Technical report 64

Participatory integrated assessment methods

An assessment of their usefulness to the European Environmental Agency

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Part I: Project description and main results

1. Project description

The objectives of the present project are to prepare a critical appraisal of participatory methods of integrated environmental assessment (IEA) and to evaluate the applicability of these methods at the European Environmental Agency (EEA) in its work on integrated environmental assessments. The main focus of the project was to develop a background document on using participatory integrated assessments in the context of the next 'State of the environment and outlook report' (SEOR).

The mission of the EEA is 'to deliver timely, targeted, relevant and reliable information to policy-makers and the public for the development and implementation of sound environmental policies in the European Union and other EEA member countries' (EEA, 1999). The most visible products of the Agency are a series of publications on a wide range of environmental issues of European concern. The main report series involves the environmental assessment reports that present essential data as well as integrated assessments. The state of the environment and outlook report is a major venture produced once in every five years, while the environmental signals reports present updates of environmental indicators and are released annually. The focus of the present study is on the SEOR to be published in the near future.

Integrated assessment has been defined as an interdisciplinary process of synthesising, interpreting and communicating knowledge from diverse scientific disciplines in order to provide relevant information for policy-makers on a specific decision problem. Two main forms of Integrated Assessments are distinguished: modelling and participatory methods. Methods belonging to these two categories can be used separately or in appropriate combinations. Models are already extensively used in the work of the EEA, but participatory techniques have so far been limited to consultation through the Eionet ([1]) network, conferences and workshops of traditional format.

The European Forum on Integrated Environmental Assessment (EFIEA) devoted a special session to the review of the IEA work at the EEA in November 1999 (see EFIEA, 2000). The primary focus was on the use of IEA in the process of preparing the report 'Environment in the European Union at the turn of the century' (EEA, 1999). The review acknowledged a series of innovative efforts undertaken by the Agency and confirmed various intentions of the EEA staff to improve the process as a whole and its individual components. The recommendations of the EFIEA sessions included, among others, to devote more attention to the development and use of scenarios, models, as well as participatory IEAs.

As a result, the EEA has expressed interest in exploring the use of participatory integrated assessment (PIA) techniques to involve stakeholders in different phases of producing its major reports such as the next SEOR. The intention is to increase

([1]) Environmental Information and Observation Network (http://www.eionet.eu.int/)

and improve the involvement of the broad range of clients and to foster the usability and usefulness of the report to a diverse group of potential users. For the sake of simplicity, we define clients as a group whose interests and demands need to be observed by the EEA in its reporting activities. Main clients include the European Commission, the Council, the Parliament, and the member countries of the EEA. The group of 'other users' involves a wider audience and varies according to the themes and coverage of specific reports. This group includes all other institutions and stakeholder groups like industrial associations, environmental non-governmental organisations and others whose wishes should be reflected to the extent possible under the ever-present constraints.

A large array of PIA methods has been developed over the past few decades to satisfy the demand emerging from diverse segments of the society. This project started out to conduct a review of specific techniques in this large domain. Following a systematic evaluation based on the criteria derived from the mission and operating conditions of EEA, the following areas have been selected as potential candidates for use in the Agency's work: focus groups and related techniques, policy exercises, the adaptive environmental assessment and management technique, simulation-gaming, with special attention to operational games and free-form games to be used in the SEOR development process, and teaching-training games as a special form of disseminating the results.

The project accomplished an extensive bibliographic research of methodological discourses and applications of these selected participatory methods in both the public and private sectors (in Annex). A systematic screening of the applications identified case studies that might be of particular relevance to EEA's interest. As a result of the evaluation phase, some changes were made to the original list of techniques. Notably, the adaptive environmental assessment and management technique was included instead of the originally listed, but very broad category of structured workshop.

In the search for relevant case studies, it was necessary to keep in mind the special situation of the EEA. Its task is to collect, organize, and present policy-relevant information about the current state and past, present and future trends of the environment. Most PIA techniques, however, have been developed and used with a strong policy-making orientation. The Agency needs to walk the fine line between collecting, synthesizing and making available policy-relevant information about the current state of the European environment, as well as its outlooks. The former is the result of environmental policies put in place by Member States or by the Community in the past, while the latter requires some assumptions about different policy options that might be implemented in the future. Both activities raise questions as to where policy-relevant or policy-oriented assessment ends and at what point policy-making (not in the EEA's area of responsibility) starts. Therefore, a major challenge in applying any of these methods will be to account for this special situation and make appropriate modifications in the original design of the selected and reviewed PIA methods when they will be applied at the Agency.

Furthermore, the Agency needs not only to serve a diverse group of clients often with widely differing perspectives and policy agendas. The Agency itself is (the central) part of a large network (Eionet) that consists of many research institutions all over the European Union and the other EEA member countries. This network includes among others the five European topic centres (ETCs), covering the environmental issues air pollution and climate change, water, waste and material flows, nature and biodiversity, and terrestrial environment. The

institutes that participate in these ETCs are partners as well as stakeholders. Wherever the EEA is mentioned in the remainder of the report as actor in PIAs, it includes the relevant parts of Eionet, and in particular the ETCs.

Applying PIA techniques in different activities of the EEA, especially in the SEOR project, might help coping with the special situation discussed above. All these techniques provide a forum for interactions in smaller or larger groups. They all involve well-designed structured discussions that focus on issues of interest to all. Although the relative merits of different PIA techniques differ in terms of to what extent they are able to help participants get to an agreement, they all foster consolidation of diverging views to some degree.

The most important recommendation for applications of PIA techniques at the Agency is that organisers, in the design of and preparations for any application, should honestly reveal the potentially diverging interests, conflicting views and possible hidden agendas of expected participants. With the arrangements available in all PIA methods and with a skilful moderator, these problems can be managed if they are identified ahead of time and appropriate contingency measures have been taken. The key is to prevent the evolution of hostile attitudes towards the participatory process itself. Meticulous preparations can turn this risk into an opportunity by creating a group dynamics that transform initial tensions into creativity.

Another important fact to consider is that most PIA methods have been developed for and applied in well-focused problem areas. Some of these were continental to global in their regional coverage but focusing on one problem (like applications of the policy exercise technique to global climate change), while others addressed a diverse set of resource and environmental issues but were limited to a relatively small region (like most AEAM applications). There is a clear trade-off between the breadth and depth of the assessment that can be meaningfully combined in any PIA implementation. One possible resolution of this dilemma in the case of broad and complex assessments like SEOR is to split the activities into meaningful units (like the five thematic threads represented by the European topic centres, or the priority European environmental problems, plus the issue of creating environmental outlooks) and run the assessment along two parallel tracks: a broad framework/synthesis assessment and a series of partial assessments. This arrangement also has the advantage that different techniques can be chosen for the partial assessments depending on the characteristics of the issues to be addressed and the resources available for implementation.

At the outset, the project was defined as a literature survey and evaluation activity. As the work evolved, a request was made to shift the main thrust of the report from preparing a large data bank of relevant literature to develop a series of PIA design outlines that demonstrate how the selected frameworks could be used in the SEOR production process. The result of this shift is also apparent in the present report. The bulk of the attention is devoted to the techniques identified as potentially useful in the SEOR process and to the presentation of how and in which phases they could be used.

The annex to the report presents more detailed discussions of the methods, each accompanied by a list of annotated bibliography.

2. Main results

The project identified the following PIA methods that are worth considering for use at the EEA in various activities:

The policy exercise method
A policy exercise is a flexibly structured process and involves participation of scientists and policy-makers. Its function is to synthesize and assess knowledge accumulated in several relevant fields of science for policy purposes in the light of complex practical management problems. It is carried out in one or more periods, each consisting of three phases (preparations, workshop, and evaluation). The core activities are scenario writing and scenario analyses via the interactive formulation and testing of alternative policies in an organisational setting that reflects the institutional features of the addressed issues.

The policy exercise method is a strong candidate for developing and testing the prospective components of the SEOR and other Agency products with a strong policy orientation. It might serve as a true test-bed of the accumulating information by putting them to use in a policy development process to which the underlying scenario(s) should also serve as input and thus could be tested as well.

The focus group technique
The focus group technique is based on a well-prepared and monitored social process that draws on small-group techniques used in applied social science research. Focus group sessions are group interviews in which a moderator facilitates the conversation process and a small group discusses the issues raised by the moderator. The most frequently used format of the focus group technique involves six to eight participants, the moderator, and assistant(s).

The focus group technique could be used to develop a shared understanding of the objectives, design and broad content of various products, including the SEOR within EEA as a first step. This technique could also be set up to involve subsets of the main client groups. If sufficient time and resources are available, most important representatives of the relatively large number of 'other users' could also be engaged via a series of FG sessions, to get a clearer picture about possibly conflicting information needs, intended uses, and other requirements specified for the report by different groups.

The adaptive environmental assessment and management (AEAM) method
The adaptive environmental assessment and management approach provides a framework for synthesizing experts' knowledge relevant to an environmental management problem, as well as a forum for assessing costs and benefits of alternative development paths for various interest groups. The procedure is designed to bridge gaps in knowledge and perspective between experts, managers, decision-makers, and citizens.

The procedure is based on a series of workshops in which representatives of relevant stakeholder groups, a team of modellers and facilitators participate. The workshops are intended to develop and improve a computer simulation model of the environmental or resource management problem at hand. Members of the facilitator team work with different subgroups of the stakeholder participants to

develop a shared perspective of the problem and formulate it in the computer model.
The adaptive environmental assessment and management approach could well be considered to develop new products dealing with environmental issues not yet on the agenda or some new components of the SEOR. This approach could prove to be especially valuable to address problems that involve diverging opinions among experts and potential conflicts among stakeholders. Even if a full-fledged application would not always be possible, many elements of the technique could be used in the context of other methodologies.

The simulation-gaming techniques
Simulation-gaming techniques combine elements of a game, a simulation, and the reality. The crucial element stemming from gaming is that participants are typically playing some pre-assigned or voluntarily assumed roles and they make decisions pertinent to those roles under a set of rules that define the boundaries of the game. Roles can be defined across the broad range from very realistic (close to the players' everyday functions) to completely abstract/symbolic. Similarly, rules of the game that regulate interactions among players and their decision-making could range from rigid and predetermined rules to more or less flexible rules that may also evolve in the course of the game.

Two sub-fields among the simulation-gaming techniques have been identified as potential candidates for use at the Agency. Scenario-based free-form games might be an interesting method to consider developing scenarios, while a specially designed operational game could turn out to be an exciting venture when the draft report is reviewed and evaluated by the client group.

