Vestlandsforsking
Boks 163, 6851 Sogndal
Internett: www.vestforsk.no

VF-rapport 13/00

Jon Teigland:

Impact Assessments as Policy and Learning Instrument

- **Why Effect Predictions Fail, and**
- **How Relevance and Reliability can be Improved**

Ph.D. thesis 2000

Department of Environment, Technology and Social Studies
Roskilde University
Roskilde, Denmark

Department of Environmental Research
Western Norway Research Institute
Sogndal, Norway

Preface

This Ph.D. dissertation focuses on impact assessment (IA) as an instrument for reducing adverse effects on the environment and society from development actions. Recent reviews find that IA is not as aneffective instrument as often intended, partly because of a lack of relevant and reliable predictions of short and long-term effects.

The main objective here is to clarify why impact predictions may fail in general, and in new and strongly growing fields as tourism and recreation especially. Improved understanding of the causes for such failures is a prerequisite for more effective IA-guidelines and also for improvements of the more technical elements of IA. The ambition is not to contribute to the development of "correct" impact predictions, but to reduce uncertainty and in that way reduce the number of poor decisions.

The emphases is on developing a conceptual framework for analysing prediction failures and to improve impact theory by confronting theory with empirical case studies. One important measure is the use of ex post impact assessments that compare ex ante predictions with the realities afterwards and evaluate the reasons for divergence. The case studies are restricted to the tourism and recreation sector. This is a strongly dynamic sector, which makes impact predictions an especially demanding task. The need for improved knowledge in this field is high, too, since tourism is claimed to be the largest industry in the world today, but lacks knowledge that is scientifically based. It is especially a need for interdisciplinary research, which this dissertation aims to be a contribution to.

Most of the dissertation has been published earlier as refereed articles in the scientific journal "Impact Assessment and Project Appraisals" or in scientific books or reports. The text of refereed papers are here published exactly as in the scientific journals, but additional information on background, methods or emirical evidence are included in short introductions and appendixes when needed. The case studies included are based on much more detailed reports published earlier only in Norwegian. Footnotes refer to earlier publications where readers will find more information on methodical issues and findings.

Bo Elling at Roskilde University Centre has been advisor to this dissertation project. Thanks also to Karl Georg Høyer and other colleagues at Western Norway Research Institute. In addition, I would like to thank Nils Gilje at University of Bergen, David Lime at University of Minnesota, Bjørn Moen at Norwegian Institute for Urban and Regional Research, and several anonymous reviewers. I apprecate good advice from the evaluation committee too.Thanks especially to the chairman, Thomas G. Weston for making available detailed notes on language problems.

Oslo/Lillehammer, January 2000

Jon Teigland

Summary

A large number of impact assessment reports have been written world-wide during the past three decades. The reports probably contain several hundred thousand predictions of how environmental and social systems are expected to respond to different types of projects and programs. However, few have attempted to check if IA-predictions have been relevant and reliable. Recent audits show, though, that most predictions have been vague and often fail. Few have studied why. That is a surprise, since one way of improving quality and influence of IA in the future is to clarify the reasons for failures.

This Ph.D. dissertation discusses why predictions of effects in impact assessments may fail in general, and in new and strongly growing fields as tourism and recreation especially. The objective is to contribute to the development of more accurate and relevant judgements of effects in the future by comparing predictions with the short and long-term realities afterwards and evaluate the reasons for divergence.

The first part is an international state of the art review of reasons for unreliable predictions in impact assessments in general and based on the existing IA-literature. This part focuses on developing a conceptual framework that is useful for understanding prediction failures and the relationships between a planned development action (the dose) and the potential response (the effects) in the types of systems involved.

The second part investigates empirically and more in depth why past predictions have failed, by using concrete cases as learning instruments. Here, a multiple case study design is used, which is longitudinal and compares predictions ex ante with the ex post realities, searching for the causes of prediction errors. Both unique and repeated types of development projects are included, with Winter Olympic Games as an example of relatively rare actions and a hydropower/highway development as an example of projects that have more repetitive character. The case studies are limited to predictions of effects on tourism and recreation interests. Effects on the environment or local community in general from tourism and recreation are not investigated in this study. However, the selected case studies are chosen as critical experiments that test general theories and concepts. The findings should, therefore, have more general relevance (and it is perhaps no coincidence that another very recent study in a totally different field has similar results on partial issues that are similar).

The main conclusions are:

- The relevance of today's impact assessment systems for democratic decision makers can be improved by requiring IA's not only to make scientifically based predictions, but in addition to critical assess the alternative impact theories that the main participants in the decision processes base their thinking and actions on.

- The reliability of IA-predictions can be improved by following a step-wise assessment procedure, which more explicitly take care of the potential for interaction and cumulative effects.

- Major improvements require, however, that society use ex post evaluations much more as policy instrument to learn the real effects of development actions. It is especially a need to organise ex post evaluations as a systematic means for improving existing project theories and gather insight in dynamic processes.

Sammendrag

Et stort antall konsekvensutredninger (KU) er publisert de siste 30 årene i ulike deler av verden. Rapportene inneholder flere hundre tusen prediksjoner av hvordan miljø og sosiale system vil reagere på ulike typer av prosjekter, program og planer. Men få forsøk er gjort på å sjekke om KU-prediksjonene har vært relevante og pålitelige. Flere kontrollstudier det siste tiåret viser at de fleste prediksjoner har vært vage og ofte feilaktige. Meget få har undersøkt hvorfor. Det er overraskende. For en måte å øke kvalitet og innflytelse fra framtidige KU er å klarlegge årsakene til feilaktige konsekvensvurderinger.

Denne avhandlingen diskuterer hvorfor KU-prediksjon av framtidige konsekvenser kan slå feil generelt, og i nye og sterkt voksende sektorer som turisme og rekreasjon spesielt. Målet er å bidra til utvikling av mer pålitelige prediksjoner ved å sammenligne framtidsvurderingene i noen konkrete prosjekter med de faktiske kort- og langsiktige virkninger som er påviselig i ettertid. Derved blir det mulig også å klargjøre årsaker til avvik mellom prognoser og realiteter.

Den første delen av avhandlingen er en kunnskapsoversikt som belyser årsaker for upålitelige prediksjoner i konsekvensanalyser generelt, med vekt på å forstå sammenhengene i det system som blir påvirket av et planlagt prosjekt. Oversikten bygger på internasjonal faglitteratur. Målet er å utvikle et begrepsapparat som kan være nyttig for å forstå prognosefeil og sammenhengene mellom en planlagt prosjekt (som en dose) og potensielle reaksjoner (effekter) i den type systemer som blir påvirket.

Den andre delen av avhandlingen er empirisk og studerer i dybde hvorfor effekt-prediksjoner i konsekvensutredninger har vært feil. Her er konkrete case brukt som læringsinstrument basert på et multicase design med langtidsstudie. Formålet har vært å sammenligne prediksjoner med realitetene etter at et prosjekt er gjennomført, og å søke etter årsaker til feil. Både unike og ofte repeterte typer av prosjekt er undersøkt. Vinter Olympiske leker er brukt som eksempel på relativt unike prosjekt, mens vannkraft- og veiutbygging eksemplifiserer prosjekter som ofte blir repetert. Case studiene er begrenset til prediksjoner av effekter i tid og rom på turisme og rekreasjonsinteresser. Effektene på miljø og lokalsamfunn, for eksempel av turisme og rekreasjon, er ikke undersøkt. Men de utvalgte case studiene fungerer som kritiske eksperiment som tester generelle teorier og begrep. Resultatene burde derfor ha mer generell relevans (noe en nylig publisert studie fra et helt annet fagfelt bidrar til å sannsynliggjøre for viktige delkonklusjoners del).

Hovedkonklusjonene er:

- Relevansen av dagens KU-system for demokratiske beslutninger kan forbedres vesentlig hvis KU ikke bare tar sikte på vitenskapsbasert prognoser, men i tillegg kritisk tester de alternative effekt-teoriene som deltakerne i beslutningsprosesser basere sine tanker og handlinger på.

- Påliteligheten av KU-prediksjoner kan bedres vesentlig ved en trinnvis analyse-metode, som mer eksplisitt studerer muligheter for samspills- og kummulative effekter.

- Det viktigste vil være om samfunnet tar i bruk ex post evaluering langt mer som et instrument for å forbedre eksisterende innsikt om prosjekteffekter, og skape innsikt i samspillet mellom et prosjekt og andre prosesser som skaper kumulative effekter.

CONTENTS

Figures:

Tables:

1 Prediction quality; A key problem in impact assessments

1.1 The theme and key problem

Major development actions, in the form of projects, plans, programs or policies, often act as experiments with more or less uncertain and unknown effects on the environment, humans and the society. Therefore, each action is a potential learning experience and a test of the prevailing theory of what will happen during and after the implementation. This theory is here referred to as the "project theory" that in advance tries to explain the effects and reactions caused by a specific development action.

The ”learning by doing” or “trial and error” strategy is one way that society can learn about the different types of desired and undesired effects, and their degree of seriousness. However, surprisingly few countries today have organised such experienced based learning processes in a systematic way, as a measure for reducing or preventing undesired effects of future development actions and to a higher degree achieve the desired ones.

The basic theme of this study, in broad terms, is how society can learn more effectively from major development actions and use the new insight to increase the quality of future judgements and decisions, by making impact predictions more relevant and reliable. It is an important theme, as newspapers world-wide most probably nearly every day tell about projects, plans or policies with unwanted and significant effects. Some of these development actions are major failures with much higher costs or more damage on humans or the environment than expected by the decision-makers or expert advisors. An unknown number of actions are also unnecessary failures, because it should have been possible to prevent them by using existing knowledge to make more accurate judgements.

A policy instrument most countries today have introduced, as part of their decision systems, are impact assessments (IA). The use of IA is often a mandatory process that requires a special impact study made before decision-makers give a final consent to implement an approved action. The aim is to help participants in democratic decision processes with as relevant and reliable information as possible about the potential effects of their decisions and actions. Thus, IA is a proactive policy instrument and part of rationalistic planning of society.

The main purpose of IA is to **identify, predict and evaluate potential effects**, and make sure that the actors, stakeholders and interested interest groups in democratic decision making processes:

- get the best possible information on the changes their decision will make (**the effects both in time and space**), especially the potentials for likely and important changes,

- improve the actors ability to evaluate the significance or value of the expected changes (**the impacts**), and
- improve their ability to assess if and how the proposed project, plan or policy should be changed to increase positive or reduce negative impacts (or compensate negative ones).

Prediction failures may be defined as the divergence between the reality observed after a development action and the predictions made before a decision to implement the action. The sheer complexity and variability of modern society explain why it is no easy task to identify, predict and evaluate effects in the future from a development action.

It is not unusual to hear people claim that predicting effects of major development actions is too difficult a task and a waste of time. Even scientists may ask themselves if it would not be better to give up making predictions altogether? But in every way that firms and governments act and plan, they are making at least implicit forecasts about the future effects of their actions. One purpose of impact assessments systems is to make such forecasts more explicit and to test them, assuming that a critical challenge may reduce the degree and significance of errors.

It is, however, few studies of how often experts and decision-makers have made wrong judgements, or how large or serious failing forecasts are. But plenty of anecdotal evidence indicates that prediction failures are a common and significant problem world-wide.

The problem is not only that erroneous forecasts contribute to less successful or even poor design of individual development actions. Unsuccessful impact predictions reduce confidence, too, in the reliability of individual IA-statements and create resistance against the use of IA as a policy instrument. In addition, predictions with low accuracy reduce the effectiveness of democratic decision processes as a measure for solving conflicts in modern society.

Therefore, one way of improving the usefulness of IA-systems in general, and effect judgements in individual impact assessments, too, is to increase the quality of predictions of future effects from development actions. **A key question is what can reduce the extent and importance of prediction problems? In other words, how can the relevance and reliability of IA-predictions be increased in effective ways?**

Those questions are the starting point for this study. The search for good answers has been based on the assumption that IA-predictions in one way or another will be based on a theory about the effects of an action - either explicit or implicit. Therefore, an obvious strategy for a scientist is to test the theories that specific predictions are based on, by comparing predictions made before a decision with the reality afterwards. If empirical evidence is divergent from what was predicted, the theory behind the predictions has to be wrong or at least have some weak points. If not, the truth is that other causes create errors and act as significant confounding

factors. An example could be prediction failures caused by manipulations of IA-predictions (a reason that naive scientists may not think about - at the beginning).

A research strategy of this type is based on studies after (ex-post) a development action has been implemented that focuses on the degree of divergence between effect predictions and the reality. But forward-looking scientists (and decision-makers) are often less concerned about what the effects of a project were, or how much prediction's failed. They are more interested in learning how the effects and predictions could have been improved. In other words, their interest is often how the desired effects can be or could be increased and failures reduced, or made different in a qualitative way.

An ex post study or evaluation that sums up the volume of change and identifies the real effects of a project, or the degree of prediction failures, is a "summative evaluation" (Mohr 1988). Scientists (and decision-makers) that want to use ex post studies to learn how to improve and form future predictions (and projects) prefer "**formative evaluations**" instead of summative evaluations. Formative evaluations focus on the reasons why a prediction failed, or why a project has had the effects it had, and not only the summative effects.

The basic distinction between summative and formative evaluations is in reality the difference in the philosophy of science between knowing what has happened and understanding why something has happened. To know what has happened requires technical competence (and is "cookbook science"), while understanding why some thing happened requires scientific insight in the forces that form a process, (which is "real science").

This dissertation tries to contribute to the real science of impact assessment. Therefore, the focus is not on the differences between (ex-ante) predictions made before a decision and the reality afterwards, which will be the interest for summative evaluations. Such studies are needed and many more should be done, since they may deliver information that makes it easier to direct attention to those types of development actions which have the highest potentials for failure. But information on how much, when and where effect-predictions have failed, give less focused guidelines on how we may reduce problems that erroneous predictions create for decision-makers and society. An that is our aim.

The subject problem focus for this study is why IA-predictions fail? In other words, the objective is to identify the main causes for errors in effect predictions and judgements. The assumption is that if a study focuses on the reasons for failures and successes, it may produce more insight that can be used to form future impact assessments and predictions in a better way. These type of studies depend on insight in a theory or a conceptual framework that explain what types of forces or causes to look for.

However, the broad objective of this dissertation is to contribute to the development of IA-systems in general as a policy instrument for improved decisions in

democracies and more systematic and effective learning by society. A starting-point is the nature of the problems with regards to the quality of predictions in individual impact assessment, and a need to find solutions to such problems. Therefore, the primary problem of interest is how impact assessments may become more relevant and reliable. But several constraints have made it necessary to focus this contribution on two elements or parts of the broad main objective.

One partial element, or objective, has been to develop a conceptual framework that can be useful for analysing why IA-predictions fail and investigate how important the different causes of IA-prediction errors are. This type of scientific insight is needed to:

- focus attention and proactive actions towards the most important reasons for failures,
- improve our understanding of the causes of misjudgements that may open up more effective ways to reduce the volume and importance of IA-failures in general,
- contribute to more precise concepts, and
- make guidelines, quality controls and production of an improved knowledge base more effective, too.

A second partial objective is to clarify how IA-predictions can become more relevant and reliable for democratic decision processes. Basic assumptions are that;

- the relevance will increase if IA tests critically the alternative theories, which the main actors base their thinking and actions on;
- the reliability will improve if ex post evaluation tests more systematically those effect theories that decision-makers often use.

The third partial objective is to contribute to insight in prediction problems that may be relevant especially for social science. Sadler (1988) claims that the prediction capability in social science is much more poorly developed than in natural sciences. But it is my judgement that the need for improved insight and knowledge varies in social science, too, and may be linked even more urgently to relatively new and strongly growing social phenomena that require interdisciplinary research. Here, this contribution is limited to one specific field of interest, the tourism and recreation sector, which is the field most of my research and IA-studies have focused on.

The tourism sector is claimed to be the largest industry in the world today and strongly growing. Therefore, UN's Commission on Sustainable Development (CSD) has recently (April 1999) emphasised a special need for IA-improvements in this field, when the Commission organised the first evaluation world-wide of progress towards sustainability during the last decade of an industrial sector (http//www.un.org/esa/sustdev/ tourism/tour2.ht).

Large volume and strong growth are among the reasons why CDS chose tourism as the first industrial sector to evaluate for progress in sustainability. But it is a clear

double-sided interrelationship between environment issues and tourism and recreation, which makes sustainability and IA especially important in this field. The growth potentials of tourism and recreation depend to a large degree on the quality of the environment, but growth in tourism and recreation may at the same time influence the environment in negative ways. One reason why UN's Commission on Sustainable Development and other authorities has expressed a substantial need for improved IA-capability in the tourism field, is the lack of, or only, fragmented research information that is available for policy judgements. Another reason is that this sector is among the few growth sectors in many developing countries, which need better insight in lessons learned from more developed countries and regions.

However, IA in the field of tourism and recreation is not the main problem of interest in this dissertation. It is of less interest, too, as to how large or serious prediction errors have been in connection with specific development actions as the Olympic Games and specific hydropower projects, which are used as case studies in this dissertation. These case studies from the tourism and recreation sector are tools to develop insight of more general interest. But an important "side-effect" of this dissertation is, hopefully, improved IA-quality in that sector in addition.

Here, a basic assumption is that if the goal is to make IA as a policy instrument more useful in general and raise the quality of individual impact assessment predictions especially, we need to increase our insight in;

- why do predictions in impact assessment fail? And,

- how to achieve better understanding of the causes of prediction failures which can then be used to improve IA-systems and individual impact assessments in the future?

These two themes and problem questions will be discussed later on in more detail. But it is easier to clarify the two main problem questions, and the objectives of this dissertation, if readers know the background of IA and the main critics of IA as a policy instrument.

1.2 The background and critical issues

January 1, year 2000, marks the 30th anniversary of the National Environmental Policy Act (NEPA) in the USA. This Act introduced for the first time impact assessment (IA) as part of a national decision system. NEPA was a response to increased environmental awareness and concern for unforeseen adverse effects of development actions in the 1960s. One of the Act’s main purposes was to establish political instruments that would reduce, prevent or eliminate damage to the environment and stimulate the health and welfare of man (Hildebrand and Cannon 1993).

A segment of NEPA requires federal agencies in the USA to prepare environmental assessments and make a systematic impact statement that predicts and evaluates the effects on the natural environment before a decision is made on implementing major actions in the form of projects, programs or policies. The intention, according to the Act's principal political sponsor, was to cause "agencies to reorder their priorities and internalise in their policies and procedures an informed concern for the environmental consequences of their actions" (Caldwell 1998).

The proponents behind the new **environmental impact assessment** (EIA) -system wanted in other words to develop a new decision procedure, and use that as a stimulus in planning and decision processes to get more environmental friendly actions as response. The theory was that a mandatory EIA-process would cause a change in institutional behaviour and, thereby, reduce or eliminate adverse environmental effects. EIA was a proactive means for attaining an end - an improved environment - and not an end in it self.

The new policy instrument require that the best available science and techniques is used to predict and evaluate potential effects from planned actions before decision makers are committing themselves to implement a specific development. The technical aim is, however, not to make predictions and evaluations of environmental effects in a narrow sense. NEPA requires that agencies "use a systematic, interdisciplinary approach which will insure the **integrated use of natural and social science** (my emphasis), and the environmental design arts in planning and decision making which may have an impact on man's environment" (PL 91-190 § 102 2(a). The U.S. -act requires also, according to Caldwell (1998), that agencies give appropriate consideration **to unquantified environmental amenities and values** (my emphasis).

Since 1970, the idea of using impact assessment as systematic instruments in environmental policy has spread rapidly world-wide. Most other countries today have, in one form or another, adopted basic principles in the NEPA-regulations. Several international organisations or agencies, as the World Bank (Robinson 1993) use EIA as an analytical technique for decision-makers on the global level, too. The common aim is to **institutionalise foresight** and ensures that major actions minimise or avoid otherwise unanticipated adverse effects. Therefore, essential parts of the different national and international EIA-systems and techniques are often the same. However, EIA-systems, concepts and techniques have changed compared with the early days as a benefit from nearly 30 years of experience and critical evaluations.

Today the scope of impact assessments is often broader than impacts on the environment itself. They include not only development actions on local or national level, but also such global policy issues as climatic change and sustainable development. The wider concept, often referred to as IA in contrast to the environmentally more focused EIA, includes procedures that require assessment of many broad impact categories and narrower themes, including the impacts on social, cultural, economical, health and other sector issues, as well as the natural environment.

According to my judgement, this broader perspective is necessary to include the often important interaction or cumulative impacts caused by complex environmental and social systems. If, for example, an impact assessment of human and social issues identify a potential for significant and undesired effects, and that contributes to the rejection of a development action or project; the environment can benefit, too. However, the broad application makes IA a demanding task and requires a much more comprehensive and integrated use of the best available science than earlier. The broader attempts to predict and evaluate probable impacts of proposed actions have strongly stimulated research activity in many fields, including development of impact theories and collection of empirical evidence for use by applied science. But impact assessment is still an evolving field with major potentials for improvements (Sadler 1996). As a policy instrument, it is under severe critique.

One of the more fundamental critics focuses on the role of IA in decision processes. The original intention has been to use IA to inform and assist planners and decision-makers, assuming that "informed" decision-makers will make the right decisions. Such an assumption may perhaps be logical in countries that have long traditions for open and democratic decision processes, or a strong faith "in the common man's inherent capabilities for sound judgement" as President Jefferson expressed it according to Webster and Fittipaldi (1998). However, experiences from many parts of the world indicate that neither proponents of a development nor decision makers do necessarily have an ethical concern for "higher goals in society" (as the need for sustainability), or, for example, a major concern for more specific environmental or social values.

Mackie and Preston (1998) conclude a recent review of impact assessments in the transport sector by stating that (quote) "appraisal optimism is the greatest danger in transport investment analysis. Appraisal optimism happens because the information contained in the appraisal tends to be owned by scheme promoters who have obvious incentives to bias the appraisals - deliberately or unwittingly -… This is a particular acute problem if the scheme is in the public rather than private sector, since the normal commercial checks and balances on excessive optimism do not apply".

This judgement is most probably relevant also outside the transport sector, since proponents and elected decision-makers in general may have a common interest in promoting a development action and use their power to take care of their own inherent interests. Impact assessments that correctly identify and predict adverse effects may in such cases not be of the decision-makers interest. Nor may they be given an appropriate weight in the decision process. Therefore, it should not be a surprise that IA has not been as efficient an instrument in environmental policy and other areas as often expected, according to my judgement.

This type of criticm focuses on a potential for weak linkage between impact assessments, as a stimulus to decision systems, and the desired response in the form of more environmental or social friendly developments. It is a criticm that points to a logical failure in the basic idea of impact assessment (and is in that way an

"ideological" critic). Other critics of impact assessments have focused on failures in more "technical elements", often assuming that the basic ideas are fine, but that poor applications of IA-methods and techniques, or a poor knowledge base in fields of substance, create poor quality of predictions and evaluations.

Several reviews have identified low or lacking quality of impact assessments as a major problem internationally (Andrews 1988, Bisset and Thomlinson 1988, Sadler 1988, Lee and Brown 1992, Lee and Dancey 1993, Warnken and Buckley 1998). Low relevance and poor quality of predictions seem especially to be important issues, and may explain why impact assessments have had less practical influence than originally desired and expected. If planners and decision-makers find the information in IA-reports and statements of low relevance, or have low confidence in the reliability of predictions, then it should be no surprise that the practical influence is less than desired.

These quality issues are in one way strange, as one of the basic guidelines in IA-systems is to use the best available science and techniques to predict and evaluate potential effects. However, it is not an unusual experience that intentions and realities are very different. Thus, a key problem may be that the applied science in EAI and IA is not the best, but lacks scientific qualities.

A recent Australian study of the quality of environmental impact assessment (EIA), as exemplified by a representative sample of 170 tourist projects, concluded even that the scientific quality "is very poor" and "a very long way short of the most basic standards for applied science" (Warnken and Buckley 1998). The authors added " There are very few comparable data on scientific quality of EIA for other countries and sectors, but no *a priori* reason to assume it is any better". Another recent review from UK and the planning sector seems to confirm that view, since it also found vague or missing predictions to be a common problem, and no or small improvements in quality over time (Wood et al. 1998).

Therefore, a third and more fundamental type of IA-critics has emerged during the last years, claiming that impact assessments have focused far too much on pre-decision predictions and judgements, and not enough on evaluating the real effects of development actions afterwards. Dipper et al. (1998) claim that this failure has severely constrained the possibility for rising the quality of IA-systems in general, and also the relevance and reliability of individual assessments.

This type of criticm focuses on the role of IA-systems. It claims that impact assessments are not only a measure for improving **democratic decision processes**. But that IA should be a way for society to **organise learning processes**, too, by using the lessons learned from earlier developments to improve future actions (Dipper et al. 1998). Few countries use IA as an instrument for systematic learning, even at project level. Dipper et al. (1998) found in a recent international review only 23 published case studies that compared impact predictions with the real effects afterwards.

The lack world-wide of systematic studies of the real effects of development actions indicates low interest in "**organised hindsight" as an instrument for improving "institutionalised foresight"**. That is strange. If IA-systems combine mandatory ex ante analysis with a more systematic approach towards ex post evaluations or auditions, they should be much more efficient instruments for improving the quality of future pre-decision (ex ante) assessments.

Mackie and Preston (1998) stressed the need for such improvements when they looked for actions to reduce "biased appraisal optimism" in the transport sector. One of their recommendations of antidotes is "to spend a lot more on ex-post evaluation than is currently done. Systematic checking of what actually happened relative to forecast is an important discipline".

The Auditor General of Norway, too, is among those who during the last years has expressed strong concern for the lack of systematic learning from earlier development failures. When evaluating if the Norwegian IA-system worked as intended by Parliament, the auditor found that this system had no organised monitoring or audition of the approved projects to check if the implementation were as decided. Neither was it a systematic evaluation of the real effects to see if the significant effects had been as predicted (Riksrevisjonen 1997-98). The Norwegian Parliament reacted quickly to this critic and asked the Ministry of Environment as responsible for the impact assessment system, to improve guidelines and implementation of guidelines as required by the Auditor General (Innst.S. nr. 130: 1997-98).

The need to learn more systematically is linked to the importance of preventing major failures in the future, and to increase the degree and rate of success in the years ahead. Figurer 1.1 illustrates the relationship between pre-decision and post-development impact assessment.

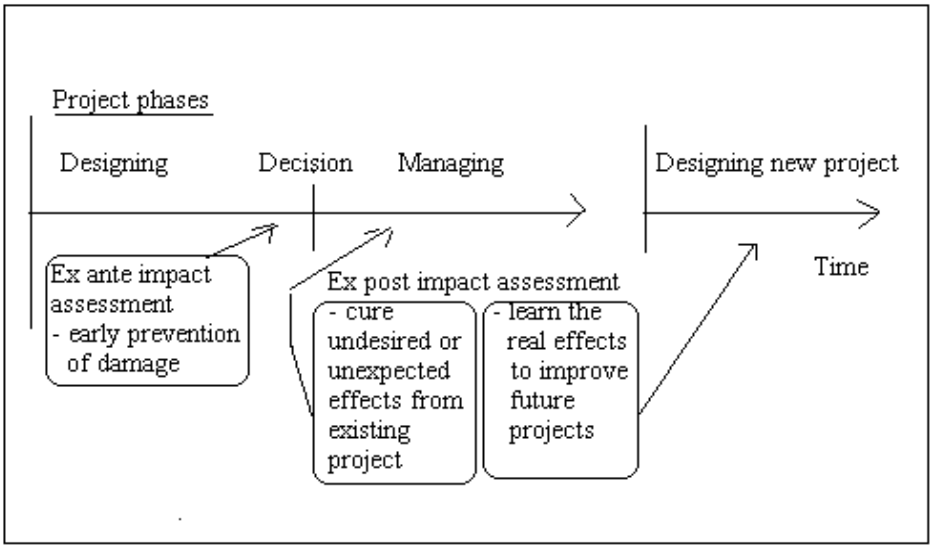


Figure 1.1 The basic types of impact assessments and their objectives

A change of focus in IA-systems - from pre-decision (ex ante) assessments to include post-implementation (ex post) studies, too, - can contribute to identification of the more significant effects and to reduced uncertainties in future predictions. However, it will be naive to believe that such improvements in themselves will secure that decisions and development actions become more environmentally friendly or more socially concerned. If IA-systems shall be an effective instrument in improving decision making at nation or international level, IA-systems have to promote more relevant and reliable predictions.

The question is how the quality of IA-predictions can be improved in an efficient way?

1.3 Basic ideas and assumptions

A basic idea in impact assessment systems is that a development action acts like a dose or stimulus to natural and social systems, which respond in more or less significant ways through different types of linkages between the dose and the responses. These linkages or relations can be described scientifically by help of "structural models" of how different mechanisms links elements together in the involved systems. For example, Chapter 3, 4 and 5 in this dissertation describe models of tourism and recreation in general, and effects of two basic types of projects in that sector. Chapter 2 is an attempt to use existing knowledge to identify the main conceptual elements in a "framework model" as to why IA-predictions fail.

An idealistic (but unrealistic) assumption in models of this kind is that by knowing the structural linkages and mechanisms and understanding the specific systems involved, it will be possible for applied science to predict the potential for and "true" response caused by the dose from a specific development action. That assumption is a controversial one and linked to analytic-rational thinking (Flyvbjerg 1999).

A more realistic assumption is that improved insight in structural linkages and the real processes that a specific dose creates could contribute to prevent major failures in decision-makers' judgement of future impact. At least this author is convinced that by combining improved analytical methods and empirical based insight in structures, it should be possible to improve our prediction capability and increase the degree of practical rationality. Participants in democratic decision processes, and fellow scientists, may disagree with this judgement. But it is not uncommon to characterise science as a body of knowledge based on cause-effect relationships that are used to predict the outcome of various events, trials, and experiments. A Nobel-prize winner in economics even states that "The ultimate goal of a positive science is the development of a "theory" or "hypothesis" that yields valid and meaningful (i.e. not truistic) predictions about phenomena not yet observed" (Friedman 1953).

This dissertation is based on the assumption that it is possible to make IA-predictions more relevant and reliable by proper use of science, and that it is important to do so.

One of the basic problems for scientists that share such viewpoints is to develop more reliable structural models of the response from specific systems on a specific type of stimulus. A key is to identify the significant linkages/mechanisms between causes and effects, and judge the degree of changes a given stimulus may create in the influenced system, both over time and space.

The degree of uncertainty in predictions based on such structural models will in general depend on:

- our insight in the casual mechanisms that forms the linkages between the elements of a system, and
- the stability or rate of change in the linkages and mechanisms, but also on
- the degree different social actors in a system can change the contexts of a specific development action, by using political power or other resources - as their creativity and ability to invent - to change structural relationships and the form of dose that an action represents.

One strategy for developing such models is to use earlier development actions as experiments that test scientifically based theories, and in that way learn more precisely how different types of systems respond to important types of projects, programs or policies. But some types of developments are major inventions or even unique, at least new phenomena at national level. Such projects, programs or policies can be special events, making it less easy to learn from earlier experiences about the potentials for significant impacts.

Therefore, the main advantage of systematic ex-post evaluations or auditions is tied to projects that are repeated over time at new sites and in new environments. Most countries repeat over time a large number of similar projects or programs, for example in the form of different types of major construction projects in the energy- and transportation sectors. There are also world-wide a large number of other types of programs and plans with many common elements, as for example regional community planning projects or designation of national parks. Each of these types of projects has a set of basic elements that are repeated from one location to another. The basic similarity should make it possible to learn from one project to another about the effects and impacts, even in cases where projects or plans evolve over time because of conceptual/technological development.

It seems logical to assume in general or at least on a project level, that if a specific type of development action is repeated at a new location, the **stimulus** itself from the new action should be **relatively stable** and comparable with earlier ones. The stability should make it easier to learn from earlier actions what will be the response or effects in a specific natural or social system of new and similar actions. If, however, a planned development action or new project is very different from earlier

actions and in that way is a unique or rare phenomenon and stimulus, it will be more difficult to use information from an earlier project to predict the response that the new type of stimulus has. Therefore, it is a difference in prediction capability between development actions that are repeated in a relatively stable form and new innovative, unique or rare projects, programs or policies. (Hydro-power and road developments, and Winter Olympic Games, are in Chapter 4 and 5 used to exemplify models of effects from repeated and rare/unique projects).

However, the degree of stability in stimuli is not the only factor that influences our capacity to learn from earlier experience and in that way reduce uncertainty in predictions. The systems that respond to a stimulus can **vary substantially both in time and space** for different reasons.

A significant reason for **change over time** in systems is the influence from external forces. If a system is not influenced by external forces, but acts as a closed system which depends only on internal mechanism and processes, then the internal linkages should be more stable compared with systems that are open for external influence. The degree of openness is, therefore, a determinant of stability and for prediction capability. Internal and external forces and processes may interact, and contribute to increased possibility for cumulative of interaction effects, if a system is open for external influences.

The degree of openness of a system is not necessarily a stable one over time. How open or closed a system is, can vary if linkages between different systems change or if a system changes internally. If a system become more open for external forces, that opens up for more variability and more uncertainty in future developments. Therefore, one of the main conclusions, in a recent international evaluation of impact assessment practise, was that the substantial and rapid changes that takes place in major systems world-wide will be a major challenge for IA in the future (Sadler 1996). The reason is that the whole world seems to change because of new heavy trends influencing the international economic and political systems.

Among the processes that increase uncertainty in impact predictions are trends towards globalisation, deregulation, privatisation, decentralisation, more complex types of development actions and a rapid change in technology. These trends are mechanisms that will influence many types of systems and make them more open and less predictable. (Chapter 6 in this dissertation discusses some mega-trends that now change tourism and recreation world-wide).

A discussion of prediction problems should, therefore, make a clear distinction between the two basic types of stimulus (repeated and unique development actions) and the two basic types of systems (open and closed systems). Table 1.1 summarises these relationships between basic types of stimuli and systems, and the potentials for using earlier experience and practical (empirical) evidence to judge potential effects from new actions.

Table 1.1 Basic types of stimulus and systems and the potentials for learning from earlier development actions.

Type of system	Type of stimulus	
	Repeated types of development actions	Rare or unique types of development actions
Closed systems	High learning and prediction potential	Reduced learning capability
Open systems	Reduced learning potentials	Less learning potentials

One reason for variability between systems of the same type is that the internal mechanisms can vary substantially between even the same type of elements and linkage. The effects of different locations, environments and contexts makes it difficult to judge if empirical impact evidence from an action in one location is relevant and reliable for the same type of action in another setting.

It is not unusual to hear proponents and opponents of a development action argue strongly about the relevance, or transferability, of impact evidence from one part of a country to another, or from one country to another (“the situation here is totally different - very similar”).

Comparative research, using similar actions (projects) in different settings as learning experiences (as used in chapter 4) should contribute to clarify the degree of similarities and, thereby, indicate the relevance of earlier actions of information and insight.

The social and political context of a development action may be among the most difficult issues to judge the effects of. If an actor that looks after its own interests, is a powerful or inventive participant in a decision process, more fundamental structural relationships can be changed during the process or afterwards. Even important structures and systems in society can be changed if a nation is determined to get the positive effects that are desired, or to prevent major undesired impacts from a specific project or program.

The "player's" that try to take care of their own or general interests in a development process, will base their arguments and actions on a "theory" about the effects of a specific development. Those "project theories" are not necessarily scientifically based and will, in connection with controversial development actions, be very divergent. Such controversies are situations where the proponet(s) and opponent(s) of a development action strongly disagree. Then, disagreements usually are either based on different judgements of the effects of an action and the relationships between the dose and response in project theories or on different evaluations of the value of the effects. Here the term "project theory" is used for the prevailing theory(ies) that both scientists and the participants in democratic decision processes base their judgements

of the effects from a specific development action, and not their evaluations of the effects.

The fact that development actions are parts of a social and political process, with both conflicting and common interests and "project theories/believes" among the involved participants, makes IA-prediction no easy task.

The historical and political context that a specific development action is part of, will influence most probably the decision-makers interest in the quality of predictions, too. If the prime concern of (some) decision-makers is to use a specific development action to take care of their own interests or the interests they represent, reliable predictions may be of low interest as long as the actions are beneficial.

If decision-makers think their role is to find political and socially acceptable solutions to major conflicts of interests tied to a specific project or program, their main concern may focus on finding a compromise and make the hard choices. Then, relevant and reliable predictions are of interest, but the prime interest is the difficult judgements and the decision. That may explain why few politicians and nations have been less concerned about learning the real effects of their experiments later on. Because, it is often too late to change the design of a project or stop the implementation after a decision to proceed is made. (In addition, some decision-makers and developers may even not be interested in learning the real effects of an earlier action, in case they may be blamed or made responsible for adverse effects from a major failure).

1.4 Research objectives, strategy and structure of the report

As mentioned earlier, the broad objective of this study is to contribute to improvements in impact assessments more in general. The subject of interest here, however, is not the political or procedural sides of impact assessment as policy instrument, but how to improve the substance or content of a more “technical” element - the quality of impact predictions. More relevant and reliable forecasts of effects from major development actions, and less prediction failures, is the goal.

It is a general problem that impact assessments made before a decision often lack predictions, or that the predictions which are made ex ante do not identify significant effects both in time and space (Bisset and Tomlinson 1988). The many vague predictions or major errors indicate a need especially for improved insight in how effects develop over time, and how responses vary in space.

Surprisingly few studies of natural and social impact categories clarify more precisely the degree of variability of effects in time and different influence zones, and the mechanisms that influence spatial effects and timing. There is most probably much **experienced-based knowledge** about such issues in the administrations, management’s and industries involved. But managers and businessmen seldom document or systematise their knowledge in such a way that their insight is

generalised and easily transferable to other situations. There is not much research based knowledge either that is based on systematic studies afterwards (ex-post), about the actual effects of very common development actions, which could be used for increasing our ability to make future ex post IA-predictions more successful.

Therefore, this dissertation focuses on three partial objectives.

1.4.1 Why IA-predictions fail; analytical concepts and the research design

The first, and main partial objective is to improve our understanding of why IA-predictions fail and to contribute to the development of a conceptual framework that is useful for identifying and analysing the major causes for impact prediction failures in general.

A thesis statement is often used to summarizes the point of view of an author, and starting point, for a scientific discussion ((Roth 1986). Here, my superior thesis, or proposition, is:

Failures in IA-predictions are effects of a limited number of general causes that may interact. Poor understanding of the relationships between a development action as a dose and the response from ecological and social systems are among the main causes. In other words, the main problem is low quality of the prevailing "project theory".

I start with an attempt to summarise as much as possible of the existing knowledge on these issues. This state-of the art-study is based mainly on research literature and not experienced based knowledge. Chapter 2 gives an overview of the findings and tries to clarify the conceptual framework for impact assessments in general, and concepts for analysis of impact prediction failures especially.

Literature reviews are, in general, attempts to learn from past research to improve future research projects. In this dissertation the review is an ex post assessment of earlier lessons from impact predictions as a measure to improve ex ante impact predictions. The review shows that there is less insight in the importance of different causes for failures, and how they may interact in different situations and create major predictions failures.

Therefore, this dissertation tries to identify **how important different causes of impact prediction errors are?** Answers to that question will add insight and probably give guidelines for attempts to make IA-predictions more reliable and relevant. But failures of IA-predictions will depend on several factors.

Here, the proposition about quality is that the main cause for errors in impact predictions is low quality of the project or development theory that predictions and decisions are based on. The intention is not to test if this thesis is “true” in general. The research strategy, which will be described more in detail in chapter 3, is to use

two case studies to investigate more in depth which category of causes are important and why. These case studies are chosen in such a way that they act as critical experiments and empirical tests of alternative effect-theories, concepts and IA-predictive models.

It may be unusual to assume that a more detailed examination of a couple of case studies in it self can provide relevant and reliable information about a broader class of phenomena. Flyvbjerg (1999) claims, however, that a large number of case studies are not needed to judge and justify the generality or typicality of scientific findings. Even one single case study can be a **critical test of alternative theories** if some specific empirical evidence is very contrary to basic assumptions in one of the alternatives. If a study show that the real world is very different from the predictions of a theory, then the empirical reality reflects “an anomaly” and the theory needs improvements.

The key idea is that each of the selected cases is strategically a study of alternative, but common effect theories. Both cases were controversial development actions and decisions, with an intense and open debate of potential impacts and the main linkages between the planned stimuli and involved natural and social systems. The involved interests had clear and very divergent impact theories, which should make it easier ex post to identify and test failures in effect judgements and in ex ante.

It is the existence of basic alternative impact theories that is a key element of the research strategy. That makes it possible to use these case studies to test the quality of the alternative theories and hypothesis against the empirical reality.

The case projects were unusual decision processes with extreme controversy and public debate. One of them acted as a "wake up" case for the Norwegian environmental interests (and even claimed to be a reason for the later creation of the Ministry of Environment). The interest in potential impacts was high and scrutiny of the quality of predictions followed accordingly. That makes these cases favourable for investigating relevance and reliability of the impact theory and predictions that the decision-makers based their final choice on.

These case studies are not only used as critical tests of alternative effect-theories and concepts, but to test relevance and reliability of structural models for effects in time and space on the tourism and recreation sector especially. A partial objective of this dissertation is to improve the empirical base for such models.

It has, however, not been possible here to cover all types of impact assessments related to tourism and recreation. Several studies have looked on the impacts that tourism and recreation has on the environment (Teigland and Holden 1996). This Ph.D. dissertation restricts it self to **effects on tourism and recreation** from important types of major development projects that are implemented today in many countries world-wide.

It is two basic types of development actions that influence the tourism and recreation sector. One type has improvements for the tourism and recreation sector as the main objective. In other words, the **positive purpose-effect** of such actions is on or within the tourism and recreation sector. The rational and stated purpose is that the actions themselves will have positive effects for the tourism and recreation interests. Examples can be the development of new major tourist and recreation facilities as new winter or summer resorts, or major events as cultural festivals or sports-events. The other main type of development actions has their main positive purpose in other sectors, outside the tourism and recreation sector. But they have a potential for significant **side effects** that influence the tourism and recreation either positive or negatively.

Development actions that have **adverse side effects** on tourism and recreation are a case of especial interest. Therefore, this dissertation covers both structural effect-models for projects that have an intended positive purpose-effect and a potential for strong positive/adverse side effects on the tourism and recreation sector.

Structural models for both types of development actions should contribute to more realistic predictions of effects in time and space. Experience from major projects in the tourism and recreation sector shows that decision-makers and other participants in decision processes have, or at least express, often unrealistic expectations about the volume and duration of effects, either expecting too positive/negative or to lasting/short-lived effects. They expect also often too large or small influence zones, or at least express such expectations.

The often strongly divergent expectations make decisions more difficult as it is not easy to find a compromise between very opposite opinions. But that may also be a part of the “democratic play” as the expressed expectations reflect positions that participants (players) in a decision process take as advocates or opponents of a specific development action. Those positions, and the effect-theories their arguments are based on, should be confronted with and tested against empirical evidence from earlier projects that are relevant.

A proposal subordinating the former one is that effects on tourism and recreation from basic types of projects have clear structure in time and space. In other words, the effects will vary substantially in space and time because of the dose or impulse from a specific project, not because of natural short-term variations.

This thesis is important since most attempts to predict future patterns of change depends on either

- an understanding of the forces that changes structure and/or processes (that require an identification of the significant forces), or '
- a possibility to project earlier structures or trends into the future (which require some kind of stability in time/space patterns).

In both cases, it makes it easier to find the main causes for change if effects have clear and observable structure in time and space.

The case studies that are presented later on test this thesis against empirical evidence, but limited to patterns of change in the tourism and recreation sector. One of these tests analyses the alternative pre-development predictions and the empirical evidence of the real effects on tourism and outdoor recreation from a common type of development (major hydropower and road developments). The other test compares effect-predictions and the reality after a relatively rare, or unique, type of projects (the mega-event of Winter Olympic Games).

The research design and methods used are described more in detail in chapter 3, which also clarify important concepts for describing and analysing tourism and recreation systems in general.

1.4.2 How to improve relevance and reliability of IA-predictions

In general, the basic alternative theories about the effects from a development action focus on and reflect the interests of the main participants (“players”) in the decision processes. These players include normally the proponents, different opponents and the decision-makers. Therefore, empirical tests of the specific and alternative "project theories" these participants base their thinking, arguments and actions on are important measures for improving these theories and, thereby, the potential for changing the actions of these actors, both before a decision and afterwards.

Impact assessment is not only an instrument to find the “true or right” scientific impact theory and prediction, but to contribute to a social and political decision-process where different actors try to take care of their interest or general values.

Here, another superior thesis is that relevance of IA-predictions will increase substantially, if IA-systems in general and individual assessments in special change their focus - from the “project theory of science” that looks for the “right predictions” - to include the "project theories" of the main participant’s in democratic decision processes, also.

The case studies that are used, are strategically tests of the basic alternative theories that major actors in specific IA-processes had. Each development action (project) that is studied was, according to the effect theory of the proponent, unusually favourable actions and expected to have large positive effects and no adverse effects (on the sectors that here are studied). The implementation of these specific projects makes it possible to test both these theories and the alternatives, by comparing predictions and the reality.

Another common feature of the strategicaly case studies is that the theories of the different participants in the decision processes and their impact predictions are well documented. It has also been possible to compare in depth the predictions with the reality in time and space.

Chapter 4 and 5 describe these strategic case studies more in detail and analyse why the IA-predictions failed, including the extent and importance of the five main causes for prediction failures and weaknesses in the alternative effect theories. Both cases focus on and are limited to effects on tourism and recreation interests. But one purpose of these studies is to test the reliability of IA-predictions, and indicate how the reliability can be improved more in general.

A co-ordinated proposal is that both relevance and reliability of IA-predictions will improve if effect theories and other causes for errors in forecasts are challenged afterwards by empirical evidence from systematic and formative ex-post studies.

Chapter 4 discusses basic structural models for projects that aim at positive purpose-effects on tourism and recreation as mega-events, and give empirical evidence of the real effects by comparing different winter Olympic games, too (a comparative multi-case study design). Chapter 5 discusses a structural model for analysing and predicting side-effects from projects that may have adverse effects on tourism and recreation, as hydro power and highway developments. That chapter compare alternative effect theories with the reality by help of one single longitudinal case study and reference area.

Both chapters' synthesise the results of research projects made over a long period of time and published in different earlier reports between 1980 and 1997 (but in Norwegian language). Both are based on longitudinal scientifically case studies aiming on clarifying and understanding effects in time and space from major developments projects. They are "pilot studies" and attempt to understand why ex ante predictions have failed.

Chapter 3 gives an overview of the research strategy and problems in general, including internal and external validity of case study designs. Each of the following chapters give information on the specific research design and methods used in each case study. They have references to much more detailed reports, too (but published in Norwegian). An important part of the work on this dissertation has been to synthesise information developed earlier, but not published in an integrated way.

Both case-studies show that an important reason as to why ex ante effect predictions have failed is a lack of insight in the dynamics of tourism and recreation itself, and the interactions between tourism and recreation as a systems and other related processes taking place in the society. Chapter 6 investigates, therefore, some of the basic driving forces behind mega-trends that today take place in tourism and recreation systems.

The last chapter summarises the main results and discusses the implications for IA-systems and guidelines in general. It also evaluates how individual impact predictions can be improved in the future by making the existing insight more relevant and reliable.

The objectives and main thesis are summarised in table 1.2.

Table 1.2 The main/partial objectives and thesis.

The main objective is to contribute to higher relevance and reliability of impact assessments in the future by increasing the insight in; - Why IA-predictions of effects fail in general, and in the tourism and recreation Sector especially, - How relevance and reliability of IA-systems and individual predictions can be improved	
Partial objectives	**Thesis (superior, subordinate and co-ordinate)**
Develop a conceptual framework for analysing why IA-predictions fail and identify the most important causes for errors	Failures in IA-predictions are effects of a limited number of causes that may interact, but poor quality of the prevailing "project theory" are among the main causes (superior).
Increase the insight as to why IA-predictions fail by two formative evaluations of effects in time and space, limited to tests of relationships in basic types of structural models for effects on the tourism and recreation sector.	Effects from basic types of projects have clear structure in time and space. In other words, the effects will vary substantially in space and time, but not because of natural short-term variations (subordinate).
Clarify how the reliability and relevance of IA-predictions can be improved by using the research finding of this dissertation	**- Relevance** will increase substantially if IA test the alternative theories that participants in democratic decision processes base their thinking and actions on, in addition to scientific effect theories (superior). **- Reliability and relevance** of IA-predictions will improve if effect theories and other causes for errors are evaluated by systematic ex-post studies (co-ordinate).

Finally, it should be mentioned that this dissertation has two minor objectives, too. One is to demonstrate the usefulness of in depth ex-post case studies as a measure to improve insight and our capability for IA-predictions in the future. The other is to share insight with other scientists internationally and in that way, too, increase the efficiency of IA-systems. The last objective explains why this dissertation is written in English.

References:

Andrews, R.N.L. 1988. Environmental impact assessment and risk assessment: learning from each other. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. pp. 85-97.

Bisset, R. and Tomlinson, P. 1988. Monitoring and auditing of impacts. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. pp. 117-128..

Caldwell, L.K. 1998. Implementing Policy Through Procedure: Impact Assessment and the National Environmental Policy Act (NEPA). In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment for the New Century. AEPI . IAIA. Fargo, USA.

Dipper, B. Jones, C. and Wood, C. 1998. Monitoring and Post-auditing in Environmental Impact Assessment: A Review. Journal of Environmental Planning and Management. Vol. 41, No. 6. Pp. 731-747.

Friedman, M. 1953. The Methodology of Positive Economics. Essays in Positive Economics". University of Chicago Press, Chicago. P. 7.

Flyvbjerg, B. 1999. Rationalitet og makt. Bind I. Det konkretes videnskab. Akademisk Forlag. Århus.

Hildebrand, S.G. and Cannon, J.B. (eds) 1993 Environmental Analysis. The NEPA experience. Introduction. Lewis Publishers. Boca Raton. Florida.

Innst.S. nr. 130 (1997-98) Innstilling fra kontroll- og konstitusjonskomiteen om Riksrevisjonens undersøkelse av miljømessige konsekvensutredninger. Stortinget. 1998. Oslo.

Lee, N. and Brown, D. 1992. Quality control in environmental assessment. Project Appraisal. Vol. 7, Nr. 1 March 1992. pp. 41-45.

Lee, N. and Dancey, R. 1993. Quality controll. The quality of environmental impact statements in Ireland and the United Kingdom: a comparative analysis. Project Appraisal. Vol. 8, Nr. 1 March 1993. pp. 31-36.

Mackie, P. And Preston, J. 1998. Twenty-one sources of error and bias in transport project appraisal. Transport Policy, Vol.5, pp. 1-7.

Mohr, L.B. 1988. Impact Analysis For Program Evaluation. Brooks/Cole Publishing Company. Pacific Grove. California.

Riksrevisjonen 1997-98. Dokument nr. 3:6. Riksrevisjonens undersøkelse av miljømessige konsekvensutredninger. Oslo. The Chief Inspestors Review of the Impact assessment system (In Norwegian).

Robinson, N.A. 1993. EIA Abroad: The Comparative and Transnational Experience. In Porter, A.L. and Fittipaldi (eds). 1998): Environmental Methods Review: Retooling Impact Assessment for the New Century: Army Environmental Policy Institute (AEPI). Atlanta.

Roth, A- J. 1986. The Research Paper. Process, Form,and content. Wadsworth Publishing Company. Belmont. California.

Sadler, B.1988. The evaluation of assessment: post-EIS research and process development. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. Pp. 129-142.

Sadler, B. 1996. Environmental Assessment in a changing world. Evaluating Practice to Improve Performance. Canadian Environmental Assessment Agency (CEAA) and International Association for Impact Assessment (IAIA).

Sadler, B. and Verheem, R. 1996. Strategic Environmental Assessment - Status, Challenges and Future Directions. Ministry of Housing, Spatial Planning and the Environment. The Netherlands, Publication nr. 53.

Teigland, J. and Holden, E. 1996. Tourism and the environment. An international «state of the art study». What can we learn from foreign abroad. VF-report 5/96. Western Norway Research Institute. (In Norwegian).

Webster, R.D. and Fittipaldi, J.J. 1998. The Army's Interest in Impact Assessment Methods Review: Relevance and Efficiency. In Porter, A.L. and Fittipaldi (eds). 1998): Environmental Methods Review: Retooling Impact Assessment for the New Century: Army Environmental Policy Institute (AEPI). Atlanta.

Wood, C.M 1995. Environmental Impact Assessment: A Comparative Review. Longman. Harlow.

Wood, C., Dipper, B. and Jones, C. 1998. Auditing the Assessment of the Environmental Impacts of Planning Projects. Results. Draft 5 of article 2 (18 April 1998).

