to challenge their thinking in ways that lead them to 'a-ha' experiences or new insights (Blythe and Young, 1994; Wack, 1985b). Although scenarios can be used to overcome common biases about the way we think about the future (see above), the selection of scenario themes can suffer equally from these biases if the people conducting the exercise are not aware of ways of overcoming them. Wack (1985a) suggests, that any first iteration of scenarios is unlikely to lead to insights because of the tendency to examine only obvious uncertainties. Techniques for stimulating creativity and overcoming biases include: (1) using extreme outcomes, not just predictable ones, (2) creating disruptions to historic trends, (3) selecting scenarios that are distinct, not ones that reflect a gradient such as high, medium and low values, or a positive and negative scenario, (4) including undesirable scenarios, (5) starting the construction of the scenario from an imagined future, rather than from extrapolation of current trends (Schoemaker, 1991, 1993; Bunn and Salo, 1993; Wack, 1985a). As the intent of the scenarios is not to predict the future but to improve abilities to adapt to it, such extreme and non-continuous elements should not be considered 'unrealistic'.

Cultural attitudes may make overcoming these biases difficult in community forests situations. For example, people are often reluctant to predict or even talk about the future in concrete terms, especially the rural poor. People accustomed to a lack of control over their lives may prefer to acknowledge the power of or defer to fate, luck or God's will rather than to make predictions. There may be a need to develop a willingness among the audience to face uncertainty and to understand the forces driving it (Wack, 1985b). Extra effort is usually required to develop undesirable scenarios because of tendency to deny evidence that contradicts people's hopes (Bunn and Salo, 1993). Similarly, to the extent people express their ideas in front of more powerful stakeholders, they are likely to feel less free to be creative, try to give the answer they hope the others want to hear, or avoid putting their ideas on the line for others to comment on. Despite this reluctance, villagers managing trees and forests obviously think about the future, and often engage in planning for forest use, sometimes in cooperation with historical antagonists. The issue is therefore how to elicit this information.

We have already mentioned the possibility of selecting participants in such a way as to facilitate dialogue, but this may come at the cost of a more complete and realistic scenario discussion. Another possibility for eliciting people's visions of the future may require getting people to talk about the future in present terms. Villagers could be asked to indicate what they would like to see remain the same about their current lives and local forest management and what they would like to see changed.

Assuming these barriers can be overcome, the scenarios need to obey certain rules to be useful. They should be internally consistent; coherent; plausible; feasible, i.e. based on real forest resources, natural processes, logic and ethics; linked to the present and understandable by the scenario user (Bossel, 1998; Blythe and Young, 1994). These requirements result in some trade-offs with creativity, but are necessary to ensure the learning is relevant to the real world. Users are more likely to comprehend and remember the relationships and causalities in scenarios to the extent information is conveyed in a story-like narrative and each story is given a label (Bunn and Salo, 1993; Schoemaker, 1993). They should be approximately the same length and involve the same amount of detail and comprehensiveness to avoid biases in their comparison (Bunn and Salo, 1993).

The recommended number of scenarios to use varies in the literature. Most authors suggest comparisons of three to nine scenarios (Wack, 1985b; Deshler, 1987; Stewart and Scott, 1995). The number of scenarios of course depends on the purpose of the analysis. One scenario may be sufficient for simple exercises where the intent is to facilitate group learning. More scenarios are necessary where a decision of consequence must be tested for its robustness against a large number of uncertainties (Bunn and Salo, 1993). Evidence from cognitive research indicates that people are also only capable of comparing a maximum of five to nine scenarios at one time (Stewart and Scott, 1995).

Wack (1985b), suggests no more than four scenarios. He recommends an ideal number of three, with one showing the surprise free world, and two showing critical uncertainties. He explains that the use of only two scenarios creates a tendency for one to be the pessimistic and one the optimistic view. People make judgements by taking a metaphorical average of the two scenarios. Where three scenarios are used, their themes should be selected to reflect different uncertainties. If the themes are only different values of the same uncertainty, people tend to select the middle one as the most desirable scenario.

