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IUFRO TASK FORCE

FOREST SCIENCE-POLICY INTERFACE

Papers presented at a Side Event
of the Third Session of the
Intergovernmental Forum on Forests (IFF 3),

Geneva, Switzerland
3-14 May 1999

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FOREWORD

The International Consultation on Research and Information Systems in Forestry (ICRIS) was held on 7-10 September 1998 in Gmunden, Austria, as an intersessional activity of the Intergovernmental Forum on Forests (IFF) under the sponsorship of the Governments of Austria and Indonesia and in collaboration with CIFOR, FAO and IUFRO. The overall objective of ICRIS was to examine ways and means to implement research support and provide background information for international forestry initiatives. The Consultation addressed the critical theme of the interface between research and the user community with particular reference to policy formulation.

In pursuance of the recommendations of ICRIS, IUFRO decided to establish a new Task Force on the *Forest Science-Policy Interface* to strengthen the interface between forest science and forest policy process at the global level.

The Task Force had a Side Event on May 10, 1999, during the Third Session of the Intergovernmental Forum on Forests (IFF 3), Geneva, May 1999, with the following programme:

1. Forest Science-Policy Interface, by Robert Lewis, Jr., Deputy Chief, USDA Forest Service and Niels Elers Koch, Director General, Danish Forest and Landscape Research Institute
2. Using Scientific Uncertainty to Shape Environmental Policy, by Gay A. Bradshaw, Researcher, USDA Forest Service
3. Forest Forum for Decision-Makers in Finland: Approach to Strengthening the Science-Policy Interface, by Eeva Hellström, Researcher, Finland
4. Reflections from the IFF Secretariat by Jag Maini, UN, IFF Secretariat

The first three papers from this Side Event are published in this Occasional Paper.

We thank the IUFRO Secretariat for their always efficient and good support also in this matter.

Niels Elers Koch
Coordinator IUFRO
Division 6

CONTENTS

FOREST SCIENCE-POLICY INTERFACE *)

Robert Lewis, Jr. and **Niels Elers Koch**

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Background

In this paper we want to share some of the experiences we have had in integrating science and policy. We have been discussing this topic and developing appropriate roles for scientists and policy makers for several years in IUFRO.

In our paper we will focus on the following six points:

1. Science helps policy makers create new visions and new possibilities for forest management.
2. Policy makers have visions too, and science can help convert their visions into reality.
3. Science helps bring organization and logic to debates among policy makers.
4. The role of a scientist and scientific processes are unique and should not be compromised.
5. Science administrators have a distinct role and it is not the same as the role of a scientist.

1. Science can help policy makers create new visions and new possibilities

Science can help policy makers create a new vision and new possibilities for forest management. Scientists by nature are seekers of truth. Knowledge generated by scientists can spark new ideas among policy makers at various levels of influence, whether local, regional, national or international in scope. The knowledge generated by scientists is most useful when it is clearly understood and aggressively communicated to a broad audience. We will use a few examples to illustrate this point.

In the United States about 80 percent of the population lives in urban and suburban communities. The U.S. Forest Service conducted a major research study to empirically show the value of urban forests in reducing energy consumption by residents and improving overall environmental quality. Knowledge generated by forest scientists documented the annual savings homeowners could realize by strategically planting trees around their homes to reduce heating costs in winter and cooling costs in summer. The secondary benefits were aesthetic improvements to urban communities. Also, the net savings in energy consumption by homeowners could reduce fossil fuel consumption for heating and generation of electricity, thereby improving the air quality. Results also showed that cities could

*) This paper is based on a paper by Robert Lewis, Jr. ("The Role of Science in Natural Resource Policy Development") presented at IUFRO Division 6 Conference, Pretoria, South Africa, January 8, 1999.

reduce the rate of storm water runoff through careful management of urban forests and well planned developments. Scientists are not policy makers, but clearly developed information or knowledge useful to policy makers.

This knowledge generated by forest scientists was communicated through a network of professionals, such as American Forests, and used by city officials in Chicago, Illinois; Atlanta, Georgia; and other major cities to change city planning practices to incorporate environmental values and long-term cost savings to residents. Clearly, the science helped city officials to see a new vision for urban planning.

The second example of science helping policy makers create a new vision for forest management deals with forest health. Millions of acres of forests in the United States are at risk due to decades of fire suppression and overstocking. Fuel loads are heavy with downed woody debris, underbrush, and too many stumps per acre. Some of the forests are so weakened that they are heavily infested by bark beetles. In most cases, simple prescribed fires alone will not solve the problem, because after the prescribed fires to clear up the underbrush, the stands are still too dense to support healthy growth. If nothing is done and droughts occur, catastrophic fires will eventually result. Consequently, soils will be damaged, streams could be polluted with siltation and/or mud slides and significant wildlife habitat could be deteriorated. Science provided the clear definition of this problem and offers possible solutions to policy makers. Research at The Forest Products Laboratory in Madison, Wisconsin, is providing options for policy makers to consider while dealing with this problem. The excessive stand stocking is composed of small diameter conifers with little or no market value in local communities. The research effort is aimed at taking a non-marketable raw material such as small diameter pine trees, and converting it into a new and marketable product. Policy makers are being presented with new research knowledge and technology to craft a new vision of restoring forest health while providing economic opportunity to rural communities. The research scientist should not provide the policy or select an action for managers, but can and should present knowledge in such as way that policy makers will see new possibilities for better forest management.

2. Science can help convert policy makers visions into reality

Policy makers have visions too, and science can help bring their visions into reality. There is an old proverb which states that “they that are without vision shall perish”. Clearly, our policy makers have vision. Research scientists and research administrators should recognize and respect the visions of policy makers. Science can and should play a major role in bringing reality to the visions of policy makers. Sometimes the policy maker's visions might be presented as a challenge to science. Science can and should respond to the challenge with the support of the policy makers.

Policy makers in many countries have articulated a very good vision on sustainable forest management. This is a very worthy vision for all nations. In fact, we have criteria and indicators for sustainability. In many countries, these criteria and indicators have received much interest from all sectors, including federal and state governments, industry and environmental groups. We are very proud of the role of the global forest scientific community in developing these criteria and indicators. IUFRO’s Task Force on *Sustainable Forestry* has been very successful in this matter.

Policy makers in Denmark have agreed upon a vision of "doubling the forest area in a tree generation". This vision involves many challenges to forest science in trying to find a better decision basis for answering questions like: Which kind of forest should be planted where, for what purpose and how? Forest scientists have helped bringing this vision into reality by i.a. documenting the need for new urban forests within walking distance for recreational purposes, and by finding new better and cheaper methods of afforestation.

Policy makers, leaders of government, and citizens around the world have expressed concern about documented increases in atmospheric carbon dioxide and subsequent global warming. The political impact on the physical and biological assets of the world would be at great risk with significant long-term changes, flooding, extended droughts, species migration and perhaps disappearance, and major disruption of delicate ecosystems could be reality if trends are not stopped and/or reversed. Major policy makers, such as Presidents, Kings, and Prime Ministers have expressed a vision for long-term reductions in atmospheric carbon dioxide. Forests serve as a major sink for carbon dioxide and science can help policy makers realize their vision through development and implementation of new knowledge and climate change technology. The knowledge necessary to manage forests and forest resource utilization for maximum carbon sequestration is a possibility. Options for forest management policy and practices to help stop and reverse the trend is an achievable role for science.

As scientists and science administrators, we should feel obligated and honored to respond to the call for truthful objective and useful knowledge through credible science programs. We can and should always perform our work with the highest ethical standards and never shade the truth emanating from our scientific inquiry.

Science should never taint its credibility by reporting anything less than the well planned, executed, analyses of scientific results following the scientific process. In the long run, policy makers will appreciate the truthfulness of science reports, even if the reports conflict with the policy maker's vision.

3. Science can help bring organization and logic to debates among policy makers

Science helps bring organization and logic to debates among policy makers. Forest management and public policy development are subject to intense debate at both international and national levels. Policy makers in both the career and elected positions are frequently placed in the middle of heated debates among interest groups and are expected to resolve the contentious issues. In forest management, clearly articulated long-term goals and a sound basis for achieving the goals are essential for problem resolution. Science can bring relevant and unbiased knowledge to the debate and help sharply focus the decision makers attention on the success factors for consideration.

Over the past seven years, the USDA Forest Service has moved toward large-scale ecosystem management and accelerated the involvement and use of science to make policy decisions and land management plans. Large assessments documents, such as, the Sierra Nevada Ecosystem Project and Interior Columbia River Basin assessment, have played a major role in resource management planning. The current state of knowledge is placed in the hands of decision makers with a number of options available for consideration.

A Management Plan for the Tongass National Forest in Alaska was recently completed after years of debate over earlier draft plans. Throughout the process, science played a major role in helping managers decide among several options. A science consistency test was developed and used to ensure adequate consideration of relevant science in the final plan. Consequently, the decision maker was able to present a defensible plan for public review and debate. Clearly, forest scientists played a major role, but they were never placed in the role of decision maker. They simply provided credible and relevant information in a timely manner.

4. The role of a scientist and scientific processes

The role of a scientist and scientific processes are unique and should not be compromised. The primary role of a scientist is to develop and communicate new and useful knowledge through the scientific process. The new knowledge is subject to intense peer review and must come across as credible. Hypotheses testing experimental design and statistical analysis are essential skills for good scientific inquiry. However, the greatest attributes of a scientist are imagination, thought process, self discipline, and the ability to communicate findings.