2 Basic IA-concepts and a review of international research literature

This chapter builds partly on a paper on the philosophy of science that was presented on a seminar organised by the University of Bergen and Professor Nils Gilje. The paper was published in the Norwegian journal Plan in 1997, number 6/97. pp. 30-39 (in Norwegian). Only parts of the paper are included here and the text has been revised extensively.

2.1 Impact assessments as instrument before an action

One of the basic ideas behind impact assessments is that it will be easier and more reasonable to prevent problems by following a precautionary principle before an action, than to repair unintended damage afterwards. Another fundamental idea is that if planned actions need improvement then today's best possible knowledge should be used. Application of the best available and objective science is, therefore, important elements in impact assessments (Caldwell 1998). A key assumption is that problems can be prevented and decisions improved by explicit analysis and documentation of the impacts (Andrews 1988). Impact assessment is, therefore, an instrument to control potential effects before an action is taken.

Relevant and reliable predictions of the likely changes that will take place, the effects, is a core element. The effects of a project/program are found by comparing what would happen during and after the project/program is implemented, with what would happen without it. A situation without a specific development action is before a decision often referred to as the "no action-alternative", "do-nothing alternative", or the "null- or 0-alternative" (Moen and Strand 1998, McCold and Saulsbury 1998). After the implementation is over, the term "counter-factual" is used for the no-change situation, too.

The difference identified by such comparisons is the effects, or result, of a specific project/program. If the predicted effects are not acceptable when assessed before a decision, plans for a development can be changed, or the proposed action stopped. If a development plan is changed (or stopped) before an implementation starts because of information from impact assessment studies, such changes in a prior proposed action plan is a feedback-effect caused by the IA-procedure.

Feedback is the way an impact assessment process can improve a plan, and should not be a rare phenomenon. But representative studies of the degree of feed-back and the degree of change in original plans are few. Sadler (1998) refers to the second

(five year) review of Dutch impact assessments, based on a sample of 100 cases, that found ”visible” environmental modifications of plans in approximately 50% of the proposals. Similar findings are referred from UK, too, but (quote): ”the large majority of modifications were classed as minor or moderate rather than major”.

Ideally, according to Wood et al. (1998), feedback should be a continuous process for any development, leading to modification and refinement of project design to reduce negative impacts and increase positive ones. Mitigation efforts should reduce negative effects to levels acceptable (by decision-makers), but may not eliminate them totally. Impact assessment should, therefore, evaluate alternative mitigation’s actions and predict the ”remaining effects” if plans are changed as recommended. Wood et al (1998) use the term ”post-mitigation” of the expected effects remaining after a plan/program have been modified in order to avoid, reduce or remedy potential impacts.

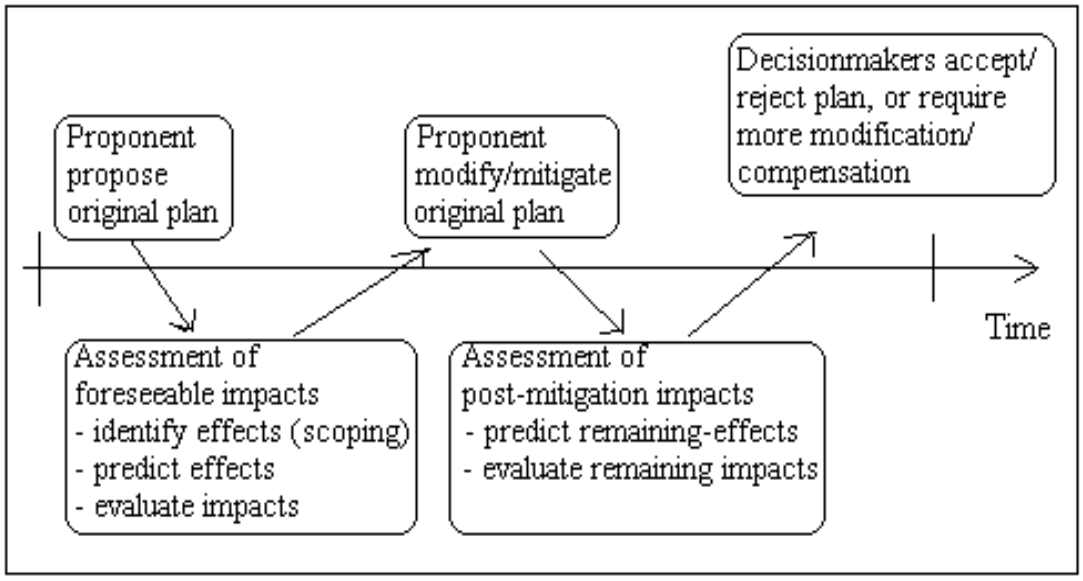


Figure 2.1 Idealised feedback process between project planning and impact assessment

Predictions of future developments will always have some degree of uncertainty about the magnitude, the significance, the timing and/or the spatial distribution of effects. Forward looking decision-makers who want to reduce uncertainties in predictions of the remaining or post-mitigation effects, may require follow-up studies after a decision (ex post), to monitor the developments taking place and the effects during the implementation and operational phase of a project. The term ”postproject analysis” (PPA) is also used for impact assessment studies done after a decision to

proceed with a given development activity (Miller 1993). "Post evaluation" or just "evaluation" are other terms often used for backward looking and systematic studies that clarify the results of a planned action (Vedung 1991). Then, decision-makers use evaluation research to check how the implementation functions, how the real effects are, or if there may be more efficient ways of reaching the decided objectives.

One aim of follow-up studies, monitoring schemes and ex post evaluations can be to check if the implementation of a development plan/program is done as decided. "Compliance audits" is a term used about follow-up studies that compare practice against intentions (Sadler 1988), or implementation against the approved plans. Then, implementation includes not only the decided plan/concept, but also the mitigations required by the decision-makers that gave permission to proceed with a development. "Tracking program" is another term used for follow-up studies that ensure the decided mitigations are carried out (Culhane 1993).

Monitoring systems can function as an "early warning system", too. Monitoring makes it possible to react earlier if unexpected and unwanted effects emerge, and to modify a development in time to change emerging effects or to mitigate such effects. Therefore, follow-up studies after a decision will function as another feedback mechanism, too, that may improve a specific project or program. Such control mechanisms will be an adaptive management and can in principle follow a project interactively through the total "life cycle" controlling adverse effects (but very few life cycle studies are known, according to Sadler 1998). "Performance audits" is a term used about this type of ex post studies (Sadler 1988). Project management PPA is the term used by Miller (1993) about compliance and performance audits in general.

2.2 Impact assessments as a learning process

Major development actions are often full scale and non-reversible experiments on the environment, human beings and the involved societies on local, regional, national or multinational level. Impact assessment is in that way not only a tool in democratic decision-making concerning a specific projects or programme. If systematic evaluation or monitoring take place during and after the implementation of a planned development, it can also be a way to learn from the experiment. Then, the learning process is not only a feedback to a specific project during the planning, implementation or management phase.

Studies done after a development have started (ex post) to clarify what really happens will contribute also to a "feed-forward" process making more knowledge available to improve future ex ante impact assessments, predictions and the "technical" concepts for new projects/ programs. In addition, follow-up studies can clarify the effectiveness of the planning and decision process, including the IA-procedural element. A study done to determine the lessons to be learned, in order that future projects and impact assessments can benefit, is a "process development PPA"

Miller (1993). But could as well be called an ex post ”learning assessment” or an evaluation study.

Ex post learning assessments are based on the idea that good insight and understanding of earlier projects (using backward looking or backcasting methods), would make it possible to foresee effects of future projects (using forward looking or forecasting methods). But symmetry between ”backcasting” and ”forecasting” may not always be the reality if there are reasons to believe that the future will not be like the past. Ex post studies may not give all of the knowledge that is needed to make accurate predictions in the future, as most ecological and social systems are complex with unknown structures and functions. New knowledge and technology may also change the form and contents of future projects and programs, and in that way also change earlier relationships between cause and effect. It can in other words be an asymmetric relationship between audits that explain earlier effects and forecasts of future effects (Gilje and Grimen 1995).

If it is symmetry, future developments will be formed by the same causal relationships as in the past. ”Projections” based on extrapolating earlier and present trends will in such cases be an important prediction method. However, knowledge based on past history and experience is not enough if it is an asymmetric relationship. Then, the effects of a new intervention or unexpected ”interference” have to be included (Westman 1985). Intervention and interference which give new causal relationships and predictions have to be based on explanatory models that ”forecast” future events (Becker 1995). An audit of prediction accuracy may not clarify the difference.

The term auditing is used in many ways (Buckley 1995). In impact assessment literature it usually refers to an ex post comparison between the existing (baseline) situation before a development action starts and the future situation after the implementation is over, indicating short- or long term change and the effects of the development. But auditing can also refer to a comparison of the real situation at a specific time with a benchmark or goal set for that time. Benchmarking is used in corporate environmental auditing, and in public planning and management auditing, as an indicator of progress and to clarify if corporate and public actions are as effective as desired (Buckley 1995).

Wood et al. (1998) use the term ”audits” about examinations of the performance of various aspects of IA- systems in general, and ”post-auditing” about investigations of the accuracy of impact predictions. Then, accuracy refers to the retrospective difference between ex ante predictions and the impacts that actually occur. Two basic approaches to post-audits have been used (Bernard et. al 1993). The first one identifies ex post the most important or significant impacts from a project, and inspects afterwards the ex ante assessments that was made to ascertain whether the impact was adequately predicted in advance. It is a ”backward” looking strategy and the term ”post/pre-audit” is used for this type of approach that will also identify important non-predicted impacts. Or ”surprises” as Bernard et al (1993) call them.

The second approach compares all individual ex ante predictions with the ex post realities, and is a ”pre/post” auditing of accuracy, that covers both important and unimportant impacts identified in ex ante assessments. But pre/post auditing will not identify the unexpected ”surprise-effects”.

Auditing studies in general measure what has happened and the degree of change, or the accuracy of predictions. They summarise only the effects of a project or program and are, therefore, referred to as ”summative evaluations”. But decision-makers that want to improve future actions need, most often, additional information about why effects have been as they have, or not as predicted. Studies that aim to improve future actions, and “form” future projects or programs, are ”formative evaluations” (Mohr 1988). Formative studies do that by increasing our understanding of the mechanisms behind the changes that takes place, or the lack of change.

Improved understanding of mechanisms that forms the effects from development actions can also be of help when generalising the information into theories with relevance for other settings or types of projects. Formative ex post studies will focus on impact theories and the causal linkages that explain why effects have not been as desired and/or how effects could have been improved.

2.3 Post-auditing as quality control

Even at the international level, there are is surprisingly few ex ante impact assessments that have been followed up with new studies afterwards (ex post) comparing impact theories, predictions and the reality. Therefore, the real short and long-term effects of large development actions are seldomly evaluated and the real significance rarely identified. An opportunity to learn from ”trial and errors-experiments by increasing the experience-based knowledge is missed in most cases. Few countries have organised systematic learning processes, requiring monitoring systems, follow-up studies or post-auditing of major projects or political programs. Netherlands has, however, established a legal requirement for postproject analysis in 1986 (Miller 1993). New Zealand did the same in 1991 (Taylor et al 1998).

The advantage of using ex post studies to learn relates to projects and programmes that are repeated, either in new locations or in slightly modified forms, such as hydro-power developments, building of highways or the designation of large nature protection actions as national parks. By studying afterwards the real impacts of earlier experiments, it should be easier to foresee and predict effects from new and similar projects, and in that way improve the quality of new ex ante impact assessments (Bernard et al. 1993).

The main problem with predictions of effects based on the experience from similar (generic) projects is to evaluate to what degree the established knowledge have relevance for future project. The problem with new and unique types of projects is that it is no experience-based knowledge of the effects from such projects. It is, however, claimed that few projects or programs are so unique phenomena that

relevant information can not be found from studies of any other earlier developments. Careful considerations may show that even ”unique” phenomenon are a special case of a more general phenomenon that is covered by a ”standard theory” (Denzin 1970).

The low interest in nearly all countries to organise systematic learning processes, and do follow-up studies, would be easy to understand if most impact assessment studies give decision-makers the relevant and reliable information they need. If today’s IA’s have high quality; ex-post studies and organised learning processes would be a waste of time and money. But low quality of ex ante impact assessments is an international problem and has been for a long time (Andrews 1988, Bisset and Thomlinson 1988, Sadler 1988, Lee and Brown 1992, Lee and Dancey 1993, Warnken and Buckley 1998).

Quality refers most often to the three key elements or functions of impact assessment;

- identification of likely and important effects,
- predictions of the effects (direction, magnitude and probability of change), and
- evaluation of the significance and importance of change (the impacts).

Some countries require that identification of likely and significant effects are done in a systematic way, through a ”screening or scoping process” before an impact assessment study takes place. This scoping can be done by experts and according to their scientific opinion (paradigm), or according to established checklists and effect-matrixes that organise potential impacts in a systematic way (see i.e. Westmann 1985). The impact assessment itself should ideally focus on the significant effects, to reduce waste of time and money.

The term ”effect” is used about the magnitude of change caused by a development action, but ”predictions of effects” include both magnitude and probability of change. A development acts like a planned dose to the environmental and socio-economic systems, and the change that takes place is the response (dose-response and cause-effect). The response may vary in time and space, and be permanent or preliminary with varying duration and degree of reversibility.

Normally the response from a dose starts with the implementation of a development project, giving implementation (construction) effects and short and long term effects afterwards during the management phase.

The time distinction between short and long term effects are, however, seldom discussed or clarified in impact assessments, or in literature that focus on predictions in general. The pattern of effects during the total life cycle of a project and the effect boundaries in time and space is also rarely discussed.

Conover (1987) identifies three spatial zones influenced by effects of a project. The influence or impact zones include:

- areas with physical disturbance (i.e. construction activities); here referred to as ”the core” of the influence zone.
- adjacent areas influenced by normal operations (i.e. the more circular range influenced by noise, air pollution etc., and more long stretched ”traffic corridors” influenced by movement of goods, animals or man).
- areas influenced by major accidental events.

Effects in time and space are often defined as the change from the baseline situation in the influence zones before the implementation of a development starts (a ”before and after”-definition). But the conceptually correct definition is that the effects are the difference between the real situation after a development and the situation that would have been without the development (a ”counterfactual” definition”). But even large change in attributes (or parameters) may have a low significance or consequence, if the change itself is not very important. Small changes may at the same time be very significant, if the change makes an important difference. If for example a tourist business is close to bankruptcy, a low reduction in the number of tourists may have large impacts on the business and on the local community. The term ”impacts” are often used about the significance or importance of the effects from a development. Impacts are then the values attributed to change.
A recent British study of a planning project did show that the magnitude of change and the significance were rarely dealt with separately and were often considered as one issue in the impact assessments reports (Wood et al 1998). Canada has, therefore, introduced a legal requirement stating that impact assessment have to analyse change (effects) and significance (impacts) separately.

Treweek (1995) use the term ”significance” about the value of the change in attributes in a specific sector, comparing for example ecological values before and after a development. The term ”importance” is used for the relative change in values between sectors, cross-comparing the change in ecological values with, for example, the values for the local community of a development. The significance of each specific category of impacts has to be clarified before any cross-comparison can evaluate the importance.

Evaluation of significance and importance are value questions that applied science may help to clarify. But the final value assessments are in democracies done by elected decision-makers and bureaucrats.

IA-processes should cover all three elements of identification, prediction and evaluation as precise and correct as possible, by using the best available knowledge in the form of applied science. But the main purpose is to provide an acceptable basis for making public decisions, within constraints of time, money and existing knowledge (Andrews 1988). Therefore, a decision process in democracies is not necessarily a scientific process looking for new truths and knowledge, as in basic research. It is mainly a social/political process, and looking for solutions that can be acceptable for the interests involved. Impact assessments that focus on the ”existing scientific paradigm” may be of less relevance for decision-makers if they are

searching for a socially acceptable compromise. The alternative impact theories that the social actors have (”the paradigms of the interest groups”) are then also relevant and important for decision-makers that want ”room for manoeuvres” in a case full of conflicts.

Reliable predictions of effects are in any case a key element for the participants in a democratic decision process. The quality of predictions has been, however, very poor in many impact assessments. Quality control of impact predictions is a relatively new phenomenon and little has been known about the qualities in general. Buckley (1995) did find only five studies in the world done before 1990 that checked the prediction accuracy in more than one project. Only one audit had at that time covered the accuracy of impact assessment for an entire country.

An early overview of quality in ex ante assessments did show a lack of predictions both of effects in time and space. A detailed case study of four major developments in UK identified 791 predictions. But only 9,7% of them were testable ex post (Bisset 1985), and the identified predictions were frequently (quote):”expressed in vague, imprecise and even ”woolly” language” (Bisset and Tomlinson 1988).

The first nation-wide and representative post-audit study from Australia gave more precise (quantitative) information, and verifies that systematic learning processes were rare, at least in the 1980’ies. Of approximate 1000 projects with environmental impact assessment documents (EIA’s), only 1,9% of the projects had testable predictions (Buckley 1995). Several thousand individual predictions were identified, but only 3% of them had been followed-up with monitoring afterwards to measure the real effects. It was in addition difficult to compare predictions with the reality afterwards in the small minority of cases that were monitored. Post-audit was only possible in 18% of the few predictions that had been followed-up. The misjudgements varied from 0.05% to more than 30 times of the predicted values (Buckley 1995). Predictions where actual impacts proved more severe than expected were on average significantly less accurate than those where they proved as or less severe.

A relatively early Canadian study found the track record of impact predictions to be mixed. Statements of magnitude of change were typically a failure, but the nature and direction of major effects were correctly identified (Munro et al. 1986). But recent studies of representative samples of planning projects in Britain and tourism projects in Australia did find no overall increase of quality over time (Warnken and Buckley 1998, Wood et al. Draft 5, 1998). The most recent Australian study of a representative sample of 170 tourist projects planned between 1987 and 1993 concludes that the scientific quality of that type of impact assessment was ”a very long way short of the most basic standards for applied science” (Warnken and Buckley 1998). The authors added ” There are very few comparable data on scientific quality of EIA for other countries and sectors, but no *a priori* reason to assume it is any better”.

2.4 Uncertainty and precautionary principle as ethical guideline

Assessments of the effects of a project/program, defined as the difference between the counterfactual and the real situation after the implementation, will always be tied to uncertainty. Before an implementation (ex ante) the new real or resulting state afterwards is not a certainty, but only hypotheses about the future. The null-alternative is also an unknown state that can be influenced by unknown future events. After an implementation (ex post) then the new real situation is observable. But the counter-factual state will not be observable and, therefore, neither the counterfactual nor the effects are possible to know with certainty. Conclusions in ex ante and ex post assessments will, therefore, always have a degree of uncertainty.

The observed low accuracy of impact assessments should, however, be a major concern for the scientific community. The large degree of unspecified or vague effect theories and predictions in IA-documents makes it difficult for scientists to use development actions as practical experiments to test a hypothesis about relationships afterwards. A low degree of ”scientism” makes project theories not testable, and makes it difficult to use ex post studies to improve the knowledge base for planning and deciding on new projects. The ability to organise scientific learning processes becomes, therefore, low. One effect is that low reliability and relevance of predictions may become a lasting problem.

Decision-makers should be concerned too, as faulty predictions will make major projects and programs economical and political failures. One effect is that decision-makers loose trust in applied science (and then reduces their interest in contributing to research budgets). Their interest in using IA-processes as a decision tool may be reduced also. Warnken and Buckley (1998) conclude, however, ”the value of EIA as a public information tool is not in doubt” and refer to another study by Buckley (1997). Their distinction between EIA as a decision system and public information system is interesting. It must indicate that the introduction of an EIA-system in Australia has improved the information distribution element, but the substance in the information is still far behind basic standards that applied science can and should deliver.

The growing documentation of low reliability of predictions does strengthen ethical requirements that ask scientists, consultants and decision-makers to follow a ”precautionary principle”. The National Committee for Research Ethics in Science and Technology in Norway (NENT) emphasise such requirements as scientists and decision-makers in many cases will not experience the negative impacts of misjudgements themselves. It is the involved parties that will feel the impacts most directly, if predictions and reality is divergent in unwanted ways. It may therefore, be ethical correct to give more weight to the viewpoints of the interest groups involved than to assessments from scientists of the advantages, disadvantages and risks from development actions (NENT 1997).

Because of the uncertainty that surround many predictions, predictive statements should always be accompanied by a discussion of the limitations of a specific impact

assessment (Andrews 1988). An early study of the scientific quality of 75 environmental impact statements produced in the USA found that 82% never used well-developed probability notions to estimate consequences, and none of these statements did so systematically (Caldwell et al 1982). Another early study of 242 IA-drafts concludes that few impact assessments did explicitly acknowledge significant sources of uncertainty, and addressed the question of incomplete and unavailable information (Reeve 1984). It is rarely the case in more recent studies either (Culhane et al 1987, Glasson 1994).

A statement of confidence, which can be attached to the predictions, should also be made. The recent British audit of a representative sample of planning projects did show that most IA-authors was confident about the nature and accuracy of the predictions they had made (Wood et al 1998). Of 865 specified predictions 15% had a high probability and 62% had a ”certain” probability of occurring. Their confidence in the predictions was with justification in around half of the cases according to the follow-up study (Wood et al 1998). Statements of confidence or uncertainty were, however, of variable quality. 20% of the audible predictions with an expressed probability, stated that the probability was low. But still the effect became a reality. Thus (quote), ”for these predictions, the overall outcome was worse than predicted: the impact did arise, with adverse consequences, despite the impact assessment saying that it would not happen”.

Normally scientists wish to have high credibility. They require a high certainty and probability before drawing a positive conclusion from empirical evidence, so users can trust the findings. A standard norm is to require at least 95% probability before empirical evidence is significant. In ”normal science” it is, therefore, important to not draw wrong conclusions, but minimise the probability for false positive conclusions (Lemons and Brown). If it is true that an experiment or project had no effect, then it is scientifically important to not make the false conclusion that the effects was significant. Statistical testing is accordingly based on low probability of falsifying a true hypothesis (making a type 1-error).

Impact assessment may, however, not be ”normal science” if the acceptance of ”a wrong conclusion” (type 2-error in testing of hypotheses) have very adverse or irreversible consequences. If an ex ante assessment gives wrong predictions and conclusions, then decision-makers can be mislead. If the prediction is that a project will have no adverse impacts on the environment or human health, and the predictions were wrong, such failures can lead to unjustified degradation of the environment or human health. Antcliffe (1999) refers to studies that indicate type II errors to be more costly, too, than type I -errors.

If, for example, an IA-expert predicts that a project will have adverse effect on the environment, and the prediction in reality is true, then the decision-makers make a type I-Error if they decide the expert’s predictions are wrong and instead expect the effects to be null. In case decision-makers draw the wrong conclusion and think a project has no effects, then they most probably will do nothing to prevent or mitigate the adverse effects they do not expect. Such “unexpected” adverse effects can be

costly, as nothing has been done to prevent them. If, however, an expert predicts adverse but untrue effects, then the decision-makers do a type II-Error if they believe in the incorrect prediction. In that case the decision-makers most probably will try to mitigate or compensate the adverse effects they expect (even if they are mistakes). The mitigation itself will be a preventing-action (based on a prediction mistake), but can be less costly than to make no action to prevent adverse effects (even if the no-action too is based on a prediction mistake).

If decisions are based on a false theory or hypothesis, then unpredicted and unprevented adverse effects can be the reality. Decision-makers should, therefore, be especially precautionary and prevent accepting false theory and predictions (type II-errors). The concern in normal scientific activity is, however, not to reject the truth. Accepting false theory and predictions are less important in normal science than not rejecting the true hypothesis or true predictions (making a type I-Error). That explains why some philosophers of science regard impact assessments as ”post-normal science” (Funtowicz and Ravetz 1993).

If scientists use the precautionary principle, that may require an unusual low degree of evidence before the conclusion should be to NOT recommend a project/program, if wrong prediction (based on wrong theory or data) may have large negative impacts. The lack of certain knowledge, and the need to prevent ignorance that can be blamed, can in itself be ethical criteria for scientists to not recommend the implementation of uncertain projects (NENT 1997). If decision-makers do want to implement a project with uncertain and possibly important adverse effects, then a monitory system should be a necessary requirement.

An important future task for scientists is to clarify the role of applied science in democratic decision processes, and ethical norms for researchers contribution to impact assessment. Another task is to clarify the limitations of impact assessment as policy instrument.

2.5 Conditional relevance and alternative policy instruments

The practical usefulness of IA in democratic decision processes depends on IA's ability to identify, ex ante, as many significant effects as possible and indicate the values related to change. However, relevant and reliable predictions are a real problem to deliver in two situations:

- either because the existing knowledge about the effects of an action is low, making reliable predictions unrealistic, or
- the main decision-makers have made up their minds already to implement a development action or are committed by earlier decisions, making impact predictions less relevant since they will be presented too late.

If the knowledge base is poor and the potentials for adverse irreversible effects seems high, an “ethical” option for scientists or IA-experts is to advice decision-makers to

not carry out such project. This judgement can be based on the importance of the precautionary principle that is accepted by the international community and discussed earlier in this dissertation.

If decision-makers are committed to implement a specific development action because of earlier decisions on higher policy, plan or programme level, IA on project level may have reduced relevance. In such cases, one logical solution is strategically impact assessments (SIA) that focus on the impacts of alternative options of action, be it alternative policies, plan or programs. SIA can in principle be a normal IA that "only" is used on a higher level of complexity and conditional ambiguity than projects. But SIA are, therefore, less concrete, specific and localised than IA, and less easy to assess.

Decision-makers can be committed for other reasons, too. One example is actions based on strong public support because of high expectations about positive outcomes in spite of low insight or high uncertainty about significant and negative side effects. Then, IA-processes and the quality of impact predictions have less relevance. In such cases, the subject problem of this dissertation - prediction failures - has minor practical relevance. The conceptual frameworks, models and empirical findings are less interesting, too.

In such situations, the decision-makers and participants in democratic decision processes have to look for alternative policy instruments if they want to take care of specific environmental or social interests. Therefore, an important question is what are the main options to impact assessments if decision-makers are committed or choose to implement a project in spite of major uncertainty. And when are the other alternatives more relevant.

At least two alternative policy instruments are in use today, if we assume that strategic impact assessment is not relevant or that decision-makers chose not to follow the precautionary principle. One alternative is to use a “limits to acceptable change”- approach and another is a “goal-means”- oriented approach.

2.5.1 Limits to acceptable change as an alternative approach

If it is difficult or not possible to judge and predict the **adverse effects** of a project in a reliable way, one alternative approach is to determine the limits of change that are acceptable for the involved interests or stakeholders. Such limits can, for example, be limits to environmental degradation that is acceptable for the involved interests, as limits to noise, pollution or psychological stress. In the case of the hydropower development in Aurlandsdalen, which is documented later on, limits to acceptable water flow in the main river was a major issue, and parliament required the

proponent to keep minimum water flow above a specific limit. (My case study of effects in Aurlandsdalen covered such issues, too, but they are not included here[1]).

The main idea behind concepts as "limits to acceptable change" (LAC) is, that if we can not predict relevant effects in a reliable way, the involved interests may instead be able to agree on what kind of change they will NOT accept (Stankey et al. 1985, Stankey 1989). If the stakeholders are able to reach a consensus on clear criteria for the limits of change that are acceptable, monitoring systems can be developed to indicate if limits decided on in advance are approached. If such a limit is approached, proactive measures can be made to prevent further change in a direction and above limits that the involved stakeholders have agreed are not acceptable.

Limits of acceptable change (LAC) is a way of preventing undesired change to be larger than a pre-fix level, for example in the environment or in social, cultural or psychological qualities that are important for the stakeholders. If decision-makers want to be on the safe side, they can fix strict limits. If they, later on, find reasons for changing their mind, for example because new knowledge show that the impacts of a change above a limit is less important than expected earlier, prefixed limits can be made less strict. But LAC is an approach that depends on a consensus among the stakeholders or decision-makers, and is in that way a human oriented decision and management system. Consensus may depend on a compromise among opposing interests, and compromises among humans today may be less strict than the interests of future generations would require or the consideration for ecological elements.

LAC-systems require no accurate predictions of the effects of a development action. But identification of clear indicators for the important qualities, which may change, is needed. LAC requires that a monitoring and decision system is developed, too, and that effective measures are available for proactive use if information from the monitory system shows that limits of acceptable change are approached.

The choice of indicators is important, as there seldom are resources to monitor over time more than a few types of change. If the system of interest is complex, as environmental and societal systems often are, key indicators may be used to gain information about change that are important for the system as a whole. All indicators are measurable qualities or characteristics that give reliable insights in how complex systems develop. It is preferred that indicators give "early warning" of approaching problems.

Decision systems, as LAC, are an alternative approach, if reliable predictions of adverse effects or the remaining effects are difficult. Another goal-oriented approach may be used, too, if predictions are less relevant, or decision-makers have made up their mind to carry out a project or committed themselves to implement a specific design.

[1] Limits to acceptable water flow for recreation purposes are discussed in Teigland, J. 1992: Water flow and recreation interests. A state of the art study with models for water flow simulations. Report nr. 65. Telemarksforsking, Bø i Telemark (in Norwegian)

2.5.2 Goals-means and sustainability as an alternative approach

If predictions of future effects are less relevant, and that may be a more rare situation on project level, it is possible to develop goals for how a project should effect important elements of the environment and society, in addition to goals for the desired effects or the purpose.

The concept of sustainable development may be used as an example of this type of approach, which states the desired direction of a development process caused by a project, plan or policy. For example, a sustainable project may be defined as a development action that does not change the available resources in an irreversible way and transfer unacceptable costs to future generations (Pigram 1992). Long-term sustainability in general focuses on the relationship between human activity and ecosystems and can be understood as “the capability of ecosystems consistently and effectively to provide the good of human life support” (Dryzek, as referred by Lafferty 1998). The term “directional analysis” is used about analytical efforts to determine whether a plan or policy contribute in a negative or positive direction with respect to reaching sustainability as a goal (Aall 1999).

The basic difference between goal oriented approaches in general and “normal” impact assessment is that IA’s focus on a development action as a specific dose (or means) and predicts and evaluates ex ante the effects (the ends). IA is, therefore, a “means-end” approach. Goal-oriented approaches has an “end-means” perspective and focus on how to get to specific desired goals (the ends) by following specific guidelines and measures (the means).

One problem, which the goal-oriented alternative have in common with the LAC-approach, is that it may be difficult to reach a consensus about what the ends are, in form of desired direction or state of the environment or society. Broad concepts as “sustainable development" is not easy to define, and so far more than 70 different definitions of sustainability have been found (Holmberg 1992, Høyer 1999). But goals do not prevent change, and can guide developments in more desired directions by giving guidelines and measures for proactive actions.

The "goal-end" approach was an important policy instrument during the 1994-Olympics and Appendix 4.2 give a short overview on how the decision-makers used that instrument after they were committed to implement the 1994 Winter Olympics. Here, the appendix is included to make the alternative approach explicit and to clarify how decision-makers can cope if predictions of future effects have limited interest and/or has low reliability.

The purpose of this dissertation is NOT to develop alternative measures to impact assessments in cases that reliable predictions of effects from development actions are unrealistic or less relevant. It is assumed that impact assessment predictions are relevant. The problem issue of interests is why IA-predictions fail.

2.6 Why predictions fail?

Another task for scientists is to increase the reliability of ex ante impact assessments and predictions. Then, a key strategy will be to clarify why earlier predictions have failed. Only a few studies are made so fare in this field. They have mostly tried to measure if predictions have been accurate and the degree of disparity between ex ante predictions and the reality afterwards as measured by ex post studies. But prediction failure may be an effect of many different causes. ”Error theory” is a term used for explanations of low accuracy of predictions (Becker 1995).

Predictions will in general require a theory that explains logically what will happen in the future because of an action, a project or program (Hansson 1969 and Popper 1974). If not, then predictions will be random and the accuracy accordingly compromised. All decisions on implementing a project, program or policy are based on an impact model, theory of action or a “project/program theory” explaining what the decision-makers expect and want to happen. If an impact model or theory is not explicit, then at least the decision-makers will have an implicit “cognitive map” that represents the assertions about some limited action. Hoogerwerf (1990) refers to Axelrod that claims that a cognitive map is “designed to capture the structure of the person’s causal assertions and generate the consequences that follow from this structure”.

An impact model or project theory that explain the relationships between a specific planned development action and different types of outcomes are, however, not enough for making predictions. A project theory needs in addition support by facts about the planned project and the existing conditions in the area where the project takes place.

An important part of impact assessment is, therefore, to test the theories/hypothesis that the main alternatives of a project or development action are based on. The aim is to reject (falsify) assumptions/hypothesis, or alternative project theories, that are not correct (Curtis and Epp 1999), and identify the least falsible theory among the possible alternative theories (or alternative projects). The best alternative to chose will be the project theory that has least unproven assumptions, as that will be most trustworthy. A choice criteria often referred to as “Occam’s razor” (Dunbar 1995).

The test includes the internal logic in a plan/concept looking for self-contradictory assumptions, and the degree of consistence with experience or other types of evidence. In other words, impact assessment is a check of two types of knowledge:

- the truth of analytical statements (logical content independent of the factual reality), and
- the truth of statements about the project and site specific reality.

The accuracy of predictions depends usually on the quality of both types of knowledge. But two other important sources for errors do also exist. Another and significant third reason for prediction failures is that project theories often include

only the effects from the project itself, assuming that the project is the only dose in time and space and that all other types of influencing forces are stable. If, however, it is other agents for change the accuracy of predictions will depend also on the cumulative effects that can be produced by interactions between the planned project and other types of doses.

A fourth reason for errors is that the predictors who make the predictions may be biased. Then, predictions are not based on an objective basis, but influenced by values or interests that the predictor consciously or unconsciously has. It is examples, too, that the administration of IA-processes (or the responsible political leadership) have been biased and not informed decision-makers about the conditions that IA-predictions are based on[2].

One effect is that important uncertainties are unknown to the decision-makers, or at least that they claim later on to have been unaware of important information.

However, my judgement is that normally the quality of project theories is the main reason for errors in IA-predictions.

2.6.1 Quality of project theories

The degree that a planned action is based on an explicit impact theory will vary. But project theories will at least link the development action (as a cause) with the intended and desired effects of the projects (the purpose, goal, objective, outcome of interest or need). ”Outcome theory” or “purpose theories” can be terms for attempts to give logical explanations of the reasons why someone wants to implement a specific project or program. The project theory of the proponent’s focus often on the project objective or the main positive benefits (also referred to as the outcome of interests or primary effects). But a project theory includes also the relationships between a project and the outcome of interests or benefits - like the creation of profits, employment or needed goods and services in private and public sector. Purpose theory in general links a development action with a problem needed to be fixed or an opportunity to be seized (Schmidt 1993).

Projects have in addition often unwanted and adverse effects for the environment, the local or regional community, or represent for example a health risk for humans and animals. The unwanted effects will, for the proponent, be less important than the primary (intended or purpose) effects. Such ”secondary” effects acts as limits to a project or program, and are ”constraining effects” that should be avoided. Mohr (1988) defines side-effects as effects that are neither desired nor avoided, but

[2] A Parliament hearing in Norway during January/February 2000 makes it clear that the IA-prediction of travel volume on the speed train system to the new national airport was deliberately "dis-informed" on administrational level. The scientist responsible for the IA-predictions on travel behaviour claimed that his predictions was misused by the Ministry in it's report to Parliament. (The decision to develop the new speed train system did cost nearly one billion US$ more than estimated).

changes that the involved interests are indifferent to and not expect. Vedung (1991), however, use side-effects as a term for effects that is **expected, but not wanted**. He makes a distinction between the expected and unwanted side effects and side effects that is **unexpected and unwanted**.

A term used for negative and unexpected effects on social systems is "latent dysfunction's" (Merton 1968). But unexpected and unwanted effects can even be contrary to the objective of an action and the desired effects that were planned for. Vedung (1991) refers to such responses from a dose as "perverse effects".

The emergence of perverse or unwanted effects is a consequence of ignorance of how the environmental or social system will respond to an action or dose. An influential philosopher of science claims that:" It is one of the striking things about social life that **nothing ever comes of exactly as intended**" Popper (1974). An important aim of impact assessment is, therefore, to make decision-makers aware of as many significant expected side effects as possible, and especially side effects that can not be eliminated. To clarify why social (and natural) side-effects can not be eliminated, is the major task of social theory, according to Popper.

Experienced-based knowledge indicates that it often is some unexpected effects from a major action. The high complexity of many systems, combined with too little understanding of the intricate interrelationships both of social and natural systems, is an important reason. It is, however, a difference between social and natural system. Nature responds reactive and after a dose is given. Social systems can also be proactive and respond before the implementation of a dose starts to prevent unwanted effects from an expected dose. Social actors may in other words react to the idea, or mental image, they have of a future dose and the expected impacts such a dose may have. The response then is a reaction to an image of a dose and a proactive action before the real dose. One example can be "panic harvesting" of natural resources as a reaction to an idea or proposal of protecting the resource one time in the future from use. ("Panic logging" of a forest is not an uncommon response to ideas about nature protection of valuable forests, far ahead of any designation process).

Impact assessments are often classified accordingly to the type of system or domain of effects they focus on, as for example "environmental impact assessment (EIA), social impact assessment (SIA), health impact assessment (HIA), risk assessment (RA) or cumulative impact assessment (CIA). The assessments are then a tool to broaden the perspective of the proponent and decision-makers, to not include only economical considerations or not only the proposed development action. Examination of the full economical, social and environmental impacts of a proposed action requires a "holistic approach" in the sense that examination of the effects on natural and social systems separately will not reveal the full scope of interactions. "Integrated impact assessment " has been used as a generic term for the full range of social and environmental impacts of development actions (Porter and Rossini 1983).

Integrated assessments have to be based on theories covering all types of significant effects. But predictions are usually based on two types of theories; a theory about the desired effects (purpose or outcome theory), and a theory about constrains and side effects (”impact or constrain theory”). Both types of theories can be wrong or inaccurate, and contribute to low accuracy in predictions. The introduction of impact assessment in democratic decision systems reflects that high level authorities are interested in the truth or falsity of project or program theories, and willing to devote some resources to testing them before a decision (Mohr 1988).

One reason why project theories in general have low quality is a lack of understanding of the relationship between a project and a specific element in the natural or social environment. Such relationships can be direct between the cause and a specific element, and is then a primary or first order relationship or causal linkage. But relationships between cause and effects can also be indirect or secondary through different intermediate causal chains. Indirect relationships can include two, three or more linkages and be of second, third or higher order. Bernard et al (1993) conclude an audit of Canadian environmental impact assessments that the longer the chain of linkages and reasoning, the greater the probability of generating inaccurate predictions and unexpected effects. Long causal linkages or pathways may be the reason why some effects are delayed in time and referred to as ”lag effects”. Some causal chains may be very long and contribute to lag effects that emerge as a response many years after the causal dose. One example is the lag effects on nature and the local community from the designation of national parks (Teigland 1995).

A British audit of planning projects by Wood and al. (1998) state that the directness of predictions are rarely receiving explicit or even implied mentioning. One particularly deficient element in impact assessments and project theories is, therefore, the lack of clarification of hypothesis about causal relationships. If the underlying logic and assumptions associated with predictions are not made explicit, it is difficult to evaluate ex ante the quality of an assessment itself. The only criterion for quality and credibility is in such cases the degree of trust that decision-makers have in the ”expert” that makes the predictions. But if another ”expert” give a divergent prediction, then it may be less easy to know whom to trust. It is therefore some (oil)rich countries that hire several experts to make independent assessments of important projects. If the experts independently came to the same conclusions and predictions, then that is used as criteria for trustworthiness. Such assessments are in reality ”IA-experiments” to test if the conclusion (and the theory behind them) can be trusted.

Another strategy that is used more often to increase the quality of project theories is to require the development of conceptual models and ”structured impact hypothesis” (Bernard et al 1993). Then, conceptual models created ex ante identify explicit the key hypothetical linkages between a project and the important intended effects, constrains- and side effects. The basic component in such models are impact hypothesis that in general include two main element joined by a causal linkage. The first element is an action or dose (causal change); the second is the response in another element (or an indicator of the response) that is effected through some kind

of functional connection. The ability to predict depends on the level of understanding of the relevant system of elements (or indicators) and linkages.

If several projects are similar then conceptual models can be developed for use in many generic impact assessments. Generic models do most often not only describe the relevant elements and logical linkages, but also quantify the significant relationships according to earlier experiences. Computers and algorithms (quantified models) can be used to estimate effects. According to Meier (1998) it is today developed computer models for almost every discipline in environmental impact assessment. A recent but informal review of 14 assessments in USA showed that 48 different computer models had been used.

Computer/algorithm models are of two types (Leon 1993). One type is developed for a specific study and adapted to the local situation by using original (parameter) data for that specific project. The other ”plug-in” type of models is developed for one type of projects in general and supplied in advance with most (default) data. But ready-made models (and parameters) are based on assumptions about the processes and the location that is modelled, not site specific and original data. An examination of a random sample of environmental impact assessments from 1989 in USA found that computer models/algorithms was at that time used in 8,3% of the 442 impact analysis (Leon 1993). But most of them (8,1%) were ”plug-in» models”, and none of these assessments had a description of the conceptual relationships or model assumptions. Only 0,2% of the analysis was based on computer models more tailored to the specific situation with original data to verify relationships.

Use of «tailored» models is, however, no guarantee for accurate predictions. Ravetz (1998) has recently evaluated the quality of models formulated most precisely (in mathematical forms) and used in Great Britain. He conclude that ”it is possible for an apparently scientific field endowed with quantitative data and mathematical techniques, to be, nevertheless, in a condition of inherently low scientific quality, best described by the acronym ”GIGO” (garbage in, garbage out)”. Even in a field like transport project planning where models have been used in 40 years, the conclusion is that travel demand models have produced some rather poor results. Monitoring schemes show low accuracy and not much progress (Mackett 1998). Nearly half of the predictions of traffic flows were more than 20% off reality one year after the opening of a new trunk road.

The reason for such poor showing is according to Bonsall (1998) that model designer's and users are reluctant ”to admit the extent to which the results are dependent on the input assumptions. Presumably this is out of fear that, were the true extent of uncertainties to be made explicit, the decision-makers would find the predictions of little practical use and would instead resort to educated guesswork”. His solution, therefore, is to reduce errors in input assumptions and analyse the sensitivity of model coefficients and parameters (Bonsall 1998).

Another proposal is to develop a more ”comprehensive, and valid, theory of travel behaviour to underpin the forecasting framework” (Mackett 1998). But a valid

conceptual model is needed in any attempt to predict the effects of a new development. If not, then the assumption in reality is that the development will have no effects, or at least ”no significant effects” (shorted to NOSIF by Americans).

One ”technocratic” way of developing or improving conceptual models of important causal linkages is to organise a workshop attended by a diverse group of disciplinary experts to discuss effects from a specific project. Such workshops are used as a scoping method and is the core idea in an Adaptive Environmental Assessment and Management (AEAM) approach. AEAM processes focus on the understanding among scientists of relevant and important relationships (the scientific paradigms) and on the development of simulation models (Bisset and Tomlinsson 1988).

The aim of most impact assessment systems is, however, not to integrate scientific paradigms and develop grand models, but to improve decisions in a democratic system involving different social interest and groups. One of the interests in the decision process is the proponent of a project that acts according to their project theory. Other interest can be opponents and have very different theories about the effects from proposed project. The project theories of the proponent and opponents can also be different from scientifically based (paradigmatic) theories.

Most impact assessment systems are, therefore, not based on a ”technocratic” approach and the development of conceptual causal models as in the AEAM simulation models. The ”democratic” approach focus instead on the main alternatives for a project and the alternative project theories that proponents and opponents have. A proponent is required to clarify the main alternatives that ”competes” with the preferred plan (the principal alternative) and the advantages or disadvantages they have. Opponents have an opportunity to put forward their own competing proposals and theories, and independent experts on impact assessments will test the main alternatives and the theories they are based on.

The aim is not to test and verify the theory behind the principal project that the proponent prefers. But contribute to an elimination of misjudgements in the competing alternatives (and theories) and in that way help decision-makers to choose the best of the competing alternative or at least not the ”worst” project and theory. A ”democratic” approach is in that way based on a falsification strategy to eliminate incorrect theories (Popper 1986). The falsification strategy is, however, used before an experiment takes place (as an ex ante assessment), but is in other ways a parallel to normal science that require a test of alternative theories and explanations after an experiment (ex post).

The democratic approach leaves the final decisions to elected representatives and is based on a ”decision theory” that are sceptical to proponents and experts responsible for predictions and evaluation of impacts. The fundamental viewpoint in ”democratic decision theories” is that project theories which proponents, opponents and experts have, can be ”wrong” or too narrow when the problem is not only accurate predictions, but to balance different considerations, interests and values. Decision-makers can, therefore, conclude that theories, predictions and evaluations also from

experts are ”wrong”, and choose to follow their own project theory in spite of advice from applied science. In that case, the implementation of a project will be an experiment that may show which theory and prediction was most accurate.

One reason why decision-makers choose an alternative action not recommended by the proponent, opponents or experts could be that their project theory includes other purposes or goals than stated officially. The stated purpose for a project/program may be different from the real purpose. That will be the case if the stated purpose or important constrain-effects of a project is not very relevant. Projects having high prestige, or giving decision-makers high benefits (politically, socially or economically), can be implemented even without good indications of achieving the stated advantages, or in spite of clear disadvantages. As will be the case if the main reason for building for example a new tunnel or section of a highway is not to improve communication for the local community, but to get more money to the local community from the national authorities or to reduce unemployment. The stated purpose of a project can, therefore, have a low rationality when compared with the effects expected in the stated project theory.

Some impact assessment systems require, therefore, explicitly that impact assessment should not only cover constrain- and side effects, but also the ”purpose theory” that explain why a project/program is proposed. The aim then is to test alternative ways of fixing a problem or seizing an opportunity, and not only alternative (technical) concepts and locations for an action aimed at a need specified by the proponent.

A focus on purpose theories may change the perspective in impact assessments. IA-systems that focus on adverse effects will often define the effects of the proposed development as the difference between the situation after the development action have been implemented and the situation without the proposed action. The situation without the action is then a ”no action or zero-alternative” used as the reference situation for comparing the effects from the other main alternatives. If the purpose of the proponent, for example, is to develop a military training field, then such IA-systems focus on the difference between ”not making the proposed training field” and the main alternative concepts and locations.

Systems that focus also on the ”purpose theory” may not only assess if it is a need for the project or that the need can be satisfied by alternative strategies. But also assess the no-action effects of not fixing the problem or covering the need a project intends to cover. Such assessments will clarify the effects for the proponent and society of not using the proposed opportunity. A focus on purpose theory will, therefore, explicitly include the effects of not developing a military training field, not only on the environment and the local community, but also on the military and other interests on local/national level. The alternative ways of fixing problems and cover needs can, however, be many. To reduce the number of alternatives, the IA-system in USA therefore restricts the number by focusing on the ”underlying need” for a project (Schmidt 1993). Which means that the purpose theory has to be specific.

Low quality of project theories will not only result in low accuracy of predictions, but that unexpected and not predicted effects also can occur. But that may be a minor problem. Wood et al (1998) do conclude an audit of the effects of planning projects in Britain between 1988 and 1996, that it was a low number of unpredicted impacts. Only six non-predicted impacts were identified in the follow-up study that covered 28 planning projects and 865 individual ex ante predictions. That finding is in agreement with Culhane et al (1987). But more unpredicted impacts would most probably be found if other methods had been used ex post. Interviews of involved interests and on-site visits, as used in the British study, are not among the most systematic monitoring methods available. Only two studies are in any case not enough to draw a definite conclusion. The findings may, however, indicate that the identification of likely effects is not the main problem in IA-systems. Ortolano and Shepherd (1995) do, however, express that:" The state-of the-art of impact prediction is such that unanticipated impacts occur often" (but without any reference to any audition studies). Buckley (1998) refers to a study of 23 mining projects that found "that many impacts which actually occurred had not been predicted".

If it is a high degree of identification of likely effects, then the project theories should include most of the relevant causal linkages. But use of a relevant theory does not necessarily say that impact assessments focus on the most significant relationships. The auditing study of Wood et al (1998) documents that non-significant impacts were predicted more correctly than significant ones. It may indicate that (quote):"many IA-writers do not focus on the more significant issues and impacts". One reason may be that the scoping-process has not identified the important linkages and mostly the relevant, but less important ones. This is, according to Wood et al. (1998) "somewhat surprising, given that scoping discussions of some sort took place in 20 (71%) of the 28 cases" in their study. It suggests that the discussions have not been comprehensive or systematic, in spite of the fact that experts participating in the scoping processes had made 55% of the selections of significant impacts.

One of the main strategies to increase the accuracy of effect predictions is, therefore, to not only improve theories about the intended effects, constrains- and side effects, but to identify more precisely the important causal relationships between a project and responses in environmental and social systems. But that will not be enough, as it is other reasons also for low prediction accuracy.

2.6.2 Predictions based on an "unstable dose"

The aim of predictions is to forecast the response created by a specific dose given in the form of a planned development action. If the dose or planned action is changed during the final decision process or the implementation phase, after the prediction is made, then the predictions is based on a different dose and can fail for good reasons. The degree of accuracy must then be related to how much a project has been modified and a monitoring system that also clarify if it is a difference between the original plans and the actual development taking place. (It is like a doctor that orders

a dose of medicine. But only half of the prescribed medicine is taken, the dose is taken at a wrong time, or the wrong medicine is used. Then it can be difficult to complain that the doctor's predictions of the effects of the medicine have not been accurate).

If decision-makers find the predictions of the effects from a proposal to be not acceptable and, therefore decide to change or modify a development concept, then the planned action (the dose) are changed. In case a proposal is mitigated then new predictions of the remaining "mitigation" effects should be made by the experts to be on the safe side (like questioning the doctor a second time before deciding to change the medicine). Wood et al. (1998) use the term "post-mitigated impact predictions" for the predictions made of the remaining effects, after an adjustment for mitigations have been made. They expected prediction accuracy to increase with the degree of mitigation measure that was implemented, but their empirical study showed no trend in that direction. Why is not explained. But the lack of relationship may indicate that the not-mitigated measures were of minor importance or relevance (and perhaps that was expected, and the reason why they have not been mitigated?).

Most predictions in impact assessment are, however, conditional in the way that they assume (explicit or implicit) the proposed development action will not be changed, or assume that recommended mitigations or alterations will take place. Such assumptions may not be correct. Ex post studies of the accuracy of prediction can, therefore, not only focus on divergence between predicted and real effects of a project. Ex post studies must also check if the project itself has changed and to what degree mitigation actions have been implemented as assumed in conditional or mitigated impact predictions. The study of recent British planning projects by Wood et al. (1998) show that in average two mitigation's had been proposed per prediction. Only ¾ of them was implemented to some degree.

2.6.3 Non-normal baseline and post-project situations

An effect prediction is usually based on a survey of the existing situation at the project location before a decision to implement or not. That survey will be a "baseline study" of the relevant and important features or indicators/parameters. But lack of time and money restrict most baseline studies strongly.

An audit of a small but representative sample of projects in USA with 442 individual impact analysis showed that nearly 80% of the analysis was not based on a baseline survey. Most of the reports had citation of results from other projects, verbal declarations of possible impacts, assertions of no impacts or a postponement of the analysis. Only 20,2% of the individual impact assessments were based on an inventory of the current situation. But more than 2/3 of them (14,3%) was nothing but an inventory or tally without any analysis or prediction of effects in the future. Not more than 5,9% was analytical studies based on site specific and original data (Leon 1993). But in addition 1,4% of the assessments were based on previously collected data and used those data as a baseline for a specific analysis of the impacts.

The situation in Europe is probably similar. A study of IA documents for 37 roads in UK found that the majority was not based on specific baseline studies. Only 37% included results of field surveys, but all of them were a ”one-off” survey (Treweek 1996).

The lack of baseline studies can in many cases explain a low accuracy in impact predictions. But a baseline study itself does not necessarily eliminate problems with predictions. If the phenomena surveyed in baseline studies are not stable in time and space, but have a ”natural” variance, then predictions based on a baseline survey of only one point (or a few points) in time and space may have an ”non-normal” and misleading starting point. Baseline studies done at and measuring the peak or bottom of the natural variance, may contribute to large over- or under-predictions. The retrospective difference between predictions and reality can, therefore, be substantial also in cases where predictions are based on a correct impact theory because of a non-normal or extreme baseline situation. It is, therefore, important to know the “natural” variation in the phenomenon and systems that will be influenced by a project or action. One way of reducing uncertainty is to establish a pre-project monitoring system, or **baseline monitoring** (Munro 1987), that measures the “natural” variability over time in the expected influence zones.

If it is an inherited (background) variation in a phenomena or parameter before a development, it probably is a natural variation also afterwards. But the natural variation before and after a development is not necessarily the same. Development actions can change processes more fundamentally if a threshold is passed. ”Threshold-effects” can change variations in earlier relationships and give ”new natural variation” pattern. Post-project monitoring that cover only a single time period ex post may, therefore, provide a misleading picture of the ”normal” ex post situation too. Monitoring of the ”real” change should ideally cover a representative sample of both ex ante and ex post time periods, and the relevant spatial influence zones. But the resources for this type of studies are seldom available.