The teaching and training games
The third sub-field of the simulation-gaming techniques, teaching and training games, embody a new technology for gaming with the primary focus on environmental and natural resource management. A typical implementation incorporates three elements: a sophisticated simulation model of the system represented by the game; a powerful micro-computer which makes the model and thus the game portable; and a playing board, with associated pieces, that serves as an accounting device and aids communication among players.

This technique could be considered to develop the material incorporated in different Agency publications, including the SEOR, into a teaching-training game for broader distribution of the report results (including computer models) for environmental education at schools and the public at large.

Details of the selected methods are presented in Part II and in the Annex. The potential usability of these techniques in the SEOR production process is presented in Part III.

Part II: Evaluation of participatory integrated assessments for use in the state of the environment and outlook report process

1. Introduction

A wide range of participatory integrated assessment (PIA) methods has been reviewed and evaluated with respect to their potential use in the state of the environment and outlook report (SEOR) process. The main objectives for using PIAs is to help design and produce the report with a deeper and more active involvement of main clients and other users in the process of design, production, release, and evaluation ([2]).

The challenge for the SEOR is enormous both in terms of the broad range of objectives and diversity of the audience. The report has to provide a comprehensive integrated assessment of environmental issues of European significance, present prospective analysis by developing baseline scenarios and environmental outlooks, benchmark countries performance and supply information in support of the evaluation of the EU environmental action programme. The SEOR is intended to serve a very wide audience, including a relevant group of policy-makers at the national and at the EU level, an extended set of stakeholders, depending on the scale and nature of the environmental decision problem, and representatives of the public.

The present report takes a selected set of PIAs and proposes possible uses of them in different steps of the SEOR production process. Table 1 presents an overview of the steps in the SEOR process and the PIAs to be considered at different stages. The table serves as a roadmap for the subsequent discussion of methods on the one hand, and their application in the SEOR production, on the other.

In order to assist the discussion of which PIA technique could be considered in which step of the SEOR process, Section 2 provides succinct presentations of the various approaches (columns of the table). In Section 3 we go through the SEOR process step by step (rows in the table) and elaborate some ideas how the relevant PIA technique could be used. From the large family of simulation-gaming techniques, two members are relevant for specific steps in the development of the SEOR. The third member, called teaching and training games, could only play a role in the distribution phase; therefore it is highlighted in a separate column in Table 1.

([2]) There is no clear definition of these groups. For the purposes of the present report, we define main clients as a group whose interests and demands need to be observed by the EEA: the European Commission, the Council, Parliament, and the EEA member countries. The group of 'other users' includes all other institutions and stakeholder groups who make use of the SEOR and other EEA reports in their work.

Table 1. An overview of the potential role of selected participatory integrated assessment methods in steps of the state of the environment and outlook report production process

Step	SEOR process	PE	FGT	AEAM	SG	TTG
1	Define policy demand and overall objectives					
2	Define content, develop storylines for the chapters	C	*	C		
3	Produce guidelines for data collection	C		C		
4	Development of outlooks	CCC		CCC	* FFG	
5	Data collection and model analysis	C		CCC		
6	Write draft report	C		C		
7	Discuss draft report	CCC	*	CCC	* OG	
8	Produce and print final report					
9	Report release and dissemination					*
10	Report evaluation		*			

NB:
* The applicability of the PIA method in the given step of the SEOR process — some PIA methods incorporate procedures that could be adopted to serve as a consistent methodological framework across several steps of the SEOR process. For such methods:
C the step is covered by the PIA application that extends across several steps;
CC some aspects of the methods could well be used in this step;
CCC the culminating phase, most beneficial for this step, of the PIA application that extends over several steps;
PIA participatory integrated assessment;
PE policy exercise;
FGT focus group technique;
AEAM adaptive environmental assessment and management;
SG simulation-gaming;
(three types: FFG = Free-Form game, OG = Operational game, and TTG = teaching-training games (a special option in the dissemination phase, therefore highlighted separately)

A central element in the outline component of the report is scenario development and analysis. A separate paper is devoted to the topic of developing and using scenarios in international environmental assessments (see Alcamo, 2000). It has been proposed that these scenario-related activities could be conceived as an assessment within the overall SEOR assessment. The scenario development process can be structured into similar steps as the report production. The use of PIA methods could be considered in single steps or through a series of multiple steps. This is summarised in Table 2 while the more detailed discussion in Part III elaborates scenario-related activities as well.

Table 2. An overview of the potential role of selected participatory integrated assessment methods in the scenario development process

Scenario development process	PE	FGT	AEAM	SG
Define policy demand and overall objectives	C		C	
Define content, develop storylines for the scenarios	CC	*	CC	
Data collection and model analysis	C		C	
Scenario development and processing	CCC		CCC	* FFG
Write draft scenarios	C		C	
Discuss draft scenarios	CCC	*	CCC	* OG
Prepare final scenarios				

NB: See Table 1

The importance of scenario development and use in the outlook part of the SEOR cannot be overemphasised. Comprehensive socioeconomic scenarios are needed to provide the background information about plausible patterns of macro-scale development. These macro-scale scenarios serve as a consistent and uniform background for the more detailed sectoral scenarios needed for the five major domains: air pollution and climate change, water, waste and material flows, nature conservation and biodiversity, and terrestrial environment. The complex vertical (top-down from macro-scale to sectoral scenarios) and horizontal (cross-sectoral) relationships require that due attention and appropriate resources be dedicated to the scenario-related activities within the SEOR process.

2. Review of selected PIA techniques

2.1. The policy exercise (PE) approach

A policy exercise (PE) is a flexibly structured process designed as an interface between academics and policy-makers (Brewer, 1986; Toth, 1986; 1988a,b, c). Its function is to synthesise and assess knowledge accumulated in several relevant fields of science for policy purposes in the light of complex practical management problems. It is carried out in one or more periods of joint work involving scientists, policy-makers, and a support staff. A period consists of three phases (preparations, workshop, evaluation) and can be repeated several times. At the heart of the process are scenario writing ('future histories', emphasising non-conventional, surprise rich but still plausible futures) and scenario analyses via the interactive formulation and testing of alternative policies that respond to challenges in the scenario. These scenario-based activities take place in an organisational setting reflecting the institutional features of the addressed issues. Throughout the exercise, a wide variety of hard (mathematical and computer models) and soft methods are used.

Principal participants in a PE are leading scientists from disciplines of critical importance to the subject, and representatives of major actors, influential policy makers, and stakeholders from the policy side. In the first phase, a series of plausible future development scenarios are prepared together with all the necessary background 'technical' documents. Scenarios provide a special framework in which issues from various fields affecting the practical problem are integrated and bounded, and in which specific policy options are tested during an interactive session at the workshop. From the methodological point of view, these sessions represent a mixture of a scenario-based free-form gaming exercise ('war game', see Brewer and Shubik, 1979), an operational gaming session, and a modelling workshop as developed in the AEAM approach. However, these techniques are not part of the PE approach.

A basic feature of the PE concept is that participants from the policy side are involved from the very beginning of the preparations. Several ways have been devised to learn about their opinions, attitudes, and perception of the problem. These include an active correspondence by mail or e-mail throughout the preparations phase, telephone interviews and detailed personal pre-interviews conducted by the organiser team with participants-to-be. They also contribute to the formulation and writing of the scenarios and technical documents this way. Participants' input is also critical in the evaluation phase when their feedback and comments on the draft synthesis report and other documents are essential.

The product of a PE is not necessarily new scientific knowledge or a series of explicit policy recommendations, but rather a new, better-structured view of the problem in the minds of the participants. The formal product of a PE is a cabinet briefing document summarising the most important policy insights. The exercise also produces statements concerning priorities for research to fill gaps of knowledge, institutional changes that are needed to better cope with the problems, technological initiatives that are necessary, and monitoring and early warning systems that could ease some of the problems in the future. In recent years we have witnessed increasing use of the PE approach to address global change issues (see Klabbers et al., 1995; 1996; Toth, 1995; Mermet, 1992) and a

wide range of public policy problems beyond environment (Andriessen, 1995; Joldersma et al., 1995; Wenzler et al., 1995).

Relevance for the EEA: The PE technique is a strong candidate for developing and testing the prospective components of the SEOR. They could provide a true test-bed of the accumulating information by putting them to use in a policy development process to which the underlying scenario(s) should also serve as input and thus could be tested as well. With a view to the size and logistics constraints of the PE technique and the resources required, only the client group could be involved in a PE-based process, while other participatory techniques or traditional formats could be used with 'other users'.

2.2. The focus group technique (FGT)

The focus group technique (FGT) is based on a well-prepared and monitored social process, which draws on small-group techniques used in applied social science research (see Krueger, 1988) and in political decision making (see Stewart et al., 1994). FGT sessions are group interviews in which a discussion leader (moderator) facilitates the conversation process and a small group discusses the issues raised by the discussion leader. The most frequently used format of the FGT involves six to eight participants, the moderator, and assistant(s), if necessary. The moderator should be an experienced specialist in small-group techniques who can direct the discussions so that they best serve the interest of the client.

FGT sessions can vary between rather rigid, questionnaire-like information acquisition to freely flowing, brainstorming-like discussions. The precise format within this spectrum is determined by the client, the objectives, the time frame, the number and properties of the participants. The responsibility for implementing the agreed design rests with the facilitator. This is not an easy task even with well-specified questions and thoroughly thought-out session procedures.

Over the past few decades, environmental organisations have become important actors among the numerous other interest and pressure groups that try to influence the governments' environmental policies directly or through industrial, energy, transport and other policies indirectly. Public opinion surveys or formal referenda have become important instruments in shaping the final decisions on local environmental issues (e.g. on siting potentially harmful or risky industrial plants, waste disposal facilities; on projects involving major transformation of the landscape) or about national environmental policies (e.g. on abandoning nuclear power). The FGT is increasingly used as a tool for soliciting public opinion on these issues.

In addition to being a pure discussion/debate activity, the FGT may also combine computer models with the monitored social process. This allows participants to express their judgments on products and services (existing or planned) to help future providers or even complex issues like public (e.g. environmental) policies in a form that provides useful information for policy-makers.

Relevance for the EEA: The FGT could be used to develop a shared understanding of the objectives, design and broad content of the SEOR within EEA as a first step. FGT sessions could also be set up to involve subsets of the main client groups. If sufficient time and resources are available, most important representatives of the relatively large number of 'other users' could also be engaged via a series of FGT sessions, to get a clearer picture about possibly conflicting information needs, intended uses, and other requirements specified for the report by different groups.

2.3. The adaptive environmental assessment and management (AEAM) approach

The AEAM approach (Holling, 1978) was one of the first attempts to provide a framework for synthesizing experts' knowledge relevant to a practical management problem, as well as a forum for assessing costs and benefits of alternative development paths for various interest groups. The procedure is designed to bridge gaps in knowledge and perspective between experts, managers, decision-makers, and other stakeholders, when confronted with a complex management problem.