Although people can only compare a limited number of scenarios at one time, large numbers of scenarios may be used during the course of a scenario exercise. A scenario exercise is usually repeated iteratively, with each iteration generating new scenarios. Stewart and Scott (1995) suggest conducting a first iteration of coarse scenarios that address the widest possible range of options. These first scenarios are used to identify a smaller subset of scenarios that are constructed at a finer level of resolution. Scenarios can also be nested. Nesting has the added advantage of addressing different scales (Wack, 1985b). For community forests scenarios could be nested to include user group scenarios, larger forest-level scenarios, regional economy scenarios, and finally country-level and international scenarios. Both iterative and nested scenarios facilitate learning by community-level decision-makers with limited knowledge of our experience with other stakeholders operating at larger scales.

The form of the scenario and its presentation should be designed with the different stakeholders' capacities and preferences in mind. The presentation of the scenario need not be written or on paper. Tan-Kim-Yong (1992), for example, found that three-dimensional models of local landscapes facilitated lively exchange of stakeholders' views about land use planning. The use of simple materials for some audiences should be balanced against the need to keep all the stakeholders involved and stimulated. The degree to which the method is transparent and understandable to all the stakeholders will further aid their ability to work with the scenarios and learn together from them (Blythe and Young, 1994).

GIS and maps can be used to represent scenarios in ways that make them more tangible and 'present' (Bocco and Toledo, 1997; Malafant and Fordham, 1997). Community-based management interventions commonly involve GIS and the generation of maps. These tools have proven popular and useful for strengthening local management. The skills for mapping and maps are increasingly widespread among NGOs and forest communities. GIS-generated scenarios have the advantage of being interactive and more readily manipulated to show different scenarios. Care should be taken, however, to avoid negative impacts on group dynamics based on different levels of familiarity with or access to such technologies.

7. Implications of the scenarios and use by decision makers

The final element is the discussion and analysis of the implications of each scenario for making decisions. Though scenarios can benefit community-level decision-makers simply by bringing stakeholders together and facilitating the exchange of information, they are most useful to the extent they influence each stakeholders' thinking and actions to enable coordination and improved management. The scenario must "come alive in 'inner space,' the manager's microcosm where choices are played out and judgement exercised" (Wack, 1985b). Wack suggests that the biggest challenge in scenario analysis is successfully reaching the decision makers, not the construction of the scenarios itself. This requires that true learning occurs, i.e. the scenarios are clearly understood and internalized among decision makers (Wack, 1985b, p. 142).

As mentioned, the stories associated with each scenario can be used as platforms for the stakeholders to articulate their views. Schoemaker (1993) observes that scenarios work well because of their cognitive appeal as stories and metaphors. This appeal may be used to facilitate interactions among stakeholders, including eliciting a range of views of management and enabling negotiation using the scenario as a basis for discussion (Stewart and Scott, 1995; Van Huylenbroeck and Coppens, 1995). They are perhaps also more appropriate than technically-focused discussions and formal negotiations where community representatives are involved, as they can reduce the differences in rhetorical skill among stakeholders. A well-told story can, however, also generate expectations that the scenario is more probable than warranted.

The analysis of a first round of scenarios commonly leads to the identification of new forces for change and new themes for scenario development. Scenario development may require several cycles before stakeholders feel that they have explored sufficient possibilities.

8. Options in scenario construction

Although these are the basic elements of scenario exercises, the range of variation in scenario-related methods is broad. Several typologies provide guidance to key differences among methods (Huss and Honton, 1987; Bunn and Salo, 1993; Ducot and Lubben, 1980). The differences related to the purposes of scenarios are discussed above (see Table 1). Differences related to the methods for generating and analyzing scenarios are summarized in Table 2 and discussed below.

Although most reviews of scenario methods distinguish between quantitative and qualitative methods, the boundaries between these two approaches have become increasingly blurred by techniques that make use of both kinds of methods and information (Bunn and Salo, 1993). Nevertheless, some methods are

Table 2
Dimensions of variation in scenario exercises (adapted from Ducot and Lubben, 1980; Bunn and Salo, 1993)

Dimension along which scenarios vary	Range of extremes[a]	
Methods of construction and analysis	Quantitative, 'hard,' formal models: -statistical forecasting -trend-impact analysis -cross-impact analysis	Qualitative, 'soft' methods: -visioning -intuitive logic
Source of information	Rational, scientific observation	Judgement and intuition of decision makers
Role of stakeholders	Passive objects of analysis	Active participants in construction and evaluation
Use of forecasting or predictive models	High	Low
Selection of scenario themes explicitness of values	Normative, e.g. scenarios reflect the desired and 'good' or the undesired and 'bad'	Descriptive, not based on social preferences
Comprehensiveness, complexity and detail of scenarios.	High	Low
Degree to which the scenarios reflect current conditions	Reflect the unexpected, hypothetical and extreme	Extrapolated from current trends
Length of scenario path	Short: 'snapshot' at one point in time	Long: story of events linked to present
Starting point of pathway	Future, uses backward inference, deductive	Present, uses future inference, inductive