The scientist is not a policy maker nor is the scientist a forest management decision maker. However, the knowledge generated by scientists is the basic foundation for good management and policy decisions. In an ideal situation, scientists should collaborate with forest managers and policy makers. True collaboration includes intellectual dialogue where both parties add value to the ultimate outcome of a research project. Scientists need to acquire a clear understanding of management and policy issues before deciding what problems to solve through scientific research. Scientists must relentlessly seek the truth through experimentation and scientific inquiry. Ultimately, they must also report the truth even when the truth or scientific conclusions conflict with current policy and practices.

Science has the role of analyzing issues and identifying the critical success factors for achieving the desired outcomes in forest management. Science also has the role of bringing order to chaotic discussions/debates. However, science does not and should not have the role of policeman of forest use and public policy debates. Success can be measured in the final outcome of policy development and, ultimately resource conditions on the ground. Resource conditions are inclusive of physical, biological and social attributes.

5. The role of science administrators

Science administrators have a distinct role and it is not the same as the role of a scientist. People in purely science administration positions are no longer research scientists and should no longer feel compelled to shy away from policy debates. However, they should be careful to not compromise the objectivity and independent thinking of their scientists. Whenever science administrators enter a public policy debate, he or she should make it clear that views expressed are personal rather than the conclusion of a scientific study, unless such conclusions are quoted.

Science administrators are primarily responsible for enabling scientists to do work. Providing the support and funding for research are two essential function for science administrators. Equally important is the direction given to scientists on program development to address the larger policy issues faced by the nation, region, or state. Science administrators should also organize and enable teams to conduct collaborative research across disciplines and organizations.

We believe science administrators should also serve as a buffer between scientists and policy makers. The science administrators must protect the independent thinking and objectivity of scientists. A scientist without credibility is a liability rather than an asset in policy debates and legal appeals to management plans. Therefore, we place great emphasis on the science administrator's role in buffering scientists from the influence of policy makers.

Conclusion

We have significantly increased our understanding of how to integrate forest science into policy decisions over the past decade. We will continue to learn more in the years to come. There are no set of rules on how this process should work, but we have tried to present a set of general guidelines which are useful in any country. We encourage us to continue to share experiences from around the world in forums similar to this one and in IUFRO. We believe we all have a common goal of helping better inform our policy makers and forest managers of the great benefits of science in resolving difficult forest management and policy problems.

Using Scientific Uncertainty to Shape Environmental Policy[1]

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ABSTRACT

Environmental management and policy formulation are increasingly characterized by conflict. Issues concerning natural resources, land-use practices, and global climate change have been fraught with debate and indecision. Some argue that the required information and levels of certainty fall short of scientific standards for decision making; others argue that science is not the issue and indecisiveness merely reflects a lack of sufficient political willpower. In the case of global climate change, even such unprecedented efforts as the IPCC appear to provide insufficient scientific guidance to formulate decisive environmental policy. Nonetheless, science remains the foundation for informing, evaluating, and shaping policy. Yet perhaps more than ever, science is subjected to keen scrutiny; scientists are required not only to report but also infer and substantiate this inference in a range of decision-making contexts. One of the most difficult and confusing aspects of translating science to policy is the interpretation of scientific uncertainty as embodied in statistics, model output, and opposing scientific opinions. Whereas scientists are familiar with uncertainty and complexity, the public and policy makers often seek certainty and deterministic solutions. We assert that environmental policy is most effective if scientific uncertainty is incorporated into a rigorous decision-theoretic framework as *knowledge*, not ignorance. Policies that best utilize scientific findings are defined here as those that accommodate the full scope of scientifically-based predictions.

INTRODUCTION

The rate at which humans are altering the biosphere has increased dramatically in the past century (see Reischauer and Fairbank 1960; Vitousek et al. 1997; United Nations 1997). For scientists, policy makers, and the public at large, the inferences drawn from scientific findings concerning these alterations differ greatly. Even unprecedented efforts such as the Intergovernmental Panel on Climate Change (IPCC; 1990, 1996) appear to provide insufficient scientific guidance to formulate decisive environmental policy. Although the latest report from the IPCC was heralded as an unprecedented international scientific consensus, considerable scrutiny and debate concerning the validity and implications of its findings followed (see Shackley and Wynne 1996; Raynor and Malone 1997). This now-familiar pattern wherein policy lags behind science has been characterized as either a cautious response to uncertain predictive capabilities or as dangerous procrastination fueled by

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1 This report is an expanded version of Bradshaw, G. A. and J. G. Borchers. 2000. Uncertainty as Information: Narrowing the Science-policy Gap. Conservation Ecology 4(1): 7. [online] URL: http://www.consecol.org/vol4/iss1/art7/

political and economic exigencies (New York Times 1997; The Oregonian 1998). Critics argue that scientists know too little about global change to warrant anticipatory policy formulation and assert that current information and their levels of certainty fall short of scientific standards for decision making. Others maintain that science is not the issue, and that the indecisiveness of policy makers reflects a shortfall of political willpower (Gelbspan 1997). In either case, science, policy, and politics are intertwined in the climate change issue as commentary on the recent withdrawal of Ford Motor Company from the fossil fuel-related Global Climate Coalition suggests (see Los Angeles Times, 1999).

We discuss the means by which some dysfunctional aspects of the science-policy interface, herein referred to as the *science-policy gap,* can be ameliorated. Specifically, we suggest that inaccurate translations from science to policy derive in large part from an improper inference of scientific uncertainty (Funtowicz and Ravetz 1990). Generally speaking, whereas scientists may be familiar with the conditions of scientific uncertainty, the public and policy makers often seek certainty and deterministic solutions. In some cases, the social and cultural standards superimposed onto those of science may become critical constraints to effective decision-making (Table 1; Gunderson et al. 1995). This discussion underscores the need for adaptive management principles and a rigorous decision-theoretic framework as a foundation for robust policy formulation (Lee 1999; Walters 1986, 1997; Dovers et al. 1996).

SOURCES OF THE SCIENCE-POLICY GAP

To better articulate the nature of the science-policy gap, it is useful to outline the life history of a scientific model from the perspective of Kuhn's (1962) paradigm shifts: the level of *confidence* in the model by the scientific community increases with the level of *scientific confirmation* (i.e., scientific activities that cumulatively corroborate the theory's hypotheses; Figure 1). As evidence accumulates to support the underlying hypotheses of a model, confidence in its representations increases (e.g., weather prediction models). In time, a model achieves greater standing as inferences concerning its representations are disseminated and debated in scientific literature and other fora. Publication, citations, and merit awards, such as competitive grants, mark acceptance. At some threshold of accord within the scientific community, consensus emerges. However, the emergence of a so-called scientific consensus does not necessarily guarantee the level of certainty demanded by most policy makers (see Lemons 1996). Even the constants of physics and chemistry are recognized as potentially inaccurate or imprecise, and subject to continual revision (Peterman and Peters 1997). In the case of large-scale simulation models, constants and parameters contain assumptions and uncertainties that propagate in uncertain ways to produce uncertain output. For scientists, this is business as usual (Raynor and Malone 1998; Morgan and Henrion 1990). For society and its decision-makers, however, such uncertainty may cast a shadow upon science itself (Shackley and Wynne 1996).

In contrast to the relatively formal process characterizing the scientific community, the acceptance of scientific results by a diverse public sector may differ markedly. We define the science-policy gap as the difference in levels of confidence for a given scientific finding expressed by the scientific community and society (Figure 1). In actuality, the broad categories of "public" and "scientific" comprise a vast array of individuals and groups having distinct histories, cultures, and belief systems that influence perceptions of non-human and human nature (Nader, 1996). For example, because of their position within government, agency scientists may hold very different attitudes toward scientific uncertainty relative to their academic counterparts. An agency scientist has fealty not only to the scientific community, but also to a sometimes highly-politicized leadership that may be directly involved in defending policy. Paradoxically, the reluctance by scientists in such agencies to reveal ambiguities and uncertainties to the public out of fear of diminishing their credibility serves only to engender greater mistrust in the public (Walters, 1997).

The science-policy lag is evidenced by the length of time required for a given scientific finding to assimilate into society. In part, the lag can be attributed to the rate of information dissemination. During this *cognition* phase, scientific information (e.g., effects of greenhouse gases) is disseminated by various media (e.g., Internet, science magazines, television). Realistically, the science-policy gap is more than an information gap; the extent to which society's level of confidence in a theory or model lags that of the scientific community depends on other significant factors.

THE ROLE OF COGNITIVE DISSONANCE AND VOLITION

Individuals and groups exhibit varied responses when faced with new information. If such information is consistent with extant behaviors and beliefs, it can be readily accepted and integrated. However, if the new information conflicts with behavior and belief, the resulting state is described as *cognitive dissonance* (Festinger 1957; Adams 1973). According to the theory, the inconsistency and psychological discomfort of cognitive dissonance can be reduced by changing one's beliefs, values, or behavior. Dissonance can be avoided by rejecting or avoiding information that challenge belief systems, or by interpreting dissonant information in a biased way.

The role of cognitive dissonance can be observed in numerous contexts. One highly publicized case concerning public land use dramatically exemplifies the collision of differing world-views. As early as 1976, a landmark report was published forecasting future shortfalls of mature, harvestable timber independent of any consideration for the northern spotted owl (*Stryx occidentalis*; Beuter et al. 1976; Yaffee 1994). In ensuing years, this shortfall, combined with improved technologies in harvesting and processing, and a vigorous raw materials export market, resulted in significant job declines. Yet despite this information, the issue continued to be misrepresented as an "owls-versus-jobs" issue, one that failed to acknowledge trends within the timber industry (Yaffee 1994). This type of oversimplification of complex issues and denial of "dissonant" information continues to embroil science in acrimonious public debates (USDA and USDI 1994; USDA 1996).