The AEAM procedure involves a series of workshops. In addition to representatives of the above stakeholder groups, a team of modellers and facilitators participates as well. The focus of the workshops is the construction of a computer simulation model of the management problem. Members of the facilitator team work with different subgroups of the stakeholder participants to develop a shared perspective of the problem and formulate it as a computer model.

The process of constructing this model provides means for synthesizing available and reliable information, identifying areas of uncertainty, improving communication and understanding different or outright conflicting perspectives in a non-adversarial setting. The model is intended to provide a common perceptual window into the complex reality of the problem at hand. The purpose of the workshop procedure is to force participants to make their mental model of the problem explicit, and to reveal their related hidden agendas for challenge by other participants.

The AEAM approach has been primarily applied to regional problems of environmental impact assessment, research planning, resource management and policy, and to project integration and synthesis. In its experimental phase in the mid-1970s, AEAM was applied to pest management in forest ecosystems, salmon management, and regional development problems in an Alpine region. Over the years, AEAM has been further refined through applications to a wide range of environmental management problems in various parts of the world (see ESSA, 1982).

To many practitioners AEAM has become much more than just one methodology for exploring complex environmental management problems. AEAM is rather considered as a philosophy of systems analysis and management. Practical applications of the AEAM approach have revealed that previously ignored interconnections between processes operating in different subsystems at different spatial and temporal scales cause 'surprising' systems behaviour. This results from integrating models and expert judgement from several disciplines into a single, management oriented framework.

Relevance for the EEA: AEAM implementations are rather expensive ventures, but may well be considered to develop some new components of the SEOR, especially those involving diverging opinions among experts and potential conflicts among stakeholders. Even if a full-fledged AEAM exercise (similar in its scale to the listed examples) would not be possible, many elements of the technique could be used in the framework of other methodologies.

2.4. Simulation-gaming techniques (SG)

Simulation-gaming techniques (SG) involve a combination of some elements of a game, a simulation, and the reality. The crucial element stemming from gaming is that participants are typically playing some pre-assigned or voluntarily assumed roles and they make decisions pertinent to those roles under a set of rules that define the boundaries of the game. Roles can be defined across the broad range from very realistic (close to the players' everyday functions) to completely abstract/symbolic. Similarly, rules of the game that regulate interactions among players and their decision-making could range from rigid and predetermined rules to more or less flexible rules that may also evolve in the course of the game.

Simulation-gaming techniques have been used for a large variety of practical management problems in business and public policy, and for research purposes primarily in the field of social science (Duke and Greenblat, 1979; Greenblat and Duke, 1981; Horn and Cleaves, 1980; Shubik, 1975). Some applications involved complex private-sector or public-policy decisions like siting a research laboratory of a large multinational pharmaceutical company or reforming the health care system of a country. Two types of SG techniques are touched upon in this section of the report: free-form games (FFG) and operational games (OG). The third type (teaching and training games) is dealt with in the next section.

Free-form games driven by a minimum set of rules and an initial scenario have been intensively used for over half a century to test military strategies in different conflict situations (see Brewer and Shubik, 1979). More recently, this technique has also spread to strategic planning and forecasting in corporate and public policy arenas.

Operational games draw on a rich collection of procedural designs, playing situations, role characteristics and paraphernalia to construct an artificial social situation. The game enhances selected features of the reality that were identified as relevant factors in shaping actors' behaviour and social processes in reality. Under the guidance of the game operator, players can act in a single, relatively large group or in several smaller groups. The relationship among the smaller groups can be cooperative, competitive, or neutral. Scoring (e.g. gaining or losing points) usually serves as an important motivator in the course of the game, but winning or losing becomes a secondary issue in the end when insights gained from playing the game are shared and collective conclusions are drawn.

Relevance for the EEA: FFG could be an interesting method to consider in developing scenarios, while a specially designed OG could turn out to be an exciting venture when the draft report is reviewed and evaluated by the client group. One other possible use of the SG technique might be to frame the design and preparation activities of producing the SEOR as a game design process, i.e., design the SEOR game. This would involve a core team of 6 to 10 people at EEA meeting at regular intervals and making improvements on a game. By thinking about the game, preparing for the sessions and debating the game, solutions for the original task (SEOR production) emerge and the game itself will probably be never played (this is typically the case for this category of SG). A detailed specification of this process would require in-depth specification of the actual SEOR objectives and conditions.

2.5. Teaching and training games (TTG)

Another area in the field of simulation-gaming with rich traditions, uncontested popularity and continuous evolution is the applications for teaching and training purposes. Education in social sciences, teaching special skills, language tuition, and company management-business training commanded the most effort. The implemented gaming frameworks, the time required to play the game, the complexity of the gamed situation differs accordingly. TTGs both draw on the tools and design elements of OGs and enrich the collection of OG techniques.

By the late-1970s, computer models in the field of environmental management had become extremely complex and sophisticated while policy-makers who were supposed to use them needed a different kind of complexity. The result was a widening gap between the analyst and the decision-maker. There were and still are several attempts to bridge this gap by designing and implementing procedures for increasing the practical use of models in actual organisations. One of these efforts, the environmental management teaching and training games, (TTGs) (see, for example, Meadows, 1985) took the simulation-gaming methodology as a starting point and developed a new technology for gaming with the primary focus on environmental and natural resource management. The typical TTG implementation incorporates three elements: a sophisticated simulation model of the system represented by the game; a powerful personal computer which makes the computer model totally portable; a playing board, with associated pieces, that serves as an accounting device, aids in communication, and helps the players visualize the important interconnections in the model.

Some of the TTGs have been successful in conveying basic lessons about the most important relationships between development and environment and in providing participants with an opportunity to gain experience in making decisions required to achieve a balanced management of a region's or nation's resources. The best of these games contain sufficient complexity to tax the analytical and management skills of most participants. The ultimate purpose of many of these games is to transform the way people think about particular aspects of environment and development, to demonstrate the unworkability of the present paradigms of development and the possibility of an even better outcome than any perceivable through the present paradigms. The games usually intend to reach these goals by transmitting lessons about specific system structures and systems behaviour like exponential growth, transition processes, long pipeline delays, trade-offs, etc.

Relevance to the EEA: This technique could be considered to develop the material incorporated in various publications, the SEOR among others, into a TTG for broader distribution of the report results (including computer models) for environmental education to schools and the public at large. The range of options is really wide: it spans from very simple, educational games for schoolchildren to rather sophisticated ones for university students up to really challenging games for environmental managers participating in continuing education.

3. The SEOR process and relevant PIAs

The diversity of the small sample IEA frameworks in the previous section demonstrates that almost endless possibilities exist to assemble individual and well-proven tools into specially designed procedures. This should be implemented according to the analytical or practical requirements involved in planning, producing, testing, improving, disseminating, and evaluating the SEOR so that the product can fulfil the needs of the targeted user communities. This is the task of this section.

It is recalled that there is no clear definition of the groups within the user communities. In the following discussion, main clients are defined as the group whose interests and demands need to be observed by the EEA in producing the SEOR and other reports: the European Commission, the Council, the Parliament, and the member countries of the EEA. The group of 'other users' includes all other institutions and stakeholder groups who make use of the SEOR and other EEA products in their work.

The process starts with some basic decisions made by the main clients (Step 1 in Table 1). These decisions define the policy demand and determine the overall objectives for the report ([3]). The content and procedures for this initial phase are largely determined by the legislative and other operating rules of the institutions involved. Hence, there is no particular role PIA techniques could play here. Nonetheless, these basic decisions will also influence the selection of the most appropriate PIA technique to support the process.

3.1. Defining the SEOR: content, structure, and outline (step 2)

Several PIA techniques can be used in this phase. Some of them, like focus groups could be used in stand-alone mode, while adopting others (AEAM or policy exercise) would mean the initial steps in using those techniques through several later stages of the production process. Thus the choice among the tools to use in this phase depends not only on what they can deliver in this phase at what cost, but also on the future plan to use the tools in subsequent phases.

(A) The focus group technique
Organising a series of focus group sessions would be a convenient and low-cost way to hear the voices of the diverse audience. The focus group technique has been successfully applied in many projects aimed at designing a product or service. A focus group application would deliver a detailed picture of what different audiences want to see in the SEOR. However, the technique is not oriented towards consensus building in the case of diverging opinions or in trade-off situations. This would require some extension of the traditional design.

The SEOR application of the focus group technique could thus involve a hierarchical design with information feedback. This arrangement would observe the fact that, on the one hand, the report is intended to serve a broad community whose requirements and expectations are inevitable diverse, while, on the other

([3]) On the basis of the Council Regulation (EEC) No 1210/90 amended by Regulation (EC) No 933/1999 that requires the EEA '… to publish a report on the state of, trends in and prospects for the environment every five years ….'

hand there are some mandates the report must fulfil but the interpretation of these is diverging even among the key players.

The above design could depict the following steps:

Step 1. The first (start-up) FGT session with the SEOR core group involving key players: the EEA, the Commission, the Council, Parliament, representatives of the member countries (maximum 8 participants). The first objective is to discuss their own ideas of the report: what should be in it, what can be in it given the time and resource endowments, and then to create a prioritised list of expectations. The second objective is to develop questions for the other focus group sessions. This implies (a) delineating the fixed points in the SEOR content and outline that cannot be changed, (b) describing options in areas in which several possible solutions exist, and (c) open-ended questions in areas with full flexibility.

Step 2. A series of FGT sessions involving subgroups of the broader clientele: industry/business groups, other NGOs. The first set of the series could involve homogeneous subgroups and explore the questions specified by the start-up session above. The second set in this series could involve mixed groups of representatives of subgroups whose criteria and expectations for the report were most diverging or outright contradicting. This session would require the first extensions of the FG technique By inclusion of consensus-seeking techniques. The field of negotiations analysis provides the appropriate methodological background to this. In this extended version, the FGT facilitator would act as a mediator among the parties with conflicting views and actively seek mutually acceptable domains, would help participants identify the so-called best alternative to no agreement (BATNA). The third set of sessions still in this series would then involve representatives from the SEOR Core Group with the objective to review and consolidate the outcomes of the preceding FGT sessions.

Step 3. Final FGT session with the SEOR core group
After a thorough analysis and evaluation of the FGT sessions in step 2 above, the final session of the core group has the objective to consolidate those results and reach agreement on the SEOR content, outline and presentation. Similarly to consensus seeking, information feedback is not a standard part of focus group techniques either. Therefore, this final session constitutes the largest diversion from the focus group technique and requires well-conceived innovative elements.