High natural variance ex post makes it difficult to estimate if a change in a parameter is an effect of a development action, or just reflects the new ”normal” variation. One way of identifying normal variations, is to select and measure the changes over time and space in control or reference areas. The change in independent reference areas is used as an indicator of the ”counter-factual” situation (that would be the reality if a planned development do not take place). A reference area must then be located outside of the influence zone of a planned development (or in other ways controlled for any causal relationships and unique historical events). The conditions in a reference area should also be as similar to the conditions in the project location as possible (to control for the influence of other factors). The effects of a project is then defined as the difference between the control area and the project area after the development, and the measurement of effects is according to a ”quasi-experimental design” (see i.e. Mohr 1988). But audits using reference areas to control for natural variance and explain errors are rare, and termed ”scientific monitoring” by Shepard (1998). (Among the few found are the case studies presented in this dissertation).

The lack of representative surveys in time and space is probably not only a European phenomenon. Warnken and Buckley (1998) document that the baseline studies for the 115 impact assessments of tourist projects in Australia, only 6% had sampled data about flora for more than one season. Marine biota was sampled more than once in 13% of the cases. But groundwater was never sampled more than once for any individual development. Marine waters were, however, sampled approx. 14 times, which indicate a focus on coastal and marine impacts. The design of ex post studies was not adequate to detect changes relative to baseline. In almost 50% of cases, spatial designs of monitoring were altered partway through the programme (Warnken and Buckley 1998). Wood et al (1998) found in their audit of British planning projects that monitoring schemes did not cover the same parameter, units or locations as the impact predictions. But they have only one reference to natural variance and sampling in time and space, which may indicate that their audit missed an important source for low accuracy in predictions.

2.6.4 Cumulative effects in open and closed systems

The project or development action that an assessment aims to evaluate is here called the ”primary project”. Assessment and monitoring studies do usually focus on the effects from the primary project itself and nothing else, assuming often that everything else is stable. But situations where a planned action is the only agent of change, and everything else are stable in time and space (a ”ceteris paribus” situation), are most probably rare. The true effects of a project that people will experience are, therefore, seldom the effects of the primary project alone. If any other source for change interacts with effects from the planned (primary) development itself, then the interaction has a cumulative effect.

Ross (1999) restricts the definition of cumulative effects to effects from a primary project in combination with effects of other past, present or (reasonably foreseeable) future human activities. But a source for combined effects may be processes in nature too taking place before, during or after a project is implemented. The primary project is then not the only cause for change, but a planned impulse that is linked to other impulses through different causes for change. These linkages can be direct or indirect, giving a distinction between direct and indirect cumulative effects. Dipper et al. (1998) claim that the level of understanding and accuracy in prediction to vary with the directness of effects, as cumulative impacts and complex systems are usually very poorly understood.

In a case with multiple agents for change, each agent can give a small dose to a natural or social system, and create small and insignificant individual response. But added together over time and space even many small insignificant responses (”nibbling effects”) can collectively produce a significant cumulative effect. That type of significant cumulative change is then ”additive” in the way that the effects of past, present and future, or several simultaneous projects are independent elements that adds together. Another type of cumulative effects are ”synergistic” in the way that one additional dose from a specific cause can strengthen or reduce the effects of

a dose from another cause. A small dose, which usually would create only a small response, can change the degree of response (volume) or give a new type (quality) of response if combined with a small dose of another agent for change. A qualitatively new response is, then, linked to a change in structure or dynamics of the system involved (Baskerville 1986).

The erosion problem created by a few hikers can for example be small in environmental sensitive areas. But the number of hikers need not increase much before a threshold is crossed where an additional hiker itself adds less to the cumulative effects of earlier hikers. A combination of heavy rain and only a few hikers may, however, have large erosion effects as the combination creates a synergy and increase the cumulative effects of each cause of change.

Agents or sources for change can be of two types. One type of agents are other planned actions or projects/programs that take place and influence the same impact zones and processes as the primary project. The effects from ”multiple projects” may interact both in space and time. Effects from multiple projects will be easier to recognise if projects are located at the same site or take place at the same time. But effects from multiple projects that do not take place at the same site or simultaneously can also interact. Such interactions take place if their influence zones overlap in space, and if effects from one or more project are lagged.

”Overlapping effects” in space and time can be a term for cumulative effects caused by multiple projects/programs. Multiple projects are, however, of two types. Some projects can be planned and decided independently of each other, but produce overlap effects. That is the case if project X is the primary project, and project Y is planned and implemented independently but still have interaction effects on the X (the primary project). Y may then be referred to as a ”prime project” for X.

But the implementation of some other projects Z may be connected to the implementation of the primary project X. The relationship then is that the primary project accelerates or decelerates the rate of development of other types of projects. Implementation of projects that depends on the primary project is here referred to as ”secondary projects”. The primary project stimulates secondary projects and has at least partly a ”precedent-setting effect” or ”growth-induced impact”. The primary project can also act as a catalyst and produce greater system-wide effects than otherwise (Contant 1993).

The planning of a new national airport will for example be a primary project that often will ”trigger” new accommodation facilities or gasoline stations as secondary projects in the vicinity. If another large project is developed at the same time and independently of the airport in a neighbour region, as a major hospital, then the effects from those two projects can interact giving overlapping effects in space or time. (The hospital and airport act then as prime/primary projects to each other). If two independent projects are large and simultaneous, then one interaction effect can be a lack of manpower in the overlapping impact zone during the construction phase and environmental stress during the operational phase.

Overlapping effects are linked to multiple projects or development actions that are planned according to specific and desired outcomes. But cumulative effects can also became a reality in case where only a single project is implemented. The reason is that some effects are not caused by planned or expected actions, but also arrive from unexpected quarters or low-probability events. Then, the agent or source for change is non-planned or not intended to influence a specific single primary project, but are side effects of other ”non-intended” processes. For example a downturn in the business cycle, an earthquake, a war or a major change in the political system is usually not planned to influence a specific project or program. But the effects from a specific development action are often influenced by such unplanned events. The events do then not act as multiple projects, but as multiple causes for change in the ”normal system” that the primary project is a part of. Then, the normal system is the network of important or crucial causal linkages that usually are influenced by a development action of a specific type (for example a hydropower project).

Impact assessments are mainly concerned with expected events (De Jongh 1988), but prediction failures are often linked to unplanned and unexpected events or “new processes” that usually are not important for the assessed system. The unplanned events and new processes are causes that come from outside of the ”normal system” of important causal linkages. If a natural or social system is totally ”closed” without any important causal linkages to other systems, then unplanned external events and processes have no influence. Only internal forces do influence within closed systems.

Most systems are open for influence from processes taking place elsewhere in other and related systems, or in ”non-normal” situations at the project location. External forces will influence across systems. System diagrams are a way of clarifying internal causal networks and linkages between systems (Bisset and Tomlinsson 1988).

System theory makes a distinction between relatively closed and relatively open systems (Becker 1995). The future of social systems is relatively open and linked to many outside systems, and influenced as mentioned earlier by social actors who are taking care of their own interests. The existence of actors who use their own willpower to attain specific effects (objectives) may explain why audits indicate that predictions of effects on social systems are less accurate. The problems with predicting if, and how, social actors will take care of their interests are especially large if different processes interact and create cumulative effects.

But prediction of cumulative effects is difficult in general for several reasons. It will always be an inaccurate picture of reasonably foreseeable actions in the future that may have significant overlap effects in space and time, or may induce growth processes influencing the primary project of interest. Monitoring systems that cover effects from multiple projects, small or large, and measure if the collective effect is significant, is most often lacking. Incomplete understanding of how different systems work, and the linkages between systems, can also contribute to less relevant and

unreliable predictions. It is in addition difficult to predict unplanned events and how different types of unexpected events will influence the effects from a primary project.

Cumulative effects are also difficult to control, as there is no single mechanism that can effectively manage multiple projects, multiple causes or excessive growth. One strategy is to use land or community planning as a control mechanism and decision system that assesses the collective effects of different small projects or large developments in private and public sector. Area wide planning on regional level is often preferred as overlap effects from multiple projects can cover a substantial scale (Hunsaker 1998).

Problems with producing reliable predictions for cumulative effects make impact assessment systems itself less effective as a tool in regional or local planning systems.

One solution is to establish benchmarks or criteria for thresholds (limits to change, carrying capacity or sustainability) that the collective effects of different projects should not pass (Contant 1993). If a new single project increase the cumulative effects above the acceptable threshold then it should not be accepted, or the proponents have to trade adverse effects with other prior developments to reduce the total cumulative effect to a level below the established threshold. But the problem most often is that limited scientific knowledge makes it difficult to predict in advance where such thresholds are.

Another solution is to integrate IA in the plan-making process (Wood 1988), and do strategic impact assessments on the effects of alternative land or community plans (Elling 1998). A third solution is to assess the effects of a specific area-wide plan. But audits of the effectiveness of such planning options in controlling cumulative effects are unknown.

The problems with applying science in this field explain most probably why audits seldom find cumulative effects covered in impact assessments also on project level. An audit of planning projects in UK concluded that the treatment of the cumulative nature of impacts was especially deficient, rarely receiving explicit or even implied mentioning (Wood et al. 1998). An audition of 366 predictions made in eight different impact assessments in UK did not find a single prediction of interaction effects (Dipper et al. 1998). Cumulative effects are lacking and ”consistently under-assessed” also according to other authors (Ortolano and Shepherd 1995).

The lack of cumulative assessments is most probably not an indicator of a lack of such effects. Buckley (1998) claims that human impact rarely acts independently on natural systems. Cumulative effects are, therefore, the rule rather than the exception; and that applies whether the impacts derive from different separate projects or a single development action. One effect of the lack of such assessments are that impact assessments themselves in most cases are biased. And that may explain why predictions often are not accurate

2.6.5 Bias

Bias is defined as a systematic over- or underestimation of effects (De Jongh 1988), and is a problem not acceptable according to quality norms for objective science and impact assessments. If ex ante predictions are biased, then decision-makers and the involved interests have a good reason for not trusting them as reliable information. But reports from ex post studies and monitoring can also be biased.

There was no evidence of systematic bias or under-prediction of impacts in a recent audit of British planning statements or reports (Wood et al. 1998). Wanken and Buckley (1998) did also find that among the few testable Australian predictions, nearly as many impacts was more severe than predicted, as less severe. There was, therefore, no evidence confirming any assumption that scientists or consultants deliberately underestimate impacts or prefer to choose positive conclusions. It was more correct predictions than under- or over-predictions, both in the Australian and British study. But the British study shows that among the effects that was in reality significant (as identified ex post), most of the predictions were inaccurate and also under-predictions. In other words, the real impacts were worse than predicted and negative (Wood et al 1998).

The indicator used for bias in these studies is the aggregated number of over and under-estimations. But an approximately equal number of over and underestimation's is not necessarily a good indication of a lack of bias. It may only indicate that the numbers of biased predictions (and predictors?) are nearly the same in both directions.

There has been a considerable debate about the objectivity of dependent and independent consultants (Buckley 1998a). The not unusual expectation that consultants hired by the proponent tend to be biased in favour of the proponent may not be confirmed by the referred studies. Wood et al (1998) has not checked if over- or under-estimations are linked to the independence of the consultants. Few studies have compared predictions by different individuals. Crompton (1995) concludes an audit of impact assessments of the effects of 20 major sports events that several ex ante analyses must have been deliberate attempts to fool the decision-makers and the public. One of the case studies in this Ph.D. dissertation, too, concludes that bias among IA-experts most probably is the only reason why important predictions have been severe failures.

However, bias in IA is not linked only to the reported findings of an IA-prediction process. A recent study by Wood (1999) makes it clear that the selection of issues that an IA-process shall focus on, in the scoping phase, may be biased, too. If the proponent and responsible administration of IA's decide from the beginning or early on that assessments of some effects are not of their interest, and that decision eliminate significant impacts, the IA-predictions will be biased. Because important aspects are eliminated from the IA-information, making the information that decision-makers get biased in that way. This later type of bias will be among the most difficult to detect ex ante, since it is "not-existing information", which can not

be controlled easily. The cause of this type of prediction failures is linked to the IA-procedure itself.

The question of bias in predictions (and predictors/bureaucracy) is a key element in controversial projects and programs. The main cause of controversies is divergent interests and divergent theories of what will be the effects of development actions. The more divergent viewpoints and conclusions the more controversial are issues. An expert who do impact assessment in such case will experience that the use of the best available science to make objective predictions, will nearly always be contrary to at least one of the interests involved in a decision. If a consultant tests the project theory of the proponent and find that significant purpose effects probably will not be as predicted by the proponents, then a major element in the project theory may be falsified. ”The dream” a project is built on, may in case be destroyed. If the impact theory of an opponent is falsified, and a theory about adverse effects not confirmed, then the opponents may not like the conclusion. A not unusual reaction among proponents and opponents in such cases is to conclude that the expert’s conclusions are not correct, but biased.

Scientifically such reactions are ”normal”. An unexpected conclusion is seen as an anomaly, and an alternative and helping explanation of the unexpected conclusion is drawn to make it possible to stick to the original project theory (Lakatos 1970). The alternative explanation is in this type of controversial cases a helping hypothesis about the expert’s character (he/she has prejudice to the participant interests and is biased). By defining an expert as biased, an interest group can keep their theories and strong belief in positive or negative effects.

The only test of objectivity and non-bias is then to see if the expert’s predictions really are accurate. But that test can only be done after a decision and the development has taken place. An alternative for decision-makers can be to prefer and trust experts that have made accurate predictions earlier. But earlier success is not necessarily a reliable indicator for objectivity and accuracy also in the future, but can be one indicator of the predictor’s competence.

Accuracy is, therefore, a core element in impact assessment. It can be viewed as a ”technical element” (Buckley 1998a). But it depends also on the predictors value judgements during the scoping phase of what will be the most important effects, and to what degree the theories of involved interests should be taken seriously.
The main scientific problem is the degree of understanding of the systems that a development action will affect. The tourism and recreation system is the fundamental one in this dissertation, and basic concepts are clarified in the next chapter.

2.7 Conclusion

Impact assessment is usually a forward looking policy instrument and evaluations are backward looking instruments. The intention of both types of instruments is to give feedback to decision processes so decision-makers can learn how to improve future actions. But these two instruments are rarely combined in a "feed-forward"-process to improve the learning of society.

This literature review indicates that impact assessments and evaluations seem to be done by two different professions with less contact with each other than desired. That may explain why impact assessment literature and evaluation literature quite often uses different terms for the same concepts. The diversity of terms creates unnecessary confusions. One aim of this chapter is to clarifying concepts and relationships between policy instruments.

Lessons learned by looking backwards are, however, not enough to prevent errors in forward-looking predictions. It is several reasons why the future may be different from the past. New knowledge and technology may change the form and contents of future actions, and also change earlier relationships between cause and effects. But lessons learned from past experiments may increase both reliability and relevance of impact assessments in the future.

Assessments of the effects of an action will, however, always be tied to uncertainty, since predictions are hypothesis about the future. Three alternative strategies to impact assessment are referred here that may be used for reducing or handling uncertainty; ethical guidelines (precautionary principle), "limits to acceptable change" and "goal-mean"-approaches (as the concept of sustainability).

When impact assessment is used as policy instrument, evaluations (auditions) of earlier impact predictions will act as a quality control of the hypothesis in a project theory that a specific action is based on and other reasons why predictions may fail. By comparing predictions and the reality it may also be possible to identify why predictions fail, and in that way improve the possibilities for successful actions to reduce prediction errors in the future. This literature review has made it possible to classify the main reasons for errors in impact predictions, and clarify some of the mechanisms that cause failures according to other scientists.

The following chapter gives an overview of the research strategies, which have been used in this dissertation to test the basic propositions.

References:

Aall, C. 1999. Direction Analysis: an Example of Municipal Sustainability Assessment in Norway. In Devuyst, D. (ed): Sustainable Assessment at the Local Level.- Columbia University Press (in press), Columbia.

Andrews, R.N.L. 1988. Environmental impact assessment and risk assessment: learning from each other. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. pp. 85-97.

Antcliffe, B.L. 1999. Environmental impact assessment and monitoring: the role of statistical power analysis. Impact Assessment and Project Appraisal. Vol. 17. No. 4, March 1999. Pp. 33-43.

Baskerville, G. 1986. Some scientific issues in cumulative environmental impact assessment. In Beanlands, G.E, Erckmann, W.J., Orians, G.H. O'Riordan, J. Policansky, D., Sadar, M.H. and Sadler, B. (eds) 1986. Cumulative Environmental Effects: A Binational Perspective. The Canadian Environmental Assessment Research Council and the United States National Research Council. Ministry of Supply and Services. Canada.

Becker, H.A. 1995. Demographic Impact Assessment. In Vanclay, F and Bronstein, D.A. (eds) 1995. Environmental and Social Impact assessment. Wiley, Chichester. pp. 141-152.

Bernard, D.P., Hunsaker, D.B. and Marmorek, D.R. 1993. Tools for Improving Predictive Capabilities of Environmental Impact Assessments: Structured Hypotheses, Audits, and Monitoring. In Hildebrand, S.G. and Cannon, J.B (eds) 1993. Environmental Analysis. The NEPA experience. Lewis Publishers. Boca Raton. USA

Bisset, R. 1985. Post-development audits to investigate the accuracy of environmental impact predictions. Zeitschrift Umweltpolitik 4/84. pp. 463-484.

Bisset, R. and Tomlinson, P. 1988. Monitoring and auditing of impacts. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. pp. 117-128..

Bonsall, P. 1998. Evolving role of models in transport planning. Impact Assessment and Project Appraisal. Volume 16, Number 2 June 1998. pp.100-104.

Buckley, R. 1995. Environmental Auditing. In Vanclay, F and Bronstein, D.A. (eds) 1995. Environmental and Social Impact assessment. Wiley, Chichester. pp.283-302.

Buckley, R. 1997. Economic and technology issues in EIA. Resources. The Canadian Institute for Resources Law. Nr. 59: pp. 1-5.

Buckley, R. 1998a. Improving the Quality of Environmental Impact Statements (EISs). In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment fot the New Century. AEPI . IAIA. Fargo, USA.

Buckley, R. 1998b. Cumulative Environmental Impacts. In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment fot the New Century. AEPI . IAIA. Fargo, USA.

Caldwell, L.K, Bartlett, R.V., Parker, D.E. and Keys, D.L. 1982. A Study of ways to improve the scientific content and methodology of environmental impact analysis. Advanced Studies of Science, Technology and Public Affairs. School of Public and Environmental Affairs, Indiana University, Bloomington. USA

Caldwell, L.K. 1998. Implementing Policy Through Procedure: Impact Assessment and The Nastional Environmental Policy Act (NEPA). In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment for the New Century. AEPI . IAIA. Fargo, USA.

Conover, S.A.M.L. 1987. Environmental effects monitoring and environment Canada: A synthesis of the findings of four workshops. In Sadler, B. (ed), Audits and Evaluation in Environmental Assessment and Management: Canadian and International Experience. Volume 2. Supporting Studies. Beauregard Press, Ltd. Canada.

Contant, C.K. 1993. Towards Defining and Assessing Cumulative Impacts: Practical and Theoretical Considerations. In Hildebrand, S.G. and Cannon, J.B (eds) 1993. Environmental Analysis. The NEPA experience. Lewis Publishers. Boca Raton. USA

Crompton, J.L.1995. Economic Impact Analysis of Sports Facilities and Events: Eleven Sources of Missapplications. Journal of Sport Managment. Vol. 9, No. 1. pp. 14-35.

Culhane, P., Friesema, H.P, and Beecher, J. A. 1987. Forecasts and Environmental Decisionmaking - The Content and Predictive Accuracy of Environmental Impact Statements. Westview, Boulder, Colorado.

Culhane,, P.J. 1993. Post-EIS environmental auditing: A first step to making rational environmental assessment a reality. The Environmental Professional. Vol. 15. Nr. 1. pp 66-75.

Curtis, F. and Epp, H. 1999. Role of deductive science in evaluation of alternatives in environmental assessment. Impact Assessment and Project Appraisal. Vol. 17, nr.1. March 1999. pp. 3-8.

De Jongh. 1988. Uncertainty in EIA. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. pp. 62-84.

Denzin, N.K. 1970. Strategies of Multiple Triangulation. The Research Act in Sociology. Butterworths. London.

Dipper, B. Jones, C. and Wood, C. 1998. Monitoring and Post-auditing in Environmental Impact Assessment: A Review. Journal of Environmental Planning and Management. Vol. 41, No. 6. Pp. 731-747.

Dunbar, R. 1995. The Trouble with Science. Faber and Faber. London.

Elling, B. 1998. Strategisk miljøvurdering i regionplanlægningen. TemaNord 1998:519. Nordisk Ministerråd, Kjøbenhavn.

Funtowicz, S.O. and Ravetz, J.R. 1993. Science for the Post-Normal Age. Futures, 25/7 September 1993. pp. 219-220.

Gilje, N and Grimen, H. 1995. Samfunnsvitenskapenes forutsetninger. Innføring i samfunnsvitenskapenes vitenskapsfilosofi. Universitetsforlaget. Oslo (Annet opplag).

Glasson, J. 1994. Life after the decision: the importance of monitoring. Built Environment. vol. 20. pp. 309-320.

Hansson, N., R. 1969. Perception and Discover. (Chapter Theory-Laden Language). Freeman, Cooper & Co. San Francisco.

Hildebrand, S.G. and Cannon, J.B (eds) 1993. Environmental Analysis. The NEPA experience. Lewis Publishers. Boca Raton. USA.

Holmberg, J. 1992. Operationalizing Sustainable Development. Unpublished paper. World Bank, Environment Department. Washington (April 24th 1992).

Hoogerwerf, A. 1990. Reconstructing Policy Theory. Evaluation and Program Planning, pp. 285-291.

Hunsaker, C. T. 1998. Cumulative Effects Assessments. In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment fot the New Century. AEPI . IAIA. Fargo, USA.

Høyer, K.G. 1999. Sustainable Mobility - the Concept and its Implications. Ph.d. thesis.Department of Environment, Technology and Social Studies. Roskilde University,Roskilde, Denmark and Department of Environmental Research. Western Norway Research Institute, Sogndal, Norway.

Innst.S. nr. 130 (1997-98) Innstilling fra kontroll- og konstitusjonskomiteen om Riksrevisjonens undersøkelse av miljømessige konsekvensutredninger. Stortinget. 1998. Oslo.

Lafferty, W.M. 1998. Democracy and Ecological Rationality: New Trials for an Old Ceremony. Paper prepared for the CPSA/IPSA Roundtable on: Integration and Disintegration: New Partnerships in the World order. Quebec City. 12-13 February 1998.

Lakatos. I. 1970. Falsification and the Methology of Scientific reserach programmes. In Lakatos, I and Musgrave, A. (eds). Criticism and the Growth of Knowledge. Cambridge University Press. Cambridge.

Lee, N. and Brown, D. 1992. Quality control in environmental assessment. Project Appraisal. Vol. 7, Nr. 1 March 1992. pp. 41-45.

Lee, N. and Dancey, R. 1993. Quality controll. The quality of environmental impact statements in Ireland and the United Kingdom: a comparative analysis. Project Appraisal. Vol. 8, Nr. 1 March 1993. pp. 31-36.

Lemons, J. and Brown, D.A. Role of Science in Sustainable Development and Environmental Protection Decisionmaking.

Leon, B.F. 1993. Survey of Analysis in Environmental Impact Statements. In Hildebrand, S.G. and Cannon, J.B (eds) 1993. Environmental Analysis. The NEPA experience. Lewis Publishers. Boca Raton. USA

Mackett, R.L. 1998. Role of travel demand models in appraisal and policy-making. . Impact assessment and Project Appraisal. Volume 16, Number 2 June 1998. pp. 91-99.

McCold, L.N. and Saulsbury, J.W. 1998. Defining the No-action Alternative for National Environmental Policy Acr Analyses of Continuing Actions. Environ. Impact. Asses. Rev. 1998:18. pp.15-37.

Meier, D. 1998. Selecting Computer Moels and Input Parameters for Analysis of Environmental Impacts. In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment for the New Century. AEPI . IAIA. Fargo, USA.

Merton, R. K. 1968. Social Theory and Social Structure. Collier-Macmillan. London.

Miller, N.A. 1993. Follow-Up of Impact assessments: International Activities. In

Moen,B. and Strand, A. 1998. The O-alternative - use and definitions internationally. (Draft in Norwegian). Norwegian Institute for Regional Research (NIBR). Oslo.

Mohr, L.B. 1988. Impact Analysis For Program Evaluation. Brooks/Cole Publishing Company. Pacific Grove. California.

Munro, D.A., Bryant, T.J. and Matte-Baker, A. 1986. Learning from experience: a state of the art review and evaluation of environmental impact assessment audits. Canadian Environmental Assessment Research Council. Hull. Quebeck. Canada.

Munro, D.A 1987. Learning from experience: auditing environmental impact assessment. In Sadler, B (ed): Audit and Evaluation in Environmental Assessment and Management: Canadian and International Experience Proceedings of the Conference on Follow-Up/Audit of EIA Results. Environment Canada/The Banff Centre, School of Management. Victoria BC.

NENT. 1997. Føre-var prinsippet: mellom Forskning og Politikk. Den nasjonale forskningsetiske komite for naturvitenskap og teknologi. NENT publikasjon nr. 11. Oslo.

Ortolano, L. And Shepherd, A. 1995. Enviromental Impact Assessment. In Vanclay, F and Bronstein, D.A. (eds) 1995. Environmental and Social Impact assessment. Wiley, Chichester. pp.3-30.

Pigram, J.J. 1992. Alternative Tourism: Tourism and Sustainable Resource Management. Published in Smith, V.L. and Eadington, W.R. (eds). Tourism Alternatives. Potentials and Problems in the Development of Tourism. John Wiley & Sons. Chishester. UK.

Popper, K. R. 1974. Conjunctures and Refutations: The Growth of Scientific Knowledge. Routledge & Kegan Paul. London. (5th ed.)

Popper, K., R. 1986. Objective Knowledge. Clarendon Press. Oxford.

Porter and Rossini 1983

Ravetz, J. 1998. Preface: The Emperor's new models? Impact Assessment and Project Appraisal. Volume 16, Number 2 June 1998. pp.79-80.

Reeve, M. 1984. Scientific uncertainty and the National Environmental Policy Act – the Council of Environmental Quality's regulation 40 C.F.R. section 1502.22. Washington Law Review, 60. pp. 101-116.

Riksrevisjonen 1997-98. Dokument nr. 3:6. Riksrevisjonens undersøkelse av miljømessige konsekvensutredninger. Oslo. The Chief Inspestors Review of the Impact assessment system (In Norwegian).

Roe, D, Dalal-Clayton,B. And Hughes, R. 1995. A Directory of Impact Assessment Guidelines. IIED, London.

Ross, W.A. 1999. Cumulative effects assessment: learning from Canadian case studies. Impact Assessment and Project Appraisal. Vol. 16, no. 4, December 1998. Pp. 267-276.

Sadler, B.1988. The evaluation of assessment: post-EIS research and process development. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. Pp. 129-142.

Sadler, B. 1998. Ex-Post Evaluation of the Effectiveness of Environmental Assessment. In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment fot the New Century. AEPI . IAIA. Fargo, USA.

Schmidt, O., L. 1993. The Statement of Underlying Need Determines the Range of Alternatives in an Environmental Document. In In Hildebrand, S.G. and Cannon, J.B (eds) 1993. Environmental Analysis. The NEPA experience. Lewis Publishers. Boca Raton. USA.

Shepard, A. 1998. Post-Project Impact assessment and Monitoring. In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment fot the New Century. AEPI . IAIA. Fargo, USA.

Stankey, G. Cole, D., Lucas, R., Peterson, M. And Frissell, S. 1985 The Limits of Acceptable Change (LAC) System for Wilderness Planning. General Technical report INT-176, Intermountain Forest and Range Experiment Station. Ogden, Utah.

Stankey, G. 1989. Conservation, recreation and tourism. Paper prepared for conference of Institute of Australian Geographers. Adelaide.

Taylor, C.N, Goodrich, C.G. and Bryan, C.H. 1998. Social Assessment. In Porter, A.L. and Fittipaldi, J.J. (eds) 1998. Environmental Methods Review: Retooling Impact Assessment for the New Century. AEPI . IAIA. Fargo, USA.

Teigland, J. 1992. Streamflow requirements from outdoor recreation interests. A state of the art study with models for river simulation systems. Report nr 65. Telemark Research Foundation. Bø i Telemark. (in Norwegian).

Teigland, J. 1993 Impacts from Hydro Power Developments on outdoor recreation and nature tourism. A state of the art report, published in Faugli et al. (eds) Watercourse exploitation; impacts and remedial measures - a state of the art summary. Report Nr. 13, 1993. The Norwegian Water Resources and Energy Administration NVE). Oslo. (in Norwegian)

Teigland, J. 1994. Konsekvenser av naturinngrep for fritidsbruken av natur. Erfaringer fra kraftutbygging i Aurlandsdalen. Rapport nr. 83. Telemarksforsking. Bø i Telemark.

Teigland, J. 1995. Impacts from designated nature protection areas on primary industries and local communities. An international state of the art study. Report nr. 101. Telemarksforsking. Bø i Telemark. (In Norwegian)

Teigland, J. 1996. Is the international demand for tourism and travel changing? An international «state of the art study» of tourism trends and short and long term change processes. VF-report 9/96. Western Norway Research Institute. Sogndal. (In Norwegian).

Teigland, J. 1997. Potential/latent demand for leisure travelling, and social/cultural change influencing developments. An international «state of the art» study. VF-report 16/97. Western Norway Research Institute. Sogndal. (In Norwegian).

Teigland, J. and Holden, E. 1996. Tourism and the environment. An international «state of the art study». What can we learn from foreign abroad. VF-report 5/96. Western Norway Research Institute. (In Norwegian).

Treweek, J. 1995. Ecological Impact assessment. In Vanclay, F and Bronstein, D.A. (eds) 1995. Environmental and Social Impact assessment. Wiley, Chichester. pp.171-191.

Treweek, J. 1996. Ecology and impact assessment, Journal of Applied Ecology. 33. pp. 191-199.

Vedung, E. 1991. Utvärdering i politik och förvaltning. Studentlitteratur. Lund.

Warnken, J. and Buckley, R., C. 1998 Scientific quality of tourism environmental impact assessment. Journal of Applied Ecology. Vol. 35. pp. 1-8.

Westman, W.E. 1985. Ecology, Impact Assessment, and Environmental Planning. John Wiley & Sons. New York.

Wood, C.M 1995. Environmental Impact Assessment: A Comparative Review. Longman. Harlow.

Wood, C. 1988. EIA in plan making. In Wathern, P. (ed) Environmental Impact Assessment. Theory and Practice. Routledge, London. pp. 98-114.

Wood, C., Dipper, B. and Jones, C. 1998. Auditing the Assessment of the Environmental Impacts of Planning Projects. Results. Draft 5 of article 2 (18 April 1998).

Wood, G. 1999. Post-development Auditing of EIA Predictive Techniques: A Spatial Analytical Approach. Journal of Environmental Planning and Management. Vol. 42, No.5. pp. 671-689.

3 Research design/methods & effects on tourism/recreation systems

3.1 Introduction

A lack of well-documented effect studies explain why planning and democratic decision-making processes can be very time consuming and difficult, if major interests are involved. That is at least the Norwegian experience from development projects during the last 30 years. These decision-making problems are, of course, based on the existence of conflict of interests, but relate partly also on very contrary expectations and effect-predictions that the involved interests have.

One of the basic problems in this field is, therefore, that the involved interests or stakeholders in a decision-making process do not trust impact predictions that the proponent or opponents of a project make, but act and react according to divergent project theories. The different interests and political actors have, or at least state, alternative or competing theories. The project theory and predictions of their opponents are in other words not relevant or unreliable, according to the different stakeholders viewpoint.

3.2 Formative evaluation and case studies as research strategy

One strategy to increase confidence in the relevance and reliability of IA-predictions is to examine contemporary projects and compare the alternative ex ante project theories and predictions with ex post realities. But ex post studies that "only" clarify the volume of change, or the degree of prediction failures, is not what should be aimed at. In stead of doing such “summative evaluation” (Mohr 1988), the research strategy in this dissertation is make formative evaluations that can be used to learn how to improve and form future predictions (and projects). Formative evaluations focus on the reasons why predictions fail or why a project has had the effects it had not only the summative effects (or change observed).

In-depth case studies and formative evaluation are research strategies, which increase the possibility for correct interpretation of the findings and may have high **internal validity** (Campbell and Stanley 1966). But they often include extensive collection of specific information, as appendix 5.1 will show an example of. There are several reasons why the dose of a project or development action interacts with other factors, which makes interpretations of observed change difficult and reduces internal validity of results. History, in the form of specific events that influence change, is among the main confounding factors in case studies. In the case study of the Winter Olympics in 1994 there are several examples of such interpretation problems, which have been created directly or indirectly in the short and long-term by unexpected

events such as the oil price collapse in 1986 and the dissolvement of the Soviet Union (chapter 4).

One scientific technique used to control for the effects of history in case studies, is to compare developments over time with independent reference areas or groups that is not influenced by the dose from an experiment (in the form of the implementation of a project, plan or policy). That research "technique" is often referred to as an experiment based on a "pretest-posttest control group design" (Campbell and Stanley 1966).

Scientifically speaking, this dissertation uses a quasi-experimental design based on "time-series experiments" and the use of comparisons with reference areas to control for the variations that history causes as a confounding factor. The use of reference areas is a measure that clarifies the "counter-factual" situation that probably would have emerged if a project had not been implemented. Campbell and Stanley (1966) claim that "In this type of scientific design the problem of internal validity boils down to the question of plausible competing hypotheses that offer likely alternative explanations of the shift in the time series other than the effect of X" (that is, the effect of the experimental dose or project on a system). In general, results from quasi-experimental designed research can only reject false theories or hypotheses, never prove a theory to be the correct or the right one. But if alternative theories are rejected, and the fewer non-rejected theories there are, the greater the remaining one(s) are "confirmed".

Another problem with case study designs is that the findings from a few cases are not easy to generalise to other projects or events, since the context most often is not presicely similar. The **external validity,** or transferability, of facts and new insight to other cases is not easy to judge. A case study design restricts the possibilities for finding evidence, too, if the chosen cases do not include specific types of phenomena. This author discovered that problem when Wood (1999) in a very recent paper referred to IA-predictions failures that were caused by the scoping process of IA. A failure, which is an example of "pre-prediction bias" that creates biased information to decision-makers. The reason is that predictions made ex ante do not include some types of effects, which the scoping process have excluded. The IA-process itself as a cause of prediction errors would not have been possible to discover in the two case studies included in this dissertation, since both of them focus on projects that did not include a formal IA-procedure and a scoping process. The failure to not identify such errors in this dissertation is caused by the choosen research design. If this dissertation had included case studies where formal scoping processes had focused the impact predictions to a limited, or restricted, types of potential effects, then the findings may have included erors caused by the scoping proces itself. The lack of identification of such errors in this dissertation is an example of a scientifically "selection bias" among potential cases (Campbell and Stanley 1966).

However, case studies can be used to generalise in an analytical sense from one project theory to more general theoretical thesis, if not from one event to populations

or universes (Yin 1984). Case studies that compare alternative theories, not events, act as critical experiments testing the alternative theories, and that are the basic research strategy used in this dissertation. The reason why we are able to generalise in such cases is, according to Campbell and Stanley (1966), that "the great bulk of potential determining factors can be disregarded". This assumption is often referred to as "the assumption of finite causation".

3.2.1 Critical experiments and multi-case design

Here, comparisons are done both between projects that are of a different type and among several projects of a similar type, but in different contexts. Therefore, the research design is as a multi-case design, looking for pattern matching when possible among different and similar types of development actions. The multi-case design is used as a way of checking the influence of different contexts and external forces, and thereby increasing the external validity of findings.

The basic reasoning is that if the observed patterns are similar among very different types of projects, and among similar projects in different contexts, the similarity should not be a coincidence but related to more general causes. This can be stated as "the assumption of the "stickiness" of nature; we assume that the closer two events are in time, space, and measured value on any or all dimensions, the more they tend to follow the same laws"(Campbell and Stanley 1966). They claim, in addition, that "generalisation always turns out to involve extrapolation into a realm not represented in one's sample. Such extrapolation is made by ***assuming*** one knows the relevant laws".

The empirical part of the dissertation looks for the "relevant laws" in the way that it tests alternative theories about effects from two different types of development actions. This is attempted by identifying why effect theories and predictions have been correct or wrong. But partly, too, it is done by clarifying the partial and interaction effects of different factors that influence pre- and post development changes in the system of interest. Here, the system of interest is tourism and recreation.

The first and basic question in this dissertation is the reasons for prediction failures, or why IA-predictions fail? Two basic theses on this subject problem are that:

- Failures in IA-predictions are effects of a limited number of causes that may interact, but poor quality of the project theory is among the main causes.
- Effects on tourism and recreation from basic types of projects have clear structure in time and space. The effects will vary substantially in space and time, but not because of natural short-term variations.

But the dissertation focuses on an important question for applied science, too, and that is how IA-systems and predictions can be improved, based on new insight in the causes of prediction errors. In other words, how can IA become a more relevant and

reliable instrument in democratic decision processes? On this subject problem, the main thesis is that:

- Relevance will increase substantially if IA test the alternative theories that participants in democratic decision processes base their thinking and actions on, in addition to scientific effect theories.
- Reliability of IA-predictions will improve if effect theories and other causes for errors are evaluated by systematic ex-post studies.

It is not the intention of this dissertation to test empirically if these four theses are "true" in general. The research strategy only is to use two specific case studies (which include some multi-case evidence) to investigate more in depth which category of causes for failures of IA-predictions are important and why. But the choice of case studies is made in such a way that they act as critical experiments and empirical tests of concepts and IA-predictive models. Therefore, the findings should have relevance for IA-predictions more in general.

Here, a common feature of the chosen case studies is that the democratic decisions was based on an intense and open debate of potential impacts and the main linkages between the planned stimuli and the responses of the involved natural and social systems. The participants in the democratic process and decision-makers were, therefore, aware of alternative impact theories, which should make it easy to identify errors in ex ante predictions and evaluate the causes of prediction failures. The existence of basic alternative impact theories is a key element, as that makes it possible to use both case studies to test the quality of the alternative theories and hypothesis against the empirical reality.

The chosen case projects were in several ways unusual decision processes with strong controversies and public debate. The interest in potential impacts was high and scrutiny of the quality of predictions accordingly. That should make them favourable cases for finding high relevance and reliability among the proposed impact theories and predictions. It may even be so, that **t**he potential for severe prediction failures should be lower than usually, and the possibility for identifying other reasons than poor scientific theory and low scientific insight to be relatively high. But Campbell and Stanley (1966) claim that the stronger the controversy and the more divergent points of view among competent observers, the more likely it is to assume a priory that both have observed something valid about the situation. "Thus, we might expect in such cases an experimental outcome with mixed results, or a balance of truth varying subtly from experiment to experiment".

3.2.2 Models of purpose- and side-effects

In addition to act as critical tests of alternative effect theories and conceptual framework, the third partial objective of those case studies was to test relevance and

reliability of structural models for effects in time and space on the tourism and recreation sector especially.

There are several general types of development actions that influence tourism and recreation, which is interesting to develop models off in the form of simplified cause-effect relationships. Here, two of the more basic ones are included.

One type of model is relevant for development actions that have improvements for the tourism and recreation sector as the main objective. In other words, such models try to explain in a simplified way actions that have **positive purpose-effect** on, or within, the tourism and recreation sector. The rational and stated purpose is that the actions themselves will have positive effects for the tourism and recreation interests. Examples can be the development of new major tourist and recreation facilities as new winter or summer resorts, or major events as cultural festivals or sports-events.

The other main type of development actions, and models, have their main positive purpose in other sectors, outside the tourism and recreation sector. But these type of actions have a potential for significant **side effects** that influence the tourism and recreation either positive or negatively. Models of development actions that have **adverse side effects** on tourism and recreation are a case of especial interest.

Therefore, the chosen case studies cover both structural effect-models for projects that have an intended positive purpose-effect and a potential for strong positive/adverse side effects on the tourism and recreation sector. One of the two case studies focuses on side effects from common and often repeated development projects (exemplified by a major hydropower and road development). The other study focuses on effects from a relatively rare, or unique, type of projects that has (or intends to have) clear and positive purpose-effects on tourism and recreation; the Winter Olympic Games.

The objective was to use both case studies to develop empirically based structural models that should improve judgements of both purpose- and side effects on tourism and recreation interests. Such models should make it easier to predict effects both in time and space. But first, it is necessary to clarify some basic concepts used to analyse tourism and recreation systems in general, and the main indicators and methods used in empirical studies of effects on tourism and recreation (chapter 3.2-3.4).

3.3 The tourism and recreation systems, basic concept[3]

Tourism can be defined as the set of activities of a person travelling preliminary to a place outside of her/his usual environment for leisure, recreation or pleasure purposes. Smith (1995) adds that the: "main purpose of travel in addition should be other than exercise of an activity remunerated from the within the place visited", excluding in that way for example "migration for temporary work paid for by an economic agent resident in the place visited". Tourism excludes, therefore, a permanent change of resident and trips within a person's community of residence or normal commuting. But persons do recreate and leisure pleasures inside their usual environment, and tourism as a concept do not include such activities. If tourism and recreation are used as combined concepts, however, then these two concepts together cover recreation and leisure activities inside and outside people's usual environment, at home and during shorter and longer trips away from home.

Persons who travel away from home for recreation or pleasure are the basic component of tourism. It is no tourism if persons do not want to move preliminary away from their permanent residence to one or more destinations. Each trip will then follow a trail or route where the travel-corridor includes also the environment around the trail/route.

Trips outside the usual environment are usually no coincidence. A large number of factors influence travel behaviour and habits, partly in a complicated interrelationship. It is easier to understand the relationships if tourism and recreation rae seen as a system, consisting of different elements that are linked together and influence each other. Travel and recreation systems will in practice have different forms, with substantial variations in the forms of elements and linkages. Such systems will in the most simplified form consist of three basic types of geographical elements or areas and three basic types of humans or social groups.

3.3.1 Basic geographical elements

The geographical elements are:

- one or more destinations that the travellers stay on a short or longer preliminary visit
- the residential areas travellers leave preliminary that are the origin or generating area, and source that tourist are coming from

[3] The following parts of this chapter build on several different papers/reports published earlier in
- Sievänen, T. (ed). 1992: Nordic Outdoor recreation. International Comparative Studies. Metsântutkismuslaioksen Tiedonantoja 439, Helsinki, and
- Teigland, J. 1996. Is the demand for travel and tourism changing? An international state of the art study of trends and forces behind short and long-term processes altering demand. VF-report 9/96. Western Norway Research Institute. Sogndal (In Norwegian)

- the travel- or transit-corridors that travellers are passing through on the way from their permanent residence to the destination(s) and on way back home.

Figure 3.1 illustrate the geographical parts of tourism and recreation systems in it most simplified form.

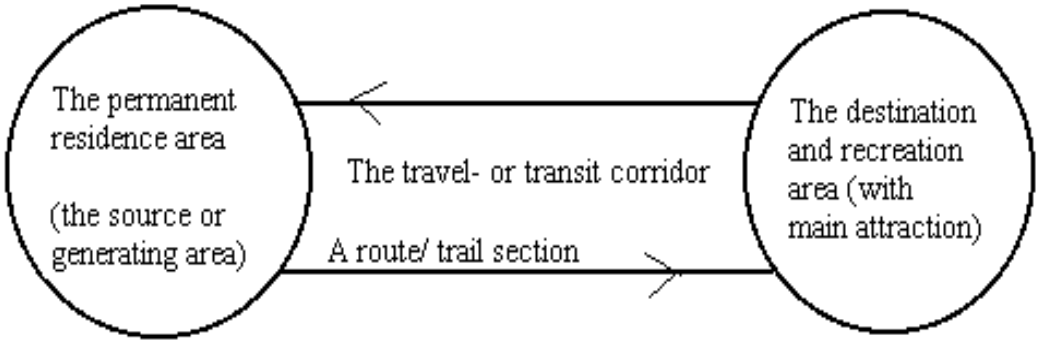


Figure 3.1 Geographical elements in the tourism and recreation system.

The spatial structures of such systems vary substantially. A trip between a residential area and the main destination or recreation area may include a few different destinations or a round-trip with many short stays at a number of different places. The travel route for a multi-destination trip (Leiper 1989) consists, therefore, of several sections or linkages in a chain of destination visits that include more or less important attractions and short or longer stops and overnight stays. Places where different routes or travel-corridors meets are often referred to as nodes (Elling and Høyer 1996).

A destination where travellers stay several days can be used as a base for shorter trips in the region around. Trips into the recreation hinterland are, however, restricted to be within a leisure commuting distance (often restricted to day-trips of 6-8 hours total travelling). Resorts are destinations planned and developed specifically for receiving leisure tourists and delivering all the main types of services that such visitors need, including accommodation, food, entertainment, activities and experiences. Resorts, which focus on delivering specific experiences, can be classified according to themes (alpine resorts, sea-resorts, gambling resorts, historic resorts, and even adventure or “wilderness-resorts”).

Travel-routes have also been planned and developed for recreation purposes, and include both recreation trails for non-motorised use and tourist-roads developed specifically for leisure travel by private car or tourist coach. Trails for non-motorised users have, for example, been developed as a means to learn about nature (nature

trails) by help of guides or self-instructional means. Some trails are developed for training, fitness or health purposes. Other trails are designed to give recreation users access to special experiences or activities (theme trails), such as “fishing-trails for the handicapped”, “illuminated cross country trails”, “trails for training hunting dogs”, or “war-game trails/survival trails”.

Road- or trail connections between two points are often tied to other roads/trail-segments between other places, creating road- or trail networks. In cases where travel routes and networks are tied together in a systematic way by common ideas, plans or management, then the routes/trails are part of a travel system or tourism route/trail system. The different units or elements in travel systems are then the road/trail segments/sections, but also the different types of services along the route/trail; for example accommodation possibilities, camping sites, hotels, service centres at junctions, or systematic signs and guides.

The development of trail/route systems is not a new idea. Such systems have been developed many years ago on most continents by, for example,

- the Incas in South America to link their empire together,
- in the Middle east to link major capitals to the religious centres in Mecca and Medina,
- in the Fare East to link political capitals to military centres (as the trails in Japan between Tokyo and Kyoto), and
- in Europe where the Romans developed extensive road systems 2000 years ago (another example is the first Norwegian kings that organised travel systems 8-900 years ago for pilgrims and other travellers to pass the major mountains).

All of these historical travel systems supplied accommodation, water and food within a one day travel distance or shorter, by constructing rest houses systematically along the route or by giving farmers or local communities along the route special privileges and/or duties for serving travellers.

A recent phenomenon is that travel systems are developed on a global scale. During the last decade large airliners have started to co-operate and establish global air travel systems with service to hundred of destinations. International hotel chains operate world-wide accommodation systems too that guarantee consumers the same type of services (if the consumers desire security of getting the same type of service). National authorities on different continents co-operate also on developing long distance tourist routes over land, as for example the efforts to re-establish the historic “silk-route” as a modern tourist route; from Japan in the east through China to Europe in the west.

3.3.2 Basic social elements

New international or national travel systems, or product elements, are mainly developed by private interests and on commercial basis. The private interests involved in tourism businesses are parts of the tourist trade that broadly defined include both profit-oriented firms and non-profit private or public suppliers of services and goods to travellers. The "tourism trade core" delivers nearly all of their products to tourists, but many tourist businesses deliver to local inhabitants or non-travellers as well. The core or tourist industry proper may, therefore, be defined as the businesses that deliver so much of their products or services to tourists that they would not exist in the absence of leisure travellers. The "tourist trade periphery" would exist well without the demand from travellers as a major part of their production is for non-travellers.

Two of the basic social elements in tourism and recreation systems are the consumers that travel or recreate, and the producers that deliver travel or recreation products or services. But such systems include in addition a third social element or interest group. The third group includes the many persons that interact directly or indirectly with the recreation travellers and tourism producers, on the destinations, along the travel corridors and in the residential areas. Most of the third social element is either:

- local inhabitants outside of the tourist trade that in one way or another are influenced by the tourists or the tourist producers, or
- inhabitants that actively try to influence the travel/recreation consumers, or
- producers in an attempt to take care of interests of common interests, either at destinations, at a residential area or in travel-corridors

These three social elements may vary strongly in form and volume from one tourism and recreation system to another. Only in extreme types of systems will the travellers not interact with at least some types of travel producers or local inhabitants on destinations or along travel routes. One of the most extreme cases will be when the travellers are very self-sufficient and take care of nearly all of their travel needs themselves. The travellers will in such cases use their own private accommodation in the form of second homes or caravan/boats, use their own means of transport, organise their own food supply, activities, experiences and also collect the needed travel and destination information on a personal basis. Another extreme will be when the consumers depend fully on the travel trade and buy a "travel package" from one single producer (a tour-operator) that provides in one package all the accommodation, transport, activities, information etc desired. But even in a case where the destination for such a tour-package is an isolated area with no local inhabitants, or a cruise ship that visit uninhabited areas, will the travellers influence some local inhabitants along the route or back to the travellers permanent residence.

3.3.3 Internal forces and external relationships

All kind of tourist and recreation systems consists, therefore, of three basic social and geographical elements that are linked together in different ways. A change in one of the social or geographical elements, or in a relationship between elements, can influence other elements in a system through different kinds of transmitting mechanisms. An important reason for the linkages is that the social groups seldom are passive onlookers. They are internal elements in a system and do often actively try to influence how the tourist and recreation system functions and develops.

Internal actions by the social elements or groups take place in all geographical elements of the tourist and recreation system both in the destinations, in the residential areas and in traffic-corridors. A local community may, for example, act to increase or reduce the number of tourists, or to change the behaviour of tourists, a tourist company or the behaviour of the travel trade more in general. Travel traders may act to make a destination or travel route more attractive, easier accessible or better known. The tourists may act too as consumers to organise themselves to get cheaper service, higher quality or improved consumer protection from national or international authorities. A travel and recreation-system is, therefore, a control-system in the meaning that different actors try to influence how the system functions and develops (Knowles and Wareing 1985). An action from one actor may create reaction(s) from other actors with opposite or similar interests, and thereby create different processes that strengthen or curb a change desired by one of the actors inside the system.

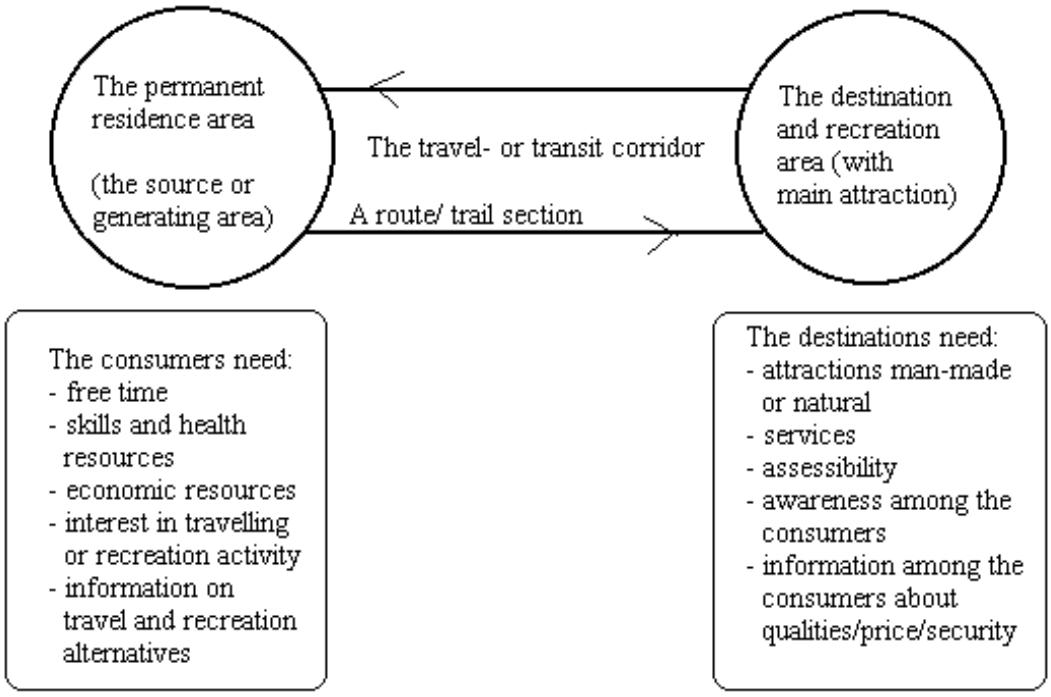
These three social actors are internal interests or forces that may influence tourist and recreation systems. But such systems are not isolated from other forces that are not related directly to the tourism and recreation interests. Actors that have general concern in mind, and not act in any conscious way to influence the travel and recreation sector or interests, are external agents for change. Such general forces or processes are often referred to as external or exogenous factors in prediction models (Lundberg et al. 1995). They are external factors as they are outside of the control of the internal social actors, and forces that the internal actors have to (mainly) accept and adjust to.