[a] The two columns do not represent coherent pairs. We could find a quantitative and descriptive scenario, for example.

recognized as more quantitative such as cross-impact analysis, which incorporates the probabilities of outcomes affecting other outcomes into the scenarios (Harrell, 1978; Duval et al., 1975), and trend impact analysis, which uses forecasting to quantify the impacts of trends (Huss and Honton, 1987). Qualitative techniques include the intuitive logics approach, which relies largely on interviews and interactions with decision makers (Huss and Honton, 1987). Bunn and Salo (1993) critique the quantitative methods for treating decision makers as passive entities, and therefore, being less relevant and less engaging a tool for changing users' thinking.

For the purposes of supporting ACM in community forests, it is clear that stakeholders need to be treated as actors and involved in the scenario process. Their perceptions and knowledge are key to creating and interpreting the scenarios. For transparency purposes, as well, there is likely to be a need for relatively qualitative techniques. Forecasting techniques may be relevant for highly predictable phenomena, but the cost and human resources for such activities may not be available. The role of values in the selection of scenario themes and degree of comprehensiveness and detail in the content of the scenarios will be site specific. Whether the analysis begins in the future and is prospective or begins in the present and is projective (Van de Klundert, 1995) will also depend on case-by-case needs. To the extent the scenarios are intended to identify visions and alternatives, the stakeholders will need to give less attention to the present and current trends. To the extent there is a need to integrate learning about the past with learning about the future, it will need to focus on the present and forward trends. Cultural preferences for learning styles may — as mentioned — influence how the approach is adapted.

9. Lessons for scenario analysis in community forest management

We draw several generalizations about the application of scenario methods to community forest landscapes. We make these observations to inform research that CIFOR has initiated in Indonesia and Madagascar on the effectiveness of scenarios as a tool for ACM.

Working together with local communities, NGOs and other forest users, CIFOR is piloting the use of scenario methods in the villages of Long Loreh and Long Langap, Bulungan Regency, East Kalimantan, Indonesia and in the villages of Anjamba and Sahavoemba, Ranomafana District, Fianarantsoa, Madagascar. Long Loreh and Long Langap are located in two timber concessions, including one operated by the parastatal corporation Inhutani II. Anjamba and Sahavoemba are located in the buffer zone of the Ranomafana National Park. CIFOR is engaged in action research that aims to improve management and local people's well-being through better coordination among villagers and the concession or park.

In Indonesia, Long Loreh and Long Langap residents want to map the territory of their lands and forest to make formal claims for policy recognition of their forest. Scenarios will be used to explore hypothetical futures about the size, location and shape of the village and community forest boundaries. In Madagascar, the villagers of Anjamba and Sahovoemba are developing land use and forest resource management plans that they hope will provide a basis for their claims to the use of forest resources located in the national park. Scenarios will be used to compare alternative management agreements with hypothetical roles and rules for the forest resources on which they depend in the park. In both sets of sites, the scenarios will be constructed with consideration of broader landscape-level demographic, economic, land use and policy changes. The method is expected to help clarify local resource users' priorities for management and generate common goals. If the first phase proves useful, scenarios will be tested again with applications determined by the community.

We use four criteria to assess the method's application. These are the extent to which the scenarios (1) create a framework for improved information flows and decision-making (2) generate new understanding and social learning about the forces for change in the forest system, (3) facilitate responsible representation among stakeholder groups and (4) facilitate the reaching of an agreement that contributes to sustainable forest management. For each criterion we will describe how and why the scenario method accomplished or did not accomplish this outcome. We are giving special attention to the concerns expressed above about how to 'level the playing field' for the weaker stakeholders and strengthen the community's capacity to communicate to policy makers and influence them. The CIFOR work provides an example of the kinds of common contexts in which scenario analysis might be useful.