Summary: the focus group technique would be a good candidate to help design the SEOR by including information from the diverse group of users. It would be a relatively low-risk extension of the preparatory meetings that took place in the past and are organic part of the process anyway. The incremental costs of FGT sessions compared to traditional meetings are estimated to be modes: design, facilitation and evaluation could be delivered by an expert in PIA techniques, in close collaboration with the SEOR core group.

(B) Other PIA techniques
As pointed out above, AEAM and the policy exercise method would also involve components that might help consolidate the structure and content of the SEOR. However, the main function and thus the strengths of these techniques are related to later stages of the SEOR production process. Therefore, the adoption and role of these techniques in the report design phase will be elaborated below.

3.2. Produce guidelines for data collection (step 3)

This is largely a technical task. Its content is determined by the outcome of the previous (design) step both for the collection of historical data and the data requirements for the outlook assessments driven by scenarios. Therefore, there is not much PIA techniques can offer for preparing and implementing specifically this step.

3.3. Development of outlooks (step 4)

This component of the SEOR is of key importance, hence its creation is a crucial part of the production process. Fortunately, several PIA techniques have been identified that might foster the implementation of this step.

(A) The policy exercise technique
Considering the flexibility offered by this method, different custom-made designs of the policy exercise technique can be conceived. The content, intended objectives, input requirements, the range of participants, and the products are all compatible with the SEOR process. One possible design is briefly outlined here, but it is important to emphasize that it is only one of many possible variant.

The problem-identification/scoping phase of the PE procedure could be used to consolidate the content of the report (step 1 above) on the one hand, and to identify input requirements for the PE workshop, on the other. The methodological underpinning for this activity could come from the general environmental assessment techniques generally adopted in PE implementations. Alternatively, the somewhat more comprehensive focus group technique could be used in this phase.

Scenarios are crucial input to any PE and they are central to the outlook part of the SEOR as well. The rich diversity of scenario types and the techniques to develop and process scenarios in the PE process offer an outstanding opportunity to integrate the many components of the report in a policy-oriented context. Setting the number of scenarios is an important decision in the production process and closely related to the ultimate objectives of the SEOR. The 'Turn of the century' report shows that the single-scenario case can work but its policy relevance is limited to the question how the projected future development will affect the key environmental indicators and their distances from some preset targets. In this case only those policies can be analysed which link the single development path to the target. It is important to point out, however, that at least two baseline scenarios (say, an optimistic and a pessimistic) are required for an insightful prospective analysis (Alcamo, 2000). Structuring, drafting, criticising, and redrafting scenarios is the central task in the preparations phase in the PE process. It provides an opportunity to involve the broader clientele into the process deeper than the focus group technique allows, because the PE process leaves more time for participants to respond and it can be repeated several times, if necessary.

From here the SEOR PE would extend into other steps of the production process. Once there is agreement on the number and content of the scenarios, the relevant teams can implement the data collection and analysis steps by using appropriate models. As results become available, they become part of the PE manual as well.

The first PE workshop would use the results of the model runs and analyses in a policy-oriented context. Representatives of the EEA, Commission, Council and Parliament, and member country delegates would become members of the Policy teams, while the rest of the SEOR core group and modellers/experts who produced the results would become members of the control team.

The SEOR PE workshop could run 2 to 2.5 days and work through the scenarios. Policy teams formulate policy moves in response to the events and trends described in the scenarios. It is important to emphasise again, that this policy formulation is not intended to replace the customary discussions by appropriate EU policy constituencies. The sole objective is to test the usability of the SEOR material in the real policy-making process. The Control Team prepares an assessment of these moves by using, to the extent it is possible, the models they have available and report back implications to the policy teams. Institutional issues and implementability are also part of these discussions.

By processing and working with the scenarios and modelling results in a policy-oriented context, PE workshop participants (i.e., the main clientele of the report) would actually thoroughly examine the content of the emerging report and test its usability for their own purposes. This is a much harder test of the material included in the draft report than a simple 'read and comment' round.

Based on the outcome and the assessment of results of the first PE workshop, scenarios might be revised, additional data collected, new model runs prepared. The results of these activities will lead to a draft report that is much closer to the expectations of the audience than without the PE crash test.

Time and resources permitting, a second PE workshop takes the draft report material, appropriately restructured as PE input documents (scenarios, data sets, background documents, etc.) and tests its use and usability by the key players once again. In order to save costs and time, this PE workshop could involve EU-level participants only, while the discussion of the draft report by the larger group could follow the traditional root or use the focus group technique once again (see below).

Documentation and reports from the PE workshop(s) will be directly usable in writing the SEOR draft report and the final report, respectively. The policy richness and policy relevance of the final product would thus be improved significantly.

(B) The AEAM approach

The AEAM approach is also a useful framework to consider for use across several closely linked steps in the SEOR production process. Its application would be particularly useful in new areas included in the report in which also a new model would need to be developed. Another possibility would be to use the AEAM process as an integrative framework in which the various fields and issues addressed in the report are synthesized, cross impacts and cumulative impacts are analysed so that a truly integrated assessment emerges.

The procedure for implementing an AEAM-based activity would include the main steps in the standard procedure. However, the content and relative importance of the various steps heavily depends on the objectives of the specific application and the available resources. As a result, a custom-made AEAM process for use in the SEOR process is not possible to sketch without the specification of the client's requirements.

(C) Simulation-gaming technique
One of the oldest areas in the larger field of SG techniques is the class of scenario-based free-form games. These games originate in investigations of political, diplomatic and military issues that arise in an international conflict situation. Quantitative models of the hard facts (e.g. available and required resources, time constraints for deployment and manoeuvring) are combined with qualitative factors in an interactive framework. The most important input to the process is a set of scenarios delineating a (typically crisis) situation to which participants are requested to react. The outcome is a large set of strategies that were pursued and evaluated in different situations. A post-game evaluation undertakes a detailed analysis of these strategies in order to identify robust ones that proved to be successful across a large range of problem situations, as opposed to those that were hyper-successful in some cases, but badly failed in many others.

This specific SG technique could well be used to develop the outlook component of the SEOR. Models adopted by research teams to explore environmental implication of the socioeconomic scenarios would provide the hard-facts component, while a group of senior policy-makers would develop their response strategies under different scenarios. This could be particularly useful in newly emerging fields of environmental management, in which the options available to manage the problems are still in the phase of their initial exploration.

There is an enormous flexibility in the design and implementation of such free-form games. Hence, a tailor-made version to serve selected objectives of the SEOR process is impossible to construct without specifying the issues, objectives, and available resources. The main steps in designing and implementing a free-form game are similar to those characterising other SG techniques. They are outlined in the Annex of this report.

3.4. Data collection and model analysis (step 5)

These activities are organic parts of the overall PE or AEAM process described above. Data need to be collected for the scenarios, for model runs and as background information for the PE manual. Data are also required for hypothesis testing and model specification in the AEAM process. Since these are largely technical activities, PIA techniques cannot offer much to support them.

3.5. Write draft report (step 6)

This step also becomes part of the overall PE or AEAM process described above. There is not much PIA techniques could contribute here either.

3.6. Discuss draft report (step 7)

In addition to being part of the PE and AEAM processes outlined above, the focus group technique could be used in this step of producing the SEOR. Another, somewhat less traditional way could be an SG exercise. These two techniques will be elaborated in this subsection.

(A) The focus group technique
One of the most successful application areas for the focus group technique is the evaluation of a planned or existing product. The structure and design of the focus group in the draft discussion phase would be similar to the one outlined for the content definition phase (see Section 3.1, part A), but the input and the questions to be explored would be different.

Irrespective of whether the focus group technique has been used in an earlier phase or not, getting small groups (six to eight people at a time) together for a comprehensive discussion of the draft report could be an efficient and cost-effective way to trigger criticism and ideas for improvement. The traditional way of reviewing draft reports is to send them for comments to representatives of the diverse audience. This process usually generates a very diverse set of comments, often with conflicting requests for changes, extensions, and revisions. This leaves report writers with the responsibility to select among the mutually exclusive options, making proponents of other options discontent with the final product. The structured discussion environment of the focus group techniques offers a good opportunity to overcome this difficulty.

The focus group application in the discussion phase would consist of three steps. The audience is structured into two parts: the SEOR core group (basically the main clients, i.e., representatives of the EEA, Commission, Council, Parliament and member countries, a total of eight participants at most) and the broader audience (representatives of stakeholder groups, such as NGOs).

Step 1: The SEOR core group is engaged in a FGT session. The session is arranged to be a structured internal evaluation of the draft report. The main thrust is to identify problem areas and issues on which the core group wants to secure the input from the other users.

Step 2: A series of FGT sessions with representatives of the 'other users' group. Several ways are conceivable to construct these sessions. One possibility is to start with homogeneous groups involving representatives from the same or similar segments of the broader audience (such as industrial NGOs, of environmental NGOs). The objective in this case is to get the consolidated views from groups with shared perspectives. These would constitute solid input to the sequel FGT sessions with mixed groups in which more diverging opinions are likely to emerge regarding the perceived problems in the draft report and how to resolve them.

Alternatively, the series of FGT sessions in Step 2 could start with mixed groups comprised of representatives of different stakeholder categories. These sessions are likely to start out with conflicting views regarding the perceived problems in the draft report and their proposed repairs and converge towards a generally accepted solution. Running mixed groups first has both advantages and possible pitfalls. The advantage is that various mixed-group sessions could produce many good proposals for improving the report. The disadvantage is that some of these could be mutually exclusive and thus difficult to consolidate.

Step 3: Whichever strategy is followed in Step 2, the SEOR core group will need to meet for a final FGT session to review the results. This would be preceded by the processing and evaluation of the outcome of the sessions conducted in Step 2. Participants in this session examine what answers have emerged to the questions they raised in Step 1 and reach the final decisions on how to update and finalise the report.

The traditional review process can easily be combined with the FGT-based discussion. This combination would involve two steps. The first is to send the report and request submission of comments in the same way as in the traditional process. Processing the comments received would reveal the main problem areas with many critical remarks on the one hand, and the conflicting requests for revisions, on the other. The FGT sessions could then concentrate on these issues, rather than spending time on areas which are not problematic. Moreover, some

sessions could involve proponents of the conflicting requests for revising the draft report. Here again, by extending the focus group technique with tools from negotiations analysis could pave the way towards a consensus or at least a compromise solution and thereby increase the acceptance of the final report.

(B) A simulation-gaming exercise
The central idea in using an SG exercise to review and discuss the draft report is to create an environment in which the perspective users themselves simulate the utilisation of the report. This would be a simulated environment, yet close to the real-life situation and operation of the participants. We call this exercise the 'SEOR draft review game'.