Tourism and recreation systems are **open systems** in the way that many other and external forces do influence consumer behaviour and their choice between travelling, recreation and other forms of use of time on a daily or yearly scale. To be able to travel or recreate then consumers need free time in the form of time periods free from work obligations or social obligations as taking care of seek relatives. Several types of recreation demand more or less activity specific skills; skills that for example are needed to take part in swimming, golfing or alpine skiing. To participate it is most often necessary to have money to pay for services. It is in addition necessary to be interested in travelling or to recreate, and desirable to have access to information about relevant travel or recreation alternatives.

These type of resources and interests are influenced by many processes that take place in the home community of the travellers, and outside of the control of the individual consumer or the tourist and recreation trade.

Several other types of general process do also influence important attributes of destinations. Some attractions are man-made, but not made to please visiting tourists or people who recreate. Man-made attractions as for example local way of life, traditions or landscape may change in spite of the traveller's interest in the qualities of the original landscape or way of life. Nature attractions may also change in a negative or positive direction because of actions that other interests in society make to attain effects the tourists and recreation interests may be against. A destination may be become less accessible if a railway is closed, or a new highway constructed that change travel behaviour.

The use of a recreation area or the flow of visitors to a destination depends, therefore, on many factors outside of the control of actors inside the tourism and recreation system. Figure 3.2 summarises some of the most important factors that influence the consumer's ability and interest in visiting a destination.



Figures 3.2 Significant factors that influence the tourist and travel system in the destination and residential source areas.

A project, program or policy that change one or more attributes of a destination or a travel/trail corridor is, therefore, only one impulse for change in one part of a complicated, dynamic and open system. But planned actions to change one single part of a travel and recreation system may have important effects and consequences for the consumers, the travel and recreation trade and the involved local/regional communities. These three social interest groups are, therefore, often interested in knowing how a project or development action will influence their future interests. A key question is how the consumers will react to major actions, and how that later on will influence tourist businesses or more common interests.

Major development actions or projects will be of two main types. Some projects have as their main purpose and stated objective to be an advantage for the tourism and recreation interests. The main outcome of interest (the primary effect) of, for example, a mega-event is most often the expected positive effects that the event itself has on the tourist trade and the local community. The project or purpose theory of such projects focus, therefore, on the advantages such projects have for the tourist and recreation interests.

Most other projects have, however, non-tourism objectives or recreation purposes, but may as important side-effects influence tourist and recreation interests in a negative or positive way (or neutral). That may be the case if a major hydropower, oil drilling or highway project change the quality of a nature attraction and make the project site or surroundings easier accessible for visitors.

The planning of both of these types of projects will be based, either explicitly or implicitly, on project theories that assume or predict effects on tourism and recreation, or that these types of impacts will be non-significant. But few studies exist that have tested and verified such theories or checked experienced-based information from earlier projects (experiments) in a systematic way. It is especially a major problem that internal and external relationships are seldom clarified, to check if observed effects are related to external forces, and less to a specific project. In any case, information from such projects and lessons learned will only be relevant for future projects of the same or similar kind in a specific context.

3.4 Effect studies; indicators of relationships and measurements

The common indicator in these case studies of the effects from different projects, and important internal and external interrelationships, are the changes that take place in consumer's travel and recreation behaviour. It is not the change in the behaviour at an individual level, but behaviour more in general in the form of aggregate demand/use of destinations/recreation areas that are used as the main effect-indicator.

Aggregate consumer behaviour is here measured by the volume and structure of traffic or travel flows through travel-corridors to destinations, or inside destinations, before, during and after a specific development action or project.

Many methods can be used to study the structure and changes in visitor flows. It is possible to measure the flow out from a residential area and to different destinations by using interviews among the populations when they stay at home. Visitor's flow can also be studies along the roads- or trails that travellers use or as border controls when visitors enter or return from a domestic destination or foreign country. Use volume and pattern can also be measured on a destination by surveys that take place internally on the destination, from administrative data coming from tourism and recreation producers (as accommodation statistics), or from observations of tourist behaviour during travel or stay at a destination. Figure 3.3 gives an overview of potential information gathering methods and main types of data sources.

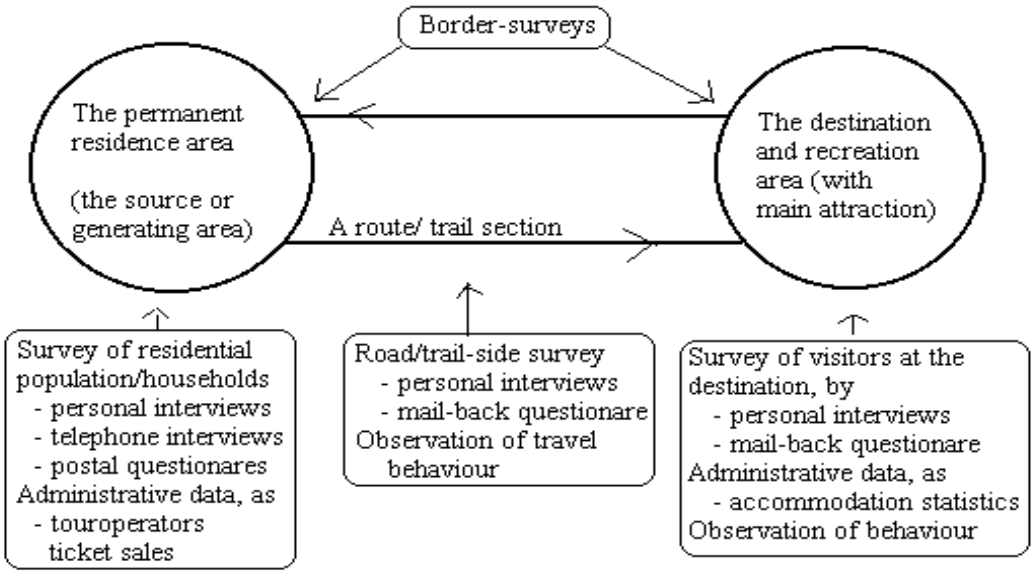


Figure 3.3 Main type of methods for studying structure and change in the consumers tourism and recreation activities

All of these methods have been applied in the case studies presented in this dissertation. The multi-measurement design has been used partly as a triangulation strategy to test if different methods give comparable information. When the information was similar, that verified the findings and increased the reliability.

If comparable studies do follow the development in visitor flows and structure over time in a systematic way, then a monitoring system has been established. But the cost

is high when information is gathered according to a comparative design, especially if data are collected with short intervals. Monitory system covers, therefore, seldom more than a few important aspects of the development of a tourism and recreation system. Most often only a few important indicators are measured that identify change in some of the main elements. The selected indicators may, then, function as a warning-system, giving early warnings about how complex systems behave. But the information from indicative monitoring systems has to be interpreted with caution. The changes that are observed may relate to very different forces, and wrong conclusions may be made if the understanding of relationships and processes behind the observed change in an indicator is weak.

The planning process before the Winter-Olympics in 1994 gave a good example how data from monitoring systems may be used to draw wrong conclusions. The regional tourist officer then argued that it was potential for a strong expansion of hotel accommodation capacity. The reason was that the Norwegian monitoring system of the hotel sector did show (at that time) a strong growth of foreign guest nights in the Olympic region. A growth the tourist officer interpreted as an effect of his intensified marketing efforts. His reasoning was that if the resources for marketing were increased even more, then it should be possible to increase the demand much more and expand the hotel capacity accordingly. A control of the data from the regional hotel accommodation statistics did, however, show that all the growth in guest nights at that time was linked to accommodation of a strongly growing number of refugees. They had most probably no relationship to intensified marketing efforts by the tourist officer. The information from the monitory system was in that case correct, the number of overnights were strongly growing, but the interpretation or theory of why it was a growth was very wrong. The basic failure was that alternative explanations were not checked, to see if an alternative theory was more relevant or if the data was reliable.

The design of the following case studies, therefore, focus strongly on measures that make it possible to test alternative explanations and check the reliability of available information.

References:

Campbell, D.T. and Stanley, J.C. 1966. Experimental and Quasi-experimental Designs for Research.Houghton Mifflin Company. Boston.

Elling, B. and Høyer, K.G. (1996) : Indledning. In : Elling,B. (red) : De Store Nordiske Transportprojekter. Transportinfrastruktur, Miljø og Regional Udvikling. NordRefo rapport 1996:4. Stockholm/København : NordRefo.

Flyvbjerg, B. 1999. Rationalitet og makt. Bind I. Det konkretes videnskab. Akademisk Forlag. Århus.

Knowles, R. and Wareing, J. 1985. Economics and Social Geography. Heinemann. London.

Leiper, N. 1989. Main destination ratios. Analysis of Tourist Flows. Annals of Tourism Research. Vol. 16, No. 4. pp. 530-541.

Lundberg, D.E., Stavenga, M.H., and Krishnamoorthy, M. 1995. Tourism Economics. John Wiley & Sons. New York.

Mohr, L.B. (1988). Impact Analysis for Program Evaluation. Brooks/Cole Publishing Company. Pacific Grove.

Smith, S.L.J. 1995. Tourism Analysis. A Handbook. Longman Group Limited. Harlow (2nd edition).

Wood, G. 1999. Post-development Auditing of EIA Predictive Techniques: A Spatial Analytical Approach. Journal of Environmental Planning and Management. Vol. 42, No.5. pp. 671-689.

Yin, R.K. 1984. Case study research. Design and Methods. Sage Publications. London.

4 Predictions and the real effects on tourism of rare development actions; a case study of the 1994 Winter Olympic Games

This chapter is identical to a paper published in Impact Assessment and Project Appraisal, December 1999, vol. 17 no.4 pp. 305-317. It covers effects in time and space on tourism and recreation from a relatively unique type of projects, the Winter Olympic Games. The paper analyse the pre- and post developments of the 1994 Olympics in Lillehammer, but only the first post-event years. Here, Appendix. 4.1 is included to document more recent long-term effects and interactions with other processes. Methodological, it is the problems created by "multiple treatments" or the interacting dose from several projects that are covered in that appendix. The strategies used for making the 1994-Olympics more environmenalt friendly are discussed in Appendix.4.2.

This case study focuses on a type of project that has as the main purpose to influence tourism and recreation directly and in positive ways. It acts as a critical experiment that tests common theories about "purpose-effects". The next chapter focuses on common theories about potential side-effects for tourism and recreation interests.

One conclusion is that the effects on tourism and recreation - from a unique type of projects as the 1994 winter games - have clear structure in time and space. International comparisons show that the volume and structure of change had several similarities with observed changes in other hosts of the same type of event, also.

Most ex ante predictions of tourism effects of the 1994-Games were, however, major failures. One reason was poorly developed project theory and lack of insight in the interrelationships between the primary project (the dose) and the response of the tourism and recreation system. Several major external and dynamic processes have contributed to the prediction failures, too, especially the direct and indirect effects of the 1996-oil price chock on the Norwegian economy and side-effects from the disintegration of the Soviet Union. In addition, there is clear evidence that biased IA-experts have caused misleading prediction, which an American scientist has found to be the case in his country, too. The accommodation of refugees in periods before the host election and recently, have contributed to non-normal baseline and post-line, also.

A substantial change in the design of the primary 1994-project and another major development project in the same region, in combination with other external processes, has reduced the local impacts of the errors in effect-judgements. First, when the Norwegian Parliament discovered that the original cost estimates were totally wrong, the economical dose (the budget) were increased fivefold with much higher developments of sports, recreation and cultural facilities than original planned for. Still the original effect predictions were far too high during the first pre-game years. Secondly, Parliament decided to develop another major project in the same region (a new national airport), which made the host area of the 1994-Games substantially more accessible for national and international tourism from 1998 on. Recently, this new project has reduced the divergence between the post-event realities and the predicted change in tourism from 1994.

The many interactions and cumulative processes reduce the external validity of the observed summative change before and after the 1994-Winter Olympics. However, it is common that IA-predictions of effects on tourism from mega-sports events diverge substantially from the reality afterwards, and are highly over-optimistic. Improved theory, identification of the partial effects and strict control of sources giving biased information, may reduce prediction failures in the future.

Mega-events and impacts on tourism; the predictions and realities of the Lillehammer Olympics[4]

Abstract

Impact assessment of unusual events is difficult, and must be based on a proper understanding of the forces forming effects in time and space. Norway discovered that after hosting the Winter Olympics in 1994. The national and local authorities expected a «big boom» of tourists afterwards, but effects on tourism have been less and different from predictions. Forty percent of the full-service hotels in the host town of Lillehammer have, therefore, failed economically or gone bankrupt afterwards.

This paper uses the 1994-event as a learning experiment and compare ex ante theories, predictions and the ex post reality. Reference areas and time-series analysis is used to clarify the counterfactual and internal validity. International comparisons among Olympic hosts identify general patterns. The aim is to help planners of mega-events and other rare projects to improve their forecasting efforts and decisions.

Ex post studies can improve the quality of future ex ante impact assessment of unique projects. But it is important to clarify partial, interaction and cumulative effects. Another lesson from the Norwegian Winter Olympic experiment is that much more careful market and cost/benefit studies are needed.

4.1 Introduction

Unique or rare types of projects can be a major challenge for the impact assessment profession. Really unique projects represent a pre-paradigmatic situation with few or no scientific theories or empirical evidence on which to built judgements. Experience-based or silent knowledge is also lacking. An important quality criterion for judging impact assessments of first-time projects is, therefore, the logic and substance in the effect-theory that predictions and decisions are based on either explicit or implicit.

Assessments of projects that are repeated can build on evidence from earlier cases and established theory. The quality challenge then is to transfer earlier knowledge to the new situation, and to assess the external validity of earlier cases. The implementation of a project will in any case act as an experiment that tests the effect-

[4] This chapter is an exact reprint of the original paper (exluding only a few language errors), but builds on a much larger and detailed report published by Western Norway Research Institute in 1996. Teigland, J. 1996. Impacts on tourism from mega-events: The case of Winter Olympic Games. VF-report 13/96. Sogndal. (In English).

theories or hypothesis on which a project is based. If important ex-ante predictions and theories are not confirmed ex-post by the empirical reality, then improved theory is needed as guide for future practice, according to rational empiricism.

The Olympic Games are in many ways an unusual type of project and not easy to assess properly. Norway learned that the hard way after hosting the Winter Olympic Games in 1994. The local, regional and national authorities expected a tourist boom if Lillehammer was chosen as the host town. Several Norwegian impact assessments supported theories and predictions based on "**boom visions**" (Selstad 1984,1989 and 1990, Aasheim et al. 1990, Kamfjord 1990). Investments were done accordingly. But theory and reality has been divergent. So fare 40% of the full-service hotels in Lillehammer have gone bankrupt. The two new large alpine facilities have been sold, too, for less than 1 US$ each to prevent bankruptcies because of uncovered large debt.

Investments that are too high, based on predictions of a **tourism boom**, are most probably not phenomena unique to Norway. Crompton (1995) has reviewed impact assessments of sports events, and found unrealistic high expectations to be a common problem. The international community could, therefore, reduce future problems by learning from earlier mega-events. Unusual projects in general give science the opportunity to test alternative theories and improve them. A single experiment or event can even be a critical test of a theory, if important effects are very contrary to predictions.

The 1994-Olympics may be such a critical experiment, testing "big tourist boom theories" in general, because, in many ways this event should be a very favourable case for large tourist effects. Lillehammer, the host town, is very small for such a large event, with only 23 500 inhabitants when selected in 1988. The local community lacked most of the necessary facilities and infrastructure, having only 3500 tourist beds and almost no major sports and alpine ski supply. In addition the 1994-games was based on a "**compact game"**-concept with most venues originally within walking distance. A strong concentration, combined with a need for many new facilities, should favour both high and easily identified impacts on tourism.

In addition, the 1994-Games became a true mega-event, much larger than first planned and more successful than dreamed of. Total cost became approximately US$ 1,7-2,0 billion, including private and public investments and operating costs, for an event lasting 16 days. The organisers had 12 000 persons working for them during the event itself, and 30 000 official guests were accommodated. A large number of other visitors did also come, since 1.2 million tickets were sold. On an average day, 669 million TV-viewers also joined the experience (Spilling 1998).

Good snow conditions, the best winter weather ever with 16 days of sunshine, and a very enthusiastic public enjoying a «big party» did also contribute to an unusual success. In many ways it would be strange if such a concentrated, massive and successful stimulus did not have major effects on the local and regional tourist industry. If it did not, one conclusion could be that "big boom visions" must be

wrong, or at least that we need a much better understanding of tourist effects from rare mega-events.

4.2 The research design

The divergence between theory and empirical evidence in the 1994-case may, however, be explained as a speciality or scientific anomaly, with low external validity. The research strategy in this paper, therefore, is to use this event as a starting point for intentionally replicated case studies of the earlier Winter Games in Calgary (1988) and Albertville (1992) looking for similarities or pattern-matching and the reasons for them.

These studies are close to a "multi-case design with embedded multiple units of analysis" as proposed by Yin (1984). The multiple cases are the different Winter Games. The main unit of analysis is the changes in tourism during the whole event-period (the holistic unit) from emergence of the idea of the event to the long-term effects. Embedded units are analysed too when effects are separated according to different time units (effects before, during and after the Games) and space units (effects at local, regional and national level).

Changes in tourist demand and supply during the total project period do clarify the **time pattern** of tourist flows and the **geographical influence** zones from mega-events. The statistical data used here are published by, or on behalf of, public authorities. This information has been checked, when possible, against different sources as part of a triangulation strategy.

The main idea is to confront alternative tourist development theories with the empirical realities. Campbell (1988) has stressed the need for such comparisons, if science is to contribute to higher quality ex ante impact assessments in this field. The aim is to help planners of future mega-events to improve their forecasting efforts, decisions and concepts. The 1994-Games are used as the basic reference and the main learning experience.

4.3 Basic forces forming effects in time and space

4.3.1 One strong impulse and butterfly-effects

Regional development was the main goal when Norway applied for the 1994 Winter Olympics. The intention was to use the Games as a massive impulse to a stagnating region, starting a dynamic development process and creating an international tourism destination. That vision was based on the idea that tourism is a growth industry, to which mega-events should strongly contribute. The Winter Olympics should be especially appropriate, as there is a close linkage between winter sports events and winter tourism (Socher and Tschurtschenthaler 1987). However, Crompton (1995)

claims that such "one-off"-events in general are unlikely to generate lasting employment because of their short term nature, and they will probably produce only short term effects on tourism.

Repeated events at the same location, as many festivals, may create several waves of development that strengthen each other through a diffusion process. One reason for sustained growth is that the catchment area of tourists will increase as awareness of a regular festival spread to areas further away over a long period (Bohlin 1996). One-off events as the Olympics, will not have the same diffusion effect over time.

Nevertheless, hosting a mega-event can inspire locals and others to organise other events before and afterwards at the same location. One event may then have "**butterfly-effects**" and start dynamic processes as a result of which even small events may have large impacts over time. Planning of mega-events seldom includes such effects, but is mostly based on theories of effects in space and time from one single large impulse.

4.3.2 Effects in time; the alternative scenarios

The Winter Olympics last no more than 14-16 days. Application, planning and preparation, however, often take 10-15 years or more. Thus, impacts on the host town and region occur during a long period, with the **event season** itself only as a short boom. Tourist development theory, which cover the **total project period** from initial idea to final implementation, follows two basic forms; a **new plateau scenario**, or a **"back to normal"**-alternative (figure 4.1).

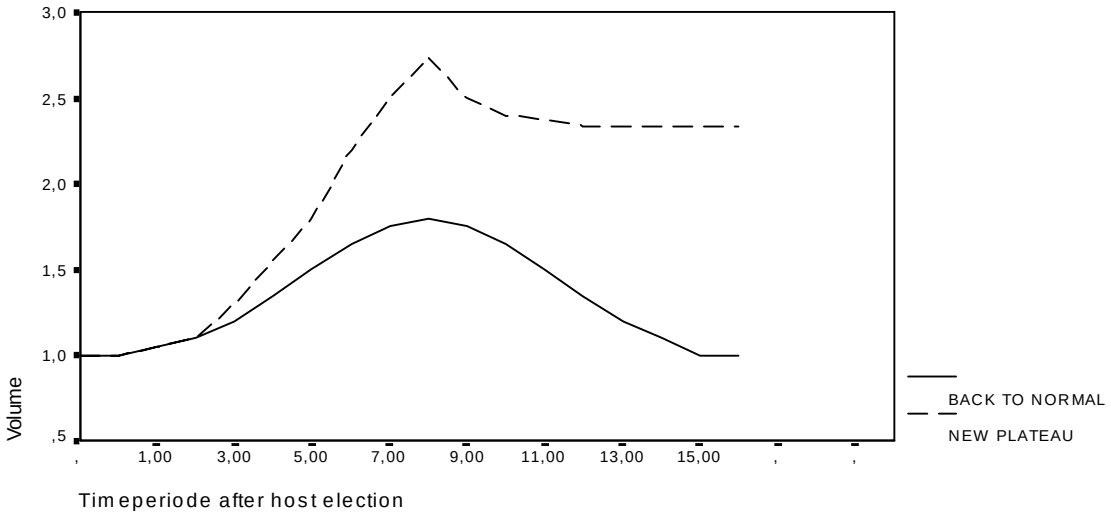


Figure 4.1 Scenarios for tourist flow related to mega-events. Time pattern with flow volume in election year equal 1,0.

New plateau theories assume that a mega-event has lasting post-event effects on tourism, because of improved awareness, attractions and accessibility created directly or indirectly by the event. The cumulative effects from such changes give the host community and region increased competitiveness in tourist markets, lifting demand to a new level. According to this theory, the total effect depends on the degree of improvements compared with other tourist destinations.

The Lillehammer community based its tourism planning on a new plateau scenario (Lillehammer Næringsselskap 1990), expecting a 125% increase in traffic between the host election year in 1988 and year 2000 (up 7% annually). Regional tourism planning was also based on very strong growth, up 102% from 1989 to 1995 or 11% annually (Oppland Fylke 1989). A local scientist was even more optimistic and claimed a steady regional growth rate of 15% annually because of the Olympics (Kamfjord 1990). One of the major national research institutes predicted clear effects on national level, too, with foreign tourism up 10% for at least 10 years after the 1994 Games, and even more if the 1994 Games were a success (Aasheim et al. 1990).

The "**back to normal**" scenario is a **bell-shaped** pattern of tourist flow over time, based on a theory about only **preliminary impacts**. This theory relates changes in tourist flow to the growth before and decline afterwards in media attention and economic stimulus from the event. A bell-shape assumes also that improvements in competitiveness are not very important or only preliminary. The economic stimulus from preparation and media attention will then be the dominating forces and continue during the first post-game years, but disappear quickly later on. A significant rise and decline in the awareness level is reported after the 1988 Olympics in Calgary (Ritchie and Smith 1991).

Most of the Norwegian assessments predicted that tourist effects would start soon after the host election (1988) with a steady growth rate up to the event itself (1994) as a linear development. However, a "**skewed**" time pattern is possible too, because of shadow effects and time lags. One type of **shadow-effect** is related to time linkages between the different Olympic Games or other events. The selection of Olympic hosts is usually made 7-8 years before the event takes place. Therefore, in the immediate post-election years, a newly elected host could experience a shadow-effect from intervening Olympic games or other mega-events, contributing to low growth in the first years.

Skewed bell-shapes are also linked to the host community's need to accommodate experts and workers during the planning and development period. The volume of preparation-related traffic depends on the degree of self-support; the smaller the host community the greater the need to import personnel. However, work-related traffic would be relevant initially and disappear afterwards. Visitors from future host countries will appear too, to learn both before, during and after an event. This may explain partly why visits to the Norwegian 1994 Games increased especially from countries hosting the next Winter Games (in Japan and USA).

Time lags, too, can skew tourist flow after a mega-event. New tour operators and sales channels that, after a successful mega-event decide to offer products in the host region often need a year to prepare. Independent leisure travellers on the other hand, make their decisions so early that a mega-event may not influence the first holiday season afterwards, but later ones. **New awareness** may create a time lag of one year between media exposure and increased demand among foreign leisure tourists, as reported by Kang and Perdue (1992).

4.3.3 Effects in space

The concept of the Olympics focuses on one **host-city** or town, but also accepts the use of secondary sites (**satellites**) within one-hour's driving distance. The host community is here referred to as the **Olympic core**, while the neighbour communities with Olympic venues are the satellite region. The **Olympic region** is the regional political unit to which the host-city or town belongs to (figure 4.2).

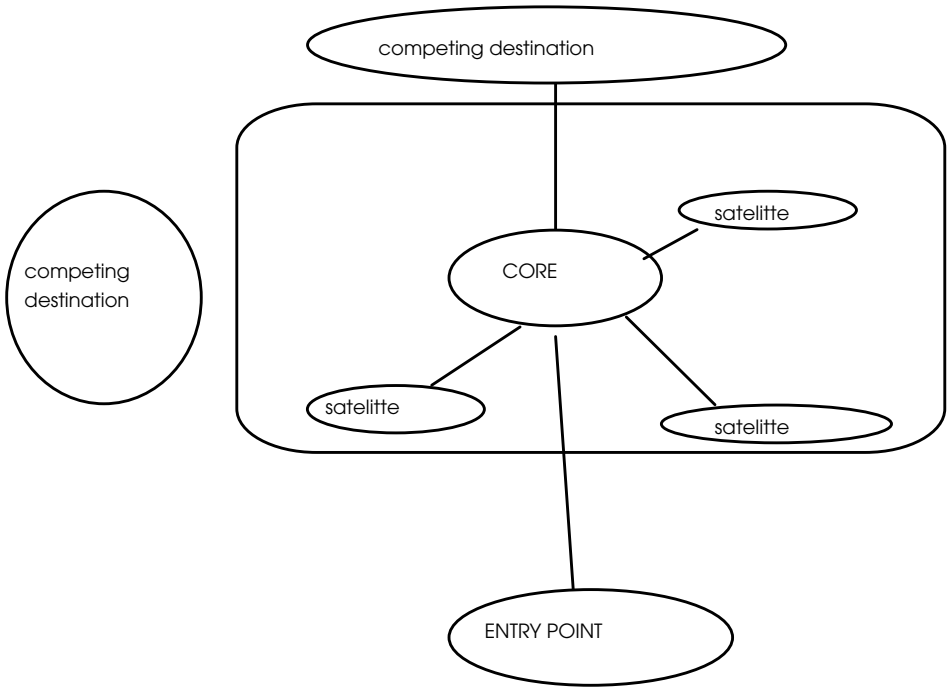


Figure 4.2. The structure of geographical influence zone of mega-events.

The **influence zone** of a particular Olympic Games will vary depending on the distribution of venues and facilities to different types of satellite areas. Such events will also influence entry and departure points to the host country or region, especially areas close to airports receiving international visitors. The main entry point to Norway (Oslo, the capital), which is a major attraction in itself, hosted 47% more of the additional foreign guest nights than Lillehammer itself during the month of the 1994 Olympics.

Intervening attractions along major travel corridors, and competing tourist destinations, may be influenced too. Thus there will be an international substitution effect as foreign visitors travel to the host country of an event instead of destinations in other countries. This effect was reported after the Summer Olympics in 1988, which increased South Korea's regional market share with 1-3% (Kang and Perdue 1992).

Internal effects can also occur. For instance, there can be an **internal-external substitution** effect causing relocation between domestic and foreign destinations. A Norwegian pre-Game study (Aasheim et al. 1990) predicted that the 1994-Olympics would reduce Norwegian demand for winter holidays abroad by 10% during a period of 10 years afterwards, and reduce summer holidays with 1%. (The same study predicted that foreign demand for holidays in Norway would increase by 10% in the first ten post-game years).

Internal substitution can also occur inside a host region or nation, as both foreign and domestic demand can be relocated internally from other domestic destinations to the core or host region. Competing destinations often express concern over such internal effects, as public founding or subsidies of Olympic facilities and infrastructure can create unfair competition. On national level **internal relocation** is a problem if the main effect of using national money for a mega-event is the movement of tourists from one region to another.

If a mega-event does not encourage enough new tourists to compensate internal relocation, then the net result for the host country will approach zero. As a large inducement was expected on national and regional level, internal substitution or displacement effects was not a concern in Norwegian pre-event studies.

Displacement is not only a geographical phenomenon, as timing of tourist flows can also change. A study from the 1984 Summer Games in Los Angeles (LA) indicates that 70% of the usual business visitors postponed their arrivals during the event period. That is a time displacement since business traffic increased accordingly afterwards (Lazer 1986). Also leisure-based attractions in the LA-area reported that visits declined by 20-35 % from the normal (Pyo et al 1988). Reduced demand was partly a result of the many locals moving away during the event to escape congestion problems. That is another type of displacement in space (Economic Research Associates 1984).

Substantial and **temporary displacement** of normal tourists was also reported during the Olympics in Innsbruck (Brönnimann 1982). The main foreign winter market for the Norwegian host region reacted in the same way during the 1994-season (figure 4.3).

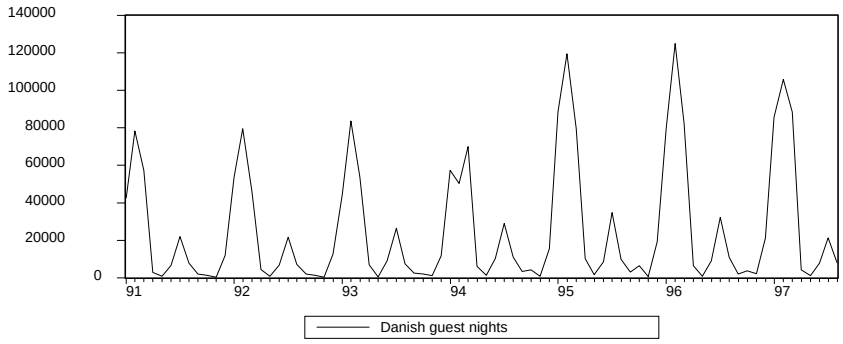


Figure 4.3. Guest nights by Danish tourists in the 1994 Olympic region (Oppland) 1991-1997. Accommodation facilities with 20 beds and more. Data source: Central Bureau of Statistics.

4.3.4 Interaction effects

The Norwegian impact assessments assumed that the event itself would be the only agent of change. Thus the effects were defined as the difference between the situation before the event and after it. To assume stability of all other forces is, however, strange when a project lasts eight to ten years.

The planned event (the **primary project**) will often stimulate other related **secondary** projects both in private and public sector, in the form of new theme parks, museums and upgraded public services. In addition, unintended processes will influence most primary and secondary projects during the long planning period and afterwards. Only parts of the total change in tourist development will be effects of the event itself, making «**partial effects**» a key concept.

Impacts on tourism from a mega-event are, therefore, usually the result of several forces creating **interaction and cumulative effects** in a dynamic development process over a period of 15-20 years. The **partial effect** of a mega-event consists of the changes that would not occur without the event idea and implementation. This definition of effects requires knowledge of the **counter-factual**, the situation which would have been without the event. An alternative effect concept could be the «**impact ratio»** (Mohr 1988), which compare the real change (in tourist flows) with that which was planned or expected.

One major problem when comparing pre-event forecasts and post-event reality is, however, that the event concept can change substantially during the planning period. The original idea was for example, to create a **compact and cheap 1994 Game**. However, cost estimates increased sharply after Lillehammer was elected as the host in 1988. Within six months the official cost estimates had increased to a level 5 times higher than originally, before Parliament fixed an upper limit. The costs increased partly because a town with 23 500 inhabitants could not possibly pay the bill. Since

the nation in any case had to pay, the locals and many other interests wanted to get as much from the "national bank" as possible. Neighbouring communities wanted part of the cake as well, and some major facilities were moved out from the core (by Parliament). That, too, partly changed the event concept.

Other dynamic forces will also influence processes and concepts, if mega-events have national importance. For example, private and public interests can promote additional projects that are only partly related to the event itself as a way of increasing their activity and budgets. «**Bandwagon effects**» were very important in Lillehammer, because public agencies changed their priorities after the host election, locating new facilities or upgrading services to a very high level in the Olympic region (to build a «good image» for visitors, especially the mass media). Some of these investments were planned before the 1994 Games, but were moved forward. However, the **acceleration effects** may reduce public activity later on, as other communities in Norway now seem to think that the 1994 Olympic hosts have had more than enough public money.

The fact that the 1994 event became a five times larger external impulse than first planned, also makes it reasonable to expect substantial greater effects than the original forecasts. Tourist effects should increase, in particular, because of much greater volume and quality of media attention, new attractions and improved accessibility than dreamed off originally. Here, however, only original predictions of tourist effects are used as reference.

4.4 Norwegian reality

The Norwegian Central Bureau of Statistics has a system monitoring tourism supply and demand. Since 1988, this has covered all accommodation facilities with 20 beds and more, giving monthly data on guest nights and room capacity at local, regional and national level. This data source is used here to indicate short and long-term tourism development in the Olympic host community, the host region and Norway in general.

4.4.1 Short-term effects locally during the event itself

The accommodation statistics show that the "compact game" concept had strong concentration effect on demand during the Olympic event itself in February 1994. The willingness of visitors to commute long distances between accommodation and sports venues was much lower than anticipated. Therefore, February 1994 became a major disappointment for many hotels in the host region. Those even 20-25 minutes away from the centre of Lillehammer had much lower traffic than expected. The strong concentration of visitors to the town centre during the event explain several bankruptcies among catering businesses located only a few hundred meters from Lillehammer's main street.

4.4.2 Long term effects on tourism on local level

A change in the Norwegian monitoring system in 1988 makes it difficult to clarify how much earlier trends in tourism demand and supply have changed from pre-election years (before 1988) to post-election years. However, comparable data are available from all years after the host election in 1988, making it possible to identify long-term changes before and after the event. The accommodation statistics show that long-term developments have been very different from those predicted, with much higher concentration spatially than expected.

The long-term development of tourism in Lillehammer, measured in guest nights, has followed a combination of «new plateau» and «back to normal» pattern (figure 4.4), although growth during the first post-election years was low. The increase in tourist to the host town started much later than predicted (3 years after the host election) and lasted only two years. A strong decline came quickly after the Games, with total number of guest nights reaching a low in Lillehammer six months after they ended. Tourist flows afterwards has varied considerably, but the flow to the Olympic core community may now be on a new plateau approximately 55-60% above the early post-election years.

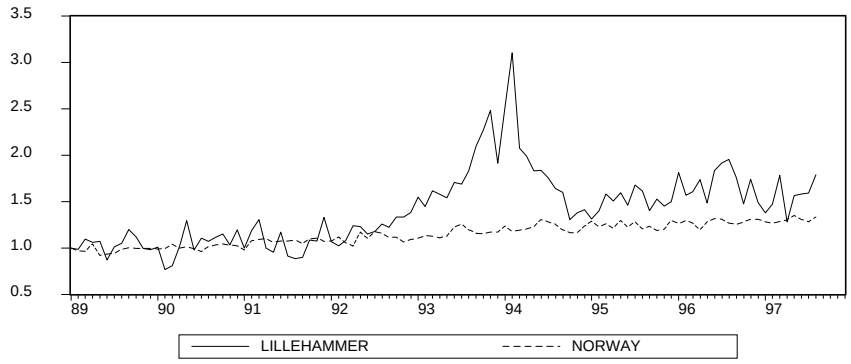


Figure 4.4. Relative accommodation development 1989-1997 in Lillehammer and Norway in general. An index showing seasonal adjusted monthly guest nights, with volume in 1989 as 1,0.

The new level is an **additive** effect of processes changing different visitor segments (figure 4.5). A strong growth in business and expert traffic to the host community did start very late, and less than one year ahead of the Games. Business visitors left very quickly afterwards too, following a «back to normal» pattern with an extreme peak during the event. The peak was much higher than figure 5 indicates since a large supply of preliminary accommodation capacity is not included in the accommodation statistics. The reduction afterwards came much more quickly than expected, as most working visitors accommodated on preliminary facilities left within two or three days of the last day.

Leisure and holiday tourism in the core community has followed a «new plateau» pattern and peaked the last summer **before** the 1994 Olympics. The fact that leisure tourism peaked before the Games is partly a «sightseeing effect», because of all the Norwegians who wanted to see the new facilities before the event. However, the early timing also reflects the lack of capacity for normal leisure tourists during the last pre-game months and during the event itself. Conference traffic (not shown in figure 5) have mostly been stable and relatively small, but with major peaks from 1994 on.

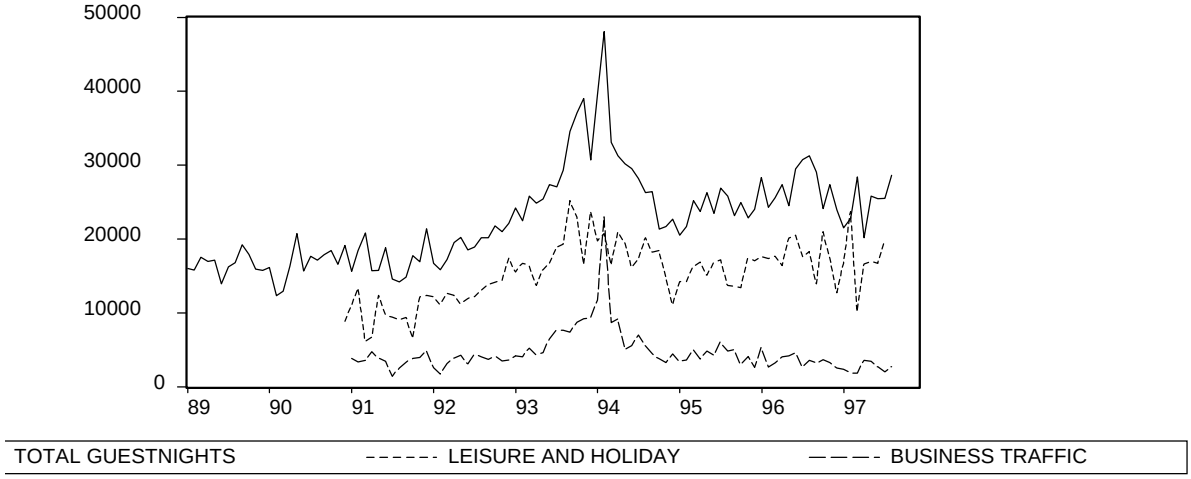


Figure 4.5. Monthly guest nights in Lillehammer 1989-1997, seasonal adjusted, at accommodation facilities with 20 beds and more. Data source: Central Bureau of Statistics. The segmentation in leisure, conference and business traffic started in 1991.

Most of the effects from the 1994-Olympics in the host town have been in the domestic marked. The number of Norwegian guest nights increased 60% between 1991 and 1997 (figure 4.6). Foreign guest nights in Lillehammer increased only half as much in percent (28%) and “only” seven percentage points more than average foreign demand on national level. Foreign demand in the host community declined substantially two to three years after the 1994-Games.

Thus, the local tourist industry is now adjusting to lower demand and over-capacity. The economical problems and bankruptcies in the core community are contrary to pre-event theory about the marketing impacts, especially from the huge media attention during the Olympic Games. It was expected among marketing experts that a successful event would give Lillehammer a very attractive image. The improved image itself should create dynamic growth in tourism also afterwards, especially in the host town who became a “brand name”.

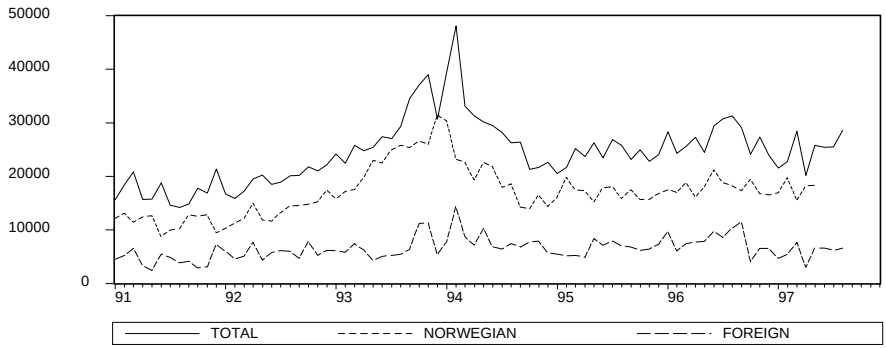


Figure 4.6. Norwegian, foreign and total guest nights in Lillehammer 1991-1997.
Monthly data, seasonal adjusted, at tourist facilities with 20 beds and more.

4.4.3 Long-term effects on tourism on regional level

If the goal is to make a destination more attractive among leisure tourists, an improved image may be less important than major improvements of leisure facilities. The long-term tourism developments in the 1994-host region seem to verify this hypothesis. At least it is true that the interest among tourist has been much less for the new image and attractions of Lillehammer itself, than for major alpine facilities developed in host satellites.

The communities that had large new alpine ski facilities because of the 1994 Olympics had strong growth in tourism also before the Games itself, after the ski facilities were ready. These satellites have had a dynamic tourist development since the Games too. In 1997 (three years after the Games) tourist demand in the alpine satellites reached 240% above the first post-election years, a strong and lasting growth in sharp contrast to the strong decline in the core community of Lillehammer afterwards (table 4.1).

More than half of the growth in guest nights in the alpine ski satellites came after the 1994 event. However, the dynamic growth has been stronger than these statistics show, because the demand for a substantial number of new second homes in the new alpine resorts is not included in the accommodation statistics.

Table 4.1. Tourism demand before, during and after the 1994-Olympics in different influence zones. The average number of monthly guest nights during the three first post-election years (1989-1991) is used as base (100%). All accommodation facilities with 20 beds or more are included.

Influence zones	1989-1991 (guest nights)	1992-1993	Olympic year*	1995-97** (guest nights)
Host region in				
General	100 (142930)	116	131	132 (188333)
-core	100 (17588)	143	204	158 (27757)
-satellites	100 (22625)	146	187	240 (54320)
-periphery	100 (102686)	104	107	100 (102893)
Norway generally	100 (1013079)	112	124	126 (1275600)

Region=Oppland. Core=Lillehammer. Satellites=Gausdal, Øyer and Ringebu, but not Gjøvik and Hamar. Periphery=region - (core + satellites). *September 1993-August 1994 **September 1994-August 1997. Data source: Central Bureau of Statistics.

Elsewhere in the host region, outside of the host core and satellites, the tourist demand have been remarkably stable. Comparing the average of the three first post-election years (1989-1991) with the first three post-Games years (1995-1997), the number of monthly guest nights has not changed at all. Even during the Olympic year, tourist demand in the "regional periphery" only increased 7% compared with the first three post-election years.

The lack of any tourism growth in the host region outside of the destinations that got the Olympic facilities is totally contrary to predictions. The regional authorities expected a strong and lasting growth (11% annually) in all parts of the host region from the host election in 1988 up to 1995. National authorities had similar views and financed also a special marketing effort to develop a common brand mark for the host region (under the trade name of Troll Park). The effects of this marketing effort and the Olympics seem, however, to have been zero in most parts of the host region.

One conclusion from the 1994 experiment may be that significant short-term and long-term effects on tourism demand have been concentrated to the influence zones less than half an hour to an hour from the host town, and only in communities with new facilities developed for the Winter Olympics. The large international media attention has improved awareness and the image of the host region, but image/awareness improvements may not be enough to change travel behaviour.

The effects on real demand have (so far) been concentrated to destinations with improved facilities. It may be a premature conclusion, as it is not easy to know how tourism would have developed without the 1994-Olympics. For example, tourism in Lillehammer and the host region could have declined markedly if the mega-event had not became a reality. Other processes are needed to explain a divergent or "counterfactual" development without an Olympic Games.

4.4.4 Counterfactual and partial effects of the 1994-event

It is easy to identify other processes that have influenced long-term tourist developments in addition to the 1994-Olympics. Among the important ones are the oil price chock in 1986, when Norway's huge oil incomes decreased, reducing private consumption and domestic travel demand in the following years. This business cycle reached a low in 1989, but domestic travel demand did achieve earlier levels only after the national economy (GDP) and private consumption started to increase again in 1990-91 (Central Bureau of Statistics 1995). Therefore, the growth in guest nights during 1989 and 1990 could be an adjustment "back to normal" at the end of a business cycle.

If an effect-study is based on «before and after» comparisons, and the benchmark (the "before period") includes the adjustment years 1989-1990 as in table 4.1, then effects from the 1994-event will be overestimated. Yet an overestimation in that case is probably low. If, for example, year 1991 (the "back to normal-year") is used as benchmark, growth in guest nights between 1991 and 1995-97 is only reduced 0-5 percentage points in the different influence zones.

However, Norway's economy expanded very strongly after 1991 as well, since a large increase in energy production have made Norway the second largest oil and gas exporter in the world (after Saudi Arabia). This substantial increased incomes in such a small country during the same period as the Olympic Games leads to identification problems. Thus a key question is; how large have the **partial effects** of the Olympics been on tourism, and how much is related to strongly increased domestic incomes and other factors?

Partial effects can be clarified by using a comparative-change design (Mohr 1988), comparing time pattern developments in host areas and reference areas during the same years. The reference areas should then represent the counterfactual; that is the situation without the mega-event. For example, one possible reference area could be Norway in general (as in figure 4.4 and table 4.1). The local and regional effects of the 1994 Winter Olympics can then be defined as the change locally and regionally compared with the national average. A comparison of the relative change shows that the long-term effect of the 1994-Games in the core community may be a 25% increase in tourist traffic above the national average (32%-points higher). However, the long-term effect in the alpine ski satellites is three times higher, as guest nights there increased 114% above national average.

A comparative change indicates also that the short-term effect on tourism demand, during the event-year, was highest in the host community with 80% more guest nights than the national average. The long-term change in other parts of the Olympic region, however, indicates a tourist **decline** (!) of 26% compared with Norway in general during the 1990'ties, a development that could be explained as an internal substitution effect of tourists away from major parts of the host region.

If the strong relative decline in the regional periphery has been an effect of the 1994 Olympics, it would be very contrary to pre-event expectations and theory. A report to the Regional Council predicted growth up to 15% annually in all parts of the Olympic region (Kamfjord 1990).

The choice of reference area is crucial, since comparative research design **assumes** that changes inside reference areas are independent of the events that we want to measure the effect. If mega-events do effect tourism on national level, or relocate tourists internally among competing destinations, then such assumptions are not easy to defend. This is especially so since forecasts of high tourist effects on national level are not unusual. Forecasts for the Summer Olympics in the year 2000, for example, predict 2 million extra international visitors (100% more) to Australia in general between 1994 and year 2004 (Mules & McDonald 1994).

The choice of a nation as reference area is, therefore, contrary to «normal» mega-event theory. If we use Norway in general as the reference area, it is necessary to check whether long-term development of tourist demand on a national level has been independent of the 1994 Games, and identify the volume of internal substitution between alternative destinations. Multivariate modelling can clarify the partial effects of the 1994 Olympics by controlling for effects of other important factors. Such models can also identify spatial relationships between tourism demand at local, regional and national level (the substitution effects).

Here different model estimations have been made according to the econometric simplification strategy of the «London School» (Gilbert 1990), that base estimation on theory and not data-digging strategies (such as step-wise regression). The estimations measure the relationship between the dependent variable (monthly guest nights) and the given change in influencing factors in the form of elastisities; that is the effects in percentage terms on guest nights from a percentage change in each of the independent factors (therefore the log-form). Elastic supply is assumed on national level. The choices of explanatory factors are based on a state-of-the-art report and an earlier Norwegian empirical study (Teigland 1996 and 1997).

The general modelling theory has been that monthly variations in demand in Norway in general (measured as guest nights) mainly relate to:

- seasonal factors (climatic, work/school patterns and seasonal price adjustments)
- calendar effects (number of weekends and days in months)
- a general growth in travel interests (dynamic and trend)
- additional growth related to improvements in Norwegian economy using monthly retail sales as indicator of economic development (no lag)
- price effects using exchange variations (lagged 3 month) and inflation (lagged 12 month) as indicators
- a special change during the Olympic event (dummy)
- an additional “kick” (up or down) after the Olympic event because of positive marketing, image and new facilities in the Olympic region (dummy measuring substitution effects).

Table 4.2 gives information on final estimation results on national level, where independent (explanatory) variables with t-value below 1 is dropped, except the 1994-Games relations. The parameters are remarkable stable when using different models, or if data from early or late years are removed. Statistical tests of unit roots and cointegration show the «trend-factor» to be deterministic for domestic demand. It was no spurious relation (as between guest nights & retail sales) which means that normal interpretation criteria can be used.

The most important substantial result is that tourist developments at a national level between 1991 and 1997 have been (nearly) independent of the 1994 Olympics. Partial effects on foreign demand after the Games (up 2%, but not significant!) is more than counterbalanced by a partial decline in domestic demand (down 2% after the Games), since domestic guest nights are twice the foreign by volume. The partial decline in domestic demand after the 1994 Olympics is contrary to pre-event theory, but is probably a substitution effect, because much higher income have strongly increased the flow of Norwegians going on holidays abroad.

Table 4.2: Effects on domestic and foreign demand from statistical significant factors, measured as percent change in seasonal adjusted monthly guest nights in Norway 1991-1997. The log-coefficients are elastitisities. Data source: the Norwegian Central Bureau of Statistics.

	Coefficient	**Std.error**	**t-statistics**	**Probability**
Model 1: Domestic demand on national level *				
Dependent variable: Norwegian guest nights (monthly)				
Independent variables:				
- A constant	12,06	0,90	13,41	0,00
- Number of days in month	-0,01	0,00	-2,67	0,01
- Number of weekends in month	0,02	0,01	2,96	0,00
- Trend (deterministic)	0,02	0,01	4,06	0,00
- Log of retail trade volume (seasonal adjusted)	0,33	0,21	1,61	0,11
- The 1994-event periode (dummy)	-0,09	0,03	-3,11	0,00
- The periode after the 1994-Games (dummy)	0,02	0,01	-1,59	0,12
R-squared= 0,84. adjusted R-squared=0,83.				
Durbin Watson sta=1,93. F-statistic=64,05				
Model 2:Foreign demand in Norway**				
Dependent variable: Foreign guest nights (monthly)				
Independent variables:				
- A constant	-2,36	4,00	-0,59	0,56
- Log of foreign guest nights lagged 12 months	0,41	0,11	3,82	0,00
- Log of consumer price index lagged 12 months	0,75	0,48	1,55	0,13
- The 1994-event periode (dummy)	0,11	0,07	1,46	0,15
- The periode after the 1994-games (dummy)	0,02	0,04	0,53	0,60
- AR(1) or first order autoregressive correction	0,16	0,12	1,39	0,17
*' R-squared=0,66. Adjusted R-squared=0.63. Durbin-Watson stat=1,96.				
** F-statistic=23,73				

The short-term effects on domestic and foreign demand of the Lillehammer-Games during the event month (February 1994) were also small on national level and nearly in counterbalance. Foreign demand increased 10% during the event-month, and domestic demand declined 9%. A clear decline in domestic demand for accommodation on national level is no surprise. Even Norwegian crime rates declined sharply during the 1994 Olympics as nearly all Norwegians focused on the Games.

Model estimations not documented here show no significant long-term change after the 1994-Games in guest nights in the main competing destination on the leisure market (Buskerud), when demand is adjusted for other factors. That indicates no internal substitution effect on national level (so fare).

There was, however, a negative change north of the satellites (Nord-Gudbrandsdalen) after the Olympics, according to the statistical modelling, indicating **relocation effects** in parts of the regional periphery. However, this relocation is not among normal leisure tourists moving to other destinations. It is a relocation of foreign military personnel on winter training from regional accommodation facilities to other parts of Norway. The Army confirms that the relocation was done to escape the expected congestion problems under and after the 1994-games (confirming also that the statistical relationship identified in the models were no coincidence).

The small and counterbalancing effects after the Olympics indicate that nearly all **net change** on national level is explained by general changes in Norwegian economy, not by the 1994-event. A lack of effects on national level is partly consistence with a study by Lee et al (1996), which concluded that the 1988 Summer Games, contrary to expectations, had no significant effect on tourism to South Korea during the event year.

The statistical independence is no guarantee that tourist development in Norway in general is a good indicator of how the counterfactual situation on local and regional level would have been without the 1994-Games. Nevertheless, it shows that general change processes most probably explain the growth in tourism on national level in Norway. The same general forces may also explain a similar part of the tourist growth in the host community and region, if the strength of the general processes was the same in that part of the country too.

The extra growth in tourist flows to the **Olympic core and region,** above the national average, can be interpreted as the effects of the 1994-events. **Positive long-term effects are in that case only identified in or close to the Olympic core.**

The partial effect of the 1994-Olympics locally has, according to these estimations, been a new level of tourist demand approx. 25% above earlier level in the Olympic core and three times more in the satellites getting the new large alpine resorts. That increase is substantial. But it is from a relatively low level before the event especially in the satellites. The effect may also be influenced by an unusual strong interest in

winter sports among the Norwegians. A key question, therefore, is if the pattern of tourist demand in the 1994-case is something special?