Dissonance between existing beliefs and new information may be shaped by a host of factors, all of which inhibit the rate at which scientific findings are assimilated into policy. In what we have called the *volition* phase of the science-policy gap, public debate around an emerging scientific consensus may derive from a combination of cultural, psychological, and economic interests threatened by the policy inferences of dissonant scientific findings. One obvious example is the tobacco industry, which is undergoing an onslaught of litigation decades after research confirmed the health risks of smoking tobacco. The volition phase of the science-policy gap may be described in many cases as social inertia borne not of a paucity of information, but of a complex, deep-seated resistance to change derived from numerous social, religious, and cultural sources (see Figure 2; Jasanoff and Wynne 1998; Lee 1993).

By definition, science is a provider of new information, and has always been cast in the dual role of both defending and attacking reigning paradigms (Schick 1997; Yearley 1996). For this reason, science will frequently produce cognitive dissonance, uncomfortable levels of uncertainty, and resistance in the body politic. Acceptance of its findings will be contingent upon attitudes and perceptions toward uncertainty and risk (Dorner 1996). In the case of global climate change, the challenge is to delineate appropriate responses to highly uncertain predictions of ecological and social crises in the absence of reliable estimates of risk (IPCC 1996).

THE ROLE OF SCIENTIFIC UNCERTAINTY

Scientific uncertainty is typically characterized by statistical analysis (e.g., statistical confidence intervals, model output). Decision making in the sciences, such as that accomplished by hypothesis testing based on frequentist statistics, is usually performed according to consistent, though arbitrary standards (e.g., Type I error probability levels of 0.05). In less controlled situations, scientific uncertainty must be ascertained by other means, such as model prediction errors. Although a familiar companion to most scientists, there is little tolerance in the policy arena, as in most organized human activity, for the uncertainty and "ignorance" typically associated with complex systems (Briskin 1998). In contrast to the society that utilizes science to reduce uncertainty, "[d]oubt is clearly a value in the sciences" (Feynman 1998). Hence, the culture of science ends up in competition with the demanding exigencies of economics and politics, except when its findings are possessed of sufficiently high levels of certainty (Sims and Baumann 1974).

Nowhere is this truer than in the case of global climate change. The large-scale simulations presented in the IPCC reports portray a set of highly uncertain outcomes for various boundary conditions (e.g., global patterns of temperature extremes under fixed scenarios for CO_2 emission controls; IPCC 1996), which are themselves based on uncertain estimates of model parameters (Shackley et al., 1998). The IPCC reports represent both a wealth of accumulated knowledge *and* uncertainty. Unlike more tractable, data-rich scientific problems that readily yield understanding from statistical analyses, science in the IPCC report appears to confound policy makers who prefer more "certain", contained estimates of risks**.** The presence of uncertainty associated with climate change science has been interpreted as an undermining of scientific authority and as a hindrance to policy (Shackley and Wynne 1996; Martin and Richards 1995).

The uncertainty (or the lack of confidence in scientific findings) perceived by the public and policy makers can be grouped into two categories. First, there is uncertainty about the uncertainty. The public is puzzled by debate within the scientific community when it surfaces in the media (e.g., compare Schlesinger and Jiang 1991 and Risbey et al. 1991; Martin and Richards 1995). For example, in a recent Congressional hearing on global change, when asked about an immediate, "act now" versus a "wait and see" policy, one scientist stated that "[m]any would argue that we know more than enough…to include it at the top of the list of issues deserving serious consideration by policy-makers" (United States 1995; pp. 1127). However, a second scientist in the same hearing wrote of his concern about the continuing increase of CO_2 in the atmosphere, claiming that "[w]e have demonstrated no acceptable scientific basis for predicting catastrophic or near catastrophic effects that would council against a wait, think and see pattern" (United States 1995; pp. 1135). Such diversity in opinion may signal confusion and ignorance, thereby supporting a rationale for inaction. As one major petroleum corporation states, "Let's face it: The science of climate change is too uncertain to mandate a plan of action..." (New York Times 1997).

Uncertainty also plagues the interpretation of science in second way. For many, the significance of scientific findings is irrelevant or incomprehensible to the exigencies of everyday life. A lack of familiarity with scientific methods hinders a ready translation of science into personal choices (Smith 1996; Joyce 1995). Underlying this phenomenon are profound differences in perceptions of space and time of the type that characterize different cultures (Deloria 1995; Abram 1997). For individuals in post-industrial societies, the vast spatial and temporal concerns of science lie far outside their experiential domain of short-term, local events (Catton 1980; see Figure 3). Not surprisingly, these differences in are reflected in the relatively short cycles of funding and elections that drive policy formulation and decision making and preclude effective treatment of long-term crises in the natural world (Gunderson et al. 1997). The problem is exacerbated by the intricacies and inaccessibility of numeric models, the primary tool for investigating large-scale, complex systems (Oreskes et al. 1994). In contrast, traditional experimental science generally retains credibility, because it is conducted at scales familiar to most individuals, or at levels of complexity where scientific inference is rarely disputed (e.g., the role of micro-organisms in disease, tidal predictions; Figure 3).

CONCLUSIONS: BRIDGING THE SCIENCE-POLICY GAP

We have asserted that the normative discontinuity, or gap, between the scientific community and policy making institutions becomes increasingly dysfunctional over high risk issues characterized by large uncertainties which derive from complex, unfamiliar spatio-temporal domains. Increasingly, these conditions describe more and more environmental issues. The present attitude that "faster and better" science is sufficient ignores the source of the science-policy gap. The idea that greater certainty can be obtained and allow for more "certain" conditions for decision making with better and faster science is based on the erroneous supposition that uncertainty is finite. This attitude is in direct contradiction with the nature of scientific inquiry (Feynmann, 1998). Whether or not, they continue to be science-based, environmental policy formulation and decision making will be accomplished under conditions of uncertainty.

We propose three general approaches for bridging the science-policy gap. Under the assumption that shared understanding of science and its implications will attenuate the polarity between science and society, the first, and most familiar approach is to directly enhance public confidence by increasing communication (Dovers et al. 1996). There are innumerable examples of the effects of science education and communication on changes in policy via the public. For example, many policy makers and legislators rely upon the views of concerned citizens, scientists, and lobbyists to formulate scientifically-valid law and policy (Wynne 1995). Since the 1960's, most national environmental legislation has been prompted, and to a great extent, shaped, by increasing public awareness of the scientific aspects of environmental degradation. Citizen groups are increasingly organized and well-versed in the scientific complexities of environmental issues (Dunlap 1992; Steel and Lovrich 1997). As such, they have become increasingly litigious in challenging the practices of government agencies. With the resulting judicial standoff, there are calls for broader participation and collaboration in environmental policy and decision making (e.g., Committee of Scientists 1999; USDA 1999; Shindler and Cheek 1999). When scientists and managers inform and involve their public constituencies in meaningful collaborations, the policy outcome is more likely to be consensus-based and less prone to legal challenge from disaffected stakeholders (Spinos, pers. comm.; Johnson and Campbell 1999).

A second possible approach is to increase confidence by increasing the rate of scientific confirmation. This approach reflects the attitude that scientists can decrease uncertainty sufficiently to allow more precise estimations of risk for policy makers. However, in the case of global climate change, the IPCC (1996) report states that perhaps the greatest weakness in trying to formulate policy derives from a demonstrated inability to predict advances in science and technology. This may doom "wait and see" policy options; science, with its large, complex simulation models of possibly chaotic systems may never produce the needed levels of certainty (Oreskes et al. 1994; Casti and Karlquist 1991; Abel 1998).

To account for these seemingly inescapable uncertainties, we propose a third alternative to bridge the science-policy gap: realign the definition of scientific uncertainty as perceived by the public and policy makers with that of the science community. This means that scientific uncertainty must be regarded in the policy arena as it is in scientific circles --- as information for hypothesis building, experimentation, and decision making. In effect, the conflicting models and statistical confidence levels that represent the bounds of scientific knowledge would delimit the scope of a flexible science-based policy (Figure 4). This strategy would recognize that: (1) science and knowledge are intrinsically uncertain, with new information continually altering our perceptions and beliefs; (2) decisions based on scientific information must be made in a context of uncertainty; and (3) faster and better science as an adequate basis for policy formulation is inconsistent with the nature of scientific inquiry and resilient policy formulation.

This perceptual shift requires policy makers to adopt a rigorous decision-theoretic framework and learning approach to policy formulation in accordance with tenets of adaptive management (e.g., see Lee 1999; Walters 1986, 1997; Gunderson et al. 1995). While there are significant obstacles to achieving such a rapprochement between science and policy (see Walters 1997; Lee 1999; Shindler and Cheek 1999; Johnson and Campbell 1999), new technologies and approaches to improve environmental planning and decision making are emerging (e.g., Lee and Bradshaw 1998; Borchers et al. in review; Reynolds et al. 1996; Berg et al. 1999). They will be most effective when utilized to enhance social learning that is linked with social action (Walters 1986; Gunderson et al. 1995). A corollary implies that scientists need to effectively articulate the true nature of science to the public and policy makers. Moreover, activities such as monitoring, designed and performed in partnership with citizens, science, and managers, can enhance public and institutional learning, especially if integrated into a statistically-sound framework for decision making (Lee and Bradshaw 1998).

Finally, as demands for more predictability have increased, the science community has become risk-averse. The charged atmosphere surrounding environmental issues threatens to obfuscate and undermine valid scientific inference (Ludwig et al. 1993). Without the freedom to engage in self-examination and self-doubt, scientific quality and integrity are diminished. This freedom, and uncertainty, is the essence of scientific inquiry.