Here again, many different designs for such a review-discussion game can be conceived. One possibility is to ask participants to outline for what purposes and how they plan to use the final product, i.e. the SEOR. The game itself would then create a competitive situation in which teams are assigned tasks resembling the real-life usage of the report. Participant teams use the draft report to solve these tasks and submit the results to the control team for evaluation. Several rounds with different types of tasks, corresponding to different real-life situations, are played. An extensive debriefing session is then the forum to discuss participants' experience with the content and presentation of the draft report, its usability and proposals for improvement.

There are many other ways to sketch an SG exercise. The main steps of the planning and implementation process associated with any design are the following.

Step 1: initiation
The initiation phase is based on a close cooperation between the game designer and the SEOR core group. This requires taking stock of the issues on which input is needed from the broader audience regarding the structure, content, and presentation of the draft report. The emerging set of issues needs to be structured according to the potential sources (which are the most competent or relevant sources) and recipients (who will be responsible to evaluate and utilise the generated input in the revision phase of the report production). Pragmatic limitations in terms of the costs and available time to complete this phase of the report preparation also need to be considered.

Step 2: game design
Two main factors determine the structure that will serve as the basis for the game design: participants in the SEOR production process, their relationships to each other and to the final product; and the central objective, namely, that the game should provide an evaluation and produce guidance for improving the draft report. The design process will define the basic structure of the game: how many players, in how many groups, how are players related to each other. These elements will largely determine the roles participants will assume when they engage into playing the game.

The next step is to create the operational procedures for the game. What are the main steps in playing the game, what kind of activities will players undertake in each step, what are the resources made available to them, and what rules should they observe in their own actions and in their interactions with other players.

These rules and procedures should be flexible. Given the nature and objectives of the 'SEOR draft review game', players should be permitted or even encouraged to

alter or amend procedures within the basic game design in order to maximise the creative features of the game. Some contingent planning is necessary in the design phase to equip the game facilitator with clear guidance regarding where 'creative improvements' of the agreed game design end and where destruction of the game structure begins so that the objectives and the expected output are jeopardised.

Step 3 game development
In the course of the game development, the game design prepared in the previous step is filled up with the subject matter as defined in Step 1 above. The external content of the information flows during the game playing are provided by the draft SEOR or its selected components. The input documents are prepared accordingly. These take the form of information packages made available to players prior to the gaming session, at the beginning or in the course of the game playing. Rules need to be written up and distributed. Depending on how participants will submit their moves, response/decision forms or other presentation aid is designed.

An important element of Step 3 is to arrange one or more test runs of the game. The SEOR Core Team is the obvious candidate for the first trial run(s). Once they are satisfied with the game, an additional test run with representatives from the broader audience could also be considered. These runs are extremely important in the process of turning an abstract design concept into a real game that provides a stimulating environment for its players.

Step 4: running the game
The 'SEOR draft review 'game could be run only once or several times. The once-only version would involve only selected representatives of all stakeholder groups, sorted into Participant Teams. Playing the game several times would allow more participants from each segment of the broader audience to get involved. While the costs of the once-only version would clearly be lower, playing the game several times with different participants is likely the generate substantially more information.

The game itself involves a series of tasks specified for participants. In order to solve those tasks, participants will need to make use of the information contained in the draft report and appropriately packaged as input material to the game. This means that playing the game becomes a non-traditional form of test for the draft report. Instead of simply reading and commenting its content, the report is actually being used in the course of the game. This leads to a substantially deeper and more thorough review than even the most careful reading.

Step 5: analysis and reporting
The thorough analysis of an SG session takes into account a broad range of inputs. Reactions received in the initiation and game development steps are usually utilized immediately in improving the game design, but they also contain useful information for the analysis at the end of the project. At the game session proper, several phases generate information for the analysis: participants' reactions to the briefing information and to the written input given to them, participants' moves during the game and the justification they provided. By far the most important information generator of any SG effort is the debriefing part. All these input need to be documented, tallied, and assessed to produce the game report that contains specific comments regarding the perceived problems in the draft report and proposals for improvements to be made in the final version of the SEOR.

3.7. Produce and print final report (Step 8)

Whichever PIA has been selected for use in the previous steps, they will all have been completed by the time the production phase commences. The reports generated from the PIA activities do not preclude undertaking the traditional form of the draft review process. However, PIAs are likely to generate different and more insightful comments simply because they expose the information content to concentrated and intense discussion (FG sessions) or to an operational environment in which the actual use and usability of the product is tested.

Production of the final report would need to draw on the PIA reports, but there is no room for using PIAs in this phase.

3.8. Report release and dissemination (Step 9)

One interesting possibility for disseminating the content of the SEOR would be to design an SG that delivers the main insights of the reports to players of the game. A dissemination project of this kind would draw on the experience accumulated over the past two decades in the design and use of teaching and training games (TTGs), a special area within the larger field of SG techniques. This experience demonstrates that well-designed TTGs can achieve a large educational impact in an entertaining and stimulating environment. The target audience (participants) of such games ranges from schoolchildren to senior managers.

There are play-alone games in which a sophisticated menu-based user interface informs players about the state-of-the-world and prompts for decisions (the SIM CITY, SIM FARM or Transport Tycoon games are examples of the popular commercial games of this category). The other category of TTGs also relies on a computer model as an accounting tool, but it makes use of many elements of the operational gaming techniques. Examples include: several players participate, they might be assigned to different groups and roles, there is usually a game operator who moderates the whole session and manages the interaction with the computer model. These games put communication among participants in the centre of the game; their educational power is significantly higher than that of the play-alone games.

TTGs as a dissemination medium of SEOR would incorporate the information contained in the report. The complexity of such games would of course vary according to the intended audience. Versions for schoolchildren and different teen-age groups could become powerful tools in environmental education. TTGs for senior managers could provide insights into the complexity of environmental management, the trade-offs involved in environmental decisions and alike.

Numerical data and other information for the game manual and briefing material could be easily extracted from the report itself. Simplified or reduced-form versions of the models behind the sectoral and regional impact assessments in SEOR would serve as accounting tools in SEOR TTGs. Nevertheless, development of such a game would be a large project. Developing the computer model itself is probably the most demanding part, but designing the appropriate board with associated pieces, inventing roles and communication channels is also a challenging process.

Steps and activities of designing a SEOR TTG would follow the general game design procedure. The four main phases of this process are: initiation, game design, game construction and use. The process would require a close

collaboration between the client (who will eventually use the product), prominent authors of the SEOR who have the expertise in the content, including the models to be integrated in the game, and the game developer.

3.9. Report evaluation (Step 10)

Producing a SEOR is a process that extends over several years. Many things change during this time: new knowledge becomes available about the environment itself and about how various environmental components respond to human forcing. People's preferences regarding socioeconomic objectives and environmental quality change, and the policy agenda is reshaped by various forces. The time required to produce the SEOR makes it impossible to adjust it according to all these changes in the course of the production.

The publication of one report, however, is soon followed by beginning the preparations for the next one. A useful first step in this process might be a re-evaluation of the previous report in the light of all the changes that had taken place since its completion. Here again, the focus group technique could be useful to consider. Participants and the process of implementation would be similar to the FGT application in the draft report review phase, but the content would be more oriented towards the requirements for the new report.

In addition to generating useful information for the (new) SEOR core group, the outcome of an evaluation FGT effort could also be a valuable input to any PIA technique that will be adopted in producing the new report.

Part III: Conclusions: The potential uses of participatory integrated assessments in the SEOR process

The main objective of the present project is to provide an in-depth evaluation of selected PIA methods with respect to their usefulness in designing and preparing the next state of the environment and outlook report (SEOR) of the EEA. Part II above presents a comprehensive discussion of the PIAs identified as most appropriate to consider for EEA and outlined several designs for implementation. Part II goes far beyond a simple methodology assessment and proposes some promising directions to consider in different phases of the SEOR production process.

The present part summarises the most important design options in an operational context: which PIA techniques could be used at what stage to involve which part of the audience with what objectives and expected achievements. The choice largely depends on whether those involved in SEOR (report authors, main clients, and other users) would be interested and willing to participate in the first place. An equally important question concerns the resources available to implement whichever technique is chosen.

Some methods could be used in implementing specific steps of the SEOR process. Others would cover several steps and could thus become a far-reaching methodological underpinning of the SEOR production. In principle, the application of any PIA could be pursued in tandem with the traditional procedures, especially if the first PIA activities are overcast with some doubt or fear of failure and a reserve option is preferred. Careful planning is required in this case to avoid disturbing interference between the parallel efforts.

The table below provides an overview of the methods, participants and expected achievements in the context of the SEOR process.

Table: Methods to use in the SEOR process with the main groups of audience

SEOR process	Main clients	Other users	Objectives	Expected outcome
Define policy demand and overall objectives				
Define content	PE, AEAM, FGT	FGT	Get wish list from other users → directions from main clients → consolidation in core group	Consolidated content, report structure, presentation format
Produce guidelines for data collection	<PE, AEAM>			
Development of outlooks	PE, AEAM, SG	{FGT}	Specify scenarios for outlook and distance-target analyses	Final scenarios for model analysis
Data collection and model analysis	<PE, AEAM>			
Write draft report	<PE, AEAM>			
Discuss draft report	PE, AEAM, SG, {FG}	{PE}, FGT	Enrich policy analysis component (PE with main clients) Test information content (FGs with other users)	Guidance for additional model runs, analyses; advice for improving content, structure, presentation
Produce and print final report				
Report release and dissemination	TTG	TTG	Package report content for wider audience; support environmental education	Tool for environmental education and management training
Report evaluation	FGT	FGT	Appraisal of the final product by clients and the broader audience	Guidance and ideas for the next report

NB:
< xxx > indicates activity integrated in the multi-step process using the given method;
{ xxx } indicates possible but less preferred options to use the given method;
PIA = participatory integrated assessment;
PE = policy exercise;
FGT = focus group technique;
AEAM = adaptive environmental assessment and management;
SG = simulation-gaming;
TTG = teaching-training games.

(A) PIAs applicable *in specific steps* of the SEOR process

The focus group technique

The focus group technique could play a valuable role in the initial phase, in which the content, the structure, the presentation, and other features of the SEOR are defined. The technique is useful for soliciting and debating the views on the role of and requests for the content of the report from representatives of the large and diverse audience. Extending the basic focus group process by adopting elements from negotiations analysis, diverging views and conflicting demands could be consolidated. A PIA technique at this stage is likely to generate a sense of ownership for the product in its main target audience. It is also likely to increase the commitment to contribute to its development.

The focus group technique is also an excellent candidate to use in the critical phase of reviewing/discussing the draft report. This application would create a stimulating environment with presumably inspiring group dynamics in which

participants can comment on the content of the draft report. This technique is also an outstanding platform to trigger new ideas and develop proposals for revising and improving the report.