4.5 International comparisons

Available data from the Winter Olympic hosts in 1988 (Calgary, Canada) and 1992 (Albertville, France) show that a preliminary strong concentration of visits in time and space during the Olympic event and season has been common pattern. A preliminary **displacement effect among the usual tourists during the event season or period** seems also to be normal in Olympic host regions. As normal tourists stays away to save money and have the preferred more quietly holiday qualities.

Another common pattern is that long-term tourist demand has grown and reached a new and higher plateau after these three Olympics. Lack of space (in the original paper) restricts the documentation of the international comparison to some of the available information. Teigland (1996) gives more details.

4.5.1 The Canadian 1988-Games

Occupancy and room rates in Calgary City did increase 10-20% after the 1988-Games (Pannell Kerr Forster, monthly statistics), but a change in the tourist monitory system in 1993, and the oil-price shocks in 1986 and 1992, does influence longitudinal comparisons. Multivariate model estimations indicate, however, that unusually high economic growth in the Canadian host province of Alberta explain most of the growth in travel to Calgary from 1988 on.

The only significant factor, explaining most of annual change in occupancy rates, was the growing regional economy (table 4.3). The main reason most probably is that, when the oil price decreased in 1986, two years before the Calgary-Olympics, the Canadian host province changed the tax system to prevent a decline in the very important oil and gas industry. One year later, during the year of the 1988-Olympics, increased profits were followed by increased salaries and a general demand that increased 8% to the highest level of growth since 1981 (Alberta Statistical Review 1988 and 1993). In reality, therefore, effects from the 1988 Games came on top of a very strong economical wave in the host region, similar to the Norwegian case.

Table 4.3. Effects on accommodation demand in Calgary City, measured as percent change in yearly occupancy rates 1981-1993. The log-coefficients are elastitisities. Data source: Alberta Treasury*.

Model 1: Domestic demand on national level *	**Coefficient**	**Std.error**	**t-statistics**	**Probability**
Dependent variable: Occupancy rates (yearly)				
Independent variables:				
- A constant	-3,38	2,73	-1,24	0,26
- Log of "Final domestic demand" in the Province of Alberta (constant$)	1,18	0,44	2,71	0,03
- The 1988-event periode (dummy)	0,05	0,06	0,92	0,39
- The periode after the 1988-Games (dummy)	-0,00	0,06	-0,02	0,99
- AR(1) or first order autoregressive correction	-0,08	0,23	-0,34	0,74
R-squared= 0,91. adjusted R-squared=0,85. Durbin Watson sta=2,30. F-statistic=16,80				

* Bureau of Statistics. Alberta Statistical Review. Edmonton

The unplanned business cycle in Alberta from 1987 on explains also why the 1988-Olympics in Calgary did not have the external-internal substitution effects that were expected in Norwegian effect theories. The inhabitants of the Canadian host province did not increase the domestic demand for travels to internal (provincial) destinations after the 1988 Olympics. Alberta's market share of the overnight trips among Albertians dropped instead. According to the regional tourist authority, this decrease "support the theory that Albertians tend to vacation closer to home during tough economical times, and when economical circumstances improve they are inclined to get out of the province"(Alberta Tourism Pulse, March 1990:2). The Canadian substitution effect is similar to the change in domestic demand in Norway after the 1994-Olympics (but contrary to Norwegian ex ante predictions).

4.5.2 The French 1992-Games

In many ways, the time-pattern of tourist development has been the same in the French 1992-Games region as in Calgary. The French host region of Savoy is mainly a winter destination and winter traffic approached a new plateau approximately 10-15% above pre-game level (Obervatoire du tourisme en Savoie 1986-1995). Increased winter traffic after the 1992 Games may partly be explained by sluggish growth in French purchasing power during the three last pre-game years, and reduced snowfalls in 1989-1991 (Cockerell, 1994). Improved domestic economy and snow conditions have thus interacted with the event.

Richard and Friend (1995) also explain the substantial growth of British skiers to the French Olympic region from 1992 on (the main growth segment) as an interaction effect, not related to the Olympics, but to increased prices in Austria and Switzerland. British consumers did reduce their costs and substituted other alpine destinations with more accessible French resorts. Barbier (1996) concludes that the

1992-Games did not change a stagnating domestic and foreign demand for visits to the Olympic region in France.

It is, therefore, a common pattern after the Winter Olympic Games in Calgary, Albertville and Lillehammer that the long-term changes in tourism has been influenced by several processes. The partial effect of the mega-event has been less than the change in tourism itself indicates. The interaction effects have been substantial, especially the partial effects of general economic growth. Potential host countries and regions that are not a major and strongly growing exporter of oil and gas should, therefore, not expect the same effects as in Calgary and Lillehammer.

Nevertheless, tourist demand at local level in all three hosts has reached a new and higher plateau afterwards. The new plateau has been 10-25% above earlier levels. However, the international comparison does not indicate any dynamic growth in tourism demand after the Winter Olympics. That is contrary to the needs today in Lillehammer, which struggle with a high oversupply and price pressure.

4.6 The planned effect ratio

The main problem today now for the Norwegian hosts and private investors is the divergent between ex ante theory and ex post reality, because the «big boom»-predictions and plans did indicate a much higher new level of tourist. The planned effect ratio, that is, the difference between plans/predictions and reality, has been low. At regional level, the growth in total tourist demand have been 85% below the most optimistic forecast, and 55% below the estimates in the regional plan.

Regionally the increase of well paying guests have especially been much lower than expected, as conference traffic to the Olympic region was only 1 (one) percent of pre-Game predictions in 1995. Local tourist flows to the core community are so far also less than half of the original predictions. These effect ratios would most probably have been even lower if the 1994-Games had not increased 5 times in economic volume compared with original plans.

Expectations that were too high have made it necessary for the Norwegian host town (Lillehammer) to reduce the total public budget by 12-15% from 1997 on. Another effect is oversupply and price pressure in the tourist industry. Nearly all of the hotels in Lillehammer have lost money from 1995 on because of low occupancy rates, and 40% of the full-service hotels have gone bankrupt. The yearly occupancy room rate was down also on regional level to nearly 40% in average in 1997. The 1994-Olympics has not prevented a declining long-term trend (figure 4.7).

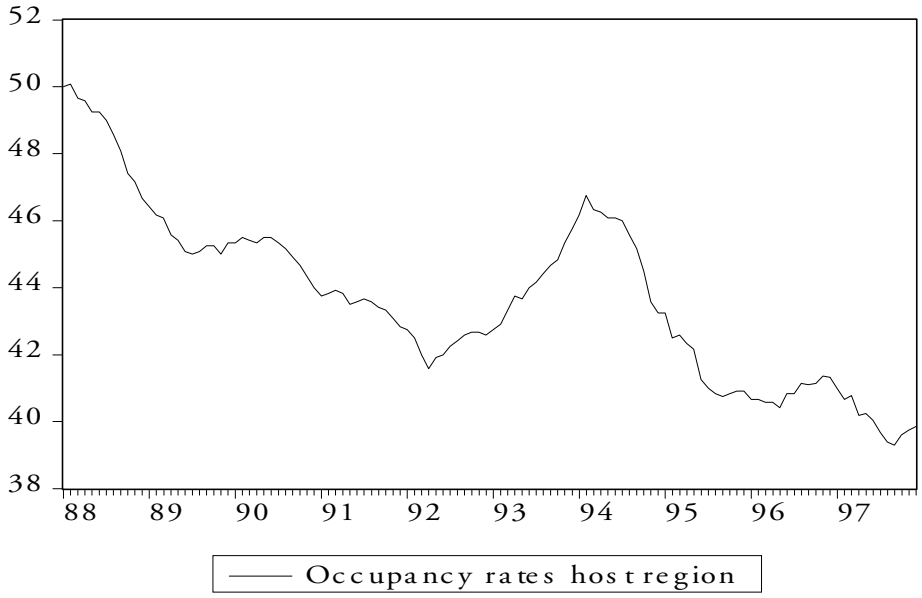


Figure 4.7. Occupancy rates for rooms at accommodation suppliers in the Olympic host region (Oppland) 1988-1997. Data source: the Norwegian Central Bureau of Statistics.

4.7 Effects, impacts and cost-effective tourism policy

The 1994 Olympics was an important part of the national tourism development strategy, which also included national economic support to 20 destinations chosen by regional authorities in all parts of the country. An evaluation of this «focused decentralisation strategy» shows that growth in tourist traffic have been twice as high in the chosen destinations as in Norway in general (Bolkesjø and Hovland 1996). If these 20 destinations are used as reference, effects of different tourist policies could be measured. The available statistics indicate that the 1994 Olympics did cost approx. 100 times more and had only twice the effects on guest nights compared with the "focused decentralisation" strategy. It shows that nations can choose between alternative strategies for tourism development, with very different cost efficiency.

Then, effects are measured only by one narrow indicator - the change in commercial guest nights. That indicator is often used in tourism studies as an objective measure of change, but, in some cases, even small change can be important for the tourist industry and local community. If tourist facilities are close to bankruptcy, a small growth in tourists can be very valuable and have large impacts on the travel trade and the local community. There is, therefore, an important distinction between change as an "effect-concept", and the value of change or "impacts".

This paper has focused mainly on effects, and only in the tourist sector. The total value for the 1994 host communities is not evaluated here. However, a study done shortly after 1994 Winter Games and repeated in 1997 shows that less than 300 new and (hopefully) permanent full-time equivalents jobs were created directly in the host

town and region because of the Olympics (Spilling 1994 and 1998). Of these jobs, 100-200 is in the tourist sector, and 40 of them in organisations set up to operate Olympic facilities after the Games. Each direct job, therefore, cost more than 3 million US dollars in public money. There may be cheaper ways of reducing unemployment.

The low employment effect in the 1994 Olympic region may not be an anomaly. A retrospective study by Mount and Leroux (1994) did not identify any lasting linkages between the 1988 Olympics in Calgary and new business activities or employment.

4.8 Conclusions

Spilling (1998) concludes his study of the long-term industrial impacts in general of the Lillehammer Olympics by saying that "the long-term impacts are marginal and out of proportion compared to the high costs of hosting the Games". That is a value statement made in retrospect, and based upon today's knowledge. He argues too, that it is easy now to see that the ex ante impact assessments made for the local and national authorities were not based on proper insights of the processes the Lillehammer Olympics would imply.

This paper has not focused on the important value questions, but tried to clarify the processes that have taken place in the tourism sector. Most ex ante assessments of mega-events predict that tourism will be heavily influenced. Improved assessments in the future require, therefore, first of all an understanding of why earlier theory and predictions of tourism effects have failed. The Lillehammer-experiment is a crucial test in many ways of "big boom" tourism expectations.

The 1994-Winter Games were a very successful sports event and had many advantages for the local community that did not pay the costs. However, the lasting effects on tourism have been less than expected. One result is an oversupply of accommodation facilities that creates problems for the tourist trades both locally and regionally.

Another effect is a much larger volume of high quality sports facilities than needed. A town with 24000 inhabitant do not need for example two ice hockey halls with 11 000 permanent seats, especially when the neighbour towns had ice hockey halls built too. The main lessons for other hosts of mega-events are, therefore, that they should make more realistic assessments of tourist effects, and plan according to the local long-term needs afterwards.

To expect high economic effects from mega-sports events and find much lower reality is not unusual. Crompton (1995) reviewed 20 pre-event impact assessments and the international literature on sports economics, and found major shortcomings. His most serious conclusion is that errors in ex ante impact assessments in several cases have been used to deliberately mislead decision-makers and the public, leading to too high expectations and investments. "Expert prostitution" (Fearnside 1994) may

be an important reason why theory and reality have been divergent also in the 1994-case.

Crompton (1995) identified 11 major errors in ex ante economic impact assessments. One error is that the influence zone is unclear or assumed too be much larger than realities afterwards justify. The Lillehammer experiment indicates that effects may be very concentrated in space and include mostly areas close to new major facilities. Another error, according to Crompton, is that economic impact assessments often are based on studies from other communities, where economic relationships may be different. New events and situations should, therefore, be analysed and assessed very carefully.

One first step should be to analyse the effects from the event itself, assuming a ceteris paribus situation with all other factors stable. The possibility of interaction effects with other planned and unplanned processes has to be assessed explicitly as the next step. Information from earlier events will be helpful, but it is important to check both total effects in time and space, partial effects from other factors than the event itself, and the reliability of data sources. Earlier hosts may have an interest in creating an unrealistic image of success.

Careful market studies and monitoring are needed before and during tourist developments. If permanent accommodation or catering supply is developed, then a location close to major new tourist attractions can be a key success factor. Timing is also important, as demand may first start to increase shortly before the event. Increased supply should in any case be linked to sustained growth in demand, reflecting a growing market in general or major improvements in competitiveness. Future host should also be concerned with internal relocation effects during the event season.

References:

Alberta Statistical Review. Quarterly. Alberta Treasury. Bureau of Statistics. Edmonton. Alberta. Canada.

Alberta Tourism Pulse. Monthly statistics. Edmonton, Alberta, Canada.

Aasheim, G. B., Bjørnland, D. and Hervik, A. (1990). Economic impacts on society from the Winter Olympic Games in 1994. Report from Centre for applied research. Bergen 1990. (In Norwegian).

Barbier, B. (1996). Problems of the French Winter Sport Resorts. Tourism Recreation Research. Vol. 18, no. 2. pp. 5-11.

Bohlin, M. (1996). The Development and Proliferation of a Cross-country Ski Race in Sweden and the Involvement of the Local Community in Staging the Event. *In* Proceedings of the Fourth International Outdoor Recreation & Tourism Trends

Symposium. May 14-17, 1995. Thompson, J., L., Lime, D., W., Gartner, B. and Sames, W., M. (eds). University of Minnesota. St. Paul.

Bolkesjø, T. and Hovland, N., P. (1996). The development of tourism in some destinations and communities during the period of 1989-1995. Report nr. 112. Telemarksforsking-Bø. Bø i Telemark. (In Norwegian).

Brönnimann, M. (1982). Die Touristische Bedeutung von Wintersport-Grossveranstaltungen. Bern. Switzerland.

Campbell, R. (1988). A critical view of forecasting and evaluation of Olympic Games. In: Massachusetts Institute of Technology and Seoul National University. 1988. Hosting the Olympics: The Long-Term Impact. Summary Report of 1988 Seoul International Conference.

Central Bureau of Statistics (1995). Adjusted data on Norwegian economic growth. Published in Ukens Statistikk no. 36/95 Oslo.(In Norwegian).

Cockerell, N. (1994). Market segments. The international ski market in Europe. EIU travel & Tourism Analyst No. 3.

Crompton, J.L. (1995). Economic Impact Analysis of Sports Facilities and Events: Eleven Sources of Misapplication." Journal of Sport Management vol. 9, no.1, pp.14-35.

Economics Research Associates (1984). Community Economic Impacts of the 1984 Olympic Games in Los Angeles. Los Angeles.

Fearnside. E. 1994. The Canadian feasibility study of the Three Gorges dam proposed for China's Yungzi River: a grave embarrassment to the impact assessment profession. Impact assessment. Vol. 12. No.1. pp 21-58.

Gilbert,C.L. (1990). Professor Hendry's Econometric Methology. In Modelling Econometric Series. ed. C.W.J.Granger. Oxford University press. Oxford.

Kamfjord, G.(1990). From The Olympic Games in Calgary 1988 to Lillehammer-Olympics 1994. What have been the impacts in Calgary and what can Lillehammer learn? Oppland Regional College. Lillehammer. (In Norwegian).

Kang, Y.-S. and Perdue, R. (1992). Long-term impact of a mega-event on international tourism to the host country: a conceptual model and the case of the 1988 Seoul Olympics. Paper submitted for publication in Journal of International Consumer Marketing.

Lazer, T. (1986). The 1985 Los Angeles Olympics. In International Events: The Real Tourist Impacts. Proceedings of the Canada Chapter of Travel and Tourism

Association annual conference. Alberta, October 20-22th. 1985. Edmonton, Alberta, pp. 137-140.

Lee, C.K, Var, T., and Blaine, T.W. (1996) Determinants of Inbound Tourist Expenditures. Annals of Tourism Research. Vol. 23. No. 3. Pp. 527-542.

Lillehammer Næringsselskap (1990). A plan for developing tourism in Lillehammer. Lillehammer. (In Norwegian).

Mohr, L.B. (1988). Impact Analysis for Program Evaluation. Brooks/Cole Publishing Company. Pacific Grove.

Mount, J. and Leroux, C. (1994). Assessing the effects of a landmark event: A retrospective study of the impact of the Olympic Games on the Calgary Business sector. Laurentian University, Ontario.

Mules, T. and McDonald, S. (1994). The economic impacts of special events: The use of forecasts. Festival Management & Event Tourism. Vol. 2. pp 45-53.

Observatoire du tourisme en Savoie. Published seasonally by Mission Dèveloppement Prospective. Le Bourget du Lac Cedex.

Oppland Fylke (1989). Plan for development of tourism in Oppland county. Lillehammer (In Norwegian).

Pannell Kerr Forster. Monthly statistics. Trends in the hotel industry. Alberta and Calgary, Calgary,

Pyo, S., Cook, R. & Howell, R. L. (1988). Summer Olympic Tourist Market - Learning from the Past. Tourism Management (June), pp. 137-144.

Richard, G. and Friend, K. (1995). The UK Ski Holiday Market. Journal of Vacation Marketing. Vol. 1, No. 3. pp. 259-264.

Ritchie, J.R.B. & Smith, B.H. (1991). The Impact of a Mega-Event on Host Region Awareness: A longitudinal Study. Journal of Travel Research 30 (Summer), pp. 3-10.

Selstad, T. (1984) Local impacts from Olympic Games. Economical, social andphysical effects of Winter-Olympic Games in Lillehammer. Report nr. 1. Eastern Research Institute. Lillehammer (In Norwegian).

Selstad, T. (1989) Regional impacts of Olympic games in Lillehammer. Report nr. 41/89. Eastern Research Institute. Lillehammer (In Norwegian).

Selstad, T. (1990) The tourist trade and the Olympics: Marketing-kick or leverage. Sosialøkonomen nr. 1 (January) 1990. (In Norwegian).

Socher, K. and Tschurtschenthaler, P. (1987). The Role and Impact of Mega-Events: Economic Perspectives - The Case of the Winter Olympic Games 1964 and 1976 at Innsbruck. In AIEST, The Role and Impact of Mega-Events and Attractions in Regional and National Tourism Development. Vol. 28 (pp 103-117). St. Gall. Switzerland.

Spilling, O.R. (1994). Short and long-term impacts from Winter Olympics 1994 on industry and trade. Final report from the project "Regional impacts from the Olympics". Report 26-1994. Østlandsforskning. Lillehammer. (In Norwegian).

Spilling, O.R. 1998. Beyond intermezzo? On the long-term industrial impacts of mega-events: The case of Lillehammer 1994. Festival Management & Event Tourism. Vol.5, pp. 101-122.

Teigland, J. 1996. Short and long-term processes changing travel demand. An international state of the art study. VF-report 9/96. Western Norway Research Institute. Sogndal (In Norwegian)

Teigland, J. 1997. Changes in the main tourist markets for Norway during the 1990'ies. A report to NORTRA (Norwegian Travel Board (In Norwegian)

Yin, R., K. (1984). Case Study Research. Design and Methods. Applied Social Research Methods Series. Volume 5. Sage Publications. Beverly Hills.

Appendix 4.1 Interaction effects 1998-1999 and prediction failures caused by dynamic processes

The original paper that is presented in the earlier part of this chapter focuses on the total and partial effects of a specific dose, the 1994 winter games. Methodologically, the research design controlled for interacting effects of other processes and bias caused by the selection of comparison areas. But a common problem in ex post evaluation is errors caused by limits to the time framework. The effects from a project are seldom definitive or "once-and-for all", and delayed long-term effects may not be identified by early post-development evaluations. Another problem is the possibility of interference from "multiple treatments"(Campbell and Stanley 1993), or effects caused by other development actions after the primary project is implemented or even before and during the implementation.

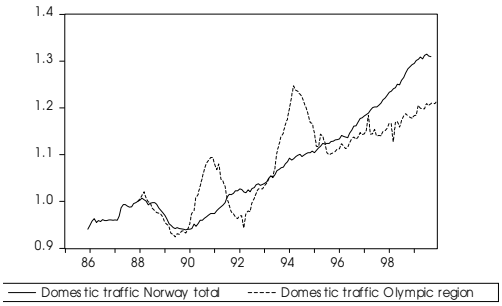
Multiple treatments or development actions may create situations where IA-predictions are a failure or "miss, for wrong reasons", or "a hit, for wrong reasons". Such doses from multiple treatments (projects) will reduce the external validity of the findings, and make information and lessons learned less transferable to other projects in the future.

This appendix discusses recent effects on tourism caused by an additional major project in the same region as the 1994 Olympic Games, Norway's new national airport at Gardermoen. The new national airport opened in 1998 after a long planning and decisions process. An important reason for the location north east of Oslo, the capital, was the political desire to use the new airport as a regional development action in the interior parts of Eastern Norway, in the same way as the Winter Olympics in 1994. One argument regionally was the synergy effects of the combination of these two large development actions, and partly the interaction effects on the tourism trade in the Olympic region and host town of the 1994 Olympics. A leading scientist suggests that the desired regional development effects of the 1994-Olympics may have strongly influenced the location of the new national airport, too (Professor Norman Aftenposten 25/10-1993).

Very recently (January 2000) and after the original paper was published, a new and minor research project makes it possible to evaluate some early effects of the new national airport, and the interaction effects with the 1994 Winter Olympic Games and other external processes. This information is included here, since it throw light on the importance of dynamic change and the need to understand the forces behind the developments after a project before judging the long-term effects of a primary project. It is information that clarifies the limits or borders in time and space of long-term effects of the 1994-Olympics, also.

The new data identify clear changes in domestic tourism demand for the Olympic region as a whole, that are concentrated to a period close to the 1994-event (figure 4.8). But it seems to be two waves of unusual domestic demands regionally. The first one during 1990-1991 came 3-4 years before the 1994-Olympics and may partly be a

post-election effect from the first planning and implementation process, when many curious Norwegian made sightseeing trips in addition.



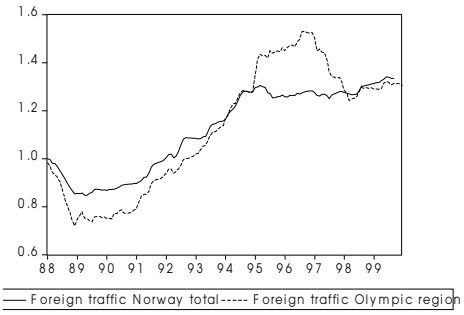


Figure 4.8 and 4.9: Norwegian and foreign guest nights in the Olympic region between 1988:01 and 1999:12 measures as an index of 12 month moving average with 1988=1, and compared with traffic developments in Norway in general.

Data source: Central Bureau of Statistics.

Evidence from the Winter Olympics in Calgary in 1988 indicates a significant rise abroad in awareness, but quick decline (Ritchie and Smith 1991). The change in foreign guest nights in the 1994-Olympic Region suggest that a mega-event may cause very limited additional interest among tourist abroad compared with the general interest for a country. The additional demand was temporarily, too, and may explain why a lagged increase in foreign demand lasted only two years after the 1994-event (figure 4.9). The lag of approx. 1/2-year after the event itself is as expected, since most tour operators need at least one season after a successful mega-event to prepare new services for interested tourists. But the "extra" demand above "normal" on national level both in domestic and foreign demand were preliminary in the Olympic region and lasted only couple of years or shorter.

The important point is, as in the main paper, that recent changes in tourism demand is influenced by several other and new processes taking place in adjacent regions and on national level. Therefore, there is a need to have a proper understanding of these additional causal forces to understand and judge why tourism have changed and the degree of failures in earlier predictions of effects caused by the 1994-Games.

A proper understanding of the external dynamic developments is in general needed if information from one project is used to predict and judge the effects of similar projects in other historical, geographical or economic situations. Since information from a specific project may be irrelevant for other projects, if there are is external processes in combination with additional projects that explain most of change that goes on in the influence zones of a primary project. In other words, the external validity of information can be low and effect judgements not transferable to other actions of the same kind, if there are is other processes that cause the summative change and not the primary project.

The external validity may be low, too, if it is a combination of several major projects that are the driving forces behind the observed summative changes. In a case where project A and project B have interacted or had cumulative effects, information from such situations will only be relevant for other primary projects of type A, if the partial effect of the primary project A is identified. If the partial effects of project A and B, or other influencing processes are not identified, information about the observed change reflects only the cumulative or summative effects. In such cases, summative information has minor relevance for future project of type A if a project of type B is not implemented in similar ways to the planned primary project A.

Therefore, it is necessary to identify the partial effects of each type of project and other processes to increase the relevance of information and lessons learned from a specific project. If not, information from earlier projects may be an uncertain base for new predictions, and may cause major prediction failures. In other words, information on tourism developments from the Norwegian host region of the 1994 Winter Games is less relevant for future hosts if the partial effects of a new national airport, and other processes, are not identified. (In principle, the observed total or summative change in tourism may became more relevant for future hosts if they implement a new national airport in the same way as the Norwegians have, in addition to hosting a similar type of mega-event).

Forces driving tourism developments 1998-1999.

The new national airport that opened in 1998 reduced travel time to Lillehammer from the old national airport south east of Oslo from nearly 4 by buss/train to less than 2 hours by train. The travel time from the population centre in Oslo was reduced too, from nearly 3,5 by train to approx. 2,5 hours. But parts of that reduction came first in August 1999, when the new speed railway tunnel between Oslo and the new airport opened. During the same period, Norway's economy past through a short, but substantial oil crisis. The reason was a drop in oil price down to less than 10$ a barrel and from autumn 1999 on moving towards the sky with more than 25$ a barrel at the beginning of year 2000, not more than a year later.

However, high growth in Norway's economy in general has made these years a period dominated by capacity pressure in several sectors (and decline in parts of the oil based industries). Pressure has been an important factor especially in the capital with a strongly increased need to accommodate business travellers to the capital; Oslo. This has increased the hotel demand towards the overall capacity, with room occupancy rates on yearly basis passing 75% at the end of 1997, which is a very high level in an industry with large fluctuations between seasons and weekends/weekdays (figure 4.10.). For example, deRoss (1999) has recently estimated that the long-run stable capacity or "natural occupancy rates" for the U.S. Lodging industry is 63% on yearly basis. All occupancy above that level indicates excessive demand, and a possibility to increase the capacity with profitability. The "natural" level of occupancy is defined to be the annual occupancy rate that produces no change in the average daily rates - that is, the annual occupancy rate at which there is no pressure on hotel owners and managers to increase or decrease the daily average" (deRoss

1999). A benchmark of 63% may not be directly applicable to Norway. But it is within the 60-65% level, which is used to explain why the hotel industry is strongly interested in increasing the accommodation capacity in Oslo and neighbour districts.

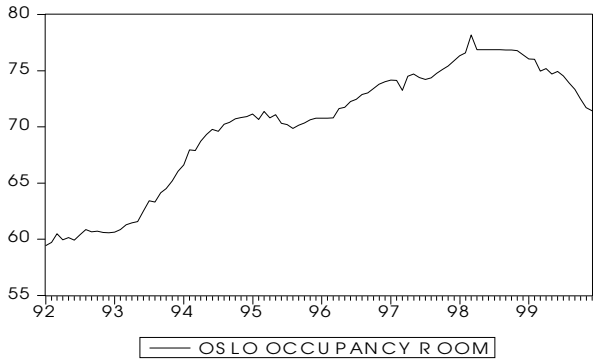


Figure 4.10. Occupancy rates for rooms in Oslo in general 1992-1999 on yearly basis for all accommodation facilities with 20 beds and more (measured as 12-month moving average).

Data source. Central Bureau of Statistics**.**

Most of the growth in demand for accommodation in Oslo was well paying business travellers. The hotel industry in that part of Norway, therefore, changed their focus from travellers in general to the most well paying guests. From 1998 on they reduced their interests especially for conference guests (figure 4.11 and 12).

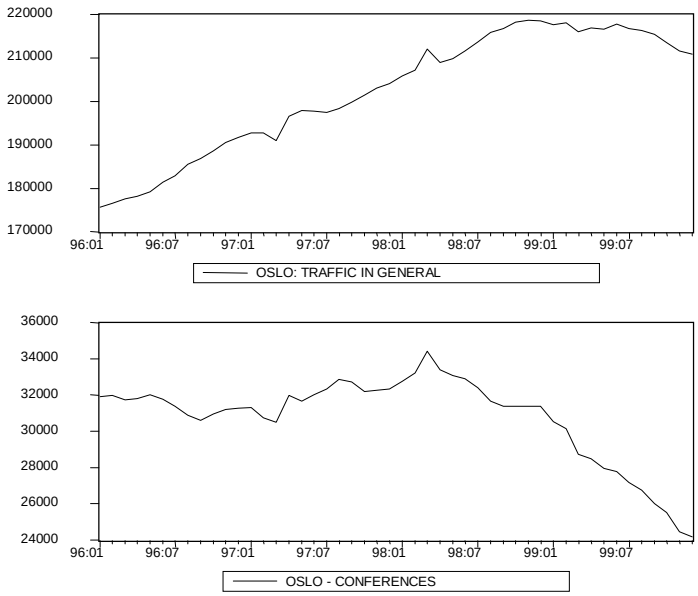


Figure 4. 11 and 12. Traffic trends in Oslo 1996-1999. Total guest nights and conferences on accommodation facilities with 20 beds and more.

Data source: Central Bureau of Statistics.

The lack of hotel capacity in Oslo has opened new possibilities for the hotels in the regions around the capital, which to a much higher degree could compete especially in the conference market. In other words, when the flow of business visitors to the capital became too large, it became an "overflow" into the regions in the surrounding periphery.

From 1998, the Olympic town of Lillehammer has benefited from this development, too. The effects came especially when the new airport (from late 1998) and new speed trains (autumn 1999) made Lillehammer much more accessible for tourists both on international, national and regional level.

However, the high and very profitable occupancy rates in Oslo over several years have made the hotel industry strongly interested in increasing the capacity in that destination, and also to develop new capacity close to the new national airport. Several new hotels have been built recently and more investments in the capital are under way. The increased capacity and the large new hotels by the airport have already started to reduce occupancy rates. But the existing hotels in the Oslo-area are still very profitable, since occupancy rates above 60-65% usually give profits. The yearly occupancy rates in Oslo in general were declining through 1999, but still well above 70% or way above the U.S. long run stabilise occupancy rates (see figure 4.10).

The changes going on in travel markets for Oslo and the new airport may partly explain important changes in the 1994 Olympic region, too, during the last two years. Traffic increased from 1998 on, with the effect that occupancy rates in the Olympic regional (Oppland) have increased again from a bottom in 1997 (figure 4.13).

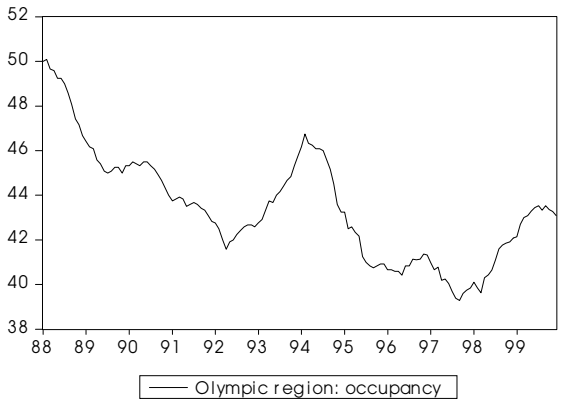


Figure 4. 13. Occupancy rates in the 1994 Winter Olympic Regions 1988- 1999 for all accommodation facilities with 20 beds and more.

Data source: Central Bureau of Statistics.

Some of the increased tourist traffic on regional and local level is effects of local initiatives based on the many sports facilities that the Olympic Games developed. Among these activities are two recent world champion sports events (men's ice hockey and women's handball), and several mass sport events repeated on a yearly basis. But parts of the increased tourism are related to the increased accessibility created by major airport and speed railway developments finished in 1998 and 1999, and the "overflow" effects cause by a lack of hotel capacity in the Oslo-area.

Parts of the recent improvements in the occupancy rates in the Olympic region, and in profitability (or the lack of it) are most probably related to other processes, also. One of these additional processes is probably a permanent one, as national and regional authorities co-operate in an effort to reduce over-capacity in the unprofitable accommodation industry in peripheral parts of Norway in general. This effort aims at rebuilding hotels for other purposes. The Olympic region, which had a yearly occupancy rate in average below 45% even in 1999, is involved in this capacity reducing effort. Another process is most probably a temporal one and related to the need to accommodate a substantial flow of refugees from Kosovo during 1999. The need to host refugees and the efforts to reduce over-capacity explain why the overall room capacity in the hotel industry open to normal travellers was reduced 3-7% from 1997 to 1999 in the Olympic region on a yearly basis.

This process has influenced recent developments in the host town of Lillehammer, too. But it is not possible to judge recent development in the Olympic core areas in a fully reliable way, as data comparable with what has been used in the original paper in chapter 4 has not been available so far from the host town of Lillehammer and the satellites. However, data delivered for another projects, which is limited to only five hotels in the centre of Lillehammer town, show a clear increase in occupancy rates for rooms from early in 1999, a few months after the new airport opened (up 5-10 %). This indicates a clear increase in profitability, too. (The level of occupancy rates for profitability is lower in the Olympic core than usual in Norway and U.S. Since earlier bankrupts have reduced capital costs for some hotels. Substantial subsidies in the form of "non-repayable loans" from the Olympic organisers, have contributes to improved economics, too).

In this appendix, data only from five hotels are included, but it is the same five hotels all years from the start of 1995 to the end of 1999. They had had a stable room capacity from 1996 to 1999 on yearly level. Because it is the same hotels, this data is not influenced directly by changes in accommodation capacity among the other hotels on local or regional level. But indirectly, traffic to these five hotels may have benefited to by the permanent or temporal closure of some other hotels (figure 4.14).

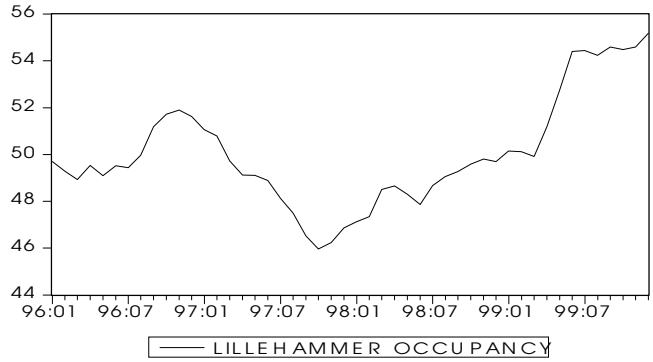


Figure 4.14. Occupancy rates for five hotels in the centre of Lillehammer 1996-1999. (12 months moving average). The same five hotels the whole period.

A statistical modelling show that 6 factors explain 87% of the variance in total guest nights at the five hotels in Lillehammer centre (table 4.a). Five of these factors are significant with a probability of more than 99%. One factor - the effects of the large celebrations during 1997 in central Norway (when Trondheim had a 1000-year birthday-year as Norway's early capital) - was less significant. But it was still nearly a 95% probability that Trondheim's celebration had an 8% negative effect during that year at the volume of guest nights for Lillehammer's hotel industry.

Among non-significant factors that are omitted from table 4.a, after a re-run of the model, are

- the trends in relative price levels of centrally located hotels at Lillehammer and Oslo,
- the economic growth 1995-1999 measured by the growth in volume of retail trade in Norway,
- the effects of the new speed train from august 1999,
- calendar factors as number of days in month, and
- the general growth in hotel demand in Norway measured in overnights.

The statistical modelling confirms that the new national airport has had positive effects for the five hotels in the centre of Lillehammer during the period, which the airport has been open from October 1998. The partial and direct effect for these Lillehammer hotel's of the new airport itself was that traffic increased from October 1998 until December 1999 on average with 13 % compared with the benchmark period January 1995- September 1998, when the effects of the five other variables were controlled for. Another important factor has been the trends in occupancy rates in Oslo in general between 1995 and the end of 1999. A ten- percent increase in the

occupancy rates in Oslo in general[5] increased total overnights at the five Lillehammer hotels with nearly 5%. [6]

The general change in tourism in the Olympic region has influenced the hotel demand in the centre of Lillehammer, too, in a positive direction. Which probably indicate that tourism development in the Olympic core is linked to the dynamic tourism developments observed in or close to the Olympic alpine satellite areas.

Statistically the modelling indicates a negative relationship between Buskerud (a main competitor) and the Lillehammer hotels in the conference market. Which may partly be an indirect effect of the new location of the airport that was in Lillehammer's favour and Buskerud's disfavour. It is a positive statistical relationship between Oslo and Lillehammer hotels on the conference markets, which indicate that the recent growth in demand in the centre of Lillehammer is not a shift from the rest of the Olympic region or conference demand in Oslo, but more probably related to shifts of traffic from other parts of the interior Eastern Norway (among them, Buskerud).

Table 4.a: Effects on accommodation demand in Lillehammer centre, measured as percent change in monthly occupancy rates 1995-1999. The log-coefficients are elastitisities, which is percent change. Data source: Central Bureau of Statistics.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
The dependent variable is percent change (log) in monthly guest nights at five centrally located hotels in Lillehammer				
GARDERMOEN AIRPORT*	0.130072	0.041694	3.089666	0.0032
TRONDHEIM CELEBRATION*	-0.080808	0.043648	-1.857703	0.0683
LOG(OSLO ROOM OCCUPANCY)	0.478581	0.199419	3.263159	0.0019
LOG(OSLO CONFERENCES**)	0.377252	0.099755	4.397444	0.0001
LOG(BUSKERUD CONFERENCES**)	-0.217216	0.029730	-7.189384	0.0000
LOG(OLYMPIC REGION***)	0.466514	0.025727	18.53021	0.0000
R-squared	0.871659	Mean dependent var		9.375815
Adjusted R-squared	0.859716	S.D. dependent var		0.339851
Log likelihood	41.70617	Durbin-Watson stat		2.144797

*Dummy variables **Guest nights
*** Olympic region minus the hotels in Lillehammer centre

[5] NB! A ten-percent change in occupancy rate, NOT a ten-percentage point change.

[6] The coefficients in table 4.a are interpreted differently, depending on being a dummy variable or a change in percent. The introduction of the new airport, a dummy, is interpreted as a 100 % change from earlier and the coefficient of 0,14 reflects a 14% change in demand in Lillehammer. A ten percent change in room occupancy rates in Oslo, and a coefficient of 0,6, indicate a growth of 6 % in guest nights in the centre of Lillehammer.

One implication of this statistical model is that only time will show if the recent improvement in demand for the Lillehammer hotel industry is sustained at recent levels. Lower occupancy rates and increased accommodation capacity in Oslo and around the new airport will most probably increase competition during the coming years, on prices and in other ways. A comparison of the relative price levels in Oslo and Lillehammer centre, measured by turn over per guest nights for the hotel trade, show that the divergence between prices are reduced in 1999. Therefore, parts of the recent improvements for the accommodation industry in the Olympic host town may be temporarily. But the direct and indirect effects of the new airport, the growth in the new alpine resorts, and the new speed train (which so fare had no statistical significant), is probably more permanent.

However, the main point here is to underline earlier findings that it is dynamic processes both inside and outside the core area of a development actions, or the region, which influence the changes going on after a specific action has been implemented. If the observed changes in an area are interpreted as effects of the primary project only, that conclusion may be wrong.

The observed changes can be caused by several different processes that interact, both deliberately and unplanned. Experience based information from one specific project should, therefore always be checked, looking for confounding factors and alternative explanations of the observed change. If not, it can be misleading information with reduced or low external validity and little relevance for future effect-predictions in other situations. Such mistakes may cause prediction failures in future IA's.

Reference:

Campbell, D.T. and Stanley, J.C. 1983. Experimental and Quasi-experimental Designs for Research.Houghton Mifflin Company. Boston.

DeRoss, J.A. 1999. Natural Occupancy Rates and Development Gaps. Cornell Hotel and Restaurant Administration Quarterly. Vol. 40, No. 2 (April 1999) pp. 14-21).

Appendix 4.2 The environmental strategy for the Olympic Games[7]

Norway had during the planning of the 1994-Olympics no impact assessment system that required the proponents to identify and predict the significant environmental effects of the 1994-Games. Neither the government, nor the organisers, had a clear strategy for how to handle the environmental issues. Therefore, the Norwegian Society for the Conservation of Nature has characterised the work to prevent adverse environmental effects as "a process of muddling forward" (Myrholt 1992).

The organisers of the Olympic Winter Games in 1994 tried instead of IA a goal-oriented approach as a measure to reduce adverse environmental effects and increase positive ones. But this strategy was first chosen after the decision-makers were committed and the most important decisions on design and locations of the Olympic facilities had been made.

The Norwegian Prime Minister during those days was a central person in international environmental politics that gave her name to the "Brundtland-report" on sustainable development. She gave a general guideline towards a goal, when the International Olympic Committee (IOC) elected the Norwegian host-town — and that was to make the coming mega event a "green Winter Olympics."

However, the organisers of the 1994-event defined the event to be a time limited project with their responsibility only to carry out the event itself. The organisers chose to be not accountable for the effects afterwards and not for a sustainable development of the Games. But strong confrontations with voluntary environmental groups, backed by the Ministry of the Environment and the International Olympic committee, made it necessary for the organisers to take a more proactive approach later on.

Not before most of the land use decisions had been made and several sites were under construction, the 1994-organisers decided to develop explicit environmental goals and guidelines for the event, and to create a control system with fines if the guidelines were not followed. Those goals and guidelines were important for the event-implementation that followed, by making the decision-makers aware of several environmental problems that was connected with earlier decisions, too. The creation of goals and guidelines had also retroactive force, when possible, with larger effects than the late creation could promise.

The Norwegians who started the work with environmental issues and the Winter Olympics, realised quickly that the 1994 event or other Olympics could not become "environmental friendly" without fundamental changes in basic Olympic concepts.

---

[7] More detailed information on the environmental strategy of the 1994-Olympics is found in: Teigland, J. 1992. Environmental impacts from mega-sports-events: Impact strategies for the winter Olympic games in 1994. A paper published in Pillmann, W. and Predl, S. (eds).1992. Strategies for reducing the environmental impacts of tourism pp. 353-367. Envirotour Vienna '92. International Society for Environmental Protection. Wien.

Therefore, the ambition or goal changed from "environmental friendliness" to give the 1994-event "a green profile." By giving goals and guidelines, and the responsibility to the top leaders with an internal control mechanism, the Olympic Games project changed in a more environmental friendly direction. External pressure groups acted as the primary controllers and reminded the organisers about their environmental commitments. These pressure groups used mass media to promote the "green profile" as much as possible, making it difficult for the organisers to reduce the environmental emphasis and the ambitious goals.

The environmental goals for the 1994 event were based on the belief that the protection of the environment is a question of awareness, care, responsibility and action. The formal goals expressed this in rather broad terms, and included the importance of using the 1994 Olympics to:

create environmental awareness
safeguard regional community concerns
promote sustainable development and industrial growth
develop environmental-friendly sites, and
require environmental quality during the Games throughout the entire organisation.

Each of these five broad goals was followed with a list of sub-goals and measures. They were also rather broad, but written in a policy document named "Olympic Games green profile" (Lillehammer'94 1992). That policy document was important for several reasons. First it committed the organisers to be more environmental friendly and act accordingly. In addition the list of sub-goals and measures gave a spectrum of important environmental actions to be taken.

To increase the awareness of the environment, for example, the policy document commits the organisers of the 1994 event to:

create environmental and safety awareness inside their own organisation by including environmental topics in the training of all volunteers and employees
create environmental awareness outside of their own organisation by requiring and implementing environmental measures in co-operation with its partners, sponsors, official suppliers and agents.
use environmental-friendliness as an important criterion in deciding goods and services to purchase.

Among measures to take care of regional community concerns for the environment was, for example, by

- establishment of a waste recycling plant for the Olympic region
- developing a plan for increasing the number of passengers using public transportation in the Lillehammer region by 50 percent by 1994

Care and responsibility is included in the sub-goals for environment-friendly development and Games, too, by, for example:

- harmonise the architecture with the distinctive characteristics of the

region
- prepare for energy saving and recycling of materials
- use consumer articles and packages with environmental labels.

The policy document was criticised as being to broad and general. But much more detailed baseline or premise documents, were developed afterwards based on the goals, with environmental requirements and auditions for sites. The environmental requirements were in this way transmitted to the licensing authorities, contractors and suppliers.

The development of environmental goals and guidelines for Lillehammer'94 was a significant step. But this "pro-active policy," however, had several weaknesses besides being developed several years too late. One weakness was that the goals and guidelines were developed for the organisation responsible for the event, and not as a common platform for the organisers, the local communities, and the regional and national authorities also involved in the preparation of the 1994 Games. Other actors, as the local communities, followed not always the organiser's environmental actions with similar positive actions.

Another weakness was the lack of clear priorities between the many goals. The environmental policy document did not clarify the importance of the different environmental challenges that had to be coped with. Being a list of goals and measures, it did not give priorities according to what could become large or minor challenges, and permanent or temporary problems. The main reason for this lack of strategic thinking may be that there was (and is) very little knowledge about the total environmental impacts from mega-events, such as the Olympic Games.

The environmental policy was in addition reluctant to clarify the work for sustainable development and industrial growth, which was one of its five main goals. The policy document, for example, did not give any guidelines for the development of tourism, and the environmental impacts such secondary projects could release.

However, this goal-oriented process caught international attention, and one of the important effects is most probably a more environmentally friendly international Olympic movement in the future. The president of the International Olympic Committee (IOC) used later on the local Norwegian environmental watchdog organisation to investigate and propose environmental guidelines for subsequent Olympic games.

Their proposals included, for example (Myrholt.1992):

- the need to make a total assessment of the environmental impacts of Olympic Games and identifying obstacles to environmental-friendly solutions.
- creation of an environmental strategy for the International Olympic Committee (IOC)
- establishment of environmental objectives for IOC

- the need to establish environmental criteria for planning, location, construction and operation of sport venue
- required environmental impact analysis and assessments as part of the selection process and application procedure.

These proposals were followed up and are now carried out by a subcommittee on Sports and Environment established within IOC.

This is an example of a proactive and goal oriented approach, where impact assessment is one of several measures to improve projects and decisions. But the focus in a "goal-means" approach is not on improving the quality of effect theory and predictions, as this dissertation focuses on. Such policy instruments are based on broader goals than IA and on a variety of means to reach the outcome of interest.

The desired ends or goals can include both effects on the environment, on other aspects of the society, and the original purpose of the proponents. Thus, the "end-means" approach may act as a proactive part of a planning and decision process, which may include impact assessments as one element that critical tests the "cause-end" assumptions. For example, if the goal of a development action is to keep the quality of environment or nature experience at the same level as earlier, the decision-makers can propose specific guidelines for the implementation,which will be a goal-end approach. But this approach can be - and should be - supplemented, as part of a proactive planning process, by an assessment that critical tests if the effects of the guidelines will be as desired. This can be an effect analysis that tests the cause-end assumption that guidelines builds on. The analytical principle will be similar to what is done in IA, but the procedure will not follow the same formal structure as impact assessment procedures.

References:

Lillehammer'94.: "Olympic Games green profile. Environmental goals for the XVII Olympic Winter Games Lillehammer 12-27 February 1994". Olympic Information. Lillehammer OL '94 & The Ministry of the Environment 1992.

Myrholt, O. 1992 "Building an Environmental Policy and Action Plan for the International Olympic Committee". Environment-Friendly Olympics. Norwegian Society for the Conservation of Nature. Lillehammer

5 Predictions and the real effects on outdoor recreation of repeated types of development actions; a case study of a major hydropower and road project.

This chapter is identical to a scientific article published in Impact Assessment and Project Appraisal. Vol. 17 No. 1, March 1999 Pp. 67-76 and includes the original abstract at the beginning. Here, appendix 5.1 is added with more information on the design and survey methods used. The aim is to clarify reliability of data.

This case study focuses on a type of project that is repeated quite often world-wide. The main purpose of such projects is to produce/deliver effects outside the tourism and recreation sector. But they have a potential for **important side effects** that influence the tourism and recreation either positive or negatively. It is a study of a critical experiment that tests common theories about side-effects.

One conclusion is that the effects on tourism and recreation had clear structure in time and space. The ex ante predictions that decision-makers based their decision on failed, partly because of a poorly developed project theory and a lack of insight in the interrelationships between the primary project (the dose) and the response of system involved (the tourism and recreation system).

An important reason for misjudgements of long-term effects was external processes, too, that have contributed to interaction-effects and dynamic developments. In this case, a major cause for prediction failure was that the primary project caused a chain of decisions and additional major road projects, which over a long period has changed the regional context. The construction road for the hydropower development evolved first into a local public road and later on into becoming the only ferry free connection between the capital in the east and the main city on the West Coast of Norway. This new highway system, which includes some of the longest car tunnels in the world, have had unpredicted and unexpected effects on tourism and recreation.

Other external and general processes have in addition contributed to unexpected changes at the end of the 1980'ies. Among them are:
- general changes in Norway's economy,
- the influence of mega-trends in the form of more equality among men and women, and
- proactive projects that has as the purpose to reduce effects from the hydropower development on tourism and recreation, and
- proactive regional tourism development projects in adjacent areas.

The summative change in tourism and outdoor recreation, which followed this hydropower and road development have, therefore, less relevance for future projects. It is the conceptual framework and identification of partial and interaction effects that may be used to improve prediction qualities in the future.

PREDICTIONS AND REALITIES: IMPACTS ON TOURISM AND RECREATION FROM HYDROPOWER AND MAJOR ROAD DEVELOPMENTS[8]

Abstract

Large projects in nature settings, as hydropower and road developments, can be controversial because of conflicts with tourist and recreation interests. The involved parties have often very contradicting effect expectations. Predictions can also be very different from ex-post realities, indicating low quality of impact assessments. More accurate predictions could reduce controversies and increase public confidence in project decisions. A key to improved predictions is identification of why predictions have failed, and what have been the real effects from such projects.

This paper presentsbasic concepts, theories and realities in a longitudinal case study, which have audited effects on tourism and recreation from major projects in Norway. Among the effects identified are changes in latent and effective demand, displacement and substitution. But interaction and cumulative effects have also been important. One way of improving ex ante predictions is, therefore, a dynamic step-wise approach to impact assessment.

5.1 Introduction

Large demonstrations late in the 1970'ies forced the Norwegian Government to use 10% of all the policemen in the country to open up the construction site of a major new hydropower project. That environmental battle lasted three months and was the end of many years of civil disobedience, which forced the Norwegian Parliament to discuss and decide three times on the development plan (Haagensen and Midtun 1984). One of the main reasons for that controversy was strong disagreement about which effects the new hydropower development would have on the local community, the environment and aboriginal interests involved.

Public resistance against new hydropower and highway projects is not a rare phenomenon, at least in the Scandinavian countries. Some of the strongest controversies have been linked to new projects located to wilderness areas or nature settings where tourism and outdoor recreation interests are sensitive. The possibility that

[8] This paper builds on a report in Norwegian published in 1994 by Telemark Research Foundation and the same author under the title: Impacts on leisure users of nature from a major hydropower project. The evidences from Aurlandsdalen. Report nr. 3. Bø i Telemark. (in Norwegian).

The publishers of this paper in Impact Assessment and Project Appraisal included two photos to give readers a picture of the landscape effects of the hydropower developments. A few more are included here, so readers may judge some of the effects on the landscape and recreation experiences, which explains partly the change in time and space of the recreational use and why ex ante predictions failed. Two pictures are by Oslo Energi, the others by the author.

new developments will destroy or substantially reduce high environmental qualities important for leisure visitors and the tourist industry is then a key issue. But hydropower developments are in such cases just one example of a **point, site or area related type** of projects in general. And new roads are only one example of **linear development** projects, as new cableways and funicular may have many similar effects.

Opponents of new linear and site specific development in sensitive nature areas in general have often predicted that a reduction of environmental qualities will also reduce substantially the number of nature based visitors and the demand for tourist products. Advocates of new roads, and hydropower projects that include new roads, have on the other side often argued that roads will make nature areas more accessible for new population groups. New cableways and funiculars can also "democratise» the accessibility and recreational use of nature. In that case more visitors and new types of visitors will strengthen the economic base for the tourist industry and local communities. These simplified, but contradictory viewpoints and predictions, show the classic conflict in Scandinavia between environmental and economic interests.

Surprisingly few studies have, however, compared the different effect theories and predictions with the reality afterwards, and helped to clarify the potential effects for tourism and outdoor recreation from new large linear and site specific developments. Decision-makers and planners have, therefore, few models, facts and guidelines to follow if they want to be more certain of the effects on outdoor recreation and tourism from controversial projects.