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Tables and Figures

Characteristics of Science and Government	
SCIENCE	**GOVERNMENT**
Probability accepted	*Certainty desired*
Inequality is a fact	*Equality desired*
Anticipatory	*Time ends at next election*
Flexibility	*Rigidity*
Problem oriented	*Service oriented*
Discovery oriented	*Mission oriented*
Failure and risk accepted	*Failure and risk intolerable*
Innovation prized	*Innovation suspect*
Replication essential for belief	*Beliefs are situational*
Clientele diffuse, diverse, or not present	*Clientele specific, immediate, and insistent*

Table1: Characteristics of science and government (after Crerar 1987, cited in Manning 1988). The institutions of science and government are generally marked by very distinct behaviors and attributes. These differences contribute to some of the difficulties associated with transmitting and translating scientific information into policy and decisions.

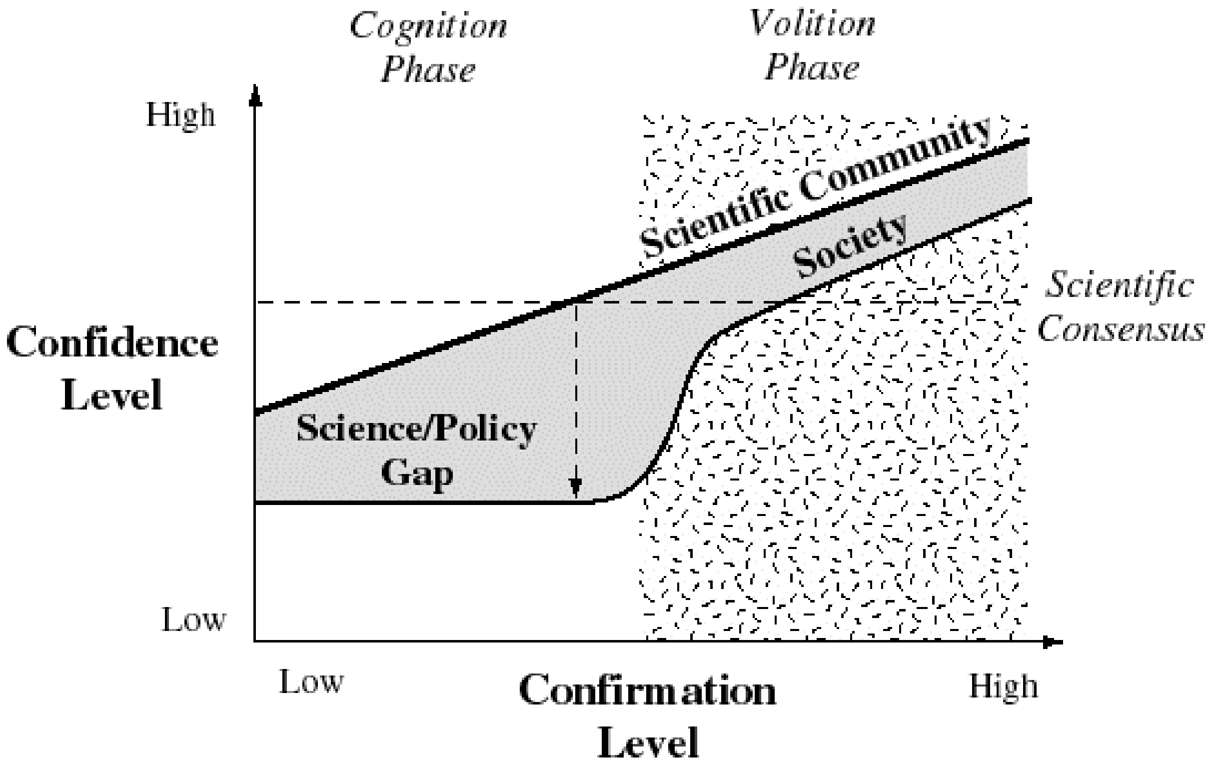

Figure 1: Schematically, the science-policy gap is defined as the difference in levels of confidence for a given scientific finding expressed by the scientific community and society. Generally speaking, as confirmation of a model or scientific finding increases, the level of confidence in the finding increases. This relationship is portrayed as linear for the scientific community where the confidence level tracks the rate of confirmation. In contrast, the degree and rate at which social confidence and consensus develops for a given scientific finding may lag that of the science community due to a complex of social factors. In reality, the shape of this function will vary with individual scientific findings.

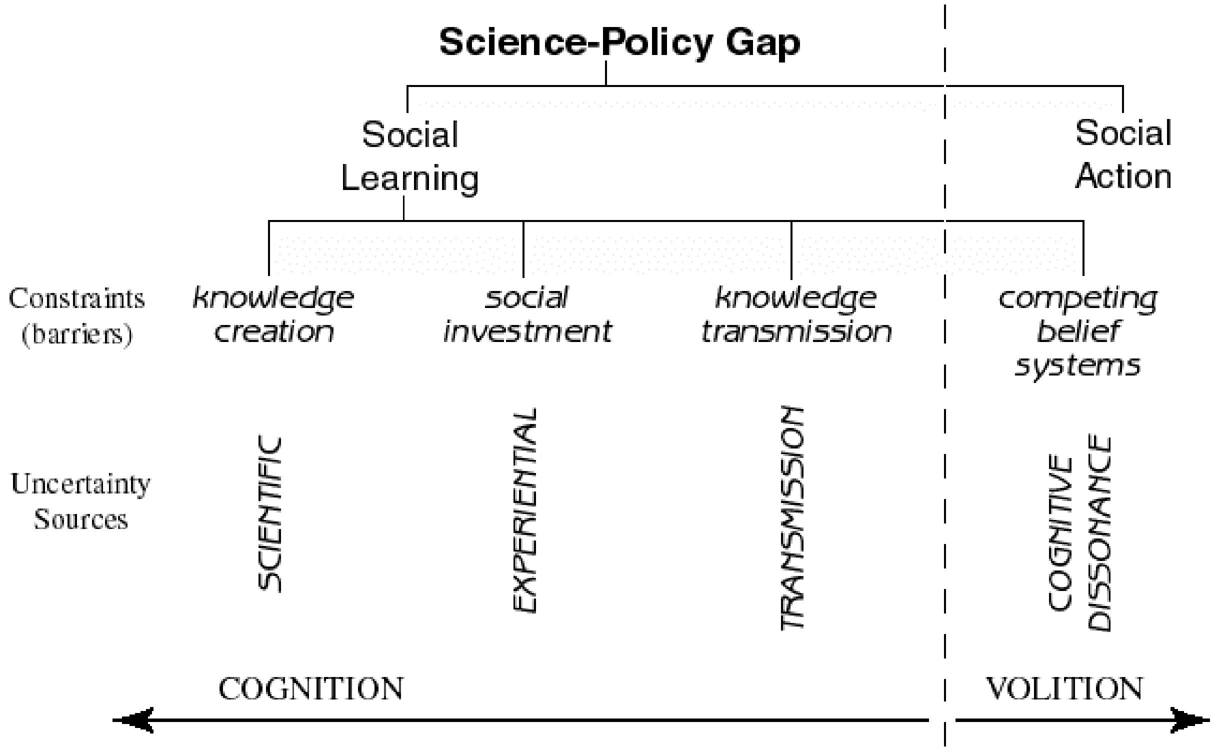

Figure 2: The science-policy gap consists of related sets of constraints and sources of uncertainty.

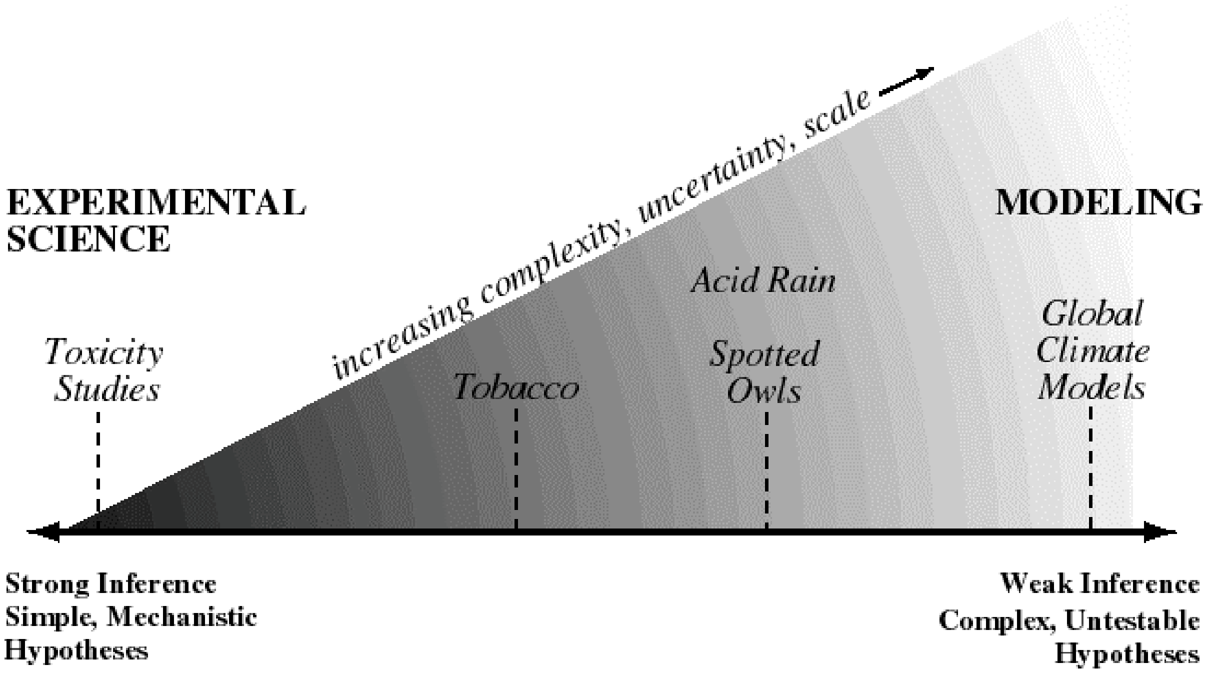

Figure 3: Science uses a combination of data, theory, and models depending on the particular problem at hand. Increasingly, models are employed to address multivariate and large-scale environmental questions such as global climate change. The strength of inference for various scientific activities will differ; generally speaking, there is less confidence in understanding large-scale, complex systems than confined experimental systems described by simple mechanistic hypotheses. Issues such as global change, involving large-scale, complex systems, are intrinsically more uncertain.