Finally, for the same reasons, the focus group technique is also worth considering if an ex post evaluation of the final SEOR is required. The main difference compared to the previous two applications is that participants in these FGT sessions could stem from a different, possibly much larger community, depending on the initiator and his/her objectives for the evaluation.

Simulation-gaming techniques
Three possible applications of SG techniques have been identified as interesting and exciting options to consider in selected steps of the SEOR process.

First, the scenario-based free-form games could provide an interesting framework to elaborate the outlook components of the relevant chapters for the report. These are excellent albeit relatively simple tools to involve selected representatives of the client community. They would face different scenarios and propose policies to manage the environmental problems at hand. The repeated cycles of policy moves — evaluation with the help of computer models and experts — revised scenarios could increase the policy richness of the report significantly.

The second candidate is an operational game in the draft review/discussion phase. The 'SEOR draft review game' would reorganise the information content of the draft report into input documents. Participants would come from various segments of the SEOR audience. They would be assigned roles similar to their real-life responsibilities and tasks resembling their real-life assignments in which they need to use the report. This procedure is expected to generate numerous critical remarks about the usability of the report and recommendations for its improvements.

A third member of the simulation-gaming family considered here is teaching-training games (TTG). This method would be used to produce a non-traditional dissemination medium for the public at large. The process to develop an SEOR-based TTG would take the information and models contained in the report, transform them into a simplified management situation and place participants in the driver's seat of environmental policy-making. This approach has the potential of developing an outstanding tool for environmental education based on the SEOR.

(B) PIAs applicable across several steps of the SEOR process:

The policy exercise method has been identified as a framework that could be used in several steps from the content definition phase to the completion of the review/evaluation of the draft report. A distinctive feature of the PE application is that in some steps it would generate information for inclusion in the report, while in other steps it would serve as a reflexive framework to review and evaluate the product. Past applications of the PE technique have been mainly targeted to gain insights for policy-making and to provide a practicing ground for effective participation in real policy-making processes. Nevertheless, the main product of PE applications, the Cabinet Briefing Document is reasonably close in its scope and content to the intended product of the SEOR effort. Considering the well-proven design elements, the significant amount of flexibility to arrange them in a specific application framework, and the considerable range of successful past applications, the PE method is certainly worth considering.

The AEAM method would also cover the same range of steps in the SEOR process as a PE application: from content definition to the completed phase of draft review. Its application would likely to be more useful in developing new components (new environmental issues or sectors) of the assessment from its inception through model development to policy analysis and reporting. Adopting AEAM to solve this task would most likely be superior to applying any other PIA method. In contrast, given the range of the issues addressed by the report and the diversity of models used in its development, the AEAM technique is less likely to be an overall integrated assessment framework. This function is more likely to be fulfilled by the PE technique.

Final remarks

All PIA methods identified for possible use at the EEA are sufficiently flexible to allow their combined application in the SEOR process. For example, the often long and expensive pre-interview phase of the PE approach could be replaced by a series of appropriately designed FGT sessions. Another combination possibility is to use different methods to involve different segments of the audience. The relatively smaller group of main clients could be involved in deeper and more demanding processes (like a PE), while the input from the broader and more diverse group of other users could be secured via simpler tools (like FGT sessions).

A note on implementation: there are some inevitable difficulties to consider in implementing PIAs in the SEOR process. These regard the severe reservations against, or at least a certain degree of doubt about, the usefulness of any participatory technique. This hindrance is rooted in the fact that the educational versions of these techniques hardly appear in university curricula in Europe and their use is minimal, if any, in business and public administration processes. Against this backdrop, fear of the unknown, anxiety about 'losing face' in a participatory exercise is fully understandable. Hence, no matter which technique is chosen, extra care is needed in the preparatory phase to gain the trust of participants-to-be and build up confidence about the people involved and the results to be achieved. Some techniques provide for this in their design phase, for example, activities in the preparations phase of the PE technique, the sequence of workshops in the AEAM method. In other cases (like FG sessions or SG exercises), specifically designed activities will have to be planned to handle the problem.

Worries of organisers and participants about participatory techniques are justified to certain extent. Even with good preparation, there is a non-negligible risk of failure caused by any or a combination of several factors. These range from false expectations of the participants to an unfavourable interpersonal chemistry among them, from equipment or model failure to poor facilitation. These risks can be reduced by thorough preparations, but cannot be eliminated completely. Contingency planning on behalf of the core group is required to enable the facilitator to handle these rare, but unfortunate turns of events.

Although this assessment is rather optimistic about the usability and usefulness of PIA techniques at the EEA, a modest start and gradual expansion towards more demanding applications is recommended. For example, start with FGT sessions in the content definition phase and observe the reaction of participants. If it is positive, a simple PE design could follow in the phase of developing the outlooks. Depending on its performance and acceptance by the audience, it could be further developed to become the tool in the draft review/discussion phase. Alternatively, a new series of FGTsessions could be adopted in this phase.

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Wenzler, R., Willems and van't Noordende, A. M., 'A policy exercise for the Dutch power industry', Crookall, D., and Arai, K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed*, Sage, Thousand Oaks, California, 1995, pp. 143–150.

Annex 1: Detailed description of participatory integrated assessment methods and annotated bibliography

The policy exercise approach

1. Objectives and main characteristics

A policy exercise is a flexibly structured process designed as an interface between scientists and policy-makers. Its function is to synthesize and assess knowledge accumulated in several relevant fields of science for policy purposes in light of complex policy or management problems. It is carried out in one or more periods of joint work involving scientists, policy-makers, and support staff. A period consists of three phases (preparations, workshop, evaluation) and can be repeated several times. Key elements of the process are scenario writing to bind the problem and scenario analysis via the interactive formulation and testing of alternative policies that respond to challenges in the scenarios. These scenario-based activities take place in an organisational setting reflecting the institutional features of the problem at hand. They are enhanced by a series of complementary activities.

The primary goals of the policy exercise approach are to synthesize complex and incomplete bodies of scientific information for use in policy-making, to test applicability and enhance actual use of scientific knowledge for policy formulation, and to get fresh insights and new perspectives from the policy side for future research.

Many individuals and research groups face similar problems when trying to pursue a synoptic perspective to identify, analyse and solve practical management problems. However, the case studies that were used to implement and test the policy exercise procedure were sufficiently different to require modifications of the same framework. These requirements directed the design efforts to create a general approach, a collection of tools that can and has to be restructured to best serve the purposes of a particular application. Therefore, the policy exercise approach can be considered as a frame containing sets of tools with a flexible structure and the know-how for assembling a carefully chosen subset of those elements for a specific application.

An appropriately specified version of the policy exercise approach might be considered for use in studies in which (a) a channel or forum is needed for communication between scientists and policy-makers; (b) addressing ill-structured, complex issues in a situation; in which (c) no single or ultimate decision-making authority exists; but (d) many actors and stakeholders operate independently; (e) trying to pursue their own (often conflicting) interests; while (f) being buffeted by a variety of strong 'external' effects outside their area of control or influence.

In addition, the situation includes the fact that (a) part of the scientific knowledge they could rely on is solid but not easily available (scattered in the literature, or encrypted in complex models); (b) other parts are uncertain but (unfortunately) important; and (c) some parts are missing because no one on the research side realised they were important for policy formulation.

In order to respond to these challenges, scenarios constitute the core of the policy exercise technique. Scenario development helps structure the problem in terms of its institutional characteristics, while participatory scenario processing sessions help explore the interactions among relevant actors.

2. Participants and procedures

A policy exercise is typically initiated by a client calling for external help to address a problem for which this technique was recognised as the useful approach, or by a research team seeking to involve the decision-making community into a policy-oriented project. Usually at least two people are required to start organizing a policy exercise: a chairman and a coordinator. The chairman should be a senior person in the client organisation or an acknowledged scientist with a good overview of the subject matter and good reputation in the policy-making community. The first task is to develop a conceptual framework for the policy exercise, define the key disciplines that could contribute to it, and to engage experts from those fields. The coordinator is a person familiar with the methodology, preferably with experience in the background methods drawn on by the policy exercise approach. His/her responsibilities include all the organisational issues and assemble elements of the basic procedure into a custom-made design in order to best serve the objectives of a particular exercise.

In developing the conceptual framework, the chairman would identify three to five key professional areas or scientific disciplines of critical importance to the subject and invite participation of one expert from each field. This core group would then guide and supervise all activities of a policy exercises from the early phase of preparations to the final report.

Most members of the core group would also become members of the control team at the policy exercise workshop. The control team is a group of experts and policy analysts who play a key role at the scenario analysis sessions. They evaluate the policies submitted by the policy teams, assess their consequences, and modify the scenarios and the 'state of the world' accordingly. The policy teams, in turn, consist of policy makers who were identified by the core group as key actors in the subject area of the policy exercise: company CEOs, senior policy advisors, representatives of interest and pressure groups. They provide the principal policy input to the exercise as well as being the most important clients.

The facilitator runs the policy exercise workshop. Special skills are required to keep the process moving, to create an atmosphere in which hard work, creative thinking, and fun are present all the time. The facilitator should have some experience at running operational games or facilitating workshops. Basic knowledge in the subject matter of the policy exercise is clearly an advantage.

Depending on the nature of the problem at hand, a certain number of support staff may be necessary. Their tasks might include compiling and modifying computer models, collecting data, preparing visual aids in the preparatory phase, quantifying and implementing on the computer policies formulated by Policy teams, helping control and policy teams to use support tools at the workshop, and preparing the necessary comparisons, sensitivity analyses, and reports in the evaluation phase.

The substantive centrepiece of a policy exercise is scenario development and analysis. Scenarios provide the framework in which issues from various fields relevant to the practical problem on the table are integrated and bounded, and in which specific policy options are tested during the interactive phase. Six basic

scenario types and associated interactive scenario processing sessions were originally developed (Toth, 1988a, 1988b). These archetypes are as follows:

— type 1: future scenario revised based on proposed policies;
— type 2: future evolution unfolds as a result of proposed policies;
— type 3: managing future crisis situations;
— type 4: backcasting — avoiding future crisis situations;
— type 5: managing the future — injecting policies at several future time points;
— type 6: managing the future in 'real time' simulation with a running 'scenario clock'.

In the applications over the past 15 years, different combinations and variants of these archetypes have also been designed, tested, and used.

In the interactive phases of scenario analysis, the scenario horizon is divided into three to five equal-time intervals called periods. The series of steps Policy and Control teams go through to complete processing one period is called a round. The length of the overall time horizon depends on the nature of the problem and the specific purposes of a particular exercise. Similarly, the resolution of time intervals is established by a carefully chosen time constant, for example the length of an investment cycle or a characteristic lead-time in the system.