First, scenario analysis provides opportunities for important forward-looking learning for the adaptive co-management of community forest landscapes. We suggest that the long-term and dynamic nature of interactions among local people's livelihoods, sustainability objectives and the biophysical conditions of community forests make prediction and simple feedback loop-type learning problematic. More open-ended, forward-looking methods are needed that address complexity and risk, particularly methods that can provide community-level decision-makers with information on multi-level social and environmental processes. The four common elements of scenario methods (purpose, structure and drivers, scenario generation and use) that make this kind of learning possible can be applied to most community forest settings, including the CIFOR sites.

Second, to the extent community forest systems involve many and competing interests, especially across groups with vastly different influence and power, scenario methods will need to give special attention to accommodating differences among these groups (Steelman and Ascher, 1997). It may not be desirable or cost-effective to work with all the stakeholders. Communication differences and the possibility for unfair decision-making are likely to increase where powerful players like timber companies are matched with weak ones like a nomadic group of hunter-gatherers (Edmunds, 1999; Anderson et al., 1999). In the CIFOR sites, the power differentials within the communities and between the communities with the park and concession are severe. In these cases, parallel rather than joint scenario processes are warranted. The scenarios can serve as a platform for debate among relatively cooperative stakeholders and be used to communicate interests in a common language among more antagonistic stakeholders. Scenarios may help to highlight interdependencies among interest groups, and thereby, also foster cooperation. Scenario creation could also be used selectively with community stakeholders to empower them, with the understanding that a subsequent stage of analysis of existing scenarios, decision-making, facilitation and negotiation would engage other relevant stakeholders. Costs will increase proportionally with duplicate processes. It is, therefore, necessary to fully understand the players needed to participate in a decision and develop a strategy of using joint scenarios, parallel scenarios or an less intensive alternative with each group.

Third, the information necessary to build scenarios in community forests is often lacking. Information is either not available (e.g. the biological characteristics of many nontimber forest products) or is held in places or among people that rarely exchange their knowledge. At the CIFOR sites, as in most, an extra investment is likely to be required just to collect the required data. Some stakeholders may not wish to share their information with others (e.g. the location of a valued resource, plans for illegal harvesting), which again suggests the need for parallel rather than joint scenario processes where negotiation occurs after the scenarios have been created. One advantage of the scenario method is that it can help prioritize information needs so that data can be collected more efficiently. As a story, the scenario can also be used to exchange information effectively and create a shared understanding among stakeholders. These are the features of the scenario method (rapid knowledge acquisition, exchange and share understanding) that contribute most directly to adaptiveness (McLain and Lee, 1996).

Fourth, to be transparent, useable by community members and replicable, the principles of simplicity and tangibility need to be applied to every step of the scenario exercise. The decision issue is best grounded using a map, a story, pictures, photos, a three-dimensional model or an existing document such as a management plan with which the community is very familiar. At the CIFOR sites a number of these options are available to us. Qualitative methods are likely to be more user-friendly than quantitative ones. The number of working scenarios is best kept to a minimum of two or three. To cope with multiple actors and scales, scenarios will most likely need to be nested. A third party may be useful to not only facilitate the scenario creation and analysis, but also to help refine them for presentation to other audiences. Such refining is already common in participatory mapping, where NGOs help communities produce maps similar to those used by government, and therefore, communicates persuasively to groups used to using these maps.

Lessons can be drawn from this experience about methods for aggregating and communicating views among different groups, as well as the limits to the role of the third party facilitator.

To sum it up, scenario methods differ from other tools for adaptive co-management by providing a framework for anticipating the future. They should prove useful in community forestry by encouraging analysis of processes and actors operating at landscape and larger scales. They can broaden perspectives about how the forest might change in unexpected ways and serve as a platform for reaching agreement among different stakeholders. Scenarios involving multiple stakeholders can speed up the process of information exchange and enhance adaptiveness by expanding the availability and flow of information for decision making, particularly from sources outside the community.

The review of methods for the construction of scenarios indicates the broad scope of possibilities for using scenarios and their relevance to adaptive co-management of community forest landscapes. While it may be appealing to consider scenario methods as generally applicable to most resource management settings, there are special conditions of community forestry that need to be considered to adapt the method successfully. As these conditions are not unique to community forest landscapes, we trust that some aspects of the approach we develop should be more generally applicable to other settings where complex stakeholder relationships and information constraints shape the nature of resource decision-making.

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