This paper gives an account of important concepts and methods that can be used in such impact assessments. It is based on Norwegian research projects done the last 15 years to reduce some of the controversies. The aim has been to identify short and long term effects on recreation and tourist interests from hydropower and major road developments in environmental sensitive areas. A detailed longitudinal case study has compared the divergent theories and predictions before a decision with the reality afterwards.[9] A major base study was done in one of the first controversial hydropower developments in Norway, where the Parliament required substantial changes in the project to make it more environmental friendly. Other studies have compared the effects from this "best possible case", looking for common patterns and the possibility to draw more general conclusions. Comparisons have also been done with reference areas that have not had hydropower and road developments during the same periods.

The findings referred here are, therefore, based on auditions following a comparative case research design, that have identified short and long effects on recreation and tourism from new hydropower and roads developments.

[9] Appendix 5.1 give more information on methods used, than space permitted in the original paper.

5.2 Basic effect concepts

Major projects affect both recreation visitors to nature areas (the **consumers**) and the providers of services and products to the visitors (the **recreation and tourist industry**). The effects and impacts on consumers and producers may, however, be different. "Effects" then refer to the volume or level of change. "Impacts" refer to the importance or value of these changes. The distinction between effects and impacts is an important one, because small changes (effects) may have large impacts (value). A small reduction in the volume of recreation visitors and tourists may have large impacts for the tourist industry and the local community, if several tourist companies are close to bankruptcy. This paper is, however, focused mainly on effects for the consumers, not the value questions, because of limited space.

5.2.1 Effects on the consumers (tourists and recreation visitors)

The research literature mentions several types of effects on recreation consumers and tourists from major projects changing the nature setting (Teigland 1986 and 1992). These effects include changes in time and space of behaviour and experiences, both among former users and non-users of a recreation area. The main effect types include displacement, substitution, quality and latent demand-effects.

Displacement effects refer to former recreational users of the influenced area - both local inhabitants and visitors/tourists - who relocate their recreation activity in space to other areas. This relocation can be either outside the influenced area (the **external or intersite displacement effect**) or to less influenced part of the same area (the **internal or intrasite displacement effect**). Former users can also continue to use the area for recreational purposes, but change the activity they are doing or the timing of their activity (a total or partial **substitution effect**). Former users can in addition use the same area, and not relocate or change their recreation activity, but experience a change in the quality or type of experience. Such **quality effects** can cover the full spectrum from positive to neutral and negative change.

Large hydropower and road developments can also release use among earlier non-users. Public debate and information through mass media about new projects can make earlier non-users aware of the recreational possibilities in an area, even before the development starts. Improved accessibility can also release a desire among earlier non-users to visit the area. If a development-project itself has attractive qualities or makes earlier attractions more visible from viewpoints or from travel corridors, new users may be attracted. Such release of new users is a **latent demand effect** (figure 5.1).

Hydropower and road developments produce also preliminary change of environmental qualities, such as noise and pollution during the construction stage. Preliminary variation in water flows during operation of hydropower stations can also influence recreation use (Giffen and Parkin 1991, Shelby et al. 1992, Teigland 1992). The consumers can adapt to such non-permanent changes by using the area as

earlier, but timing their activities to less or not influenced periods. That is an **internal displacement effect - not in space, but in time**.

Consumers, who feel strongly for undeveloped nature or wilderness qualities can be presumed to be most prone to leave the area. Others may adapt according to how severely they think the changes in social or nature qualities are (Kuentzel and Heberlein 1992). No studies are found so far, which show the degree and speed in case of adaptation.

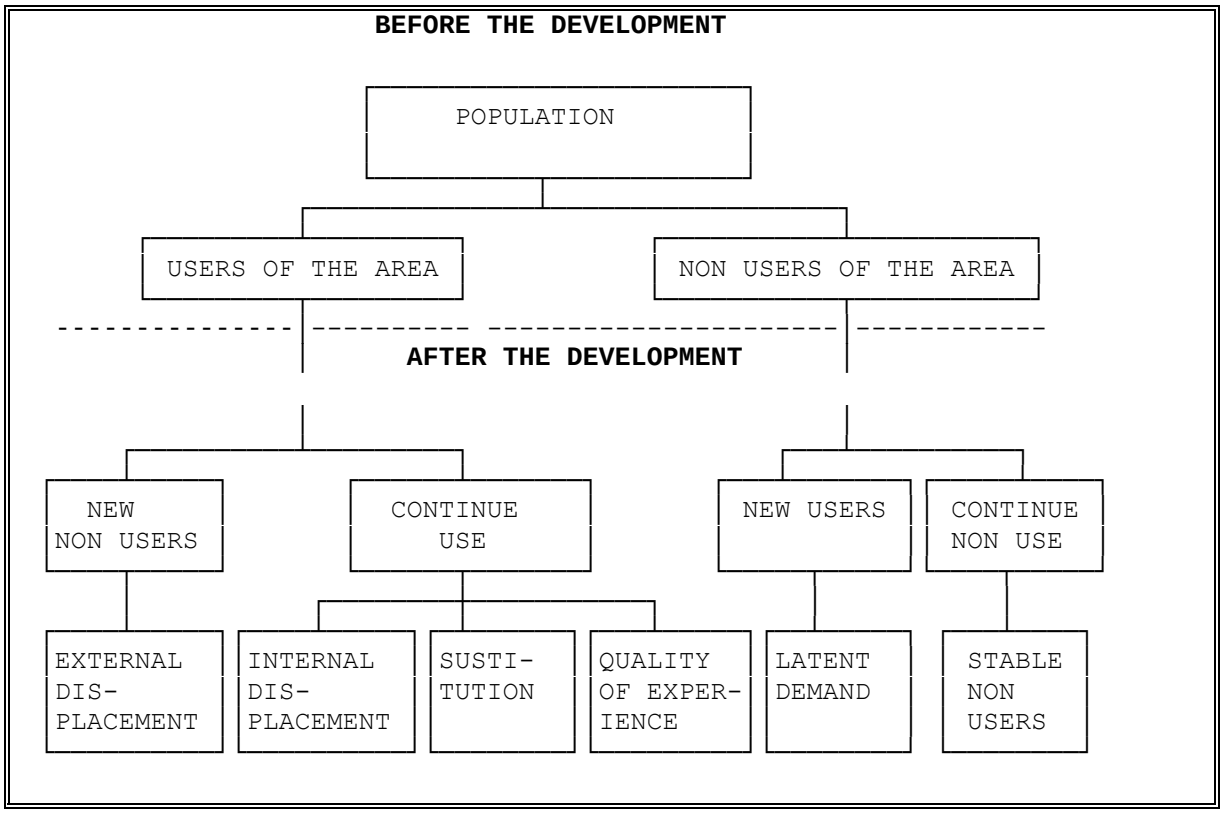


Figure 5.1 Types of effects on recreation consumers from projects that change nature settings, as new hydropower and highway developments

5.2.2 Impacts on the tourist and recreation industry

Change in the behaviour of consumers who are using a nature setting or area for recreation purposes, may affect producers and suppliers of services in the core area where the project takes place (as an **internal effect**). But the tourist and recreation industry outside of the core area, can be influenced too (**external effects**).

Internal and external effects on the tourist industry can be linked. A new road can reduce the traffic on older roads in the neighbourhood, if the new road is a useful alternative for the consumers. The building of new roads can in such cases have **redistribution effects** and directly effect established tourist companies along existing roads. If a new road does not increase total traffic volume in a region, then other alternative roads and the tourist companies there will lose traffic. If total volume of tourist demand do not increase when a new road is built, then the reduction in traffic volume along the old roads will be equal to the traffic along the new one. New roads can on regional level, therefore, be a "zero sum game" for the regional tourist industry, with tourist companies along earlier roads in the region as the losers.

Large reduction in recreation traffic along an old road may, however, have small impacts on tourist companies along such roads if they mainly serve other types of customers (as visitors to the local community, business visitors, and conference guests). The impact of a new major road and hydropower development on the tourist and recreation industry will, therefore, depend to a large degree on the general market situation in the area before and after a new development project.

New roads can, however, have internal "**braking and detour effects**" if recreation visitors and tourist find a new road to be an attraction in itself or make adjacent attractions more accessible. That may also be the case if the use of a new road makes travellers aware of new attractions along the road. If new information or unexpected views of adjacent attractions make travellers interested in using more time along the road, then the new road has a "braking effect" with potential impacts on the tourist industry along the travel corridor. In cases where attractions in adjacent areas make the travellers interested in a detour from the new main road, the road have a "detour-effect". These impacts will in a large degree depend on the quality of the attractions, which the new roads make accessibly for tourist and recreation purposes.

The braking and detour-effects will also depend on the relationship between the new road, the total itinerary the travellers have planned and the location of the main destination of the travellers. If travellers have limited time and a fixed itinerary with a clear plan to visit one main destination away from the new road, then attractions along the new road will be only intervening opportunities. In such cases even dramatic views of international unique nature from a road may have only small braking or detour-effects on tourists driving by in private cars. A case study from Northern Norway did show that only a few percent of the tourists driving private cars through an international unique nature area did take a few hours' detour to take a

closer look at the unique nature attractions (Teigland 1991). The average braking effect was a 3 minute stop along the road to look at the most breath taking view (of one of Europe's largest glaziers, which attracts many international cruise ships).

The few car-travelling tourists who did take a detour stayed, however, more often overnight along the new road than the other through-travellers. The detours had, therefore, a minor braking effect further along the road corridor having external effects on tourist companies also outside of the project region.

5.2.3 The influence-zone

New roads and hydropower projects may have a large **influence zone** outside of the core area, if environmentally sensitive recreation users are travelling through **a recreation corridor** (as roads and trails). The flow of visitors along the whole corridor can in such cases be changed, even if the new development project only affect directly one small part of the corridor.

Few case studies have looked on the extent or length of the influence zone from road or hydropower development, which take place in a recreation corridor. But influence zones may include long corridors and cover distances measured in several days of travelling (by car or on foot). When a new road was developed through a section of an attractive wilderness trail corridor in Southern Norway, then the volume of long distance hikers was reduced along the whole trail corridor which covered a 3-4 day travel distance (Teigland 1991 and 1994).

A distinction between stationary recreation users of the core area and travellers on recreation trips through the area is, therefore, important. Stationary users then stay most of the time in a smaller area or point» (as second-home owners or beach users). Travellers moving through a corridor (as hikers, boaters, bicyclists and car tourists) have usually more recreation alternatives than stationary users of the core area of a new project. One way to mitigate some negative effects from new projects on environmental sensitive travellers can, therefore, be to develop alternative routes and relocate trails away from the core areas. Another strategy is to secure and inform about alternative "unspoiled" recreation areas.

5.2.4 Primary projects and interaction effects

Impact assessment focuses often only on outcomes of the planned project (the primary project). But new projects may release other (secondary) projects during the building phase or later on, and in that way be one event in a chain of decisions. A new road fore example may release also gasoline stations, rest and accommodation facilities, or new road linkages later on. The effects from a primary project will, therefore, interact with effects from "unplanned" secondary projects. Effects from secondary projects may be substantial. A study of effects from a new highway

section in Sweden on the local tourist industry did identify low effects from the new road itself, but high effects from the many new secondary projects along the new road (Teigland 1992).

Some impact assessments are assuming that the planned project is the only change taking place in the core and adjacent areas. To assume that everything else is stable is a bold assumption as a new road or hydropower development is seldom the only agent of change, especially as the construction of major roads and hydropower developments take a long time to plan and implement. Effects from primary and secondary projects will, therefore, most often interact with other processes going on in society and nature. Cumulative effects are difficult to predict, but may be crucial for the real changes taking place and for the short and long term effects of a project on tourism and recreation.

5.3 Audition of the real effects; the importance of dynamics

5.3.1 The basic case study area

Figure 5.2 The location of case study area; Aurlandsdalen

The basic longitudinal study was done in one of the most popular mountain hiking areas in Southern Norway, close to the longest fjords in the world on the west coast; Sognefjorden. That area, the Aurland catchment area, was an undeveloped nature area with no roads or other modern technical developments before the hydropower developments started in 1969. Three earlier alpine summer farms did, however, provide accommodation and catering services to hikers who followed the old 70-km long path through the main mountain valley down to the fjord. The hike took usually 3-4 days. It was a popular summer recreation activity in an area easy to reach by railway from the main population centres both in Eastern and Western Norway. The

development has now divided the old long distance hiking trail into three zones with different impacts on the nature qualities. Each zone is usually a day hike for long distance hikers.

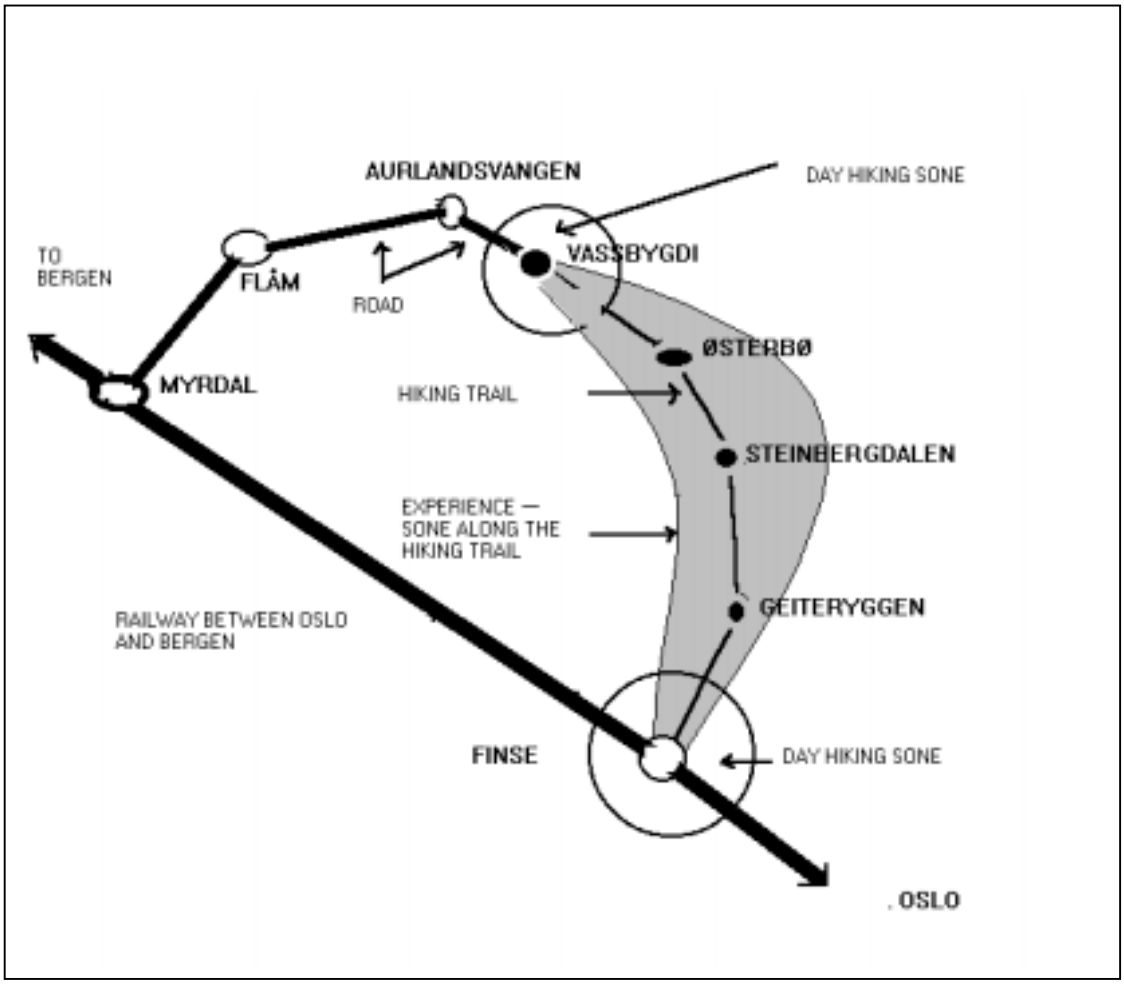


Figure 5.3: Hiking system in Aurlandsdalen before the hydropower development startet in 1970

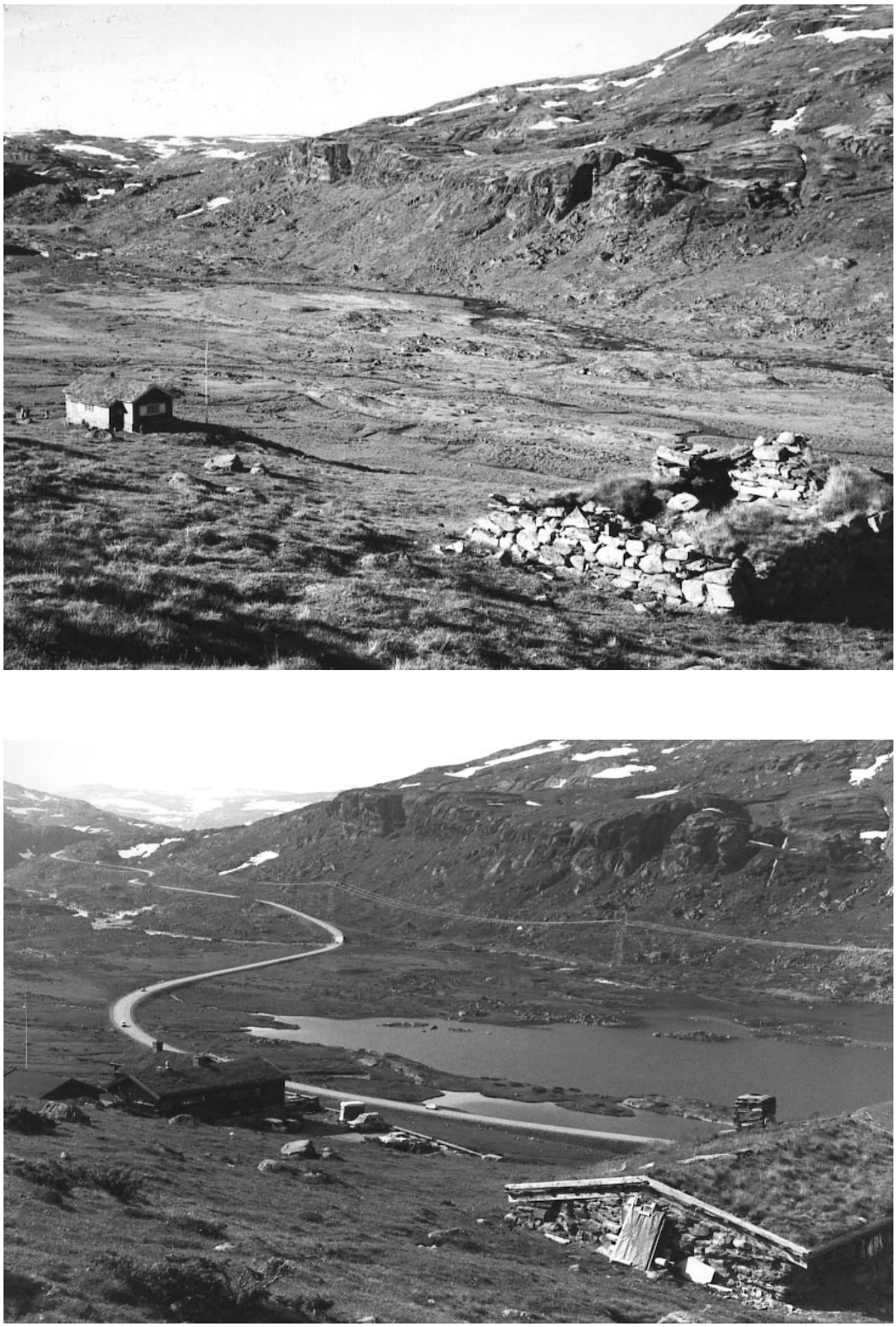
The change in nature qualities along the hiking corridor was a major concern in the public debate during the planning process, which met strong public resistance in the 1960'ties. The Parliament decided, therefore, as a compromise to leave the northern and most dramatically and scenic part of the old hiking trail without visible developments. No roads, dams or power lines were permitted in this zone of the mountain valley, but the water level was reduced substantially in the main river. The new road in this area was build through many very long tunnels to avoid the protected valley section (picture 1). Large power lines, two minor dams and a road, however, were located in or through the central part of the traditional hiking route (picture 2 and 3).

Picture 1: The nature protected lower parts of Aurlandsdalen, which today is a one day hiking zone of the original valley. Section consists of four segments that follow each other as a 90-degree turn of the direction, creating separated landscape rooms. This picture is from the third segment, showing the reduced water flows at the end of the high hiking season

Picture 2: The core area, which is now developed for hydropower production, was earlier open landscape rooms with lakes and river as the main landscape elements. These pictures are taken from the same point at tradition hiking path in august 1965 and 1994, showing the new highway, reduced water flow and flat stone tips with grass in the lower parts of the core area (Grønestøl against Østerbø). The 1965 picture: Oslo Energi.

Picture 3: The hiking path followed the bottom of the valley through the core area before the hydropower development. An important element of the experience was the river and the tremendous water flow, which made it difficult to make any conversation at several places. Today the hiking path is relocated up into the mountainside, and major dams and reduced water flow are the main elements of the tradition user areas. These pictures are from the same site. August 1971 and August 1994.

Picture 4: All the rivers and streams coming into the valley from different directions was major landscape elements before the developments. Afterwards, the highway and the dry side rivers have changed the landscape in the middle parts of the core area. These pictures are from the same site (towards Grøna), August 1971 and August 1994.



Picture 5: The upper parts of the core area were before the development used for summer grazing land. Today, the highway, power lines and a new lake is the main landscape elements. The earlier tourist cottage is developed into a larger tourist facility with parking lots, and the remains of a small stone house rebuilt as a historical monument. Both pictures are from the same point 1966 and 1994. The 1966 picture: Oslo Energi

The construction road, which was built for the hydropower development from the fjord up and into the mountain valley of Aurlandsdalen, was later on upgraded and made into a major passage road between Eastern and Western Norway. In 1991-92 new huge tunnels to the west made this road the only ferry free road between the most important town on the west coast (Bergen) and the capital Oslo in Eastern Norway.

The southern part of the old hiking trail has not been affected by this development and has remained an undeveloped zone in the recreation system (but with reduced water flow).

5.3.2 Latent demand effects

An important argument for a passage road through the central zone of Aurlandsdalen was that the area would be opened up for new recreational users who would otherwise not have the opportunity to experience the nature there. New user groups also could hike the remaining high quality day-use section in the northern zone.

Road surveys show, however, that the through road did not release a strong latent demand for outdoor recreation in Aurlandsdalen. Road interviews were obtained from a representative sample of private cars (300 in 1986 and 550 in 1991) that was driving through the area during summer time. Most tourists drove directly through the central section of the old hiking trail without stopping, finding the nature attractive but not unique enough as a stopping place. Large power lines located (as secondary projects) along parts of the new road were an element, which the majority of tourists disliked most (picture 6).

Picture 6: The power lines were the main new landscape elements, which the car driving tourists disliked most.

80-85 percent of the people, who stopped their vehicle, stayed by the car making only a short rest (to get fresh air etc.). Only 5-10 percent of them walked more than 1 km away from the road. Only two cars in a thousand had persons who hiked the northern part of Aurlandsdalen, which Parliament protected as a more wilderness like area. Self-registration measurements along the trail show that the traditional long distance hikers still are the majority of the users. The new road, therefore, has not released many new day-hikers in the most attractive part of Aurlandsdalen.

Postal interviews with 1200 hikers in 1986 and 500 in 1991 (with response rates of 90 and 75 percent respectively) show in addition, that 40-50 percent of the day-hikers in the protected part of Aurlandsdalen were organised hikers. The day-hikers were members of the same hiking organisations as the long distance hikers (mainly the Norwegian hiking association DNT). One effect of the new accessibility is, therefore, that the tradition users have started to use the protected area in new ways, through day-hikes in addition to long distance hiking. That is a **partial substitution effect** in the way that the key attraction still is hiking in a wilderness areas, but without the long distance element.

The main effect of the road among new recreation consumers, however, has been that a relatively low but stable number of recreation drivers have experienced the scenery of a new valley through the car windows. But the scenery was something several travellers were not aware of when interviewed at the border of the valley, leaving the area after a short visit on the way through. (When asked about the large power lines one driver said that he had not seen any. But, then, a small boy in the car interrupted, saying “But father, that was the place where our radio made all the noise”. The attention of many tourists was not on the landscape qualities, but conditions or issues inside the car).

Traffic measurements, which started in 1974 when the road opened as a toll road, indicate very small changes in the use of this road up to 1992. However, the new ferry free road system west of Aurlandsdalen changed this situation from 1992 on. The low latent demand effect before 1992 was most probably linked to the fact that tourists driving private cars had many alternative roads in this part of the country. The new road did, therefore, not create any major change in travelling possibilities during the 1970 and 1980’ties. But when the whole road system was upgraded and became the main ferry free linkage between Western and Eastern Norway, then the recreation use started to grow. Very substantial investments in new high standard roads may, therefore, be necessary to release latent recreation/tourist demand in a country with many existing alternative roads. Especially may that be the case if the developers of a new road does not prevent secondary projects (as new power lines), which reduce the remaining qualities and values in the road corridor.

5.3.3 Displacement effects among traditional users

The volume of traditional recreation use (long distance hiking) has, however, changed considerably since the hydropower development planning started in the 1960'ties. Accommodation figures from one of the hiking huts along the traditional trail, which even today have no public car access, makes it possible to compare use volume and user characteristics from 1936 to 1997. This longitudinal information is consistent with other data from Aurlandsdalen. It shows that the long distance hiking traffic in Aurlandsdalen increased steadily before the development decision in 1969. The growth was 2-3 percent more per year than in two comparable hiking areas used as reference areas (Hardangervidda and Jotunheimen).

The long distance hiking volume in Aurlandsdalen, however, rose dramatically (nearly 50 percent) the summer after Parliament decided to allow the development, a strong growth not seen in the two reference areas. A larger part of that growth is most probably connected with the "environmental wake up" publicity, which the decision process created. Partly it was hikers who came to see the area before the development started, or "to see it the last time." The unusual strong growth was turned to a strong reduction (25 percent) in hiking volume the next year. This reaction, therefore, can be seen as a temporary **"publicity and farewell effect"** among the traditional recreation users. The publicity effect was probably higher than usual as the development planning created a very strong public debate, being one of the first major environmental battles in Norway.

Hiking volume in Aurlandsdalen declined substantially when the construction road was built into the traditional hiking corridor three years later on (1972). The number of long distance hikers decreased during these years with 50 percent, a decline not found in the two reference areas. The use was reduced in the whole hiking corridor, not only the core area where the road and hydropower construction took place.

The strongly decreased hiking traffic may be interpreted as an **external displacement** effect of the development, when earlier users were transferring their activity to other areas. Surveys in 1986 and 1991 among the hikers did in addition show **internal displacement** effects, as some hikers chose to use new trails bypassing the most developed areas. Other long distance hikers reduced the time they spent in the core area, travelling by bus or car through that part of the valley. The **total displacement** effect measured in recreation days, therefore, may be as high as 60-65 percent during the mid-1970s. The large reduction did came in spite of the major changes Parliament made in the original plans to make the development more environmental friendly. All the money used on building the construction roads in very long tunnels, to protect the environment, did not prevent that the wilderness interested long distance hikers moved their recreation activity away.

The long distance hiking volume has, however, increased substantially again from the middle of the 1980'ties (Figure 5.4).

Figure 5.4 Volume of long distance hiking 1961-1996 in Aurlandsdalen and a reference area (Hardangervidda).

5.3.4 Interaction effects; a test of alternative theories

The U-shape over time in the long distance hiking volume raises several important questions about the processes behind the change in traditional recreation use. The decrease in hiking traffic after 1970 can be interpreted primarily as an external displacement effect. None of the studies in Aurlandsdalen have, however, shown directly that earlier users have relocated their activity to other areas. Some persons, therefore, have doubt about the hydropower and road developments as the real reason for the change in use pattern over time. Alternative explanations should be examined before a conclusion is drawn. That is especially necessary if the aim of an audition is to help decision-makers and different interest groups to adjust their theories and predictions to the empirical reality, by learning from earlier development projects.

One alternative explanation, proposed in meetings discussing these research findings, is that strong negative argumentation against the hydropower developments from the hiking organisations did create a picture or belief among many Norwegians that Aurlandsdalen would be destroyed. One possibility, therefore, is that an incorrect **tainted and subjective image** may be the cause of the decrease in hiking traffic in Aurlandsdalen, not the objective changes in environmental qualities. Incorrect tainted images are, however, difficult to maintain which may explain the increase in traffic again after some year. Interviews in 1986 with a nationally representative sample of Norwegians (1000 adults) do show, however, that the “wrong image” explanation is not a probable one. The Norwegians and hikers in general did not have a “negative or not correct image” of Aurlandsdalen, at least that year.

Another explanation for the U-shape may be that many people start to accept modern development in nature areas when time goes by. The studies in Aurlandsdalen do show, however, that the rise in hiking traffic in Aurlandsdalen after 1986 is **not** related to any **increasing tolerance of the road and hydropower developments among the recreation users**. The surveys in Aurlandsdalen show in fact that the pleasure drivers and hikers in the area had more negative opinions about the development aspects in 1991 than in 1986, indicating a growing environmental concern and not any reductions. (One reason can be that the nuclear accident at Chernobyl occurred shortly before the 1986-interviews. That event may have created more positive attitude towards hydropower developments then compared with five years after Chernobyl).

The U-shape in hiking volume between 1972 and 1986 do closely follow the timing of the 14-year long implementation of the power plan. A third explanation, therefore, could be that **temporary disturbances during the construction period** do strongly influence use pattern, not the permanent changes in nature qualities. The hiking volume in Aurlandsdalen, however, began to rise again simultaneously with increased hiking in two Norwegian references areas (Figure 5.4 compares the time pattern only with one reference area to increase visual clarity. But the time pattern developments of hiking volume have in both reference areas the main patterns in common, but with some variability).

Changes in local conditions, as few disturbances after the construction (or improved image) can hardly explain the increased hiking in both of the two reference mountain recreation areas. It is more probable, therefore, that some general processes are the reasons for the growth the last ten years, from 1985 to 1996.

These general processes include the effects of several major changes on national level. First of all the Norwegian national economy and recreation habits in general have changed, especially after the oil price declined in 1986. That changed Norway's oil based economy and reduced the flow of Norwegians abroad on holidays, increasing the use of domestic recreation possibility again at the end of the 1980'ies (also in the mountain areas).

The studies in Aurlandsdalen show, in addition, that some of the increased hiking traffic between 1986 and 1991 is linked to local and regional processes. Most important are new tourism attractions developed in adjacent areas to Aurlandsdalen as a response to a new national tourist policy with investment subsidies. Entrepreneurial activity in the form of new ways of organising the hiking activity in the area (mass hiking events, commercial hiking groups), have also had effects.

The most important factor is, however, the largely increased accessibility because of the new ferry free road between Western and Eastern Norway. That huge project released also a new long distance bus system (another secondary project), which explain a substantial growth in hiking volume from 1991-92 on. Social change on national and international level has also contributed, especially the strengthening of the position in society of women. More young women participate in general in sports

activities, also in long distance hiking. (And rumours say that the growth in number of young female hikers has made the wilderness more attractive also among Norwegian men – in all age groups).

The changes in hiking traffic in Aurlandsdalen the last 30 years are, therefore, influenced by many processes, not only the hydropower and road developments. **Displacement because of the hydropower and road developments, however, seems to be the best explanation so far of the decline in traditional hiking volume between 1972 and 1985. Other processes have compensated that decline later on. But first to a large degree when very substantial changes came in the accessibility because of immense investments in new highway systems including road tunnels among the longest in the world. (The longest road tunnel in the world will be finished year 2000 as part of the same huge system).**

These attempts to measure the magnitude of impacts and to improve the understanding of the processes going on have to less degree looked into the significance of the effects (the impacts or values for example in economical terms). The studies, however, show that many long distance hikers still use Aurlandsdalen, and the area **remains valuable for the traditional recreation users**. But areas such as Aurlandsdalen provide also important values and benefits for non-users. Non-users for example would like to keep the possibility open for them selves to experience the area (the **option value**) and for knowing an area is protected (the **existence value**). North American studies show that option, existence and other values connected with nature areas, can be much larger than use-value's (Walsh - 1986). The studies in Aurlandsdalen, however, include not such values.

5.4 The need for dynamic ex ante assessment

The goal of impact assessment in this field is, normally, to improve the knowledge about important effects and the impacts on tourism and recreation **before a decision is taken on a planned change of nature**. Such impact assessment is usually applied science, concentrating on identifying and predicting the magnitude of effects, and on evaluating the significance. The goal is to improve the quality of decisions (Armour 1991).

The ex post studies in Aurlandsdalen show, that high quality impact assessment made before a decision should include not only effects from the primary project but also the potential **interaction and cumulative effects** with other (secondary) projects which are released by the planned project. In addition, impacts from other - unplanned - changes in society must be considered, if predictions of the planned changes should be more precise.

Assessment of effects in the future is difficult. One reason is that construction of a new hydropower development or a major highway-section will usually take many years. The Norwegian hydropower development referred to here did last 14 years.

The prediction problems are not made easier by the fact that the planned changes (the primary project) in all likelihood will interact with several unplanned general changes, which will occur at the same time as business cycles, political and social changes. In addition to such unplanned interaction and cumulative effects, it will be effects also from secondary projects (as new road service-facilities and new tourist attractions), that the new development itself (the primary project) can release. The Scandinavian experience so far is that a new main road can release many unexpected secondary projects both on short and long term. The new road through parts of the Norwegian mountain area have, for example, released both the development of more roads, power lines, second home developments, accommodation facilities, and a non-permanent summer ski-resort (Teigland 1994). A project may therefore be only one in a chain of projects over time. Few Norwegians thought of during the planning process in the 1960'ies that the hydropower development in Aurlandsdalen would make it possible 25 years later to create a ferry free road between Western and Eastern Norway (by building the longest car tunnels in the world).

Secondary projects released by the primary project can, therefore, have very important effects later on. The Swedish impact assessment referred to earlier showed, for example, that the cumulative-effects of planned secondary projects along the new highway had a potential for larger negative impacts on the existing tourist industry than the development of the new highway-section itself (Teigland 1992). That was an effect non-of the involved interest groups had thought of in advance, but which could be reduced or avoided by adjusting the plans for secondary projects.

The interaction and cumulative effects from unplanned changes and secondary projects will always be difficult to assess in advance. One way of handling such effects ex ante can be to:

- first assume that all other factors than the new road or highway section will be stable both on short and on long term, and do a partial analysis of the effects of the planned (primary) project it self.
- after such a partial analysis, the assessment can then discuss more briefly possible and probable changes in other factors on short and long term, given the knowledge at the time of the study about other changes going on (as interaction effects from changes in national economy, the integration in Europe (with no tax free ferries), and change in tourist pattern regionally).
- impacts from secondary projects can often be assessed more thoroughly, as road projects often very early release several plans for road-service facilities, accommodation facilities and new tourist attractions. An analysis of effects from secondary projects can not, however, include more than secondary projects known at the time of the assessment.

An impact assessment can clarify what kind of effects a new hydropower or road development in a nature area can have on outdoor recreation and tourism, and analyse alternative solutions. How important this information will be in the planning and decision process is, however, difficult to know. It may depend on the political

strength of the outdoor recreation and tourist interests, and the value's connected with nature and environment qualities in each country.

5.5 Conclusions

The concepts used in this paper may give the impression that the value of nature for outdoor recreation and tourism is closely tied to the use of an area. Research has, however, shown that an area not only have such use values. But it often has large value also for non-users who would like to keep the possibility open both for them self to experience the area (the option value) and for knowing that an area is protected (the existence value). North American studies show that option-, existence- and other values can be larger than use values (Walsh 1986).

The existence of larger areas without modern developments has been reduced dramatically in the Scandinavian countries during the last 30-40 years, but no studies show the existence and option value's connected with the remaining wilderness like areas. The Norwegian case study referred to show, however, that the use-value of such wilderness areas could be reduced significantly for traditional recreation users if a new road and hydropower project is developed. Only a very important new road did release latent demand (from 1991 on) which did "compensate the volume of use» which could be expected if no development. The reference areas are then used as an indicator of the «counter-factual» situation.

The reduction in quality was not so strong that visitors did not use the road for recreational purposes, and it is now a significant number of long distance hikers using the area. The area has, therefore, a remaining value for recreation and tourism. But the remaining value in this area is mainly a result of the environmental concern expressed when the development was planned. The public reactions to those plans and the crude impact assessments done then (1968-69) on expected effects, was so strong that the parliament as a compromise, decided to protect the most attractive parts of the area from all kinds of roads and other developments.

The use today show that the remaining attractions for the traditional and new recreation users are in a large degree concentrated to the high quality parts of the area, which was protected from new roads and other developments. But the protection of the most valuable parts have in spite of the increased accessibility, released relatively few new groups of users. Most of the users of the high quality protected area are still hikers of similar kind to them who used the area also before the development. The hikers, have, however, started to use the area in new ways; not only for long distance hiking, but also for day-hikes.

The different main effects of this new road reflect perhaps that a new road through a nature area does not increase the interest for nature experience. The main effect of a new road can be that it give people already interested in nature a new possibility to experience the remaining nature value's in that area. But new roads in environmental sensitive areas may have more negative impacts on traditional recreation and less

positive tourist impacts than often expected. To build such roads for recreational or tourist purposes is, therefore, of low importance at least in the Scandinavian countries. It is possible that similar auditing studies and impact assessments will show the same realities in other countries.

References:

Armour, A.:" Impact assessment and the planning process: A status report" Impact Assessment Bulletin, Volume 9, No .4 (1991), p. 27-33.

Bäck, L. Jonasson, C. & Strömquist, L. 1990. Environmental Impact Studies of the Highway Construction between Kiruna and Riksgränsen. Long term impacts 1985-1989. UNGI Rapport Nr. 75. Uppsala University, Department of Physical Geography. Uppsala. (In Swedish)

Giffen, R. A. and Parkin, D.O. 1991. Using systematic field evaluations to determine instream flow needs for recreation. Hallowell, ME. Land and Water Associates.

Kuentzel,W. F and Heberlein,T.A. 1992. Cognitive and Behavioral Adaptations To Perceived Crowding: A Panel Study of Coping and Displacement. Journal of Leisure Research. Vol.24. No. 4, 377-393.

Haagensen, K. and Midtun, A. 1984. Hydropower development, conflicts and protests. Universitetsforlaget. Oslo. (In Norwegian).

Shelby, B., Brown, T.C. and Taylor, J.G. 1992. Streamflow and Recreation. USDA Forest Service. Report RM-209. Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Teigland, J. 1986 "Impacts on outdoor recreation and tourism from hydropower. An international state of the art study". NTNF's utvalg for miljøvirkninger av vassdragsutbygging. Rapport nr. A4, Oslo. (In Norwegian)

Teigland, J 1991: "The outdoor recreation and tourist-interests at Engabreen/ Svartisen glacier. A before and after study of impacts from a hydropower and road development. Baseline study summer 1991". Norwegian Institute for Nature Research. Oppdragsmelding 084, Lillehammer. (In Norwegian)

Teigland, J. 1992 "Impacts on tourism and outdoor recreation from a new European highway-section. A case study from E4 in Central-Sweden". Telemark Research Foundation. Rapport nr. 55, Bø i Telemark. (In Norwegian)

Teigland, J. 1992. Quality of recreation experiences and streamflows. An international state of the art study with models for hydropower simulations. Rapport nr. 65. Telemarksforsking. Bø. (In Norwegian)

Teigland, J. 1994. Impacts on leisure use of nature from hydropower developments. A case study in Aurlandsdalen. Telemarkforsking. Rapport 83. Bø. (In Norwegian).

Walsh, R. G. 1986 “Recreation economic decisions: Comparing benefits and costs”. Venture Publishing, Pennsylvania.

Appendix 5.1 Methods used in the Aurlandsdalen case study

This case study started in 1986, 15 years after the hydropower and highway development began. It was, therefore, not possible to study directly either the planning process which started in 1964 and the participants theories about the effects, or the pre-study recreation behaviour.

A. Information on ex ante predictions

The development plans started an unusually active public debate. All written participation in that debate between 1995 and 1970 when the formal decision was made by the Parliament had been collected by the Norwegian River Management Agency and published without comments in 1986 (NVE 1986). The written statements include all letters or interviews published in national or local news papers, all letters to the Parliament or River Management Agency, and the public written accounts of the Parliaments debate before the decision.

These statements give a clear picture of the project theories the main participants in the decision based their thinking and actions on. Some of the statements were of course parts of the political battle. But actions show the seriousness of the thinking, too. The Norwegian Hiking Association, for example, sold one of their huts in the area, since their purpose was not to delivering services to car tourists and in the belief that the hiking traffic through the core would be reduced substantially.

To clarify if such theories give a correct picture of the realities, information on the degree of change in recreational use is needed, which show a reliable picture of use volume and patterns before and after the development. In addition, insight as to why use pattern have changed over time is needed since change may not only be related to the planned development actions.

Since this case study started in 1986, 15 years after the implementation of development actions started, documentation of earlier recreation use is based on indicators of the historical developments over time and space.

B. Indicators of recreation use; the volume and pattern in time and space

a. Earlier use and historical data

Before the hydropower development started in 1971, there were no roads in valley and mountains of Aurlanddalen. All traffic was, therefore, on foot. Indicators of earlier use should preferably cover all the main types of recreational use, which included four main types:

- long distance hikers passing through the area staying overnight at four cottages open for public use, and partly managed by the Norwegian Hiking Association

- long distance hikers passing through the area, but staying in tents
- dayhikers using the outer parts of the area, close to the railway and road heads
- dayhikers inside the area using one or more of the four cottages as base for dayhiking trip

Today, there is no accurate information on the volume and use patterns of those dayhikers who used the outer areas, or about the tent users. Local informers agree, however, that those two groups were very few in numbers before 1970. The large user group was the long distance hikers, and partly the dayhikers inside the area using the tourist huts as base. Even today, it is relatively reliable information about these last two types of users. The Norwegian Hiking Association (DNT) has published yearly statistics from 1934 on overnight stays in the area, and guest books, "bill registrations" from individual guests and economical accounts are available.

The most reliable source for historical data is the overnight statistics from one specific tourist hut managed locally on behalf of the hiking associations, since that information have been used to divide the income between the association and the local management.

b. Today's recreation use.

Field studies 1986-1991 among the hikers

User studies among the day- and long distance hikers were done both during summer 1986, 1987, 1988 and 1991 to get as accurate picture of today's hiking activity. These studies combined several methods, but the main ones were based on self-registration equipments and large postal interview surveys. Different mechanical counting systems were also used, together with observations and personal interviews among a small sample of users.

Self-registration equipment was put up in 1986, 1988 and 1991 along the main trail close to the end of the four day long hike. The surveys indicate that 97-98% of the hikers passed that registration point, where a large billboard asked the passers by to fill in a registration card with name and address and some information on their trip. The billboard and registration cards were in Norwegian, English and German, but only 5% used the non-Norwegian cards. (This area is a national outdoor recreation area and not so much of international interest, partly because of the hydropower developments).

Observations of the passers-by showed that 60-75% of the hikers stopped and filled in the information. All together 7838 hikers above 15 years gave their name and address. In addition approx. 10% less than 15 years old gave the required self-registration information. But they were not included in the postal surveys done each autumn after the hiking season was over.

A control survey done along the trail, after the self registration system was passed [10]show that it was no special group who did not fill in the required information (one exception were persons who had only short time to reach a rare local buss). The self-registration system was in 1988 in action from very early in the season to very late, to get a precise picture also of the off-season traffic.

Postal interviews among hikers in 1986 and 1991.

10-12% of the hikers in Aurlandsdalen were foreigners both before, during and after the hydropower development, according to nearly 2587 "guest book-registrations" at local tourist huts in 1950, 1960, 1965, 1970, and the self-registration cards in 1986 and 1991. Approx. 50% of the foreign hikers was from Denmark and Sweden.

In 1986 all adults 15 years and older who would understand Norwegian (1196 persons, mostly Norwegians, Danes and Swedes), were contacted by post and asked for more detailed information about their hiking trip. The questionnaire was 10 pages long, but still the response rate was 94% (!).

To reduce the workload in 1991, a lottery sample of 800 adults who understood Norwegian was contacted. They got almost the same questionnaire as in 1986. The response rate was 84%. The reason for a somewhat lower response rate in 1991 is probably that the number of postal reminders was only one that year, compared with three in 1986.

Personal interviews among hikers in 1987

In addition, a smaller sample of site interviews were done during two periods summer 1987 among the users of the tourist hut (Geiteryggen), which delivered the historical data on hiking in the area. 258 guests were interviewed during their overnight stay, most of them at the hut, but tent campers in the neighbourhood were also included. The main aim was to check if the overnight statistics were a valid indicator and relevant for the number of long distance users hiking along the main trail. Most of the hikers who stayed overnights at that tourist hut did hike the main trail through Aurlandsdalen. Information collected for many years earlier on the "hiking bills" make it clear that the geographical use pattern among hikers visiting this hut were stable. Which means that the historical data most likely is a reliable indicator for the change over time in hiking volume.

The postal and personal interviews give clear evidence that these users have a very common opinion about the quality of nature experiences after the hydropower developments, according to a battery of attitude measures, which table 5.1.a and b give only a few examples from. The high inter-subjectivity was stable also over time for nearly all of the other attitude questions, too, and for data on the hiker's recreation behavioural and background (Teigland 1994). The fact that different surveys among

[10] It combined observation of who did not stop and fill out self registration cards, with radio messages to an interviewer further along the trail

independent samples of recreation users gave the same results indicates that the quality of data and reliability is high.

Table 5.1.a Long distance hikers in 1986 or 1991 after attitude towards some potential nature changing actions in the northern parts of Aurlandsdalen valley (only some of the actions asked for in the questionnaire are included here). Percent*

Nature changing actions	Attitude towards potential nature changing actions					
	Strongly Against	Against	Neither against nor in favour	In favour	Strongly in favour	Total
New power line						
1986	75	16	7	1	1	100
1991	78	16	6	0	0	100
No water flow in river						
1986	87	11	1	1	0	100
1991	89	9	1	0	0	100

*Basis: 494 hikers in 1986 and 331 hikers in 1991. Only persons 15 years and older who had hiked all of the 4 day hike, and therefore, had personal experience of the whole trail

Table 5.1.b Long distance hikers in 1986 or 1991 after their experience of the hiking trip through the northern parts of Aurlandsdalen valley. (Only some of the experiences asked for in the questionnaire are included here). Percent*

	Do not agree	Neither agree nor disagree	Agrees	The questions is not relevant	Total
The hike through the lower parts of the valley was one of the best nature experiences I have had					
1986	2	8	89	1	100
1991	3	10	86	-	100
The hike was fully worth the time and money					
1986	2	1	95	1	100
1999	1	2	97	1	100

* Basis: 494 hikers in 1986 and 331 hikers in 1991. Only persons 15 years and older who had hiked the entire 4 day hike, and therefore, had personal experience of the whole trail.

Field studies among the car tourist's 1986- 1999

The construction road through Aurlandsdalen and the core area of hydropower development is 16 km long and was open for public use from 1975 on. It was a toll road 1975-1983 with a stable but relatively low traffic volume most of the time. Automatic car counter systems give reliable data on volume from 1983 on, with 10-15 cars per hour, which is low compared with many other touristic roads in Norway.

The car tourists use of Aurlandsdalen, and the latent demand they represent, was studied by stopping a sample of cars driving through the area, when they passed the area border on the way out. This interviews acted as "border controls" giving possibilities to interview this user group about their activities and experiences inside the area. Altogether 327 cars were stopped and interviewed during summer 1986 and 561 in 1991. The interviews were based on a questionnaire in Norwegian and German (with English also in 1986). Only 3% passed without stopping in 1991, not including bussed, lorries and locals on shopping trips (not recreational users). The response rate among the recreation users were 94% in 1991, and high also in 1986 but detailed statistics were not made on this issue in 1986.

The car interviews were limited to two periods each summer, which covered the main Norwegian holiday season in general (the first weeks of July) and the main hiking season (the first weeks of August). The car interviews covered both weekdays and weekends. As these periods are the high season, the results most likely overestimate the car tourist's recreational use of the study area.

Comparisons with the other user studies made in the area, as part of a triangulation strategy, indicate the same findings concerning the use pattern among car tourists. The car tourists opinions about the qualities of nature experiences were very similar both in 1986 and 1999 (Teigland 1994). The fact that different methods give identical results increases the reliability of the information.

However, the car users on the highway did in general not use the new smaller construction roads, which goes from the highway into the mountains in Aurlandsdalen. Therefore, additional interviews were made along these roads during summer 1987 when 277 cars was stopped and interviewed on the side roads. (The latent demand released by the smaller construction roads was small, too).

Local recreational use of Aurlandsdalen

Aurlandsdalen is a part of one of the smallest local municipalities in Norway with only 1900 inhabitants. The user surveys of car tourists and hikers had so few representatives of local recreation users, that a special survey was made among a representative sample of 400 adult inhabitants (15 -74 years) during autumn 1987. The sample was drawn as a lottery sample from the national population register. It was a postal survey, which included every 3-4 adult in the community. Several persons in some households, therefore, received a questionnaire with many questions. The response rate was 44%. A shorter version of the questionnaire was 4-6 weeks later mailed to all that had not respondent to the main questionnaire. In addition 20% of the sample was contacted by telephone. The response rate on the telephone interviews was 75% among those who had not returned the main or shorter version of the postal questionnaire.

The additional surveys increased the total response rate among the original sample of 400 adults to 70%. The responders were representative of the local inhabitants

according to a comparison with the 1980 census. The additional surveys show, however, that those persons who respondent on the main questionnaire were more active outdoor recreation users than the population in general. The volume of activity recorded by some questions which the additional and shorter versions did not include, were probably over estimated by approx. 10%.

National survey of recreation in general and "non-users" of Aurlandsdalen in special

Most of the increased hiking activity in Aurlandsdalen at the last parts of the 1980's was related to Norwegian users. Foreign users explain only 13% of the increased use. Therefore, a national representative interview study was made during autumn 1988 of outdoor recreation in general, which was comparable with two earlier national studies done by Central Bureau of Statistics in 1970 and 1982.

1050 Norwegian adults were interviewed about their outdoor recreation activity in 1988, and about their image and knowledge of Aurlandsdalen. These surveys confirm that most of the change observed in the case study area in the 1980's was caused by general change in recreation activity among the Norwegians.

A general conclusion is that the information gathered on recreation use before and after the hydropower development is reliable. To check the reliability, the findings were presented on a public meeting with local interests, the proponents and opponents of the development. Their review show that the research information was accepted as facts, but the interpretations of why recreation had changed was open to debate, especially the value of change in recreation use (the impacts). A new study of the effects and on the local tourist trade was, therefore done, which show that the marked for the traditional tourist hut inside Aurlandsdalen most probably was lower after the development that it would have been without the development. But this is a counter-factual judgement, which include the usual uncertainty with evaluations of what would have happened if a development action had not been implemented.

References:

NVE. 1986. A collection of statements and opinions on nature and landscape in connection with the hydropower developments in Aurlandsdalen (In Norwegian and with the title: Samling av uttalelser og meningsytringer om natur og landskap i forbindelse med utbyggingen av Aurlandsvasssdraget). Vassdragsdirektoratet. Natur- og landskapsavdelingen. Del A og B. Oslo

6 Uncertainty in IA-predictions caused by external processes; the effects on tourism of mega-trends

This chapter is identical with a chapter accepted for publication after review by Gartner, W. and Lime, D.W. (eds.) in a major research book with the title: Trends in Outdoor Recreation, Leisure and Tourism. CAB International, Wallingford, UK. (2000)

Predictions of effects from development actions, and the short and long-term stability or change in time and space, will depend to a major degree on external processes that contribute to interaction-effects and dynamic developments. One of the major problems with IA-predictions is the possibility for changes in the political or economic systems that are involved. This problem is especially relevant today with global processes, which influence the general development of society. It is a type of fundamental change of systems on global scale that most probably increases uncertainties in future IA-predictions in substantial ways.

A common assumption in many IA-predictions is that the main systems and general trends will continue as earlier, which means that trend projections can be used as a prediction method. This chapter focuses on three mega-trends that are important for most social impact assessments and the quality of IA-predictions. Effects from these trends were identified in both case studies that are included in this dissertation, causing major prediction failures.

Here, the subject of interest are the forces creating stability and change in three specific mega-trends, and the implications for tourism and recreation and IA-predictions in the future. One conclusion is that earlier growth rates in tourism and recreation will not continue in important parts of the western world. Because it is clear ceilings and restricting factors that will reduce volume growth of leisure tourism in general. But tourism and recreation will probably change in space and forms, which indicate that trend-projections are not a reliable prediction method.