The policy exercise workshop offers a simulated, 'artificial' working environment for its participants. There are two contradicting concerns when organisers of the exercise design this environment. It should remove participants from their daily, routine, problem-solving tasks and the related organizational/bureaucratic structures and help them focus on longer-term, wider-perspective strategic issues. At the same time, it should preserve basic features of the 'real-life' position and institutional constraints; otherwise the exercise becomes irrelevant to participants' real problems, rendering the outcomes of the exercise nearly useless.

Devising appropriate roles for the participants involves the geographical and jurisdictional areas to be included, as well as the particular interests to be represented and the mandates attached to each role in the exercise. Roles should approximate the participants' actual jobs and responsibilities, and that only top-level policy-makers from each sector should take part in the workshop part of an exercise. Participation of trusted deputies in the preparation phase, however, might be very useful.

Rules governing the processes in the interactive scenario analysis session cover both the formal (procedural) aspects as well as the content side of the exercise. They are developed in the preparation phase together with the role specifications, procedural design, and content formulation. Formal rules of the exercise govern actions of each participant, their interactions in the course of the exercise, and the sequence of events they follow in various sessions. Most of these formal rules are specified either as part of the role descriptions or in the procedural outlines characteristic of each scenario session.

In the workshop phase of a policy exercise, the actual procedures are largely determined by steps of the interactive scenario analysis sessions. There are, however, a number of general considerations required to create a smooth, productive working environment for those sessions. The objectives here are to realistically simulate sequences of decisions and feedbacks; and to provide sufficient time for reflective assessment of policies. The policy/decision cycles should include the long term but should be short enough so that feedback responses are relevant to the available policy options. Sufficient time, opportunity and means should be provided

for all participants (control and policy teams) to share information (perspectives, values, beliefs, facts).

In addition to gamed scenarios, other elements of the workshop procedure that require careful planning and preparations concern the models and supporting data, indicators and some kind of accounting system to measure the performance of the policy teams, and the related rules for performance evaluation itself.

3. The implementation of a policy exercise

A policy exercise is carried out in three phases. In the preparations phase a small team called the core group identifies and invites participants, they collect, organise, and distribute relevant information. The workshop is the centrepiece of the exercise. It engages a number of senior policy-makers and experts to work through one or more gamed scenario sessions by formulating and evaluating strategic policy alternatives. The workshop is followed by an evaluation phase when the core group synthesises and analyses the outcome of the workshop; they prepare the documents of the exercise for wider distribution.

(A) Preparations

This phase of the policy exercise would usually take 3–10 months depending on the nature of the problem and the staff and resources available. Steps in this phase include:

— problem definition;
— first meeting of the core group;
— preparing the first drafts of scenarios;
— designing and sending out the loose-leaf manual;
— pre-interviews;
— final preparations.

(B) Workshop

The culminating phase of a policy exercise is the workshop. Although the time and effort devoted to the activities in the preparation phase can vary depending on the subject, each step is essential and none can be skipped without jeopardiSing the success of the whole exercise. There is more flexibility in the actual design and length of the workshop, the number and types of scenarios discussed, the time available to work through one scenario, and the way time is split between policy formulation, control team activities, and general discussions. The four parts ('Introduction — briefing', 'Scenario sessions', 'Debriefing' and 'Social event') would be standard to any policy exercise workshop.

The workshop would form an intensive and focused 2–5 day period of work. In practice, the typical length turned out to be 2 to 2.5 days. Some policy exercises were condensed to an opening dinner and one working day and they were successful. At the other end of the spectrum, it turned out to be impossible to get together senior policy participants (in fact, any meaningful participant group) for longer than 3 days. The facilitator whose main responsibility is to keep the process moving, to coordinate actions of the participant groups and control team, to provide support with logistics, etc, plays a key role.

The steps in a policy exercise workshop procedure involve the following:
— Introduction — briefing;
— Scenario sessions, including:
    1. Introduction to the session
    2. Scenario presentation
    3. Formulating the moves — policy teams discuss and agree on a policy to pursue
    4. Submitting moves — policy teams record their policy proposals and hand them over to the control team
    5. Revealing moves to other policy teams — policy teams present their proposals
    6. Policy teams' assessment
    7. Control team assessment and update
    8. Control team report
    9. Discussion of the policy assessment and system update
    10. Starting the next cycle
— Debriefing;
— Relieving group tensions: Social event.

(C) Evaluation and follow-up activities

After the workshop is completed, the core group has to process all the information generated at the workshop, prepare the documents of the exercise and distribute relevant products created by the exercise. These activities are interwoven with a systematic evaluation of the exercise.

The most important product of the exercise is the concise cabinet briefing document. It summarises the key policy-relevant insights gained at the workshop. A more detailed documentation is also often prepared that includes a deeper analysis of the workshop results. The information base for writing these documents includes the original scenarios and background documents, the repeated policy moves submitted by the participants, the policy assessments and system updates prepared by the control team, and the comments and observations presented at the debriefing by all participants.

4. Resource requirements

The absolute minimum requirement even for a relatively simple, single-cycle (preparations, workshop, evaluation) policy exercise is four to six man-months time of an organiser/core team leader, 12 man-months time of an assistant, travel costs, meeting facilities and some general expenses. The costs grow substantially for more complex exercises in which background studies, data collection, models and scenarios need to be commissioned, face-to-face pre-interviews with participants have to be conducted and more experts need to contribute to the core team activities. In the case of the EEA, some of these resources (data, models, experts, meeting facilities) might be available in house. This would significantly reduce the costs of even a relatively ambitious policy exercise venture.

5. Selected and partially annotated literature

Brewer, G. D., 'Methods for synthesis: policy exercises', in Clark, W. C., and Munn, R., (eds.) *Sustainable development of the biosphere*. Cambridge University Press, Cambridge, 1986, pp. 455–473.

A conceptual outline of the policy exercise approach, largely based on experience in and assessment of free-form games, the so-called war games.

Sonntag, N. C., 'Commentary — Methods for synthesis: policy exercises', in. Clark, W. C, and Munn, R., (eds.) *Sustainable development of the biosphere.* Cambridge University Press, Cambridge, 1986, pp. 473–475.

This is a commentary on Brewer (1986) and proposes that the policy exercise approach should be a hybrid technique, drawing on, among others the AEAM method.

Toth, F. L., *Practicing the future: Implementing the 'policy exercise' concept*, WP-86-23. International Institute for Applied Systems Analysis, Laxenburg, Austria, 1986.

The first operational design of the policy exercise method. The paper outlines the overall procedure, presents the first four scenario types for interactive scenario processing sessions, and other design elements.

Toth, F. L., *Practicing the future. Part 2: Lessons from the first experiments with policy exercises*, WP-88-12. International Institute for Applied Systems Analysis, Laxenburg, Austria, 1998.

The first experiments with the policy exercise method involved an international group of doctoral students participating in the summer program at the International Institute for Applied Systems Analysis (IIASA). This Working Paper reports the results. Many design elements presented in Toth (1986) are improved and consolidated. New elements and scenario types are added.

Toth, F. L., 'Policy exercises. Objectives and design elements', *Simulation and games*, Volume 19(3), 1988, pp. 235–255.

This is the first of two companion papers published in peer-reviewed journals about the policy exercise method. The paper describes the background and motivation for developing the policy exercises, its objectives and participants, the building elements which contain six different types of gamed scenarios, and additional design elements like roles, rules, procedures to follow. Special attention is devoted to the role of scenarios, models and supporting data, as well as the indicators and accounting systems for performance evaluation.

Toth, F. L., 'Policy exercises. Procedures and implementation', *Simulation and games,* Volume 19(3), 1988, pp. 256–276.

This is the second of two companion papers published in peer-reviewed journals about the policy exercise method. The paper describes the implementation procedure starting with preparations that includes the precise problem definition, meeting of the core group, scenario drafting, preparation of the exercise manual, pre-interviews, and other activities. The workshop procedure starts with the introduction and briefing session and it is followed by several scenario sessions using the same or different scenario types. The culmination of the policy exercise workshop is the debriefing session. The third phase is then presented that involves evaluation and follow-up activities.

Toth, F. L., *Policy exercises. Journal reprint*, RR-89-2. International Institute for Applied Systems Analysis, Laxenburg, Austria, 1989.

A widely distributed reprint of the above companion papers published in Simulation & games.

Duinker, P. N., Nilsson, S., and Toth, F. L., *Testing the policy exercise in studies of Europe's forest sector: Methodological reflections on a bittersweet experience.* WP-93-23, IIASA, Laxenburg, Austria, 1993.

An early application of the policy exercise method is documented and evaluated. The policy exercise brought together senior executives of forestry and forest product companies from many European countries. The exercise processed a series of environmental (forest dieback) and economic (European demand for forest products in the context of global trade)

scenarios to explore robust company strategies and Europe/national-scale policy interventions.

Toth, F. L., 'Policy responses to climate change in southeast Asia', in Schmandt, J., and Clarkson, J., (eds.) *The regions and global warming: Impacts and response strategies*. Oxford University Press, New York, 1992, pp. 304–322.

A series of policy exercises were conducted in the context of a UNEP project to explore adaptation responses and opportunities to the impacts of global climate change in south-east Asia. The exercises involved senior national-level policy makers (deputy minister and state secretary level) and senior analysts to explore policy responses under different climate change and impact scenarios. This paper reports on the background, the procedures and the results of these policy exercises.

Toth, F. L., 'Policy implications'. in Parry, M. L., Blantran de Rozari, M, Chong, A. L., and Panich, S., (eds.) *The potential socioeconomic effects of climate change in south-east Asia*. United Nations Environment Programme, Nairobi, 1992, pp. 109–121.

This is a content-oriented summary of Toth (1992) above.

Toth, F. L., 'Global change and the cross-cultural transfer of policy games', in D. Crookall and K. Arai (eds.) *Global interdependence*. Springer, Tokyo, 1992, pp. 208–215.

This paper summarises the methodological lessons gained from the UNEP south-east Asia project. The project and this paper demonstrate that it is possible to transfer participatory techniques such as the policy exercise method across different cultures, but special characteristics of the target culture need to be observed and appropriate modifications in the method have to be made.

Toth, F. L., Kasemir, B., and Masing, V., 'Climate policy as a business opportunity for venture capital in Europe' *Ulysses Working Paper,* WP-98-2, ZIT, Darmstadt University, Darmstadt, 1998.