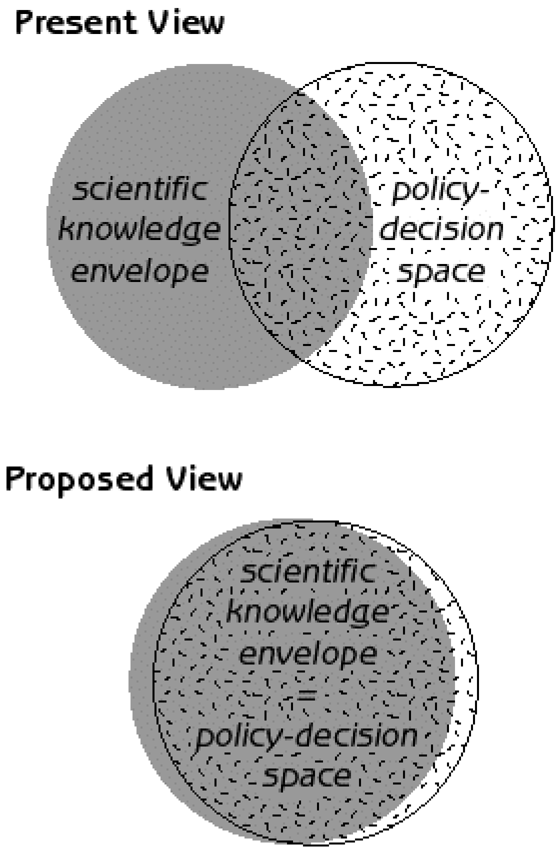

Figure 4: Scientific information is best represented by policy if the entire envelope of relevant scientific knowledge (including uncertainty) is encompassed. This translates to formulating a policy that spans the range of scientific opinion that has undergone the process of peer review.

Forest Forum for Decision-Makers in Finland:

New Approach to Strengthening the Science-Policy Interface[1]

Eeva Hellström[2]

1 Forest Forums in Addressing International Policy Needs

Towards the end of the millennium, the quest for sustainable forest management has gained increasing importance in the international policy agenda. In recognising the complexity of issues related to sustainable forest management, the international forestry community has expressed a particular need to improve the interface between the forest sector and other actors with an interest in forests. This international strive for participatory and consensus based decision-making is visible in all major international forest policy since the UNCED conference (e.g. Criteria and Indicator processes, IPF and IFF processes).

Another relevant but less recognised issue of interest in relation to participation in forest policy processes is, who are the true decision-makers of today? No doubt, they include top-level representatives of various forest related interests (e.g. administrators, industries, forest owners, forest workers, NGOs). However, they are not alone. Other important decision-makers in forestry issues include top-level decision-makers in banking and insurance, trade, other industrial sectors, education, labour unions, politicians, the media, etc. Lately, the forest sector has been too worried about whether various forest related actors are involved in forest policy processes in order to question whether we are ourselves involved in much of the decision-making that sets the economic and societal frame for forestry. If not, what can be done?

A further, frequently expressed need among forest policy makers internationally is to improve the use of forestry research in support of policy decisions. In particular, this issue was raised in Gmunden, Austria where the International Consultation on Research and Information Systems in Forestry (ICRIS) convened in 1998 for seeking ways and means to implement research support and provide background information for international forestry initiatives. Following the recommendations of ICRIS, the International Union of Forestry Research Organisations (IUFRO) has lately established a task force for the very purpose of strengthening the interface of science and policymaking in forestry globally. As already noted, regarding the relationship between forest sector and other sectors, participatory policies are gaining increasing support world-wide. However, the participation of scientists in policymaking is typically regarded as undesirable. Does it need to be?

[1] This document is based on a presentation held on May 10, 1999 at a side event arranged by the International Union of Forestry Research Organisations during the Third Session of the Intergovernmental Forest Forum in Geneva, Switzerland.

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Are the three needs discussed above separate ones which should also be resolved separately, or do they all reflect the same type of deficiencies in the international policy arena, so that they may be addressed through similar means? How effectively do present forums related to forestry address these needs?

In the international policy sphere, three main types of discussion forums can be identified (Figure 1). The IPF and IFF processes, for example, represent ***negotiation forums*** which also involve joint decision-making, to some degree. These forums are supported by traditional ***scientific seminars*** and ***working groups*** with the task of resolving a specific problem. Although there are some combinations of each of these types of forums (marked with x), forums which share some of the characteristics of each of these types are extremely rare. Moreover, forums which reach out from the "forestry triangle" presented in the figure towards the to the rest of society are also difficult to find.

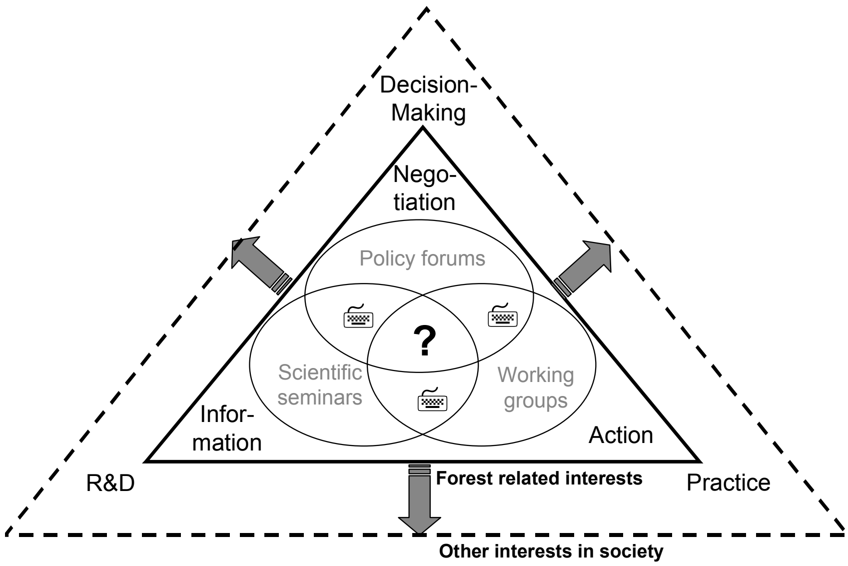

Figure 1. New dimensions in the spectrum of forest policy forums today.

In this paper, the benefits of a forum that simultaneously aims at improving the three interfaces discussed above are discussed. These interfaces are:

- Forest sector – other forest related interests
- Forest related interests – other interests in society
- Science-policymaking

As a basis for discussion, an example of a national forum of this type, the Forest Forum for Decision-Makers in Finland (FFDM), is presented. During only a few years of action, the FFDM has succeeded not only in improving the interface between science and policymaking, but also in increasing dialogue between decision-maker in forestry and other sectors of society. Although these two types of interfaces are regarded as inseparable in the concept of the FFDM, it is here particularly discussed in the framework of the science-policy interface.

2 Interface between science and policymaking

2.1 Dimensions of the interface

Lampinen (1985) identifies three different types of utilisation of scientific knowledge in decision-making. ***Instrumental*** utilisation has direct influence in decision-making. From a supply point of view, this approach involves the well known chain of basic research – applied research – development – application. This type of approach is most typical for the innovative processes related to natural sciences and technological solutions. Problem solving, on the other hand, is a demand oriented approach to instrumental utilisation of scientific knowledge. This process may be described through the following chain: analysis of decision-making situation – identification of information needs – production or gathering of scientific information – interpretation of the research results within the framework of the decision-making situation – choice of solution. In short, the decision-maker uses scientific evidence consciously in order to fill in gaps of knowledge that are strategic to his decision-making. At large, the instrumental utilisation of science in decision-making is open to many types of criticism. Even in its best applications describe the utilisation of scientific knowledge only partly.

In ***conceptual*** utilisation of science, research does not provide direct answers to predefined questions but has a more indirect influence on decision-making. Research helps to conceptualise the problem in question. Most often, research has more impact on problem formulation than problem resolution. In this approach, science has no monopoly to "correct" information. Decision-making is also based on previous experiences, and other non-scientific communication.

Political utilisation is another form of indirect influence of science to decision-making. Instead of using research to search for the best possible solution, science is used to support a specific policy. Often, in political utilisation, research results are harnessed to serve purposes for which they were not produced. However, researchers may also themselves offer decision-makers such results that they are themselves comfortable with. Their motivation may be increased research funding of willingness to influence decision-making towards the researchers own views.

Basically, all three approaches deal with what type of information to produce and how to use the produced information. Indeed, the most typical forms of the science-policy interface are production-oriented; they are related to the dissemination of research results (e.g. extension, education), or to the identification of information and research needs. These two form an important feed back system where at best, the scientific community and decision-makers are in constant interaction. However, the science and policy-making interface may be much more. It can be viewed in a two dimensional setting of production and joint information processing (Figure 2).