Another conclusion is that the three mega-trends discussed in this chapter will increase uncertainty in IA-predictions in general. The main reason is that systems and ideological based patterns of actions and behaviour, which earlier were stabilising factor inside a nation, now are changing world-wide. One proactive strategy for coping with the increased uncertainty in IA-predictions should be to improve our insight in the forces driving mega-trends.

THE EFFECTS ON TRAVEL AND TOURISM DEMAND FROM THREE MEGA-TRENDS; DEMOCRATISATION, MARKET IDEOLOGY AND POST-MATERIALISM AS CULTURAL WAVE

A trend is a trend is a trend
But the question is, will it bend?
Will it alter its course,
Through some unforeseen force
And come close to a premature end?
(Cairncross 1969)

6.1 Introduction

It is a common phenomenon that the demand for recreation and travel do not develop as investors or policymakers expect. But when investments or policies are failures, it is rarely a coincidence. Misjudgements are most often based on a lack of understanding of the forces forming consumer behaviour in time and space.

One reason for failures is a tendency to believe that earlier trends will continue. But technological or organisational change can shift demand to new levels, up or down, with the main trend as earlier. Trends may also turn if travel habits change more fundamentally. A problem for investors and policymakers, therefore, is to foresee major shifts or turning points in the demand and especially long-term change in direction. “Heavy trends” may be a term for more fundamental but stable long-term changes in travel and recreation behaviour. “Mega-trends” refer to major changes in the society in general (Smeral 1994), that can cause new heavy trends in travelling.

This chapter focuses on social forces and ideas shaping three mega-trends in western societies and the effects on travel and tourism behaviour of:

- long-term democratisation of tourism and travel consumption
- the recent dominant influence of market system ideology
- post-materialistic trends and modernisation of value systems.

Leisure travel and recreation were earlier activities for the few, but a reality today for many inhabitants in industrial societies. It has been a social evolution that has “democratised” travel consumption. Western Europe has in many ways lead this development and become a “leisure continent” with a higher degree of democratisation and different leisure systems from other continents (Clark 1999). Industrialised countries in other parts of the world have focused more on other ideas and lead the way towards the growing importance of market system ideology. That mega-trend has influenced economic systems and one effect is polarised consumer behaviour with growth in demand at the same time for luxury goods and cheap bargains. The third mega-trend in post-modern society is major changes in value

systems, especially in the interest for material belongings and conspicuous consumption. All three mega-trends have major implications for recent and future trends in travel and tourism.

6.2 Basic concepts: stability, change and interaction effects

Effects of mega-trends can emerge gradually or be hidden for a long period if short-term or preliminary processes affect demand in the opposite direction at the same time. A cause and the visible effect also can be separated and lagged by substantial time. Heavy trends and major turning points are, therefore, not always easy to identify. Interactions between short and long-term change give interpretation problems, too. The tourist industry in northeastern USA realised for example a misinterpretation some years ago. A declining tourist demand at the beginning of 1990'ies was not preliminary and caused by a business cycle, as the industry believed, but a long-term effect of reduced relative attractiveness (Kuentzel et al 1996).

A substantial change in tourism demand may come quickly if short-term processes start to move demand in the same direction as long-term heavy trends. The tourist industry in Switzerland discovered that during the first half of the 1990'ties. Then short-term economic problems reduced demand in general and interacted with a long-term trend towards more domestic demand for holiday abroad. This interaction effect forced a new Swiss hotel to close down every 62 hour in average for a period of five years (Kaspar 1995 p 140).

Stability in recreation and travel behaviour, not change, may be the most prominent feature in many industrialised countries. But few comparative longitudinal studies are available. USA and Sweden are the only countries having comprehensive and longitudinal travel studies covering both day- and overnight trips. These studies show that several of the main structure of travel behaviour has been remarkable stable in the 1990'ties. Leisure oriented travel has been the main component (60-80%) of total travel volume in both countries (NTS 1995, Nyberg 1995). Most trips (80-90%) were domestic, and 85-95% of total volume was overnight trips if volume is measured in travel-days. The majority of overnight leisure trips (55-65%) in both countries was visits to relatives and friends or based on the use of private second homes, recreation boats, caravans or trailers. Longer leisure trips, or holidays, is concentrated to a few summer months. 75-80% of overnight trips abroad was leisure trips both in Western Europe and USA, and only 20-25% was business trips (IPK 1996, NTS 1995).

The structural stability is most probably no coincidence, but indicate established consumer habits and mature markets in many industrialised countries if Sweden and USA can be used as references. The similarity in major structural elements also indicates that important forces forming travel behaviour are not very different. Among the stabilising factors are the institutionalised (legal) rights to leisure, including 4-7 weeks of paid holidays in West European countries, but less on other

continents. A substantial volume of private leisure capital that is "locked up" in second homes, caravans, leisure boats etc., and different kinds of skills (as foreign languages or skills in skiing), also stabilise volume and structure of leisure behaviour. The large volume of visits within social networks, reflecting the lasting importance of relatives, friends and work-relations stabilise the structure of leisure behaviour, too.

However, travel behaviour on national level has not a frozen structure. Volume changes too, partly together with short-term fluctuations in structure. The travel market in USA between 1985 and 1997, fore example, was characterised by 44% growth in total travel volume (NTS 1997). Business travel increased, however, less than pleasure and vacation travelling (47%), measured in trips. Visits to relatives and friends were the strongest growing segment in USA (up 87%). Travel volume in Sweden showed a very different pattern during the same period, going from substantial growth to strong decline, and later partly back again. Leisure visits to relatives and friends, and to second homes, were stabilising elements during the most turbulent years in Sweden at the beginning of the 1990'ies (Nyberg 1995, Sahlberg 1996). A variety of substitution processes took place, with effects both in time and space. Among the important ones were shifts between domestic and foreign destinations (external substitution) and between domestic types of travelling (internal substitution).

One reason for turbulence in general, or major shifts and turning points, is unexpected events that partly or totally change assumptions a project or policy are based on. Such events include unexpected and rapid change in macro economic conditions (as in the Swedish and Swiss cases), natural disasters (e.g. earthquakes or hurricanes), and a major shift in a political system (such as the breakdown of Soviet Union). A major war or terrorist action also can give an unexpected and strong shock to recreation and travel demand, with short and long-term effects in a large influence zone.

The effects from such impulse-processes can be especially strong if several events came at the same time. That was the case when the Gulf War reduced air traffic in most parts of the world for a short period. But the main problem then for the travel trade was that the Gulf War came during a slow down in the North American economy, which already had reduced economical robustness. Many bankruptcies were, therefore, an interaction effect between a war going on far away and a relatively small downturn in the business cycle, which changed demand in the same direction. The strong changes in Sweden in 1991 and 1992 were interaction effects, too. A major devaluation, a business cycle influenced partly by the earlier breakdown of Soviet Union (a lag effect), and a major change in taxation system interacted during a relatively short period with large cumulative effects on travel demand among Swedish citizens.

Some events are not unexpected, but planned and well known years ahead. A major policy change such as the deregulation of the air transport market in USA and Europe, a new tax system, or a mega-event such as an Olympic Game, should not

came as a totally unexpected happening. But if investors and policymakers do not understand what is going on, or have a poor theory of the effects from the planned event itself and interactions, they may get themselves into major troubles even in such cases. The 1994 Winter Olympic Games in Norway can be one example. Instead of the expected boom in tourism and recreation demand afterwards, the reality became different. The divergence between high growth predictions based on poor impact theory and the lower reality explain why 40% of the full service hotels in the Norwegian host town (Lillehammer) have failed or gone bankrupt (as measured at the end of 1997).

The Olympic Game failure relates partly to a lack of understanding of long-term mega-trends in many high-income countries and especially in Germany, the most important tourist generating country in the world. Concepts as democratisation processes and roof effects increase our understanding.

6.3 Democratisation processes

Travelling for pleasure was at the beginning of this century something only the very rich did. Today the majority of people in many industrialised countries are holidaymakers each year. That process has "democratised" the possibility of travelling as consumption phenomena. But democratisation as a concept can be used about processes that in general reduce earlier differences in society; politically, economically and socially. According to Minogue (1985) was democracy in the classical Greek the name of a constitution in which the poorer people exercised power in their own interest as against the interest of the rich and aristocratic. The struggle for racial and sexual equality is also democratisation processes having effects on tourism and recreation, but not discussed here.

French scientists claim that the lower classes of society copy the consumption of the upper classes and also their recreation and travel patterns (Monteiro and Rowenczyk 1992). Social diffusion and lag mechanisms affect development among rich and poor countries, too. The rich countries in Europe have, fore example, in many ways lead the democratisation of travel behaviour. A large majority of the inhabitants (70-80%) in rich countries like Sweden and Switzerland travelled on holidays as early as in the 1970'ies. Many other countries, especially in Southern Europe were far behind with much lower participation rates (30-40%) at that time.

In Europe "holiday" is then defined as a leisure trip away from home lasting at least five days or four nights. Leisure trips that last 1-3 nights are referred to as "short holidays" (Schmidhauser 1992). Travel surveys from USA do not define trips in the same way, but measure trips according to distance travelled (NTS 1995). A "vacation trip" in USA can, therefore, be different from a European "holiday". In fact, most "vacation trips" (ca. 50-60%) in USA last only one to four days, indicating that half of total leisure travel volume was day-trips or short holidays according to European definitions. It is important to be aware of conceptual and methodological differences when transferring information on trends between the two continents.

An important trend in USA and parts of Europe during the last 10-15 years have been a substantial growth in the demand for short holidays, mostly having effects on the local and regional level. On international level, however, the most important process recently has been the democratisation of holiday habits in the largest country in Europe, Germany. One effect of this process was a huge increase between 1986 and 1994 of German tourists' abroad. During those eight years the number of German visitors to other countries on holiday (lasting at least 5 days) nearly doubled (Aderhold 1996), making Germany the most import source of international tourists.

The strong growth of German tourists to most parts of the world was an interaction effect between internal democratisation of consumption and a major external political event in the Soviet. The political democratisation of Easy Germany and the reunion with West Germany in 1989 added in 1994 at least three millions to the many German tourists travelling abroad on holidays. But more important for other countries was democratisation of travel behaviour in West Germany during nearly the same years. Only 57% of the West Germans went on holiday in 1986 compared with 78% in 1994. The number of West Germans on holiday increased, therefore, with nearly 12 million during those eight year. As the majority (64-71%) of them travelled abroad, the effect was nearly a 100% increase internationally of German holidaymakers (Aderhold 1996).

The growth measured in travel days on holidays to foreign countries was probably more than 100 million days, as Germany introduced a six weeks holiday with pay early in that period (Nahrstedt 1993). Only 4% of the West-Germans had a six weeks holiday in 1980 compared with 70% in 1990 (Grümer 1993).

This major change in travel behaviour had effects in the host-region of the 1994 Winter Olympics, too. But the investors and policymakers in Norway believed the large influx of German tourists before the 1994 event to be an effect of strong pre-event media-attention, and an indication also of huge growth potentials afterwards from the event itself. They invested accordingly; unaware of the real cause of the growth in German tourists and that democratisation of consumer behaviour has limits in Germany, also.

The upper limit to holidaymaking is in theory that 100% of the inhabitants in a country participate. But some inhabitants will lack money, free time, be too sick or old to travel away from home on holidays. In practise, therefore, the upper limit for participation rates is perhaps at a level of 75-85% in many countries (Edwards 1985; 1992). If participation approaches such levels then growth in holiday volume may level off. The strong democratisation of holidaymaking recently in Germany and other countries in Europe, with participation rates above 70-75%, indicate that holidaymaking is approaching an upper limit or roof. Increased holiday participation will in such countries not be a major driving force behind growth in travel demand. That roof-effect in itself reduces growth rates and stabilises demand more and more the closer participation get to 100%.

The growth in travel demand in a country does, however, not depend only on participation rates. Travel volume measured in days (or in monetary terms) can grow even with stable participation rates, if the volume of free time (or money) increases by the introduction of an extra week of holidays or higher incomes, for example. Volume also can grow if the inhabitants use more of the available free time (or money) on travelling. That will be the case if nearly 100% of paid holidays are used for travelling (as in Austria and Switzerland), instead of 50% that is a more normal upper limit or roof, according to Edwards (1992). Limits on the volume of free time, and the degree free time is used for travel can, therefore, act as two other types of upper limits or "roof" influencing the volume of travel demand. These two types of "time-roof-effects" can move upwards substantially and quickly if the inhabitants get more free time or choose to travel more during available leisure time

Leisure systems are very different among industrial countries. The European Union introduced from 1999 on a common minimum 4 weeks paid holiday in all member countries, but some European countries have more. The average volume per year of holiday with pay among industrial workers is much higher in Europe (4-7 weeks) than for example in USA and Japan (2.5 weeks). Available leisure time sets the ceiling for holiday travel volume at a much higher level in Europe than in the two biggest industrial countries in the world. The different leisure systems and free time volume are not a coincidence, but reflects different history, culture and way of thinking.

Leisure systems in Western Europe are linked to the history of organised labour unions. The socio-democratic unions decided in the 1920'ies that a revolution as in Russia should not be their strategy in the struggle for a fare share of economic development. The organised workers in Western Europe decided instead to negotiate common (collective) wage agreements with the owners of production means. The negotiations focused on more pay and improved working conditions. More time free from work obligations was also an important requirement, with shorter workdays and workweeks, lower retirement ages and longer holidays. The struggle for more free time was based on the view that work is a burden, which workers would like to reduce (in a combination with higher pay).

One effect of this social century long struggle is a significant reduction in the number of paid work hours, both on a yearly basis and on a (theoretical) lifetime basis. A "normal work-year" in a rich country as Norway has been reduced from 3 000 hours in year 1900 to 1 750 hours in 1997. Reduced retirement age and more years used in the education system have reduced the "theoretical lifetime work" with 55%, from 165 000 hours in 1900 to 75 000 in 1997 (Landsorganisasjonen 1998).

The volume of organised free time has increased slowly, but steady and stepwise in many European countries. The introduction of 1-2 weeks holidays with pay before the Second World War was followed up with demands for three weeks during the 1950'ies. When that became a reality, the labour unions asked for a five-day workweek (and longer weekends). A four week holiday was introduced in several countries during the 1960'ies, with a strong increase in travel demand the following

years. Countries with good economies and strong labour unions lead the way, with a diffusion of ideas and demands to labour unions in other European countries the following years. If one union got five weeks holidays or lower retirement ages, then other unions wanted the same (and quickly, to keep up with the "neighbours").

A major shift in thinking came during the 1970'ies, as high unemployment in many West European countries became a long-term phenomenon. Labour unions reasoned that if it is not possible to increase the number of jobs by increasing the economic activity, and in that way reduce unemployment, then alternative solutions should be found. One alternative would be to reduce the number of people looking for a job, by reducing retirement age or keeping the youths longer in the education system. Another way would be to share the available jobs, and to do that by increasing the number of paid holidays or reducing the number of weekly work hours. The changed thinking reflects that jobs are not only a necessary burden, but also a good (having variable quality) which should be shared according to socio-democratic ideologies.

During the last 10-15 years, European labour unions have implemented such ideas. One effect is that 5, 6 and even 7 weeks paid holidays have been introduced in some countries according to law or wage agreement for industrial workers (Table 6.1). Other countries have reduced retirement ages and hourly workweek. It is, however, a fundamental difference inside Europe as countries emphasise equality in the way that all (or most) workers have a right to the same volume of free time (even farmers have 3 weeks holiday paid by the state in Norway). Egalitarian conscious countries like France and the Nordic countries have, therefore, the same number of paid holidays for "everyone", reflecting inspiration from the French revolution and it's equality idea.

European Union have today a common "minimum rule" (introduced in 1999), stating that the number of holiday weeks should at least be 4 weeks also for non-industrial employee's. But persons in countries as UK and Germany that have worked for some years in an organisation, or are at a high level, may have (much) more than the minimum. Non-egalitarian systems are also common on other continents (as in USA).

Table 6.1. Days per year with paid holidays for industrial workers according to wage agreement. 1995.

Country	Days with pay for holidays	Holiday weeks 5 days=1 week
Japan	11	2,2
USA	12	2,4
Europe		
Finland	37	7,4
Italy	35	7
Netherlands	32	6,4
West-Germany	30	6
Austria	26	5,2
Denmark	25	5
Sweden	25	5
France	25	5
Great-Britain	25	5
Spain	24	4,8
Switzerland	24	4,8
Greek	22	4,4
Portugal	22	4,4
Ireland	21	4,2
Norway	21	4,2
Belgium	20	4

Source: Opaschowski 1996

One effect in Europe of the many new, but different collective agreements is that the volume of institutionalised free time has increased during the last decades. Leisure time limits that have restricted leisure travelling have, therefore, been lifted to higher levels. But there is a question if the forces behind this social evolution can sustain an upward trend much longer. Some governments seem to thinks so, and France has recently introduced a 35 hours workweek (with no reduction of salaries). Italy has reduced the workweek too.

Europe has, however, also signed world trade agreements recently that are opening up their economies for global competition. Most European countries have also a growing imbalance between people in work and out of the work markets. A strongly growing number of elderly makes it necessary to reverse the reduced pension age (OECD 1998) and restrict growth in leisure in general. It may not be possible for Europe to increase or even keep the existing free time volumes, if the competition increase with countries that have much less free time. Increasing global competition and economic problems may reduce some “time-roofs” again, and stabilise or reduce leisure travel, too. A new study published the by World Tourism organisation revealed a reduction in free time in developed countries world-wide (Clark 1999). In all the leading outbound countries, in Europe, the United States and Japan, there was

little hope of an increase in paid holidays in the near future. The reason is that the competitiveness of the world economy will act as a brake against more leisure time.

6.4 Polarisation trends as an effect of market system ideology.

A driving force behind stronger competition globally is the increased faith in market economy and free trade as system, which is another recent mega-trend in many countries.

The end of Soviet Union was a turning point for market theory as international guideline for the organisation of society. But the trend towards commercialisation and privatisation of public services started earlier. A core idea is that more competition would make the private and public sectors more efficient, and reduce wasteful use of resources. The resources available for other use should, therefore, increase. Reduced costs and prices also should contribute to higher living standards generally.

Use of "market fundamentalist" guidelines is a controversial ideological issue. A fact is, however, that several countries are increasingly organising the public and private sectors according to market theories. Countries such as Great Britain, New Zealand, and USA have led this process, which affects many sectors in society. One effect for the travel industry is reduced public responsibility and support for travel policy issues, and a trend towards privatisation, for example, of the budgets for national tourist organisations.

Few studies have clarified direct and indirect effects of market ideology trends on consumer behaviour and travel demand. But European research shows a polarisation of consumption in general. The affluent members of society generally have increased their incomes substantially during the last 10-15 years, while low-income families have had relatively small or nearly no pay increases. One effect in Europe is a strong growth in demand for expensive goods and luxury holidays; such as trips to other continents and expensive special events, high cost adventure travelling and purchase of high quality second homes and yachts. It has at the same time been a strong increase in demand for cheap bargains, such as "mass-produced" charter flights, as consumers increasingly seek "value for money". The growth simultaneously in demand for both high and low priced products on the poles (or edges) of the price scale is a polarised consumption phenomena (Nilsson and Solgaard 1995).

Similar changes in consumption patterns has most probably also taken place in USA, as income differences have increased there, too. The 20% most affluent Americans increased their real incomes by 20% from 1984 to 1994, while the 20% poorest inhabitants did only have a 0,1% increase during the same period (Kacapyr 1996). More uneven income distribution is, according to Kacapyr, a characteristic of market economies, because markets will mostly reward resourceful inhabitants using new opportunities.

A more skewed income distribution in Great Britain has influenced travel demand in several ways during the last 10-15 years (Prentice 1993). The UK experience indicates that higher incomes among low and middle-income groups should increase travel demand volume in general by democratising the participation in travelling. Increased income for the affluent increases demand, too, but mainly in the form of additional trips to the main holiday or more expensive trips. If international trends towards the use of market theory continue, with increased affluence as the expected effect, then trends in the most affluent European countries such as Switzerland and Norway may indicate future travel trends in other countries also. A major long-term trend both in Switzerland and Norway have been increased travel abroad and especially long distance.

Comparative studies show that trips abroad are a luxury with an average income-elastisity above one in general and 1,76-1,86 in western countries (Crounch and Shaw 1994, Crouch 1994; 1995). Which means that if incomes increase with one percent in western countries, trips abroad will increase with 1,76-1,86 percent. The more advanced countries in Asia, such as Japan, have very high elastisities for travels abroad. But the income level in developing countries has to reach a threshold before trips to foreign countries takes off. If the income level is high, as among the affluent, then higher income will not increase the number of trips abroad but the expensiveness (Crouch 1994).

Such trips are partly a substitution from "inferior" domestic holidays to more attractive ones abroad. One effect in European countries, where it is relatively short distances abroad, is a decline of domestic demand for holidays in the homeland, especially during summertime. Extended trips to other continents increased among Swiss inhabitants with 178% from 1980 to 1992 at the same time as the number of Swiss holidays in Switzerland declined 4% (Schmidhauser 1995). The reduction of Swiss demand for domestic holidays would have been even stronger if a growing number of winter holidays had not been located to Switzerland. The flow of holidaymaker's abroad from (oil) rich Norway increased so much during the same years that Norwegian demand for domestic holidays decreased 30% measured in days (Teigland 1990). Such changes create problems for the tourist industry as the consumers can change spatial travel patterns quickly and substantial, but the tourist supply are not mobile in the same way.

Short and long-term external substitution processes combined with the immobility of most tourist supply contributed to the many bankruptcies both among Swiss hotels during the 1990'ies, and after the 1994 Winter Olympics in the Norwegian host region.

Affluence is only a partial cause of the external substitution from domestic to foreign destinations. A comparative study from several continents shows that the demand for travel to foreign countries followed a strongly growing trend independent of other factors such as increased economic growth. This independently growing time-trend or "trend of our times" was 4,5% per year for travels abroad in general, and 7% for long distance trips (Crouch 1994). The time-trend for travel to Europe from other

continents was, however, negative and –2%, but strongly positive (14% per year) for trips to countries in the Pacific Ocean!

Interactions between "time-trends" and growing incomes, especially among the affluent, may explain the increased demand for high quality and especially "luxury" travels. Luxury is, however, a dynamic concept that varies over time, and between countries and cultures.

Germans make a distinction between "old" and "new" forms of luxury. Enzensberger (1996) claims that the new luxury for the privileged 10 million Germans, who have more than they need of material luxury objects, is life qualities, as;

- time to do what you determine yourself,
- privacy, including large space and escape from unwanted attention security from violence and crime
- high environmental qualities; as nice surroundings, quietness, and clean air and water.

Such "post-materialistic" change in value orientation has been predicted in industrial countries in general (Inglehart 1977, 1990). Basic value systems that oscillate over time can be viewed as cultural waves that create new trends also in travel behaviour.

6.5 Post-materialistic trends

Post-materialistic theories focus on a difference in value systems among the old and young generations in the western world. The older generations that grow up with high unemployment in the 1930'ies and the hardships during the Second World War had been marked by their experiences most of their life. A core value for them is security and material prosperity. Such values are more a matter of course for later generations. The new generations are, therefore, more interested in "post-materialistic" values and life qualities like personal development, co-determination and environmental issues, according to postmaterialist theory (Inglehart 1977). Inglehart predicted that generation replacement would create a clear trend from materialistic to postmaterialistic value systems. This process, which was to take place gradually and almost noticed, was called the silent revolution.

Longitudinal studies have confirmed a trend towards postmaterialism in 18 of 20 societies on five continents for which we have comparable data from 1981 and 1990-91 (Becker 1995). The European/World Values Surveys covering 70% of the world's population indicate that this value shift have occurred in societies that has experienced sufficient economic growth in recent decades so that the pre-adult experiences of younger generations were more secure than those of the older ones. A study of work values indicates at the same time that evaluations of North Americans and Europeans became more similar during the 1980'ies (Zanders and Harding 1995). Convergence is also the overall pattern of value change in a comparison of Canadian and US-values, but in many domains Canadian values appear to "lead" the

American ones (Nevitte and Inglehart 1995). The value systems at the individual level have, however, became more pluralistic or fragmented and less similar according to a study of four Europe and North American regions (Halman and Pettersson 1995).

Post-materialistic values has so far not become the dominant ones and the interest in material belongings, conspicuous consumption and economic development has grown in countries like Norway, especially among the young (Hellevik 1996). High material living standard does, therefore, not necessarily reduce the interest for more material belongings. It is still important among "materialistic" oriented inhabitants to get more, or the right brands, as they do not "have enough" (Hellevik 1996). This trend is probably not only a phenomenon in northern parts of Europe, but helps explain why "shopping tourism" is the top activity among domestic travellers in the United States (NTS 1997) and strongly growing also in Asia.

6.6 Implications

Democratisation of free time, polarisation of consumption patterns and post-materialism as a cultural wave are the three mega-trends discussed in this chapter. They have implications both for public policy and for planning and investments in the private sector. Consumer behaviour depends, however, also on other types of mega-trends. Women's struggle world-wide for equality is another important democratisation processes taking place that have effects both on leisure and business travelling. The polarisation of the population in physical active and passive groups is a mega-trend, too, having effects as growing overweight problems and increased passive recreational use of nature. The percent of adults who are obese increased for example in the United States from 24% in the 1960s to 35% in 1994 (Dortch 1997). Physical fitness is declining in Europe too. That explains partly why the trend among tourists in the European Alps is that everybody wants to experience nature - but not on foot.

Our understanding of the dynamic processes shaping demand is, alas, limited. But we do know that mega-trends will interact also with other short-term processes shaping travel demand. Unexpected events, such as the economic crisis in Asia or the war in Yugoslavia, in combination with major changes in international policies such as the introduction of the new European money system or world trade agreements, make tourism and recreation trends less predictable. Decision-makers should, therefore, plan for a more dynamic world and more uncertainty. It is increasingly important to be flexible and invest accordingly. To keep options open may be one of the most important strategies for long-term survival for tourist investments or policies.

If the trend towards more international competition continues, and the effect is higher economic growth globally and regionally (as predicted by market theory), then travel demand will increase. In that case, it is probably that travel demand among the affluent parts of society will grow most strongly. Higher incomes, but not much more free time, may change demand towards products costing more per time-unit as

short and expensive breaks, or towards other forms of "luxury" or high quality experiences. Substantial higher income among the affluent may explain why a strong demand on several continents for very expensive leisure capital as de lux yacht or second homes located at high quality destinations or resorts.

A development towards higher incomes more in general, but not more free time or even less, would change the way holidays are taken (Clark 1999). Holidays would tend to be shorter, more frequent and more intense forms of recreation. To stay back at home will then be an increasingly important alternative for the consumers, especially if consumers continue to buy more and more leisure equipment for home based recreation.

Destinations that want to compete on the market for the more frequent, shorter and intense holidays will most probably need to supply more diversity and higher quality than earlier. One reason is that improved home based recreation possibilities will be a cheap alternative, making the consumers more price sensitive towards tourism supply close to home. One important implication is that it will be a growing demand for quality at a lower price.

If globalisation is a brake not only against more leisure time, but also against higher incomes for large population groups, that mega-trend will contribute to increased demand for quality at a lower price. No surprise then that the European and North American markets show a growing interest for organised journeys (according to Freitag 1999). As organised holidays and short breaks are ways for producers to standardise and deliver quality and lower price to a higher volume of consumers.

Roof effects will, however, restrict growth potentials in the total volume of holiday travelling, especially in North and Central Europe where the volume of leisure most probably will stabilise during the coming years. But the introduction of a minimum four weeks holiday with pay in all of the European Community from January 1999 will increase travel demand especially in the southern parts of Europe in the years to come. It is, however, necessary with strong and stable economic growth during a long period, perhaps 30-40 years, before the inhabitants in East Europe in general reach the same level of holiday demand as in the West today.

The European and Japanese experience indicate that higher incomes will especially increase the volume of trips abroad and to long-haul destinations. When incomes reach the same high level as rich countries as Norway and Switzerland, then the demand for some of the traditional domestic holidays may decline. Substitution effects can reduce demand on regional level also in large countries, if domestic supply is of a common or "inferior" type. The flexibility of the cruise industry in delivering new experiences to the consumers, combined with a predictable travel quality, make cruise products an increasingly attractive and affordable "luxury".

The strong growth of travelling abroad creates problems for the consumers who often discover that what they have paid for before departure is different from what they get from foreign producers on the destination. This problem became a major political

issue in Germany where more than 2/3 of the holidaymakers travels abroad. The large number of complains from German tourists that visited other countries, made it necessary to improve consumer protection. Germany introduced several years ago a law giving domestic sales or travel agents full responsibility for the delivery off what the consumers have paid for in advance. The European Community has now introduced the same system.

If an European consumer do not get all the holiday qualities they have paid for in advance, either at home or in a foreign country, then the tourists have a legal right according to the EU-system to an economic compensation from the sales agent, not the producer who fails. The legal rights include also compensation for "reduced holiday pleasures" during a visit to a destination. If for example a tourist brochure give wrong information about an attraction, such as a major ski lift or museum that happens to be closed during the tourists stay, then that give a legal right to compensation. Precise information and delivery are, therefore, needed according to the European consumer protection system. If not, then the European sales agents will charge the producers afterwards, also on other continents, or decide to never use the producer or destination again. It is one of the many examples of recent developments that show that tourism and recreation are influenced by mega-trends on different continents. Democratisation, polarisation and changes in value systems are among them.

References:

Aderhold, P. 1996. Urlaubreisen 1970-1994. Ausgewälte Zeitreihen. Die reiseanalyse. Forschungsgemeinschaft Urlaub und Reisen e.V. (F.U.R.). Hamburg.

Becker, H.A. 1995. Generations and Value Change. In de Moor, R. (ed): 1995. Values in Western Societies. Tilburg University Press. Le Tilburg.

Cairncross, A. 1969. Economic forecasting. Economic Journal vol. 79, pp. 797-812.

Clark, C. 1999. Changes in Leisure Time: The Impact on Tourism. World Tourism Organisation. Madrid.

Crouch, G., I. 1994. The Study of International Tourism Demand. A Review of Findings. Journal of Travel Research. Vol. 33. No. 1. pp. 12-23.

Crouch, G., I. 1995. A Meta-Analysis of Tourism Demand. Annals of Tourism Research. Vol. 22. No. 1. pp. 103-118.

Crouch, G.I and Shaw, R.N. 1994. International Tourism Demand. A Meta-Analytical Integration of Research Findings. In Johnson, P. And Thomas, B. (eds) Chiose and Demand in Tourism. Mansell Publishing Limited. London.

Dortch, S. 1997. American Weights In. American Demographics. June 1997.
Edwards, A. 1985. International Tourism Forecasts to 1995. Special report No. 188. The Economist Intelligence Unit. London.

Edwards, A. 1992. International Tourism Forecasts to 2005. Special report No. 2454. The Economist Intelligence Unit. London.

Enzensberger, H.,M. 1996. Reminiszenzen an den Überfluss. Der alte und der neue Luxury. Der Spiegel. Nr. 51 (16.12.96) pp. 108-118.

Freitag, R. 1999. Leisure Time. WTO News/feb-Mars. 1999. http://www.world-tourism.org/newslett/febmar99/leisure.htm

Grümer, K-W. 1993. Gesellschaftliche Rahmenbedingungen für Mobilität/Tourismus/Reisen. In Hahn, H. and Kagelmann, H.J (eds) 1993. Tourismuspsychologie und Tourismussoziologie. Ein Handbuch zur Tourismuswissenschaft. Quintessenz Verlag. Hamburg.

Halman, L. and Pettersson, T. 1995. Individualization and Value Fragmentation. In de Moor, R. (ed): 1995. Values in Western Societies. Tilburg University Press. Le Tilburg.

Hellevik, O. 1996. Nordmenn og det gode liv. Norsk Monitor 1985-1995. Universitetsforlaget. Oslo.

Inglehart, R. 1977. The silent revolution. Princeton University Press, Princeton.

Inglehart, R. 1990 Culture shift in advanced industrial society. Princeton University Press. Princeton.

Kacapyr,E. 1996. Are You Middle Class? American Demographics. October 1996.

Kaspar, C. (ed) 1995. Jahrbuch der Schweitzerischen Tourismuswirtschaft 1994/95. Institut für Tourismus und Verkehrswirtschaft and der Hochschule St.Gallen. St.Gallen.

Kuentzel, W., F., Robertson, R., A. og Ramaswamy, V., M. 1996. A Time-series Comparison of Vermont and New Hampshire Travel Trends. In Thompson, J.L., Lime,

D., Gartner, B. and Sames, W.M. (eds) 1996. Proceedings of the Fourth International Outdoor Recreation & Tourism Trends Symposium. May 14-15, 1995. University of Minnesota. St. Paul.

Landsorganisasjonen 1998. Arbeidstid i et nytt årtusen. LO. Oslo (In Norwegian).
Minogue, K. 1985. Democracy. In Kuper, A. and Kuper, J. 1985. The Social Science Encyclopedia. Routledge & Kegan Paul. London

Monteiro, S. og Rowenczyk, C. 1992. Les Vacances des Francais. Tendances Conques et resultats. Institut National de la Statistique et des étydes Economiques (INSEE). Paris.

Nahrstedt, W. 1993. Leisure Policy in Germany. In Bramham, P., Henry, I., Mommaas, H. and von der Poel, H. (eds). 1993. Leisure Policies in Europe. CAB International. Wallingford

Nevitte, N. And Inglehart, R. 1995. North American Value Change and Integration. Lessons from Western Europe? In de Moor, R. (ed): 1995. Values in Western Societies. Tilburg University Press. Le Tilburg.

Nilsson, O., S. and Solgaard, H., S. 1995. The changing consumer in Denmark. International Journal of Research in Marketing. Vol. 12 (1995). pp. 405-416.
NTS 1995 and 1997. Full year results of national travel survey (NTS). Marked report from US. Travel Data Center and the Travel Industry Association of America. Washington DC. See also Statistical Abstract of the Unites States 1998 (under Parks, Recreation and Travel).

Nyberg, K. 1995. Changes in Tourism Demand – The Swedish Case. The Tourist Review nr. 1/95, pp. 53-57.

OECD 1998. Maintaining Prosperity in an Aging Societry. Paris

Opaschowski, H. W. 1996. Tourismus. Systematische Einführung - Analysen und Prognosen. Leske+Budrich. Opladen.

Prentice, R. 1993. Tourism and heritage attractions. Routledge. London.

Sahlberg, B. 1996. The structure and dynamics of tourism - The Swedish Case. Paper presented at the 31th Tourist Research Centre. Bergen, 16-19 May.

Schmidhauser. H. 1992. The Distinction between Short and Long Holidays. Revue de Tourisme. AIEST. No. 2. 1992. pp. 10-13.

Schmidhauser. H. 1995. Die Reiseziele der Schweizer 1980-1992 nach Altersklassen. Trend zur Globalisierung - Aufholen der Ältern - Abkehr der Jugendlichen von Europa. In Kaspar, C. 1995. Jahrbuch der Schweizerischen Tourismuswirtschaft 1994/95. St.Gallen.

Smeral, E. 1994. Tourismus 2005. Entwicklungsaspekte und Szenarien für die Tourismus- und Freizeitwirtschaft. Wirtschaftsverlag, Ueberreuter.

Teigland, J. 1990. The Norwegian holidays in the 1970- and 1980'ies. Norwegian Institute for Nature Research. Oppdragsmelding 30. Lillehammer (In Norwegian)

Zanders, H. and Harding, S. 1995. Changing Work Values in Europe and North America. Continents and Occupations Compared. In de Moor, R. (ed): 1995. Values in Western Societies. Tilburg University Press. Le Tilburg.

7 Conclusion. Relevance and reliability of IA-predictions - so what?

7.1 Introduction

The purpose theory for most dissertations claims that the main objective is to develop new and original knowledge. Kuhn (1970) argues that new knowledge is of two types. One type is major new ideas that change in a fundamental way how scientists in a field think and work. This is “scientific revolutions” which contributes to situations where the active scientists agree on a new approach or paradigm. The other type is “normal science” that tests the implications and limits of the existing paradigm. Lakatos (1978) argued that a paradigm functions in a programmatic way, as a research program, or framework theory, that draws our attention to important features in the observable world. While other theories are more concerned with the details of how the programme or framework theory itself works.

This dissertation is an example of “normal science”, that aim at improving our insight in one element of impact assessments, why IA-predictions fail and what can be done to reduce such problems. Becker (1995) defines impact assessment as "the process of identifying the future consequences of a current or proposed action in general". The purpose is to identify future consequences of a planned development so early that it should be possible to assess and control significant consequences by modifying a project or program at the design phase. In other words, the objective is to improve decision-making and to ensure that development actions under consideration are environmentally and socially sound and sustainable. Therefore, IA is concerned with "**identifying, predicting and evaluating the foreseeable impacts**, both beneficial and adverse, of public and private (development) activities, alternatives and mitigating measures, and aims to eliminate or minimise negative impacts and optimise positive impacts” (Roe et al. 1995). The emphasis is on early prevention of damage, rather than its subsequent cure (Dipper et al. 1998). But early prevention requires early predictions and assessments, too.

The dissertation is normal science that builds on existing impact assessment theory and concepts reviewed in the introductory chapters. It focuses mainly on one important, but more “technical element” of IA as a policy instrument, the quality of IA-predictions. This chapter summarises the main objectives and findings. Here, focus is on what has been learned and how the new knowledge can be used in the future to make impact assessments, and IA-predictions especially, more relevant and reliable for democratic decision processes.

7.2 The objectives and research strategy, a reminder

The broad objective of this dissertation is to contribute to improvements in IA-systems as a policy instrument and to more systematic learning of the real effects of major development actions. The starting-point was problems, created by prediction

failures in individual impact assessment, and a need to find solutions to such problems. Recent reviews confirm both that:

- impact assessment systems are not as efficient instruments for preventing adverse impacts as intended (Armour 1991, Sadler 1996 and Tengström 1999), and
- a lack of quality in many individual assessments is one of the main problems internationally (Lee and Brown 1992, Lee and Dancey 1993, Sadler and Verheem 1996).

According to these reviews, it is not unusual to discover after a development action that very significant and adverse effects are not identified and predicted by the experts who were hired to help during the planning and decision stage. But even if the right effects were identified, predictions and the real effects observed afterwards are often severely divergent in time and space. Then, a prediction failure can be defined as a situation where the real effects are substantially different from what was expected ex ante, either implicit or explicit by predictions of IA-experts, the decision-makers and proponents/opponents. (The fact that predictions may be "correct or fail, but for wrong reasons", will be discussed later on).

The prediction problems are in one way strange, as a basic idea in IA-systems is to use the best available knowledge in the form of applied science to predict and evaluate potential effects of a planned action. The extent of the problem is also a surprise, as relevant and reliable predictions are a prerequisite for sound judgements by participants in decision processes. But few nations seem to care. At least in the way that they use systematic measures to raise the quality of impact assessments and, thereby, contribute to improved designs and decisions in the future (Wood 1995, Sadler 1996).

This problem has recently got more attention among some national authorities that have asked for improvements in formal IA-procedures and guidelines. I have earlier referred to critics both from the Auditor General and the Norwegian Parliament ((Innst.S. nr. 130 (1997-98), Riksrevisjonen 1997-98). But formal measures are no guarantee of high quality substance. It is, therefore, necessary to improve the knowledge base and methods for identifying and predicting significant impacts in direct or indirect ways. It is in other words a need for improving the more "technical elements" of IA, in addition to better IA-systems, procedures and guidelines.

The need for improved "techniques" includes:

- more focused use of scientific insight and methods,
- more precise analytical concepts, and
- more reliable empirical evidence of the real effects that different types of development actions have.

In addition, it is important to develop practical examples of how more relevant and reliable impact assessments can be carried out in different sectors. This author agrees

in other words with those who claim that true expertise has to be based both on analytical-rationality and experience from practical trials (Flyvbjerg 1999).

Therefore, the main objectives of this dissertation were to contribute to higher quality of impact assessments by;

- increasing our understanding of why predictions of effects may fail in general (and in tourism and recreation assessments in special) by improving concepts and collecting evidence from practical "experiments", and
- clarify how such insights can be used to improve relevance and reliability of IA-systems and individual predictions.

Here, the research base is a state of the art study of the existing knowledge, as documented in the international IA-literature and in other closely connected scientific fields. This review was a first step towards establishing a conceptual framework, which could be useful not only for analysing ex post why IA-predictions have failed, but also for proactive attempts to prevent prediction failures in the future. The conceptual framework is tested in two case studies, which cover very different types of projects. Both case studies are restricted to effects in time and space on a specific sector, the tourism and recreation interests. This is a large and growing sector world-wide. Therefore, UN's Commission on Sustainable Development has recently (April 1999) emphasised a strong need for IA-improvements in this field, and for practical examples of relevant and reliable assessments (http: //www.un.org/esa/sustdev/tourism/tour2.ht).

The empirical evidence compare changes that take place in time and space in several cases. This multiple case study design is used to increase our insight by looking for potential weaknesses in alternative effect-theories and the conceptual framework in “prediction-failure theory”. It is a design that gives knowledge more in depth than generality. But by using each case study as a critical test or experiment of common, but divergent theories, the results should have external validity, too. One way to test the external validity of concepts and findings would be to do more case studies, and especially case studies that would cover other types of projects or other substantive fields. This type of test of the external validity and the possibility to transfer findings to other projects and subjects is not done as part of this dissertation. But Wood (1999) has very recently published a study of failures of IA-predictions of environmental effects on noise, air quality and visual qualities from three other types of projects. He found similar causes of failures as in this dissertation (that study and the conclusions will be referred more in detail later on).

This dissertation focuses not on the quality of IA-predictions in environmental or nature science, but in social science. It uses case studies from the dynamic sector of tourism and recreation to look for evidence and insight in the prediction capability of common effect theories, which participants in democratic decision processes often base their thinking and actions on in this sector. Each case study focused on different types of projects, but a common mark is that these development actions had created a strong public debate. The controversies should contribute to more explicit and

alternative effect theories, hypothesis and predictions, which should be more favourable situations for testing why predictions were wrong. The effect theories and predictions that decision-makers based their effect-judgements on could be of a somewhat higher quality, too, as the controversies probably have made the decision-makers more aware of the possibilities for prediction errors. If effect predictions are wrong even in such controversial experiments, the project theory should be wrong. Or it could be easier to identify other causes of prediction failures.

By choosing this type of research design, the findings from critical experiments most probably will have more general validity than a few case studies in it self would indicate. Table 7.1 reminds readers of the main objectives and thesis.

Table 7.1 The main/partial objectives and thesis.

The main objective is to contribute to higher relevance and reliability of impact assessments in the future by increasing the insight in; - Why IA-predictions of effects fail in general, and in the tourism and recreation sector especially, - How relevance and reliability of IA-systems and individual predictions can be Improved	
Partial objectives	**Thesis (superior, subordinate and co-ordinate)**
Develop a conceptual framework for analysing why IA-predictions fail and identify the most important causes for errors	Failures in IA-predictions are effects of a limited number of causes that may interact, but poor quality of the prevailing "project theory" are among the main causes (superior).
Increase the insight as to why IA-predictions fail by two formative evaluations of effects in time and space, limited to tests of relationships in basic types of structural models for effects on the tourism and recreation sector.	Effects from basic types of projects have clear structure in time and space. In other words, the effects will vary substantially in space and time, but not because of natural short-term variations (subordinate).
Clarify how the reliability and relevance of IA-predictions can be improved by using the research finding of this dissertation	**- Relevance** will increase substantially if IA test the alternative theories that participants in democratic decision processes base their thinking and actions on, in addition to scientific effect theories (superior). **- Reliability and relevance** of IA-predictions will improve if effect theories and other causes for errors are evaluated by systematic ex-post studies (co-ordinate).

7.3 The main objective; higher relevance and reliability of IA

The broad objective is to contribute to higher relevance and reliability of impact assessments in the future. This contribution is based on two important assumptions about the relevance of IA-systems and IA-concepts, and the recognition that IA in some situations have limited or conditional relevance for decision-making and learning processes.

A basic assumption in this dissertation is that improved understanding of why predictions fail is a key - but not the only one - to improved quality of individual impact assessments in the future, and to increased certainty and usefulness of IA-systems in general. The assumption is NOT that judgements of future effects need to be accurate, since imprecise predictions may be useful, too. Then, the definition of accuracy is that ex ante IA-predictions include no over- and under predictions of the real significant effects observed ex post.

What is important is the ability of IA to predict correctly the direction of changes that are caused by a development action, and whether the effects will move into a range which holds serious implications. IA-predictions have serious implications if they predict that:

- the desired effects of an action (the aim or purpose effects) will be significantly lower than expected, or
- the negative side effects will be significantly larger compared with the proponent's project theory.

The seriousness increases if IA's predict both the purpose-effects and side effects to be significantly more negative than expected ex ante by the proponent and decision-makers.

In case IA-predictions are negative in one way or another, even imprecise predictions can lead to appropriate mitigation and management actions, and after all, that is the ultimate aim of impact assessment (Dipper et al.1998). But if predictions are not formulated as precise (quantitative) and falsifiable null-hypotheses, they will not be testable by ex-post studies. Therefore, the scientific value of imprecise and vague (qualitative) statements of future effects is relatively low. As documented earlier, it is an unfortunate fact reported widely in the impact assessment literature that impact predictions are frequently tentative and to uncertain to test in rigorous ex post studies or post-auditions.

7.3.1 The relevance ex post for learning processes

The ultimate test of an ex ante project theory and the quality of predictions, both from experts or judgements of decision-makers, is to see what happens when a project is implemented and during the short- and long-term periods afterwards. Only

development actions that are carried out in practice, as parts of a “trial and error”-strategy, is a strong way of testing if a project theory is wrong or have significant weak points. If the real effects are as the project theory of the decision-makers (or opponents of an action) predicted either explicit or implicit, that project theory is strengthened and tempered in Popper’s sense (Miller 1985). If important effects are not as predicted by a theory, that theory does not correspond with practical evidence and may be of less relevance, both as a base for predictions and for decisions.

However, ex ante theories and IA-prediction may conform with the ex post realities, and be judged as correct or accurate according to the observed change that have emerged, but for wrong reasons. Predictions that according to all criterion have high quality ex ante may prove to be wrong, too, because of confounding processes. Such external process or events may influence the effects from a project in such ways that the end results are far different from what they would have been under normal circumstances.

Normally it will be reasonably to expect that low quality of effect theories, and/or low quality of baseline data about the existing situation of development action, or biased experts, will give low conformity between IA-predictions and the ex-post reality. The fact that IA-predictions based on wrong information or poor insight miss the target, should be no surprise. Such situations ex post may be termed "a miss, for right reasons".

It is reasonably to expect, too, that high quality theory combined with good quality of baseline data and non-biased IA-performers will create ex post situations where the ex post realities will be according to the ex ante predictions. Then, the IA-predictions afterwards were a "hit, for right reasons".

But every situation after a development action is implemented is not necessarily like these two types of cases. Two other situations may emerge ex post. If the quality of the effect theory is low and/or baseline data wrong, that should normally make the predictions wrong. But external processes may still influence the changes that emerge after a project in such directions that it is no or only small divergence between predictions and the realities ex post. It such cases, the IA-predictions are a "hit, but for wrong reasons". Then, we assume that the decision-makers or proponents have not change the design of the project during the implementation process to adjust the effects in the "right direction" (which the Norwegian Parliament in reality did by increasing the economical impulse from the 1994 Olympics fivefold). In other words, predictions may "hit the bull's eye" because the bull has moved in the right direction. (Predictions may be wrong, too, because projects are unstable objects).

If the quality of effect theories are high and good base line data is combined with honest IA-experts and an administration with no bias), unexpected external process may change the emerging effects substantially, too. Such processes can change the ex post developments in ways that create substantial divergence between ex ante predictions and the ex post realities. In that case, IA-predictions may prove wrong,

but for wrong reasons. This situation many be termed a "no-hit, but for wrong reasons". Table 7.2 summarises these four types of ex post situations.

Table 7.2. Four types of relationship between the quality of ex ante IA-predictions and the degree of conformity between predictions and the realities observed after a development action.

The quality of IA-predictions (judged by effect theory, baseline data and/or the degree of bias)	The degree of conformity between ex post reality and ex ante IA-predictions	
	Low (reality not as predicted)	High (reality as predicted)
Low quality (poor theory, or wrong base line, bias)	A miss, for right reasons	A hit, for wrong reasons
High quality (correct theory and base line, unbiased	A miss, for wrong (unpredictable) reason	A hit, for right reasons

My experiences from IA-processes indicate that decision-makers after a development action is implemented are not interested in the quality of IA-predictions as long as the changes that emerge afterwards are as expected or have substantial similarity. If the results, at least at the end, are as expected and desired (or not feared), who cares if the IA-predictions really was wrong, but became a "hit, for wrong reasons"? In other words, poor IA-predictions have after the implementation of a project no or low relevance for the decision-makers and the involved interest groups, as long as the changes are within acceptable levels from the desired or not close to the negative side effects that were feared.

For example, why should the proponents or local communities in the cases studies included in this dissertation be concerned about low quality of ex ante-predictions in the tourism and recreation sector, as long as the economical impulse from the projects became many times higher than planned for originally. It is neither a large reason for complaint if other unexpected processes, as strongly growing oil incomes, a new airport or increased leisure time among Germans and Norwegians, reduce the divergence between ex ante predictions and the ex post reality within acceptable levels. One exception is the unfortunate private interests that lost money on failing investments that was based on wrong predictions. Another exception is the national authorities that would have liked to use the money for other purposes[11].

[11] The Norwegian Minister of Finance complained afterwards that the costs of the 1994 Olympics became fare too high, and that the money should have been used for a purpose with more substantial and lasting advantages.

Therefore, IA-predictions that create a "hit, for wrong reasons" situation may afterwards be mainly of scientific interest, since the observed change is not or only partly an effect of those development actions that were originally planned and assessed/predicted by an IA. The important relevance for future IA's and for science of such situations is linked to the fact that information about the observed change are not transferable to other similar projects without proper insight in why it was a "hit, but for wrong reasons". The external validity of information is low, if users have no proper insight in the causes of change and the partial effects of the project of interests (the primary project).

However, decision-makers and the involved stakeholders may be strongly concerned if IA-predictions afterwards prove to be a miss and significantly wrong, especially if that fact costs (themselves) substantially more (new) money or a "miss" reduces other types of values substantially. Then, the original IA-predictions are relevant not only for science, but became of interest in addition for new decision processes that may take place after the implementation of the original primary project. In such ex post situations, the relevance of IA-predictions for decision-makers and involved interests seems often to be related to a desire to know whom to blame, as part of the political "responsibility game"[12].

If IA-predictions are wrong, the scientifically interest is most often tied to situations where the effect theory seems to be "wrong", since understanding why the effects became not as predicted or unexpected could improve both our understanding and the possibility to make better predictions in the future. It seems rare that scientists care if poor quality IA-predictions miss the target, as that may be the expected outcome. In any case, IA-predictions that fail without having a substantial and sever implication for strong interests, most often release no feed-back to those who were responsible for making the IA-prediction failures.

With the exception that IA-predictions are right, and for the right reasons, it is strange according to my judgement, that society finds it of so little relevance to learn from the many major experiments that development actions are. At least the scientific society should, since development actions act as experiments that can be used to test theories. Especially would that be the case if such studies were organised in a proper way as instruments in learning processes. But most often the purpose of IA-systems is, at least so far, not to be learning instruments. Today IA is a policy instrument used to deliver relevant and reliable information to the interests that participate in democratic decision processes. The relevance before a decision, not afterwards, is a key issue.

[12] The Norwegian Prime Minister responsible for the 1994-Olympic's budget even complained that it was difficult to deny the old King Olav's strong interest for hosting the Olympics. He said so after the King had passed away, which is perhaps an example of "how to blame the dead" (giving in addition an interesting insight to the Norwegian political decision system).

7.3.2 Relevance ex ante for decisions

An important assumption in IA-theory in general is that proponents and decision-makers are rational and compare the potential effects of a development action proposal with the main alternatives. The specific action that the proponents propose and decision-makers choose, should normally be “the best” alternative for attaining a specific purpose and better than the “no-action-alternative”. But rationality is a concept that is used in many ways, since it in later years has changed from a more “narrow economical” content to include several components of cognitive, social or psychological nature (Becker 1996) and ecological relationships (Lafferty 1998). Still, rational behaviour is often assumed to be forward-looking and based on “maximising” choices.

Max Weber makes a distinction between purpose and value rationality of actions, in addition to traditional and affective rationality (Weber 1999). In purpose rational actions the actors have definite aims and explore and apply the means which are best adapted to achieve the aims. Value rational actions do not take into consideration their short or long-term effects, since their aim is to realise an intrinsic or normative value of ethical, esthetical, religious or other kind.

IA-systems assume that development actions are purpose rational. But my practical experiences from 20 years of both ex ante and ex post impact assessments indicate that projects and policies may have varying degree of value rationality, too, especially if they have a kind of symbolic or ideological value[13]. Some projects may be so valuable in itself for proponents and decision-makers that the intrinsic values and "value rationality" become high and the purpose rationality surprisingly low. At least some proponents seem to believe (nearly religiously) in the intrinsic values of "their" project, at the same time as opponents have strong opposite convictions. In such controversial decision processes the relevance of IA-predictions is not only a question of applied science and cognitive quality, but depends on social-psychological factors, too.