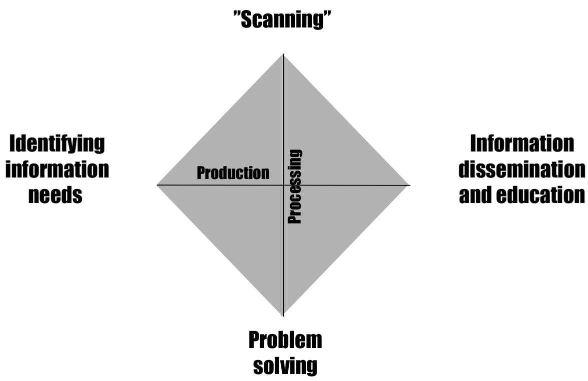

Figure 2. The interface between science and policymaking.

The second dimension related to the interface – joint information processing - is based on an essentially closer connection between the scientific community and decision-makers. In addition to being involved in information production and information exchange, both parties may be jointly involved in information processing. This approach is particularly applicable in situations where there is great need to combine information of various types in order to raise the level of understanding (e.g. scanning the decision-making situation and alternative future developments, facilitated problem solving). Although this type of information processing is already found in many working groups, there is still great fear among both policymakers and researchers that this approach results in political utilisation of research results. In other words, many fear that lobbying and research do not go together.

The question of relevance for this paper is, whether we may understand lobbying in such a new and broader way that this fear may be extinguished. This is done by first scanning global trends which challenge traditional lobbying, and subsequently by presenting the concept of participatory lobbying. Finally, this concept is illustrated with the example of the Forest Forum for Decision-Makers in Finland.

2.2 Changing Environment of the Interface

2.2.1 New Forms of Governance

Generally speaking, policy makers have a myriad of alternative means which can be used to support the functions of the market forces. Typically, these means are divided into the following groups in the text books of forest policy:

1. Juridical-administrative control:
   - laws and statutes, administrative guidelines, announcements, registrations, orders and prohibitions
2. Direct economic incentives:
   - subsidies, subventions, loans, taxes, tax concessions, payments, material support
3. Public ownership and planning:
   - state owned forest industry and forests

4. Information means:
   - research activities, education, advising, information services, communication.

Particularly the internationalisation of the forestry debate has highlighted the inability of traditional forest policy means in securing sustainable forest management. Simultaneously, conflict management has become an important field of forest policy at national and local levels. Problem solving in either field cannot be forced upon any of these actors through any of the policy means mentioned above.

The latest approaches in policy research identify one further group of policy means, namely negotiation (e.g. Sairinen 1996). Common denominators for means within this group are interaction, negotiating, problem solving and joint commitment by different parties to commonly agreed goals or actions. Examples of methods in this group include international environmental resolutions and environmental conflict resolution.

The differences between the categories of information and negotiation means can be viewed from the point of view of the interface between forest science and policymaking. The production-oriented approach to the interface resembles information means, whereas the processing oriented approach resembles a negotiation oriented approach to policy. Within this frame, it is relevant to question, *how can the science-policy interface be developed as to more effectively support the use of negotiation oriented means of forest policy?*

2.2.3 From National to Branch Thinking

Owing to the global character of most forest issues, it is commonly accepted that many of the urgent global forestry problems cannot be resolved by the forest sector alone. This is particularly visible within international forest policy processes, most of which have originated from concern over deforestation and strive for sustainable forest management. Environmental threats such as loss of biodiversity and climate change have forced policymakers from different fields into more vigorous co-operation than ever.

Equally, as another consequence of globalisation, there is increased recognition of the fact that the resolution of many of even the most internal problems of the forest sector cross national boundaries. As a consequence, the importance of international within-sector interaction has increased. The growth of such interaction is not only visible in the emergence of forestry issues to the global policy agenda but also in industrial activities and finance markets. In finance markets, national portfolios are being increasingly challenged by branch portfolios. Among the most important industrial branches, the forest industry is still one of the least concentrated. Along with the continuing concentration, branch thinking is expected to reach unparalleled levels.

The fact that national competitiveness has been strongly supplemented with branch competitiveness, has brought about the need to redefine branches and strengthen within-branch co-operation. Within the forest sector, one example of this type of new thinking is the European Forest Cluster Project (www.forestcluster.com) which aims at increased understanding of the interrelations between various forest-based actors (forestry, forest industries, logistics, chemical industries, machinery, printing, etc.) and supporting co-operation of all major players in the forest sector for an en economical edge in the international market.

In relation to these developments, a relevant question is, *how can the science-policy interface help to channel the support of the whole forest branch to the resolution of problems of broader concern for the whole society?*

2.2.3 Information overpopulation

Towards the end of the millennium, the world has been increasingly fascinated by the information revolution that is said to have been brought about by modern information technology. According to Drucker (1999), however, the real information boom of this century was not the technological one that has boosted since the 1990s. The real information revolution took place much earlier, through the print revolution. He argues that although the new electronic distribution channels will change the printed book, it will nevertheless remain a printed product, with the main task of providing information.

Today, there is a great market for information. Within this market, we live in a confusing situation of information overpopulation (Koski 1998). It has become increasingly difficult to build up knowledge from pieces of information and apply it into practice through know-how generation. A strategic key issue for future information management is to learn how to organise and increase the value added of information as a key resource.

We can describe this process through a chain of know-how generation (Figure 3). The chain begins from basic or raw data; bits and pieces of unorganised information. The processing of data into time series etc. results in information. Only when such information is processed through, for example, methods of scientific research, and only when we learn to understand connections between different aspects, may we talk about knowledge. Knowledge involves synergy where the sum of pieces is more than the whole. The difference between information and knowledge can be illustrated as information being on paper or in the web, whereas knowledge is in the mind. Too often, the chain of know-how already ends here; information remains on paper and becomes know-how of the researcher at the most. When knowledge is supplemented with skills and readiness gained from, for example, education may we speak about know-how. In addition to being able to answer to the question "what", know-how implies an ability to answer to the question "how". However, even know-how is hot sufficient to guarantee application (Seppälä 1998).

The further we proceed from data towards know-how, the stronger the processing aspect of the science-policy interface becomes, and the smaller the production aspect of the science policy interface becomes (see Figures 2 and 3). Accordingly, the process-oriented approach to the science-policy interface is essential in building knowledge and know-how. The processing of quality information is essentially based on high quality processors, that is, individuals.

Again, the relevant question here is, *how can we effectively use the science and policy-making interface to take step further from information dissemination towards joint generation of knowledge and know-how?*

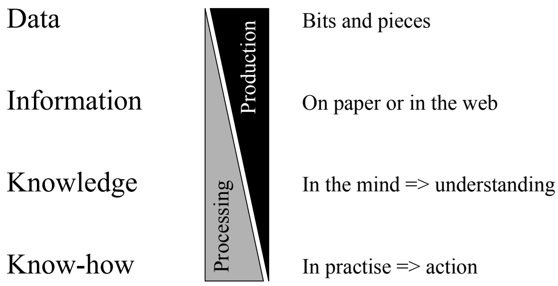

Figure 3. The roles of information processing and production within the process of generating know-how.

2.3 Challenges to Traditional Lobbying

The word "lobbying" has a very negative sound to it, particularly when the word is associated with research. This is also very visible from the suspicion which Lampinen (1985) places on political utilisation of research results.

Jaatinen (1999) defines lobbying *as influencing political decision-making in the interest of a group by communicating with publics relevant to the political process in a certain issue*. These publics are the political decision-makers and officials, competitors, the mass media, citizens, and the constituents (e.g. employees, members) of the lobbyist.

If we were to think about lobbying shortly as *influencing through communication*, isn't this just what the research community is expected to do: communicate about knowledge provided by scientific methods in an open manner, in order to influence decision-making? However, the issue is not this simple. Lobbying is traditionally perceived to involve an interest of a specific group. It is this interest that gives the negative perception of lobbying in relation to science. In order to analyse the relationship between lobbying and science further, it is important to look deeper into various types of lobbying.

Traditional lobbying involves *lobbying by individuals and organisations* with a clear interest involved. In forestry in the 1990s, *joint lobbying* by the whole sector has become increasingly important. Such lobbying is based on the identification of common interests and joint action towards actors outside the forestry sector. The problem with traditional lobbying is that it implies that the lobbyist knows what decisions are in line with the own interests of the group. This, again, implies that the lobbyist is well aware of the political, economic, social and cultural environment in which such decisions are made. Considering the three developments described above (new forms of policy, branch thinking, information overpopulation), this is no longer self evident in modern society.

Lobbying, does not necessarily need to be understood as a linear process of one group influencing another. Lobbying can also be viewed as a series of linear influence efforts by alternating parties in striving for an agreement (Jaatinen 1999). This is largely what *participatory lobbying* is about. Instead of communicating on the behalf of achieving a certain predefined goals, communication is used to test and reformulate the goals of the organisations involved in the communication, so that they are better aligned with overall social, economic, and political development.. Goals and arguments that are better aligned with overall social development are more easily recognised and accepted, and in the long, they also best contribute to the successful development of the organisations involved.

Accordingly, lobbying may be understood not only as influence through communication but also as *communication for improved abilities for influence*. The latter form of lobbying involves joint processing of information and the building of common knowledge in an open manner. It is based on the idea that communication is more about listening than talking. Accordingly, participatory lobbying is more about than learning than informing or persuading.

Participatory lobbying is only possible to achieve through open and broad-based communication with a variety of societal actors. Also the need to increase joint processing of information requires "opening up". There are obstacles fur such opening up, though. For example, it is an often heard argument that the forest sector must first be uniform in its views before it can engage itself in open discussion with others. This view is based on the idea of traditional lobbying where the forest sector assumes that it may tackle the problems of international forestry issues, new policy developments and information overpopulation by itself. Alternatively, we might also suggest that opening up to external pressure helps build common ground within the sector!