---

[13] It may be to stretch Weber's value rational concept to far, but the public debate about the Winter Olympics in 1994 gave several indication of "the intrinsic values" of such projects and the, perhaps, less importance of short or long-term effects afterwards. For example, The Director of Norway's National Bank claimed that the 1994 Olympic Games should be viewed as a huge party for the world and a celebration every nation should afford at least once a century. In such cases, "the purpose rationality" of such "parties" is less linked to future effects, but to the present and intrinsic values. In that case, the assessments of future effects become less interesting and relevant, as the pleasures of the enjoyment today (the party) are the relevant effects, not effects after the party, which IA-predictions normally focus on.

Ex-post, it will be relatively easy to see the degree of purpose rationality since the difference between the original purposes of a project and the real effects give clear evidence. If, for example, the real effects observed after a development action is very negative compared with what was expected, the purpose rationality has been low. But the purpose rationality of projects may be low even before a decision, if the value rationality is high or even dominant from the idea of a project emerges in the public domain.

In controversial decision processes, experts that make IA-predictions will nearly always arrive at conclusions that one or more interest groups find negative and against their interests, both in ex ante and ex post impact assessments. Thus, in this type of "post-normal science", it is naive to believe that a scientist's or expert's advice can be objective in the meaning of "value free" or "impartial". Therefore, when predictions in impact statements are judged, it can be more important to look for other criteria for objectivity or non-bias. Schrader-Frechette (1990) emphasises in general that a theory can be more objective if it gives a base for more precise and reliable predictions or more power to explanations.

If this criterion for objectivity is applied on IA, the main problem is to know in advance which predictions will be closest to the reality afterwards. When different experts give divergent predictions and involve themselves in a controversy, decision-makers get confidence problems[14].

Decision-makers may solve controversy by trusting experts that earlier have made relevant and reliable predictions (at least compared with others). Then, "experienced based accuracy" will be the criterion for the ability of scientists and experts to be objective in the future, too (but that may not necessarily be an accurate prediction of whom to trust). When IA-predictions are divergent and it is a controversial decision, relevance of IA-predictions easily became a political issue.

If proponents and decision-makers have a strong "belief" in high positive effects and the purpose rationality of a project, IA-experts may predict and warn decision-makers in vain, for example, about significant adverse effects in the future. Their advice and predictions may be regarded as having low relevance.

Proponents and decision-makers may interpret IA-predictions that are contrary to and falsify the purpose-theory of a project as a special case or an anomaly. In that case, the predictions are irrelevant according to their project-theory. Opponents may draw that conclusion, also, if IA-predictions diverge with the their project theory. But the different actors in a decision process can introduce an alternative interpretation, too, if an impact assessment give a negative conclusion that threaten to falsify the project theory they builds their thinking and actions on. For example, it is not unusual that decision-makers or proponents/opponents claim that experts are biased if the experts make unexpected predictions contrary to the actor's own project theory. In that case, those IA-predictions will be "defined" as having no relevance for the decision (since

[14] It is few studies of IA-controversies and expert biases. However, a test of several attempts in USA to predict the effects of the large "spotted owl" protection plan on the local and regional communities showed that much of the divergence and controversy came because of methodological differences in impact assessments. One reason why predictions were different was conceptual, since the studies focused on different influence zones and covered different time periods. Other methodological causes for divergent predictions were the use of different baselines and different assumptions on interest rates (Sample and Le Master 1992).

the expert is biased or even looked at as an "enemy" of a project or an opponent's viewpoints).

Therefore, the relevance of IA-predictions depends not only on the quality of the scientific theory, which the predictions build on, but on the theories that the proponents, opponents and decision-makers build their thinking and actions on. The social, psychological, political and historical context may influence what are judged as relevant predictions and information, also. In some situations, therefore, IA will be of limited interest for decision-makers that look for efficient policy instruments, as discussed more in detail in chapter 2.5

This dissertation focuses on situation where IA-systems and concepts are relevant, but find that applications are not without problems. A major one is to identify and predict the significant effects and do so without failing. Such problems may be reduced if we have a more proper understanding of why IA-predictions fail.

7.4 Partial objective one; why IA-predictions fail?

The first partial objective of this dissertation was to develop a conceptual framework, which can be used to identify and analyse the reasons for IA-predictions failure. The main thesis was that:

Failures in IA-predictions are effects of a limited number of general causes that may interact. Poor understanding of the relationships between a development action as a dose and the response from ecological and social systems, in the form of low quality of the project theory are among the main causes.

The literature review in chapter 2 found five major causes for failures in IA-predictions that reduced their relevance and reliability. These causes are:

- **low quality of the project theory** in the form of low understanding of the significant linkages between the primary project (the dose/impulse) and the effects.
- **unstable dose/impulse** in the form of a change in the project design during planning or implementation, but after predictions were made.
- **non-normal baseline** and/or post-project situation.
- low insight in the potentials for **interaction and cumulative effects** with secondary projects and external processes, and the degree of open/closed system that a primary project relates to.
- **bias** among experts that produce IA-predictions or reports on post-project impacts, and/or in the IA-information distributed to decision-makers from the administration, which implement the IA-process.

The empirical case studies were used to test the relevance of these typology and conceptual framework. This test makes it clear that all five of these types of causes did contribute in one way or another to failures in IA-judgements of future effects.

Then, the prediction failure was that the real effects on tourism and recreation were substantially different from what was expected ex ante. But the research design itself did, as mentioned earlier in the discussion of the methodology (chapter 3), prevent the possibility of finding that the IA-procedure itself could cause biased information to the decision-makers. Because the development actions chosen as case studies were implemented before Norway had a formal IA-system.

The strategically chosen case studies show that even under very favourable conditions, major hypothesis in the project theory of proponents and decision-makers were not confirmed. The negative effects on traditional user interests became larger than expected, and the favourable effects on latent demand lower after the hydropower developments in Aurlandsdalen, in spite of claims by the developers that this development action would be very environmental friendly. The large positive effects on tourism that were predicted from proponents of the Winter Games became not a reality either, in spite of very favourable conditions according to all criterions. One exception was much stronger growth of tourism than expected in the alpine satellites.

Some predictions in the 1994 Winter Olympic case where extremely wrong, when comparing for example the expected pre-event growth of 15% per year in tourism on regional level with the 0 growth reality (or even a decline in some areas). Or the fact that the guest nights relating to conferences in the Olympic region did not increase 100% as predicted, but one percent during the period that the prediction covered (1988 to 1995). The strong and lasting effects on tourism on national level were not identifiable either, since the partial effects of the 1994 Olympic Games where probably close to zero when the controlling for the effects of other factors. The ex post evaluations show that all predictions of tourist-effects made by or on behalf of the proponents of that project were over-optimistic. Even the summative change was around 50% off the target for the Olympic core. At the same time, the substantial effects on tourism in the alpine satellites were not identified or under-estimated, at least explicit, in IA-reports.

The predictions of effects from the hydropower developments failed, too. The most important one is probably that the expected no significant change in long-hiking activity after the nature was changed, was different from the 50-65% drop in use during the first ten years. In this case, the proponents were under-estimating the degree of negative side effects, since they became larger than expected. The proponents were too optimistic, also, about positive effects in the form of released latent demand.

Therefore, the divergence between predictions and the ex post change were substantial when comparing predictions, which were made either implicit or explicit of IA-experts or the decision-makers and proponents, with the observed change after the projects were implemented. The divergence between effect-theories, the predictions and the reality is so substantial that even the summative change can not be explained as a coincidence. Both case studies confirm in that way that one of the

main causes for prediction failures was poorly developed theory for the effects on tourism and recreation from major types of projects.

These theories identified the direction of change correctly for some of the important effects, but was based on low insight in the degree of change in time and space and the forces that formed developments. The fact that both case studies in these ways were critical test of common theories about cause-effect relationships most probably imply that the identification of why the predictions failed have more general validity than a couple of case studies normally have.

However, another important reason for prediction failures was a lack ex ante of insight and ability to predict interaction and cumulative processes. Both ex post evaluations identified major cumulative effects from the primary project and different secondary project. In addition, the primary and secondary projects interacted with a variety of external and dynamic processes. In the hydropower case, the primary project was the start of a chain of decisions and projects, which created a strong dynamic infrastructure development including some of the largest road tunnel developments in the world. It was this combination of different planned and unplanned changes over time and on different levels of the national and international community, which were important causes for prediction errors and prediction failures.

The importance of interactions and cumulative processes were substantial in both case studies, which covered development actions both of different types (hydropower development and mega-events) and during different time-periods (1965-1990 and 1985-1998). This indicates that interactions and cumulative effects can be a key element, which has to be included in IA-predictions of effects in open systems, as tourism and recreation. It is interesting, too, that in spite of different types of projects and time periods, the same types of factors caused the main misjudgements of future effects and failures in IA-prediction.

Therefore, it is reasonable to conclude that in open systems like tourism and recreation, one important measure for improving prediction quality will be to increase our understanding of the dynamics in development processes. The dynamic processes include both interactions inside the relevant systems and changes in the external relationships that planned and unplanned processes create. But the dynamics are linked to chains of development projects, also, which are not easy to identify in advance.

It is interesting, too, that both case studies show short and long-term changes in tourism and recreation to be linked to mega-trends in the society. Trends that are influenced by major changes in the way political and economical systems are organised, and to democratisation processes and cultural change (which is discussed in chapter 6). This indicates that some of the forces that forms effects in time and space most probably have a general or global character, which means that improvements of IA-predictions depends on more insight in these types of processes.

In addition, these studies indicate that several causes for prediction errors have interacted in both cases, with cumulative effects on the degree of error in effect predictions. In the case study of hydropower developments in Aurlandsdalen, project theory weaknesses combined with interaction effects and partly non-normal base line or non-normal post-project situation have caused misjudgements both ex ante and ex post. In the case of the 1994-Winter Games, it is poor project theory combined with major change of the project design and dynamic external processes that have been the main causes for errors in predictions both before and after the implementation. High "value rationality" and[15] bias have most probably in the Olympic Game case contributed to major errors in judgements, also.

It is possible that “appraisal optimism” has been an important factor in both case studies, which explain especially why IA-predictions failed severely in the case of the 1994-Games. Appraisal optimism happens, according to Mackie and Preston (1998), because the information contained in an appraisal “tends to be owned by scheme promoters who have obvious incentives to bias the appraisals - deliberately or unwittingly -… This is a particular acute problem if the scheme is in the public rather than private sector, since the normal commercial checks and balances on excessive optimism do not apply”.

However, non-of these two case studies measure precisely how much each of the five causes for prediction errors contributes to the divergence between ex ante expectations and ex post realities. This author’s judgement, though, is that weaknesses in project theory and a lack of understanding of interactions effects and cumulative processes have been the main problems in both cases. Table 7.2 tries to summarise these judgements in a comparable way.

[15] Conceptual and methodological differences can, however, not explain the many divergent predictions among experts involved in the controversy over effects from the Winter Olympic Games in 1994. Tests of alternative explanations do not explain why some experts ex ante repeatedly did predict effects that were not according to internal logic and factual evidence. Therefore, it should be no surprise if those predictions diverged substantially from the realities found in ex post studies, too. In this case, "expert prostitution" may be the only explanation of the divergent predictions.

In general, experts participating in a controversy should not draw the conclusion that opponents, or decision-makers, are biased before alternative explanations of why predictions and judgements diverge, are tested carefully. In other words, a conclusion about bias should only be made if other alternative explanations are tested and rejected. But my conclusion is that expert prostitution was part of the 1994-Winter Olympic Games. It is possible to document that one IA-expert lied to decision-makers and the public, at least once. This judgement is based on written evidence. It is other indications of bias, too, in the Norwegian 1994-case.

Biases IA-experts is probably a phenomenon in other countries also. At least, Crompton (1995) concludes that biased IA-predictions have been an important element in several other sports events.

Table 7.3 Relevance of concepts in prediction-failure theory for the case studies of effects from Aurlandsdalen (hydropower development) and 1994-Winter Games (mega-event).

Cause of error	Aurlandsdalen	1994-Winter Games
Weak project theory for effects in time and space	Relevant and important	Relevant and important
Changed design	Relevant, but less important	Relevant, and important as major change in design reduced prediction failures
Non-normal baseline/post-project situation	Only post-project problems identified, but of less significance	Relevant both ex ante and ex post, but less important for public decisions. Private investors made misjudgements
Interaction and cumulative effects	Relevant and important	Relevant and important
Bias among predictors	Not identified	Relevant for several scientific contributions

The similarities indicate that these conclusions are valid at least for these two case studies. But that is no guarantee that the findings have external validity outside these cases. Only two case studies are too few to prove that weaknesses in project theories and interaction effects are the main prediction problems in general. The similarities in it self only indicate that participants in democratic decision process and scientists, so far, should especially be concerned about these two types of problems.

However, one of the main objectives of this dissertation was to contribute to improved understanding of why predictions may fail in general, by using the tourist and recreation case studies as practical experiments and tests of the conceptual framework. The implicit assumption was that a conceptual framework developed and tested on major types of development actions and a specific substantive field should be transferable and useful in other fields, too.

One way to test the external validity of concepts would be to do case studies that cover other types of projects or fields. Wood (1999) has very recently published a study of errors in IA-prediction caused by the predictive techniques, that partly investigate similar issues. His study was an audition of post-development that try to explain the errors in EIA-predictions of effects on noise, air quality and visual qualities from different kinds of projects (power station, ethylene project and waste incinerator). The main findings of his study are that a substantial degree of the prediction errors depend on the formulation of relationships in the predictive models (the structural quality of project theory) and uncertainty in baseline information. But

he identified errors caused by external development and changes in project design, also.

One of Wood's conclusions is (quote):" Best practice EIA should therefore endeavour to incorporate an assessment of the state of the future baseline alongside impact predictions through a consideration of other sources of impacts which may occur (or cease to occur) over the life cycle of the proposed development". In other words, it is important to assess interactions and cumulative effects caused by external processes. It is interesting that another study, which cover very different fields, indicates similar results - even when using other concepts and methods.

7.5 Partial objective two; Clear structure and "predictability"

Another partial objective of this dissertation is to test and improve relationships in structural models that can be used to predict and evaluate effects in time and space. Such models and prediction methods require that it is possible to identify clear pattern of change, and relatively stable patterns without substantial short-term variation in the important indicators of effects. This part of the dissertation is restricted to **effects in time and space on tourism and recreation** from two important types of major development projects.

The thesis is that effects on tourism and recreation from basic types of projects have clear structure in time and space, with low short-term variability caused by natural fluctuations.

This thesis does not claim that the pattern of the observed changes should be the same in all kinds of situations. On the contrary, the case studies were chosen deliberately so that the expected changes should be different or even opposite to each over. The first case study focused on a type of projects that normally should have positive effects on tourism and/or recreation, since that was the main purpose according to the proponent and decision-makers. Substantial growth both in time and space is the expected pattern to be observed in these cases (that here is exemplified by a mega-event as the Winter Olympic Games).

The other type of projects has not positive effects on tourism and recreational as the purpose, but aim at producing/delivering other kinds of goods. They change, however, environmental qualities and have, therefore, as side effects that may effect tourism and recreation interests in negative ways. Here, hydropower and major road developments exemplify this type of projects.

A basic thesis was that the effects in time and space on tourism and recreation from both types of projects would follow a clear structure, or in other words that the effects will vary substantially in space and time, but not because of natural short-term variations. An important reason why the **effects in space** will vary in general is that spatial effects depend on the spatial form of a project. The spatial structure is

either site/area-related (as energy projects or urban developments) or linked to linear developments (as roads, railways, and funiculars). **Effects in time** depend on the timing of the significant stimuli, which a project represents. The duration of a project is important, too, as projects that last several decades are open to more interaction effects with other processes taking place at the same time.

The comparisons of ex ante predictions and ex post realities in the two case studies show that it was a clear structural pattern in the actual effects, and that the direction of some main effects was predicted correctly in both case studies. The mega-event that had as its purpose to increase tourism traffic strongly was followed by a clear increase in tourism. But growth in tourism before and after the Winter-Olympics was significant lower and came later than expected, and were non-existing on regional level and not identifiable on national level. The purpose-effect was in other words lower than expected by decision-makers, proponents and most experts participating in the decision process.

The major hydropower and road project, too, changed tourism and recreation behaviour in some of the major directions that decision-makers and proponents had expected. But the release of potential tourism demand was lower than expected and the reduction among traditional recreation (hiking) interests was higher than expected by most participants in the decision process.

Effect predictions were inaccurate both in time and space. The divergence in growth rates in time between predictions and the reality, the "predicted/planned effect ratio", were between 55 and 85 % off the "bull's eye" in the case of the 1994-Olympics on regional and even higher on national level. The effects in space were in both case studies much more concentrated to areas directly influenced by physical developments than expected. In the hydropower case, which influenced an important recreation traffic corridor, the recreation use in most of a several days long corridor was changed in a negative way far outside the core of development. However, the influence zone of the 1994-Olympic Games is limited - at least so far - to those communities that got new sports facilities, and mainly the new alpine resorts.

Both case studies indicate that it is the real changes in the environment or new physical structures that are important for the reactions among tourism and recreation consumers more in general, and not the image of change created by mass media. However, it is some indications that “the image” of a development does influence behaviour, too, not only physical change in the form of recreation facilities or changed quality of the nature. One example is the “social attractiveness” of buying second homes in the new alpine resorts developed for the 1994-Winter Games[16]. This image (snob or status seeker)-effect concentrated second home demand especially in space.

[16] The most important tourist entrepreneurs state that they deliberately offered some very well known and rich persons to buy second home early in the development process of the new alpine resorts. These entrepreneurs claim that the combination of “1994 Olympic fame” of the new resort and the fact that famous persons would be among the neighbours, had increased the demand for second homes in the alpine resorts substantially.

It could be argued that other changes in behaviour in both case studies reflects changes in "image of a development site", too, and not the physical change. In the hydropower case, it was a strong increase if long distance hikers before the construction started, partly as a farewell effects before the environment where change. But also to experience the nature qualities of that area before the physical changes started, which indicate that it was the physical change in the near future that caused a proactive response among potential users. The Olympic Game case has a similar strong pre-event growth of Norwegians on sightseeing, too, but they wanted to see the new facilities.

The time-pattern of effects has also been different from the expected, in both case studies. The growth in tourism came much later in the case of the mega-event and first substantially after most of the Olympic facilities were ready for use. The decrease in recreation use in the hydropower case came very quickly and substantial as soon as the construction interfered with the user's interests in "wilderness or untouched" nature. This, too, indicates that it is the timing of physical change that counts, and not as much the change in image.

The clear identification of cumulative effects in both case studies makes it reasonable to expect that effects on tourism and recreation may vary substantially depending on the timing and type of influences from different external processes. If Norway did not have a strong growth in its oil-based economy after the hydropower project and during most of the Olympic project, the effects most probably would have been different. How different the counter factual situation would have been is difficult to estimate in a strictly reliable way. But the comparison of change in tourism before, during and after the Winter Olympic Games in 1964/76, 1988, 1992 and 1994 does indicate that the main effects from the same type of project have more similarity than difference.

The multi-case comparative design of the effects of Winter Olympics includes perhaps to few cases to conclude on the external validity of that finding, too. It is interesting, though, that the comparison of prediction errors across so different types of projects as hydropower developments and mega-events, and across four different Winter Olympic Games, indicate several similarities in the structure of effects both in time and space. The similarities are in spite of major differences in settings, locations, design and volume of these projects.

One reason for such similarities is most probably that common forces are dominant in tourism and recreation systems, across different types of development actions and countries or continents. If common forces and structures are the dominant factors, it should be possible for planners and decision-makers to learn from earlier experiments of different types in other parts of the world, and to deliver more relevant and reliable impact assessments in the future.

One conclusion of these formative evaluations is that ex-post studies makes it possible to clarify the relationships between a development action and the

effects in time and space, even in open systems as tourism and recreation. The structural relationships have important similarities and major patterns of change and effects seem to be relatively stable. Natural variability does not explain the observed change, but the effects from other processes and development actions are substantial (as discussed earlier).

These findings indicate that better insight based on empirical tests of common theories should make it possible to reduce prediction failures in the future. But it should be possible to improve the relevance of IA-systems and concepts, in addition.

7.6 Partial objective three; How to improve IA-relevance and reliability

7.6.1 The main lessons learned

Another partial objective of this dissertation was to try to apply insights from the literature reviews and case studies more systematically and in that way contribute to improvements of impact assessments more in general. At this subject problem the main thesis were that:

- the relevance of IA-predictions will increase substantially, if IA-systems in general and individual assessments in special change it's focus - from the "project theory of science" that looks for the "right predictions" - to include the "project theories of the participant's" in democratic decision processes, also.
- the reliability of IA-predictions will improve if project theories and other causes for errors in forecasts are challenged afterwards by empirical evidence from systematic and formative ex-post studies.

Ideally, an empirical test of this type of thesis would require at least two comparative studies. One of them should study how relevance varies between IA-processes that focus only on "scientifical project theories" or include project theories of the participants, too. The other should focus on how reliability varies according to the degree that IA-predictions were based on earlier ex post evaluations. Such tests are not included in this dissertation. Here, the overview of lessons learned is based on the internal logic of basic ideas and concept and evidence from the research processes of the two case studies included.

Lesson one

One lesson learned from participating in IA-processes in general and these two case studies especially is that IA as policy and learning instrument has limited relevance, if the significant effects are too uncertain to access on a scientific basis. Relevance is limited in addition if the decision to implement in reality is already made or the decision-makers are committed to implement in other ways. One example can be earlier strategic decisions on international or national level that commits a nation to improve specific transportation or energy systems, making the "no-action alternative"

not relevant. If a nation has decided for strategic reason to improve the major highway from the capital to a regional centre up to EU-standard, then impact assessments of each new road segment is based on the political fact that decision-makers are committed to implement a specific design. The aim of an IA is "only" to select "the best" among alternative road lines that fits EU's standards.

In cases with significant uncertainty the ethical solution for IA-experts is to advise decision-makers to follow the precautionary principle discussed in chapter 2.4. If decision-makers have committed themselves to implement a project in spite of high uncertainties or for other reasons, they may use two other policy instruments that are alternatives to IA. Appendix 7.1 gives a short overview, including the experiences from the 1994 Winter Games.

The fact that IA has limited or conditional relevance as policy instrument in some situations is important. But the research-based knowledge developed by this study and documented in earlier chapters has its limitations, too. One limitation is analytical. Here, the more complex problems of IA and prediction failures are analysed by separating the whole entities (of impacts) into parts that are easier to understand (in the form of effects in time and space from different types of projects). Such analytical-rational thinking is according to Flyvbjerg (1991) typical of western science, but represents only the first and lower steps in learning processes.

Higher level of learning includes insight in the importance of context and combine rule-based or abstract thinking with practical experience from detailed and concrete cases. Some experienced-based knowledge that is acquired by practical work with impact assessment is included in this chapter, too, in an attempt to move one step higher on the learning ladder. This experienced-based knowledge supplements the research-based knowledge and is used here to clarify the role of science in IA-processes.

Lesson two

Another lesson learned from the case studies documented in this dissertation and other practical IA-experiences, is that IA-processes is not a scientific adventure but parts of a democratic decision process where different actors or stakeholders try to take care of their own interests or more general values. These actors base their thinking and actions on explicit or implicit theories about the effects of the relevant development action. The stakeholders picture of the realities can be very divergent. One contribution that IA-experts and scientists can make is to test and eliminate elements of those pictures that can be falsified by scientific methods and today's best knowledge. The fact that IA is part of a social and political decision-process creates not only cognitive problems, but also psychological problems in addition, which IA-experts have to be aware off.

The psychological problems seems, according to my practical experiences, to be especially high if IA-experts predict that a specific project most probably has much less of the purpose effects than desired. Because the purpose of a project - and “the

dream" of proponents and (some) decision-makers - may be destroyed at the same time. Practical experience from both case studies that are included in this dissertation and other cases indicates that IA-predictions, which question the purpose of a development action, act as a strong critic of the rationality of that action. That may create strong reactions, too, from the proponents or related interests[17]. Some reactions can be very negative personal experiences. Still, it may be an ethical duty for scientists to contribute to IA-processes. The conference that followed up the Brundtland report on sustainable development concluded that (quote):" The scientific community has a an absolute duty both to give the best possible information and a clear explanation of the quality of the scientific knowledge, including the uncertainties" (Ministry of Environment 1999)

The force of the reactions among the involved interest groups may be a good indicator of the relevance of IA-predictions. If the reactions are very strong, the IA-predictions and information may be experienced as a threat to an important element of the project theory that a stakeholder is basing thinking and actions on. But such reactions may not be linked to the quality of an IA-prediction in it self, but to the political effects that a prediction or new information have[18].

My judgement, though, is that all IA's should include a critical assessment of the positive (purpose) effects that proponents expect from an action. If a project theory fail in the way that an ex ante IA find over-optimistic expectations about the positive purpose-effects, that may reduce the proponents and decision-makers interests in implementing the development, or at least open their minds up for modifications.

It is an important reality that the relevance of IA-predictions depends not only on the quality of the scientific theory, which the predictions build on, but on the theories that the proponents, opponents and decision-makers build their thinking and actions on. The historical and social context influence what are judged as relevant predictions and information, also. Therefore, one way of increasing the relevance of IA is to take the divergent project theories of proponents and opponents seriously,

[17] Personal experience indicates that the reactions from proponents, opponents or decision-makers can be pretty strong if IA-conclusions are against their interests, especially if much money is involved. If errors in the logical arguments of an IA, or the empirical findings that predictions are based on, are not easy to find, such attacks can focus on an IA-expert as a person.
In earlier days, persons that delivered bad news were some times killed. Today, the reactions may have other forms. At least I thought so, until an American colleague told about the gun that was used to threaten him during a public IA-hearing on the effects of a major environmental protection action.

[18] I discovered the political importance of such issues as a young student when doing a study for a national planning committee working on a controversial regional planning project of a large mountain area. The study showed that a majority of the regional inhabitants preferred a large national park. That finding was very contrary to the claims from proponents of a major hydropower development in the same area. They claimed the inhabitants wanted the energy project. The political implications were clear, and the reactions were strong both from proponents and opponents of the development action. One reaction in Parliament was that three members used the Parliaments debate to accuse a young scientist by name for giving misleading information. It was in one way an understandable reaction, since they later lost the vote - by one single vote majority.

and use the IA-process as explicit tests of the stakeholders alternative theories, in addition to the more scientifically based theory about effect.

Open discussions between proponents and opponents, and controversies between experts, may ideally act as creative processes that produce and clarify alternative theories about the effects a project may have (and the quality of predictions and experts). In such cases, the alternative theories are tested critically in attempts to find the best judgements of the realities. Then, democratic processes may contribute to growth in insight and knowledge and verify Feyerabend's argument that our knowledge grows best when it faces direct challenges from new theories (Durban 1995). In those cases that impact assessments act as a competition between alternative project theories, which is an "impact assessment-as-market-analogy", it may contribute to more purpose rational decisions, too. It may at least be a relevant idea in "competitive democracies" where political decision-makers compete in free elections.

Therefore, my judgement is that a significant part of all ex ante impact assessments should be to test the theory/hypotheses that the main alternative project theories and predictions builds on, by trying to falsify hypotheses and assumptions. But that judgement is based on practical experience, not a scientific test of the effectiveness of alternative approaches to IA's.

The important measure in ex ante assessments is to check the internal logic of a project theory and the predicted effects looking for self-contradictions. That is the only one that is available if a proposed project is really a unique one (but few are). If the proposed action is not unique, another test is to check if factual information lack conformity with earlier experience or today's situation[19]. In the latter case, scientific documented evidence or information collected by critical minds from earlier projects can be of substantial help. Since that kind of information should, hopefully, identify the real effects of earlier projects.

Lesson three

A third lesson learned from the analysis of the case studies is that it is possible to identify more clearly and precisely what the real effects are of a project, and the partial effects of other forces that influence the summative change that take place over time and in space. We will never know the counter-factual, and the precise

[19] Conceptual and methodological confusion explain some attempts to predict significant and positive effects of the 1994-Games. One of the more enjoyable examples is referred earlier (chapter 3.5) Another one is the Norwegian scientist who claimed in a report that it was no problem to develop new major alpine resorts (a reference can be given on request). The reason was that Norway was fare behind Sweden in alpine ski activity and, therefore, would experience a strong growth in demand in that sector in the future. He based his theory on the fact that the yearly sale of alpine skies in Sweden was twice as high as in Norway. However, this scientist had forgotten the fact that it is nearly twice as many Swedes, too, as Norwegians. The higher volume of skies sold may, therefore, in itself neither indicate a higher level of interest in alpine skiing in Sweden, nor a strong growth potentials in Norway (It could be higher interest or potentials, but for other reasons than suggested by this international comparative approach).

effects, but the use of reference areas in combination with clear pattern in change both in time and space indicate in a reasonable way what the main effects are.

The findings in both case studies in this dissertation confirm that systematic ex post evaluations or auditions can improve our understanding of important cause-effect relationships substantially (but they are resource-consuming measures). This is especially the case if formative evaluations focus on key elements in common project theories and are critical tests of cause-effect relationships. One condition is that ex post evaluations can be based on relative precise IA-predictions of effects in time and space, since they can act as hypothesis that can be tested scientifically.

Wood (1999) claims that the most effective feedback on quality of predictive technique should be based, not on ex ante predictions, but on predictions made ex post; that is after the specific development is implemented and operational. Since such auditions are likely to be more fruitful as alterations in project design can quickly invalidate the relevance and reliability of predictions. But his arguments are relevant only for studies of the techniques used in IA-predictions, and not for ex post studies of the relevance and reliability of IA-predictions made before a decision to implement a development action, which this study focuses on.

However, ex post studies that are done as a part of a learning process will contribute not only to methodological improvements, but to a social process, too, with implications in time and (social) space for different interest groups and actors. For example, the findings from an ex post evaluation may cause reactions from the involved interests that have been influenced by a project, and/or from the decision-makers that was responsible for the implementation. Actors may find findings in an ex post evaluation that confirm or diverge from their own picture of the real ex post effects of a development.

Actors that disagree with the interpretation of empirical facts that are reported in ex post evaluations may introduce alternative explanations of what have happened. For example, that an observed change was not caused by a specific project, but an effect of other and external forces or processes. In case, a new and alternative theory or auxiliary hypotheses may explain an unexpected and unpredicted effect (an anomaly) in the original project theory that an actor has. Such auxiliary hypotheses may act as an "explanation away" of the empirical threat from an ex post study to the existing theory.

For instance, when the developers of the hydropower project in Aurlandsdalen that are presented in this dissertation, were informed that the volume of hiking did decline substantially after the development started, they accepted the decline as a fact. But they offered at the same time the auxiliary hypotheses that the decline was not a response to negative changes in nature qualities, which such developments may have. Their proposition was that the decline was caused by the "negative image", which the opponents of the project had created in mass media, and not the change of nature caused by the hydropower project. That new hypotheses could act as an

"explanation away", if not tested later on and falsified (as documented in chapter 5 and Teigland 1994).

Empirical evidence from the ex post study of hydropower developments in Aurlandsdalen falsified or "destroyed" other ex post project theories, too, that earlier was accepted by involved social actors, with practical implications. One example is that the owners of a tourist hut early on went to court claiming compensation from the developers for the decline of visitors during the first part of the construction period. The court decided that the main cause of the decline was preliminary noise and other environmental problems created early in the construction process, and restricted the compensation accordingly to cover negative effects during only a short time period. The ex post study did, however, indicate that the decline was more than preliminary. The new fact started a heated debate between the developers and the hut owner that discovered that the court's theory had weak points (with the effect that the compensation was lower than the new effect theory and empirical facts indicate).

Alternative ex post explanations will in general compete for "the truth", and may have practical implications, but they will also act as measures to improve our understanding (Lakatos 1970). If the purpose of ex post studies is to change future decisions and behaviour, attempts to "explain away" evidence from ex post studies have to taken seriously. The ex post "explanation away's" which emerge have to be tested carefully (Troye 1994), if a falsification should be possible. If not, participants in decision processes may conclude that it is no reason to change their existing picture of the reality and the project theory they base their decisions and behaviour on. If the cause of adverse changes is not effects from a project or because of the project design itself, but external or preliminary processes, future projects may be designed and implemented in the same way as earlier.

"Ex post explanations away's" is a reality not only among proponents, opponents and decision-makers, but among IA-experts, too. It is scientists who have made IA-predictions before a decision, who later adapts descriptions of their own predictions in such ways that they ex post are more in accordance with the real developments. One mechanism, which has been used in relation to the 1994-Olympics, is to enlarge the geographical area for ex-post evaluations in such ways that the observed change (summative effects) become more like "the predicted"[20]. The evaluations ex post includes in that way a larger area than the areas that ex ante predictions were based on. Such adaptations may perhaps be caused by problems with collecting comparable data from the same areas as earlier, but is it can be an attempt to influence "historical judgements", or to get support for "who were right in scientific controversy". Some adaptations ex post can be attempt to hide "expert prostitution", too.

By introducing auxiliary hypotheses, players in democratic decision processes can keep their original theory and original thinking intact and proceed as earlier, with no change in behaviour even in cases where the adverse effects of their projects are very

[20] The scientist who ex post choose a larger areas for comparisons of the reality afterwards with ex ante predictions is the same person who according to my judgement made biased ex ante prediction, which may be no coincidence.

significant. Therefore, effective use of ex post studies as a measure for learning and improving decisions, has to take the social actors seriously and test their alternative ex post "explain away" theories, too. Such critical tests of new ex-post theories must be added to tests of the actor's earlier ex ante theories and predictions, if the aim is to change behaviour by improving earlier project theory.

Then, the aim is to use science to improve future decisions by changing cognitive patterns and earlier behaviour. In other words, applied science uses knowledge as power and not only to improve our understanding of pure scientifically aspects.

My conclusion is that IA-system's in general, and individual ex-ante impact assessments in special, would be more relevant for democratic decision processes if IA's have a broader focus. In addition to tests of scientifically based project theories, IA should include critical assessment of the alternative project theories that the participants in decisions processes base their thinking and actions on.

Scientific ex post studies, too, will in such cases become a more relevant and reliable learning instrument with more potentials for change of the behaviour of the involved participants in future development actions. But reliable ex post evaluations have to be based on a trustworthy scientific design, which use reference area/groups and/or multivariate analyses to identify the counter-factual and the partial effects of a development action from the effects of general process that influence the observed ex post changes. However, even strong designs will not prevent that it is alternative explanations of the observed change that can not be falsified. Ex post evaluations will, therefore, only reduce uncertainty and the degree of misjudgements in predictions of effects in the future.

7.6.2 Recommended change of IA-systems and guidelines

Both case studies give clear evidences that is possible and valuable to make adjustments in impact assessments systems and guidelines in general. Some changes are of an institutional type. But most changes that are needed, will according to my judgement be adjustments that require individual IA's to adopt more precise concepts and to focus on more explicit quality criterion.

One of the most effective institutional measures will be if nations and the international society could organise and use ex post studies in a more systematic way to learn from earlier development actions by using some of them as experiments. It should not be necessary with a large sample of ex post evaluations, if such studies focus on development actions that act as critical experiments of common project theories. Then, a few systematic ex post studies in the form of formative evaluations are needed to clarify the main effects in time and space, and the influence from interactions and cumulative processes.

Among the needed improvements of IA-systems are guidelines that require individual IA's to use more precise concepts and a "follow-up" system that make sure that the requirements are carried out. One important change will be to require that IA should assess both short and long-term effects explicitly, and clarify more precisely the boundaries of effects in time and space. In addition, IA-systems should require that individual IA's explicitly compare the potential changes caused by a development action with the no-action alternative. IA-systems, too, should explicit require that the probability of potential effects are analysed and reasons for uncertainty described. In other words, IA's should make sure that decision-makers could judge more precisely the potential change (the effects), the values of change (the impacts) and the degree of uncertainty in IA-predictions.

One way IA-guidelines could improve the reliability of predictions in those directions, is to require that assessments should follow a stepwise procedure:

- The first step should be that impact assessments focus on predicting the significant changes that may take place if the primary project is the only agent for change.
- The next step should be to evaluate the potentials for interaction effects between effects from the primary projects, secondary projects and other processes that are under way, based on today's best available knowledge.
- A third step should include an explicit judgement of the potentials or risk for unexpected events that may increase the uncertainty of IA predictions made in the two preceding steps.

If IA-systems require such a step-wise approach that will act as a more precise guideline for assessing the effects of a development action. The first step requires that an explicit comparison be made of the difference between the no-action alternative and the primary project, assuming all other agents for change being stable. The second step focuses on the real potential for change from the no-action alternative, which is caused by other processes in addition to the primary project. This step includes an assessment explicitly of changes both of general character independent of the planned development action, and caused by secondary project directly and indirectly. These two first steps will explicit evaluate the degree of change that is possible by the planned action itself and by interactions or cumulative agents for change. But to prevent pure speculations, the second step should be limited to processes and secondary projects, which are well recognised or acknowledge at the time an ex ante study is made. Then, the third step is an explicit evaluation of the involved uncertainty and the probability that unplanned processes and events will influence the expected change.

In addition, it should be possible to improve the reliability of individual IA's, if IA-systems and guidelines explicit require a check of additional causes for those prediction failures that are not covered by the proposed step-wise approached. The reason is that a step-wise approach as mentioned above will only cover prediction errors caused by failure to assess the potential interaction and cumulative effects from secondary projects and other external agents for change, plus uncertainty

because of unplanned events. IA-systems, also, should require that individual ex ante impact predictions includes an explicit check of the possibility that baseline information is influenced by natural variation or special events, and, therefore, based on a "non-normal" picture of the realities.

IA-guidelines should require, too, that ex-post evaluation check include explicit tests of both the normality of base line and the post development situation. If data on the base line situation is not representative, or the data from a post development time unit is not normal, ex post findings and conclusions can be misleading. Ex post evaluations should in addition check the degree of change in project design after the decision to implement. And ideally, ex ante predictions should be updated accordingly if the planned design is changed in significant way during the decision process or afterwards.

It is necessary to control possible bias in a more systematic way, also. One guideline should be that IA-systems require that all individual impact assessment separate explicit between value issues and the more objective indicators for potential change because of development actions. In other words, IA-systems should require that individual IA's deal separately and explicit both with the changes a development action may have (the predicted effects), and the values that relates to such change (assessing the impacts). It should also be possible to organise more effective control of biases, by introducing "peer reviews" and have open public hearings with the IA experts, and the administrations, that participate in democratic decision processes.

As a measure to reduce the possibility for bias, the working papers that IA-reports builds on, should be accessible for public reading and control. In controversial and very significant decision-processes, important stakeholders who are opponents and have contrary interests to the proponents, should ideally have the possibility to hire IA-experts as "counter-expertise" paid by national authorities or the proponent. If controversy is high, foreign IA-expertise may be used to reduce the potential for bias, or the fear among participants that domestic or local IA-experts are biased[21].

The need to use really independent IA-expertise may be more linked to the psychological sides of decision processes, since the not unusual expectation that consultants hired by the proponent tend to be biased in favour of the proponent is confirmed by earlier referred studies. But few studies have compared predictions by different individuals. However, Crompton (1995) concluded an audit of impact assessments of the effects of 20 major sports events that several ex ante analyses must have been deliberate attempts to fool the decision-makers and the public.

[21] In a controversial highway case, Swedish authorities hired a foreign IA-expert to assess the effects on tourism and recreation of a large new bridge and road system through a nature protected area in Northern Sweden. That was done as a measure to reduce the level of controversy, after the main opponents rejected the first IA-report on this issue. See Teigland, J. 1992. The impacts on tourism and recreation of a new European highway section. An impact assessment from E-4 in Central Sweden, by Ångermanälven and Höga Kusten. Report no. 55. Telemark Research Foundation. Bø i Telemark. (in Norwegian).

One of the case studies in this Ph.D. dissertation, too, concludes that bias among the involved experts that delivered effect predictions ex ante to the decision process, most probably is the only reason why important predictions became severe failures. That type of bias is linked to the results of the IA-prediction process, the findings that is reported in IA-reports or in public statements afterwards by the involved IA-experts.

The application process towards Norway' s decision to apply for hosting the Winter Olympic Game have at least on example of how the administration of the application process gave biased information to decision-makers and the public[22]. None of these case studies identified bias that was related to the early phase of the usual IA-procedure, when the issues for IA's are selected. Bias among the involved that select, screen or scope what the IA's shall focus on is not easily detectable since information on such decision may be "non-existing". But the reason why such errors were not found is simply the fact that both projects included in this dissertation's case studies were implemented before Norway had a formal IA-procedure in place. In that way the selection of these two case studies were a failure, as the research design itself prevented detection of one type of prediction errors (that is; errors caused by the scooping phase in the IA-process).

The focus in most IA's on "the report", and the potentials for errors as bias in the results of the IA-process, is a weak point of IA since many decisions takes place earlier on that may be influenced by biased interests (another reasons for errors). Therefore, it is important that both the selection of IA-issues during the screening phase, and all final products and background materials for IA-predictions, should be open for control by all interests involved in a democratic decision process. To make such information accessible, most IA-systems today require that the relevant interests should be informed at the start of the IA-process, before the IA-issues are selected. Open control is needed when the results of the IA's are delivered to the proponent or an authority, too. To make IA-information easily accessible, it is not uncommon to require that IA-reports should be available at a well-known specific location and open for the public scrutiny.

It is my judgement, though, that it is as important or even more important, that IA-systems in general and individual ex-ante impact assessments in special, broaden

[22] The application committee hired a foreign consultant company to assess the potential tourism effects of developing Lillehammer as a major tourist destination (Analytikerne 1986). The conclusion was that it would be a great market for such a development, also abroad, and published on the front page of the local newspapers. But as soon as the news were release, the report was decided to be confidential (as the committee was organised like a company, who could claim that competition made it necessary to keep the information internal). This author received, however, later on a copy, which show that the conclusion was based on a very poor study. For example, the report claimed that a major tourist development at Lillehammer would make the town very interesting as a conference centre for Danish businesses, too, with a potential of approx. 70 million kr. in yearly incomes in the 1990's from this Danish market segment alone. But that conclusion was based on one single interview with the leader of one single Danish business company who was sure that his company would choose Lillehammer as conferences site in the 1990'ies.

their perspectives. The focus of IA should change from testing scientifically based project theories to include in addition those project theories that the participants in democratic decision processes base their thinking and actions on. Scientific ex post studies, too, will in such cases be a more relevant and effective learning instrument with higher potentials for changing the future behaviour of the participants.

Therefore, IA-systems should require that individual IA's explicit evaluate the main project theories and hypothesis that participants in democratic decision processes are expressing during the planning process. IA's should especially focus on key elements in the purpose theory of proponents and the significant side-effects that opponents propose, and try to falsify the key hypotheses in the project theories that proponents and oppositions are basing their thinking and actions on. IA-information and effect predictions should be open for public control and a critical review by other experts.

7.6.3 A need for more insight and factual knowledge

The institutional and conceptual changes in IA-framework that are mentioned so fare may help decision-makers by improving the relevance and reliability of IA-predictions in general. In new scientific fields as tourism and recreation, it most probably will be necessary in addition, and perhaps even more effective, to improve the factual knowledge base. Three issues should have priority in IA-research that focuses on relatively new phenomenon as tourism and recreation.

A first and general issue is the need to help decision-makers and other participants in decision processes to evaluate the values or interests, which will be influenced by a planned development action. It is especially a need to make it possible for participants in decision processes to compare different interests and the values that are involved across sector interests. The strong need to clarify value questions is relevant for tourist and recreation interests, too. For example, one weakness of the case studies in this dissertation is that they do not more explicit discusses the major value questions involved. The basic reason is that it has been a difficult issue in it self to clarify the degree of change and try to identify the partial effects from other factors than the primary project. In other words, the first and necessary step has been and is to assess the real changes and the partial effects of the primary project. Only relevant and reliable information on the partial effects caused by the planned and implemented development actions can be a base for evaluations of the values of change.

It may be helpful to introduce more precise value concepts, too, into IA-guidelines. Some of Treweek's (1995) terms should be useful. Then, "significance" will refer to the value of change in attributes in a specific sector, comparing for example touristic values before and after a development action. The term "importance" will refer to the relative change in values between sectors, cross-comparing the change in touristic or ecological values with, for example, the values for the local community of a

development. The significance of each specific category of impacts has to be clarified before any cross-comparison can evaluate the importance.

Therefore, the evaluation of values in IA's will be a step-wise process, too, with predictions of effects in each sector as the first step. This first step should be followed by evaluations of the significance of change in each sector, and of the importance across sectors as the last step. But science can only contribute to clarification of such value issues. In democratic societies, it is - and should be - the elected representatives and the bureaucracy that evaluates and tries to find acceptable solutions to the planned development problems.

A second important issue that is relevant for all kinds of open systems, is the need to strongly improve insight in the many long and short term processes that influence how a development action will interact and be effected cumulatively from other processes. Increased understanding of long-term processes is, perhaps, the principal issue if the quality of IA in tourism and recreation sector will rise. Only more insight in the major forces that form tourism and recreation behaviour in general in the long term will improve the possibility to predict interaction effects and cumulative processes in a significant way[23].

A third important issue is the external validity of some of the empirical relationships found in this dissertation. Some conclusions in this dissertation are based on only two cases study, and experienced based insight from other practical experiments. These sources of evidence may not be representative. Therefore, it is a need to test the external validity by doing some comparative case studies to see if other experiments identify similar or divergent effects. In addition, it is a need to evaluate ex post the real effects of other important types of projects, especially projects that probably will grow in number and influence in the future on global level, as transportation and energy-projects or urbanisation developments.

Other changes in society will most probably increase the need for more knowledge and new research projects in the field of IA and tourism and recreation. Among the studies that are needed is new ex-post studies that checks if the results from the two case studies reported here have been influenced by "non-normal" ex post situations. It may, fore example, be that the effects from the 1994-Winter Games have been delayed by some unknown lag-mechanism and that the long-term effects will emerge first later on. Therefore, only time and new ex-post studies will show if this dissertation have drawn premature conclusions on substantive issues.

[23] One step in the right direction will, hopefully, be a new research project that the Norwegian Research Board has founded for this author. It is a project that focus on the effects of social change on tourism and recreation, with emphasis on the effects of increased private economy, urbanisation, change in family structure and leisure systems in general, which take place in high income countries like Norway. The strategy is based on panel-study and interviews of the same sample of Norwegians in 1999 that was interviewed 14 years earlier (in 1986) about their holiday and recreation behaviour. That research project is an effect of the work on this dissertation, or in other words a secondary project and side effect of this study. The intended outcome of the new secondary project is that today's perspectives on long term trends hopefully will change (no revolution is expected, thou).

References:

Analytikerne. 1986. Lillehammer på 90-tallet. Stockholm. Rapport til Lillehammer Næringsselskap.

Armour, A. 1991. Impact assessment and the planning process: a status report. Impact Assessment Bulletin, vol. 9. Nr. 4. Pp. 27-33.

Becker, G.S. 1996. Accounting for tastes. Harvard University Press. Cambridge.

Becker, H.A. 1995. Demographic Impact Assessment. In Vanclay, F and Bronstein, D.A. (eds) 1995. Environmental and Social Impact assessment. Wiley, Chichester. pp. 141-152.

Crompton, J.L.1995. Economic Impact Analysis of Sports Facilities and Events: Eleven Sources of Missapplications. Journal of Sport Managment. Vol. 9, No. 1. pp. 14-35.

Dipper, B. Jones, C. and Wood, C. 1998. Monitoring and Post-auditing in Environmental Impact Assessment: A Review. Journal of Environmental Planning and Management. Vol. 41, No. 6. Pp. 731-747.

Durban, R. 1995. The Trouble with Science. Faber and Faber. London.

Gilje, N. And Grimen, H. 1995. Samfunnsvitenskapenes forutsetninger. Innføring i samfunnsvitenskapenes vitenskapsfilosofi. Universitetsforlaget. Oslo (Annet opplag)

Innst.S. nr. 130 (1997-98). Innstilling fra kontroll- og konstitusjonskomiteen om Riksrevisjonens undersøkelse av miljømessige konsekvensutredninger. Stortinget. 1998. Oslo.

Jacobsen, B., Schnack, K. and Wahlgren, B. 1995. Vitenskabsteori. Gyldendal. København (12 opplag).

Kuhn, T.S. 1970. The Structure of Scientific Revolutions. University of Chicago Press (2nd edition). Chicago.

Lafferty, W.M. 1998. Democracy and Ecological Rationality: New Trials for an Old Ceremony. Paper prepared for the CPSA/IPSA Roundtable on: Integration and Disintegration: New Partnerships in the World order. Quebec City. 12-13 February 1998.

Lakatos. I. 1970. Falsification and the Methodology of Scientific programmes. Published in Lakatos, I. And Musgrave, A. (eds) Criticism and the Growth of Knowledge. Cambrigde University Press. Cambridge.

Lakatos, I. 1978. The Methodology of Scientific Research Programmes. Vol. 1. Cambridge University Press. Cambridge.

Lee, N. and Brown, D. 1992. Quality control in environmental assessment. Project Appraisal. Vol. 7, Nr. 1 March 1992. pp. 41-45.

Lee, N. and Dancey, R. 1993. Quality controll. The quality of environmental impact statements in Ireland and the United Kingdom: a comparative analysis. Project Appraisal. Vol. 8, Nr. 1 March 1993. pp. 31-36.

Miller, D. (ed) 1985. Popper Selections. Princeton University Press. Princeton. New Jersey.

Ministry of Environment, 1990. Action for a common future. Bergen. May 8-16, 1990. Conference report. The Norwegian Ministry of Environment. Oslo.

Mohr, L.B. 1988. Impact Analysis For Program Evaluation. Brooks/Cole Publishing Company. Pacific Grove. California.

Pigram, J.J. 1992. Alternative Tourism: Tourism and Sustainable Resource Management. Published in Smith, V.L. and Eadington, W.R. (eds). Tourism Alternatives. Potentials and Problems in the Development of Tourism. John Wiley & Sons. Chishester. UK.

Riksrevisjonen 1997-98. Dokument nr. 3:6. Riksrevisjonens undersøkelse av miljømessige konsekvensutredninger. Oslo. The Chief Inspestors Review of the Impact assessment system (In Norwegian).

Roe, D, Dalal-Clayton,B. And Hughes, R. 1995. A Directory of Impact Assessment Guidelines. IIED, London.

Sadler, B. 1996. Environmental Assessment in a changing world. Evaluating Practice to Improve Performance. Canadian Environmental Assessment Agency (CEAA) and International Association for Impact Assessment (IAIA).

Sadler, B. and Verheem, R. 1996. Strategic Environmental Assessment - Status, Challenges and Future Directions. Ministry of Housing, Spatial Planning and the Environment. The Netherlands, Publication nr. 53.

Sample, V.A. and Le Master, D.C.E. 1992. Economic Effects of Northern Spotted Owl Protection. An examination of four studies. Journal of Forestry. August 1992. Pp. 31-35.

Shrader-Frechette, K. 1990. Scientific Method, Anti-Foundationalism, and Public Decisonmaking. In “Risk- Issues in Health & Safety. Vol. 23 (Winter 1990). Pp. 23-41.

Teigland, J. 1994. Impacts on leisure use of nature from hydropower developments. A case study in Aurlandsdalen. Telemarkforsking. Rapport 83. Bø. (In Norwegian).

Teigland, J. and Holden, E. 1996. Reiseliv og miljø. Hva kan vi lære av andre. En internasjonal kunnskapsoversikt. VF-rapport 5/96. Vestlandsforsking. Sogndal.

Tengström, E. 1999. Environmental Sustainment in Transport Policy - How is the Situation in Denmark, The Netherlands and Sweden?. Trafikdage på Aalborg Universitet 30.-31. August 1999. Konferanserapport. pp. iii-ix.

Treweek, J. 1995. Ecological Impact assessment. In Vanclay, F and Bronstein, D.A. (eds) 1995. Environmental and Social Impact assessment. Wiley, Chichester. pp.171-

Troye, S.V. 1994. Teori- og forskningsevaluering. Et kritisk realistisk perspektiv. Tano.

Weber, M. 1999. Verdi og handling. Pax Forlag. Oslo.

Wood, C.M 1995. Environmental Impact Assessment: A Comparative Review. Longman. Harlow.

Wood, G. 1999. Post-development Audition of EIA Predictive Techniques: A Spatial Analytical Approach. Journal of Environmental Planning and Management, Volume 42, Nr. 5. Pp. 671-689.

Wood, C., Dipper, B. and Jones, C. 1998. Auditing the Assessment of the Environmental Impacts of Planning Projects. Results. Draft 5 of article 2 (18 April 1998).

Yin, R.K. 1984. Case study research. Design and Methods. Sage Publications. London.