The relevant question here is, *does participatory lobbying open up new roles for science in the science-policy interface?*

3 Forest Forum for Decision-Makers

3.1 The FFDM in a Nutshell

The Forest Forum for Decision-Makers in Finland (FFDM) is not a decision-making body, nor is it a body that would compensate for any existing type of forum. It is both a course and discussion forum on forest issues, directed at top-level decision-makers of society, with main focus on participants from outside the forest sector. One third of the participants represent forestry or forest based industries, whereas two thirds represent other sectors of society (Figure 4). The forums have 25-30 participants in each, and each forum is participated by different individuals.

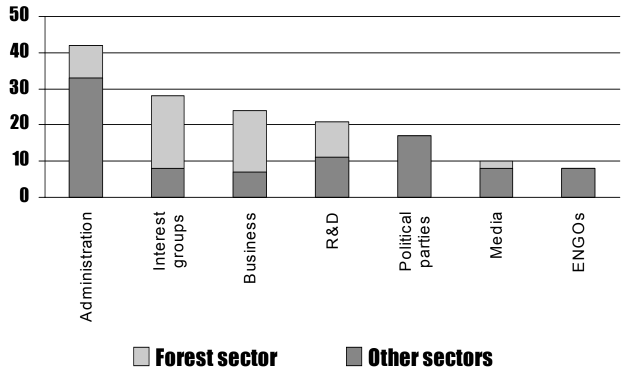

Figure 4. Participants of the first seven Forest Forums for Decision-Makers (September 1997 - May 1999).

Annually two new Forest Forums are arranged. The forums last for a total of four days, including a seminar session arranged in the Helsinki region, and an excursion to other parts of Finland. In addition to these forums, seminars and other gatherings are regularly arranged jointly for all those who have participated one of the forums. Essentially, the Forest Forum is not only about single courses or forums, it is about networking and "keeping in touch" with decision-makers throughout the society.

The forums contain short 15 minute lectures that act as impulses for a number of group discussions, group work and joint strategy discussions. These lectures and discussions may take place in seminar rooms, paper mills, in management stands, or in forest conservation areas. They have even been held on a rafts on the lake, or in an auditorium built of hay stacks. The speakers of the forums include e.g. cabinet ministers, administrators, leading scientists, interest group leaders, and practitioners. The participants themselves are also an important group of lecturers. In the FFDM, no one is an expert in everything, and every one has something to share.

Each forest forum aims at providing a general understanding of the whole branch, the so called forest cluster. It focuses on e.g. global forest development, national forest, environmental and industrial policy, rural development, family forestry, silviculture, forest ecology and protection, recreation, wood procurement, bioenergy, pulp and paper industries, wood working industries, packaging, and forest related machine industries.

The FFDM is both open and closed. Participation in the forum is closed; only invitees take part. The sessions are also closed from the media, with the exception of a few individual sessions. The fact that each participant represents different interest and different organisations, and that they participate as individuals instead of representatives of organisations, reduces social pressure. This setting is very fruitful for open discussion. According to the feedback, the participants have felt that in the FFDM, they have been able to talk more freely than usual, and engage themselves in productive strategic discussion. Moreover, the lack of social pressure helps the participants to open up their minds for new ideas and broadening their views.

If we apply the categorisation of forest policy means presented in section 2.2.1, the Forest Forum for Decision Makers can be associated with category 4 (information) because one of its basic elements is the aspiration to increase the forest and environmental knowledge of decision-makers. However, the FFDM is much more.

Although the FFDM does not aim, say, at activities that are binding to all parties concerned, it underlines the interactive way of communication, problem solving and increased personal commitment to joint ideas. Accordingly, the Forest Forum involves many of the features that characterised negotiation oriented policy means. This aspect is emphasised even more if the FFDM is understood through the new concept of participatory lobbying.

3.2 How did it all begin?

The establishment of a discussion forum for top-level decision-makers throughout the Finnish society was considered in forest sector organisations already in the early 1990s. The idea had been floated as early as in the 1960s, perhaps even earlier. Two decades ago, in the mid-1970s, a discussion club for decision-makers actually convened for few years. This was mainly based on a calculation model for the forest sector ('Messu') developed at the Finnish Forest Research Institute. By altering the parameters in the model, future scenarios for the forest sector and the whole national economy were studied, and means to reach desired goals in the future were reflected on. Compared with the Forest Forum for Decision Makers, this model was solely a dialogue between forest researchers and decision makers, not an interaction between different sectors of society.

The Forest Forum for Decision Makers made the first concrete steps in 1995 when the Finnish Forestry Association - in particular its President Aarne Reunala and Executive Director Juhani Karvonen - called together an advisory group to discuss whether there is a need for "a discussion forum for the country's central decision makers and opinion leaders".

With the support by the group Dr. Pentti Hyttinen wrote an extensive preliminary report in the summer 1995. During the preliminary study nearly 50 potential participants of the forum and representatives of relevant organisations were interviewed. Furthermore, the organisational side of the Forum was mapped out. Certain types of examples for the Forum were the national defence courses and economic leadership courses by the Finnish National Fund for Research and Development. These courses look into significant matters of national benefit from different angles, too.

On the basis of the preliminary study, both the State and the forest sector came to the conclusion that the Forest Forum for Decision Makers would be the most apt forum for considering nationally significant matters such as this. The model developed during the preliminary study was, indeed, decided to put into use nearly in its original form. At the first stage the funding was granted for the years 1996-97. A prominent advisory committee was formed to work behind the scenes. The Chairman of the Committee was the Secretary of the State, Raimo Sailas, from the Ministry of Finance.

The first Forest Forum was opened by the Prime Minister of Finland, Mr. Paavo Lipponen in September 1996. By the end of the Millennium, a total of eight forums will be arranged. The activities were financed during the initial phase by three different ministries (Agriculture and Forestry, Environment and Trade and Industry). Due to budgetary reasons the public funding has since then come solely from the Ministry of Agriculture and Forestry. After the founding of the Finnish Forest Foundation has been the key financier from the private sector. (Hyttinen & Hellström 1997)

3.3 Participants and expectations – development of the concept

Initially, the FFDM was based on the following goals:

- The forest sector will increasingly open up to the rest of society by offering decision-makers and opinion leaders broad-based information on the forest sector and the prerequisites for its operation.
- The aim is to improved ability to resolve forest related problems through over sectoral, interactive co-operation.

In the beginning, the approach was based on the notion that the *forest sector cannot resolve many forest related problems by itself but needs co-operation with other sectors*. Although outreaching, the basic idea still had resemblance with the joint lobbying approach; the forest sector faced problems which it could not resolve alone, and "went out" for help. Increased public funding of forestry was one issue that many forest sector participants were eager to lobby for.

In time, the activities of the Forest Forum have been developed further, in order to better meet the needs of the participants. The identification of the participants' needs has been crucial in this respect. Instead of aiming at decision-making that is better aligned with the interests of the forest sector, the aim today is also to increase alignment of the forest sector goals and strategies with overall social development.

A further goal is to *improve the ability of decision-makers to make long sighted positive impacts for the forests and people*. What these decisions are, is left to the participants themselves to decide. In order for this to be possible, the forest sector has to be willing to open up, give their support to societal decision-making and rely on the decision-makers abilities to look at things from a wider perspective. Even if in the short term, there is bound to exist conflicts of interests between society and the forest sector, in the long run, the best conditions for success exist if forest sector goals are parallel with more general societal goals. Participatory lobbying is crucial in identifying such strategies and implementing them.

In the beginning of each forum, the participants were asked about their expectations. How can we help to improve the abilities in decision-making related to forestry? The answers can be divided into three main groups, with similar emphasis given to each:

1. Information
    - e.g. high quality and multiple aspect information about the present state and future economic, ecological and social challenges of forests and the forest sector in global development.

2. Interaction
   - e.g. new personal and over-sectoral contacts, broadening of one's understanding of forest issues through open dialogue, and immemorable experiences in a relaxed atmosphere.
3. Integrated views
   - e.g. new ideas, integrated visions and strategies, and seeds for over-sectoral cooperation.

On the basis of the needs of the participants, the following operational concept was created for the forum. The activities of the FFDM are based on offering high quality and multiple aspect information, creating a natural setting for personal interaction and open dialogue, and by involving persons with different types of interests and background (Figure 5).

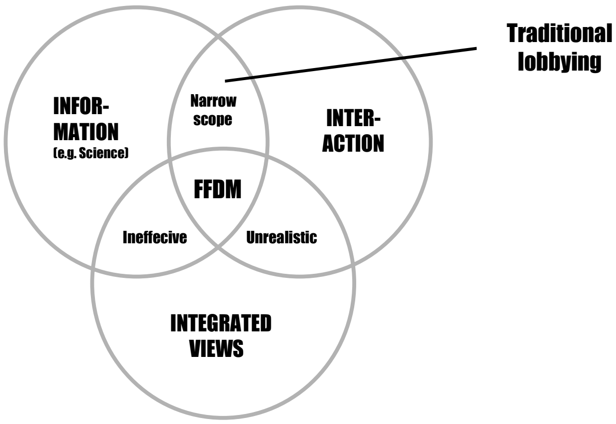

Figure 5. The concept of the Forest Forum for Decision-Makers in Finland (FFDM).

The most interesting part in Figure 5 are the intersections of the three elements. In a situation where interaction taking place on the basis of high quality information but without the involvement of multiple parties, resembles a situation where traditional lobbying takes place. Discussions tend to be narrow in scope and are leaned towards individual interests (not seeing the forest from the trees). On the other hand, if interaction takes place among multiple parties, without the involvement of high quality information, there is a danger that strategies may be unrealistic (roots firmly in the air). Finally, in a situation where decisions are made on the basis of high quality information and multiple parties, but personal interaction is lacking, there is still a danger that decision-making is ineffective (the forest does not answer when called at). This highlights the importance of all three aspects in discussion forums that aim at building knowledge and know-how in support of decision-making.

In relation to the science-policy interface, a relevant question is, what is the role of science in the FFDM. As seen from Figure 5, science is an integral part of the concept, and has a two fold role in it. The traditional production oriented approach to the science-policy interface is presented at the top in Figure 6. In this traditional approach, science is involved in a linear feed-back system with political decision-makers. However, in the model represented by the Forest Forum for Decision-Makers, the scientific community is also actively involved with decision-makers in joint processing of information into knowledge and know-how. In this model, scientists are not involved only as experts of their own field but as participants with wide expertise in forest related issues.

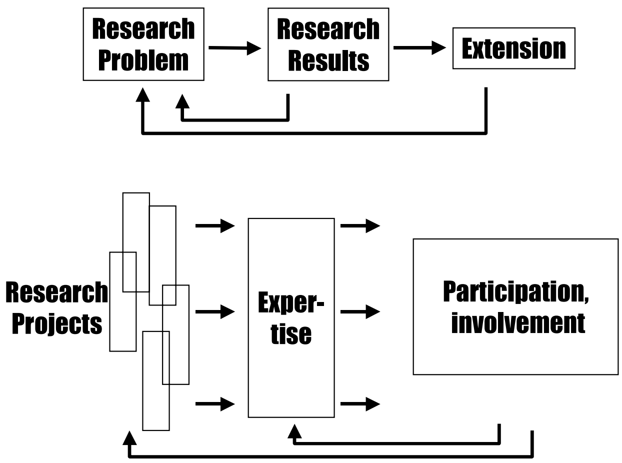

Figure 6. The roles of science in the FFDM.

Here, the question may be raised whether this involvement of scientists is an example of political utilisation of science, mentioned in the beginning of the paper. No, there is a substantial difference. Instead of dissemination of selected information, the role of the scientist in the Forest Forum is participation in joint information processing. Isn't this just what scientists are supposed to do?

4 Concluding Questions and Answers

4.1 Evaluation of Results - Why Does it Work?

To date (spring 1999), the Forest Forum has been active for two and a half years, during which a total of seven individual forums have been arranged. This gives a good basis for evaluating the results of the Forum. The following analysis is based on the model presented in Figure 7.

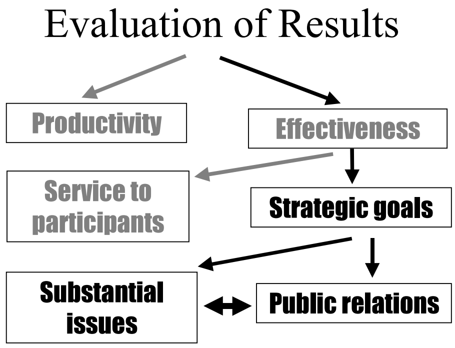

Figure 7. Evaluation of results of the Forest Forum for Decision-Makers in Finland.

Productivity and ***service to participants*** are rather easy to evaluate on the basis of the cost structures of the activity, and on the basis feed back from the participants. According to the feed back forms filled in by each participant, the Forum has within a short period time become a respected independent body in Finnish forest policy. As an average, the participants have graded their overall satisfaction with the forums as 8.5-9, with a scale of ten as the maximum. In particular, the participants have acknowledged the openness of communication and the way in which forest issues have been dealt with from a variety of angles, leaving the conclusions to the participants to make. There seems to exist genuine demand fort the activity which is reflected in the fact that interest to participate in the Forum is excellent. It is by many considered as a prestige to be involved as either a participant or speaker. The satisfaction of the participants is also reflected in frequent requests of previous participants of the FFDM to participate in future activities of the Forum as well.

Perhaps the most important aspect of evaluation is the of realisation of the ***strategic goals*** of the Forum. These are also the most difficult results to assess because they have to be viewed in relation to broader international and societal concerns. Related to such concerns, three important questions were asked in the beginning of this paper. In the following, it will be discussed, how does the concept of the Forest Forum for Decision-Makers address these concerns.

How can the science-policy interface help to channel the support of the whole forest branch to the resolution of problems of broader concern for the whole society?

Although it is, or course, difficult to point out that a certain decision in forest or other policy has been induced by the Forest Forum, the forest sector has been convinced that the ***substantial results*** have been worthy of the input. This is illustrated in the numerous official and unofficial recognition received from the Finnish forest sector (e.g. “Forest Action of the Year” prize by the Finnish Association of Professional Foresters).

However, it is important to note that rather than promoting individual substantial issues of interest to the forest sector, the main substantial output of the Forum has been in helping the forest sector to integrate their views and build joint strategies that are aligned with overall social development. A good example of this is the active involvement of the Forest Forum in dialogue related to the Finnish National Forest Programme during its preparation in 1998.

Moreover, a very important substantial benefit of the FFDM has been the opening up of channels for traditional information dissemination. Decision-makers within the FFDM network have become more interested in and receptive to forest related information.

Is the forest sector itself involved in much of the decision-making that sets the societal frame for forestry. If not, what can be done?

In aiming at "opening up", the Forest Forum has been an effective means of ***public relations***. The Forest Forum has succeeded to increase both knowledge and interest in forest issues – factors which are necessary for making good decisions. In distributing information and creating dialogue, the Forest Forum has been effective not only through the sessions arranged but also through visibility in the media, and through effective dissemination of reports. This type of multi-faced opening up has created increased trust and credibility of the forest sector. The improved overall image of the forest sector helps open up new opportunities for increased involvement and integration of the forest sector in society.

Moreover, the network of personal contacts created at the FFDM has opened up channels for traditional ways of influence for all people and organisations involved. This also means increased influence in issues of interest to the forest sector.

Although both elements of strategic goals – public relations and substantial issues – are of importance *per se*, they are very much interrelated. One would not work without the other. This is one important background for the success of the Forum.

Does participatory lobbying open up new roles for science in the science-policy interface? If so, how can we effectively use the science and policy-making interface to take a step further from information dissemination towards joint generation of knowledge and know-how?

In this paper, lobbying was not only understood as the dissemination of politically selected information, but also as communication with other interests which, in many ways, is nothing more than joint processing of information. In contrast to individual or joint lobbying, the primary aim of participatory lobbying is the alignment of ones own goals with overall social development. The focus of influence is not only "the other" but also "the self". Therefore, in contrast to the more traditional forms of lobbying - individual and joint lobbying – participatory lobbying is closer to conceptual utilisation of research than political utilisation of research. Thus, it is one potential direction in improving the science-policy interface.

In participatory lobbying, the generation of knowledge and know-how is essentially based on personal interaction. An important feature of the FFDM is that scientists and policymakers interact at an individual level. Moreover, such personal interaction takes place between scientists and policymakers representing very different types of disciplines and interests. This multitude of aspects is the core of generating new, integrated knowledge.

After two and a half years of operation and joint information processing, new ideas and integrated views to forest sector strategies have risen to the level of having potential impact on the development of the sector. The final test of the FFDM for the following years is to find ways to use this generated knowledge to effectively support policymaking and strategy building within the forest sector and society at large.

4.2 Regional and International Applications

There is ample recognition of the fact that global change inevitably results in a need to change what we do about it (substantive change). This is well reflected in the relationships between the scientific community and decision-makers at the substance level. However, less emphasis has been paid upon the fact that global changes also introduces a need to change the way in which things are done (procedural change). As discussed previously in this paper, there is a particular need to move from information dissemination to involved processing of information, and from internal influencing to external influencing. In Finland, the FFDM concept has successfully addressed these needs at the national level. However, to what extent is the concept applicable at regional or international levels?

In Finland, subsequent to the success of the FFDM at the national level, the concept has begun to also raise interest at the regional level. Indeed, some forest forums for regional decision-makers have already been arranged. It is a simple fact that the forest sector has such importance in the Finnish society that top-level decision-makers are often genuinely interested in forest matters which has facilitated the launching of this new concept.

However, perhaps the most important reason behind the success of the Forum is not the importance of the forest sector, nor the brand that it has become but the fact that the FFDM is committed to serving the needs of modern decision-makers in building up their capacity for decision-making in forestry issues through a balanced combination of information, interaction and integrated views (Figure 5). Moreover, it has been essential that the major themes for discussion have been selected jointly by the decision-makers themselves and the forest sector. In fact, the Forest Forums form a continuum where knowledge processed in one session forms the basis for knowledge-building in the following session. If this is considered as the core of the FFDM, is there any reason why – with slight modifications - the concept would not work in other conditions, even internationally?

In discussing possible international applications, it is important to note two facts: 1) the concept presented here does not compensate for any existing type of activity, and 2) the forum concept presented here is not a decision-making body, nor a body based on official representation.

The new potentials provided by this type of forum are based on specific characteristics related to information. Each of these different types of forums discussed in the very beginning of this paper - policy forums, scientific seminars, and working groups - have a different relation to information. However, none of these forums primarily aim at joint information processing and knowledge generation. In other words, the potentials offered by the enormous amount of existing information are not utilised as effectively as could be done in any of the existing international processes.

Another deficiency with most existing forest-related forums is that although many of them are participated by a multitude of forest related interests, they do not sufficiently involve decision-makers and other actors in other parts of the international community. There is evident need to reach out from the forestry community towards other parts of society. Reaching out in an open manner is only possible as a joint effort of the international forest community.

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