A policy exercise was conducted with the participation of representatives from the European venture capital sector, dynamic small companies involved in developing energy and carbon saving technologies and the European Commission. Background studies produced a catalogue of relevant technologies in two major areas: household energy use and transportation. Different global economic and climate change policy scenarios were prepared. Participants assessed the opportunities for venture capital to invest in the relevant energy technology companies under those scenarios. This policy exercises was yet another demonstration that it is possible to engage 'serious' business people into a quasi-simulation/game-like environment if the content is of their interest and sufficient trust and substance is generated in the course of a well-designed preparations phase. This Working Paper is the fully documented report of the exercise.

Kasemir, B., Toth, F. L., and Masing, V., 'Venture capital and climate policy in Europe: Second example of specific stakeholder dialogues' in *Ulysses: Urban lifestyles, sustainability, and integrated environmental assessment*, Final Report. ZIT, Darmstadt University of Technology, Darmstadt, 1999, pp. 151–163.

This is a condensed version of the Toth et al. (1998) report on the venture capital policy exercise.

Kasemir, B., Toth, F. L., and Masing, V., 'Climate policy as a business opportunity for venture capital in Europe', *Journal of common market studies*, forthcoming, 2000.

This paper builds on the venture capital policy exercise by Toth et al. (1998) and provides an extended analysis from the perspectives of European policies.

Takkenberg, C. A. T., 'Policy exercise, (group) decision support' in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D., (eds.) *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts.* Pergamon Press, Oxford, 1989, pp. 169–171.

Policy is considered as a sort of planning. Planning is the most basic management function and requires the designation of goals and the selection of alternatives throughout all levels and divisions of the organisation. Structuring the organisation as such, activating human resources within the framework of this structure, and the subsequent control processes require all planning. When we plan we decide in advance what must be done. The alternative to planning could only be something akin to random behaviour with frequent shifts in direction and inconsistent activity. A lack of planning on the part of management would be seen as surrendering to excessive attention to immediate problems — putting out fires — and erratic, ad hoc, and perhaps inconclusive decisions. Plans may be firm or flexible; they deal with goals and the means of achieving them. Objectives will be seen as special goals and to accomplish them, policies, rules and procedures may be used. These are all constraints or guidance that border the path leading to the objective. Policies are likely to take the form of general statements or understandings that serve to channel activity toward the objective. Rules and procedures are more rigid and more suitable for guiding short-term decision-making.
Policy exercise is a field where simulation and gaming come into action; often some form of decision support system will be used for interactive simulation. The gaming context for DSS is an effective one.

Underwood, Steven E., 'Structured participation in technology assessment: the policy exercise' in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D., (eds.), *Simulationg-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts.* Pergamon Press, Oxford, 1989, pp. 172–179.

This paper presents a new hybrid method with potential benefits for technology assessment. The policy exercise is a scenario development and assessment procedure that brings together stakeholders, policy experts, and institutional experts to synthesise and explore collective knowledge for policy making. The core of the method is a workshop where participants develop scenarios to forecast technological, environmental, and institutional events and to assess their potential impacts. This paper presents the concept for the policy exercise, describes the current research on methodological developments, and considers the implementation and possible benefits in the context of technology assessment.

Polic, Mario, and Wenzler, Ivo, 'Project definition gaming/ simulation exercise', pp. 180–188 in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts.* Pergamon Press, Oxford, 1989.

With the goal of contributing to the export competitiveness of Yugoslav economy, the Yugoslav Bank for International Economic Cooperation (Yubiec) has initiated a project intended to serve as a permanent basis for the formulation of Yubiec strategies. In view of the great complexity of the problem and the need for a multiple-perspective approach, a gaming/ simulation exercise was designed with a goal to define the project outline and organizational structure of the project. The exercise included a problem definition workshop and the running of the Yubiec game. Both were attended by a team of Yubiec executives, and by experts from major research, business and government institutions. Based on the workshop results and the different approaches taken, four distinct perspectives on the competitiveness of Yugoslav exports were formulated at the beginning of the game run. Because of effective communication among participants an appreciation for, and a consensus of the problems were generated. In addition joint proposals for possible solutions to certain key elements of Yugoslav export competitiveness were developed.

Underwood, Steven, E., and Duke, Richard, D., 'Decisions at the top: Gaming as an aid to formulating policy options' in Crookall,D., Greenblat,C. S., Coote, A., Klabbers, J. H. G., D R Watson, Eds., *Simulation — Gaming in the Late 1980s*. Pergamon Press, Oxford, 1987, pp. 289–296.

The field of policy gaming — the application of gaming to strategy formulation in a non-military setting — needs a conceptual framework on which to develop sound design and application principles. In this paper we address this need by delineating some methodological requirements for a policy formulation technique and suggest some characteristics of gaming that meets these requirements. We trace the history of strategic gaining from World War II to the present, describing how the institutional environment has evolved during that period. Top level strategic problems in the 1980s are characterised by high levels of complexity, conflict, and risk; the effective management of strategic issues requiring managers to formulate policy with incomplete and qualitative information, ambiguous organisational goals, and little ability to predict outcomes. The traditional approaches of formulating policy formal modelling and expert assessment — are viewed as limited in this context. Policy gaming is proposed as an alternative approach that is more appropriate than the traditional approaches for exploring the structure and impacts of policy options in a complex and turbulent policy environment.

'Laurent Mermet policy exercises on global environmental problems', Crookall, D., and Arai, K., (eds.), *Global interdependence: Simulation and gaming perspectives*. Springer Verlag, Tokyo, 1992, pp. 216–222.

A network of scientists at and in connection with IIASA has been working for several years on the development of policy exercises (PEs) to explore the options available for acting on global environmental issues. A number of experimental workshops have shown that the methodology, which uses gaming techniques in a context of scientific research and of policy-making, has a high potential. It has made significant progress, but some basic problems remain, both in design and debriefing. The paper presents some pragmatic options for overcoming them in future developments of PEs. But these difficulties also point to deeper theoretical issues, which will have to be addressed fully if PEs are to reach their main objective, that is, to simulate the dynamics of global environmental problems.

Wysk, Radiger, B., 'A computer- supported meeting environment for policy exercises', pp. 230–237 in Crookall, D., and Arai, K., (eds.), *Global interdependence: Simulation and gaming perspectives*. Springer Verlag, Tokyo, 1992.

Complex and long-range issues present significant challenges to policy-making methods such as computerized models and expert panels. Policy exercises are recognised as a more open and appropriate way to synthesise information, tools, and methods in policy-making. From brainstorming to questionnaires, from group dictionary to stakeholder identification, more tools and methods are now automated and/or supported. This article, after reviewing policy exercises, describes a computer-supported meeting environment (COSME) framework and evaluates the use of that information technology to support policy exercises. A possible extension of policy exercises to electronic meeting systems with global reach is mentioned.

Joldersma, Cisca, Geurts, Jac L., Vermaas, Juliette and Heyne, Gerton, 'A policy exercise for the Dutch health care system for the elderly', in Crookall, D., and Arai, K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed*. SAGE Publications, Thousand Oaks, 1995, pp. 111–121.

In the Dutch healthcare system, a number of profound changes are taking place. Relations between parties in the field of health care are becoming less regulated by government intervention and more dependent on market forces. To survive in this new structure of health care, actors must alter their strategies. A policy exercise (PE) is a useful tool for learning to deal with such a situation. A PE can be defined as a deliberate procedure in which goals and objectives are systematically clarified and strategic alternatives are invented and evaluated in terms of the values at stake. The exercise is a preparatory activity for

effective participation in official decisions. A PE offers a set of players in a policy network the possibility of exploring structural changes and finding ways to react to these changes. In this paper, a PE is described involving a gaming/simulation of chronic health care of the elderly in a Dutch region from 1990 to 2000. The game, called Diagnost, elaborates on a previously developed health care gaming/simulation. In contrast to the closed character of this earlier game, the underlying idea of Diagnost was that a gaming/simulation with an open, free-form structure should be developed. The driving force for developing an open game was a healthcare PE previously developed in Great Britain.

Klabbers, J. H. G., Swart, R. J., Van Ulden, A. P., and Vellinga, Pier, 'Climate policy: management of organised complexity through gaming', Crookall, D., and Arai, K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed.* SAGE Publications, Thousand Oaks, 1995, pp. 122–133.

Government and industry policy makers and individual consumers base their response to the climate change issue on the balance between three types of considerations: perceived risks of climate change, socioeconomic and technological feasibility of response options, and ethical aspects of an equitable distribution of responsibilities among different social actors. Especially in industrialized countries, they are overwhelmed by a profusion of complex and sometimes contradictory information from the scientific community. Internationally, the Intergovernmental Panel on Climate Change (IPCC) prepares assessments that synthesize, integrate, and evaluate scientific knowledge in support of the policy-making process. Notwithstanding the consensus building objectives of the Panel, the value-laden debate about the IPCC assessment reports and their policy maker summaries indicates that this is a tricky task. In the Netherlands, the National Research Programme on global air pollution and climate change (NRP) was started in 1990, its main objective being to support scientific research that contributes to the policy debate. In the Netherlands, climate change is an established environmental policy theme, and in the 1990 National Environmental Policy Plan, greenhouse gas emissions targets were formulated. Gradually, it became evident that reaching these targets did not mesh easily with socioeconomic objectives. Policy makers addressed the scientific community to gather usable information about the risks and response options related to climate change.

Wenzler, Ivo, Willems, Rob, and Van 't Noordende, A. M., 'A policy exercise for the Dutch power industry', Crookall, D., and Arai,K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed.* SAGE Publications, Thousand Oaks, 1995, pp. 143–150.

In recent years, the Dutch electricity production and distribution industry has come under increasing pressure to move toward a more market-oriented system. The process of European integration is accompanied by phrases like single market, competition, and internationalisation. Whereas the European Commission strives for more competition, free access to European markets, and higher transparency of pricing, the Dutch electric power industry has exclusive rights over energy distribution and pooling of production costs. Whether or not the European single market will eventually happen is as yet unknown. Nevertheless, the clients considered it wise to explore what effects such a market would have on the electricity industry in the Netherlands. The authors were asked to develop a policy exercise that would simulate an electric power industry in which the changes proposed by the European Commission were already implemented.

Annex 2: The focus group technique

1. Objectives and main characteristics

The focus group technique is primarily a tool for information acquisition by triggering participants with well-designed questions, listening to their discussions and learning from them. Several lines of communication are created as a focus group session: first, between the moderator and the participants and second, among the participants. This communication is inherent to the focus group. It is embedded into a broader context of directing the discussion process and filtering the emerging information: (a) organisers select the topics they want to hear to be discussed; (b) a discussion evolves among the participants by triggering new questions as they respond to previous ones; (c) organisers interpret, summarise and condense the information gathered from the focus group discussion.

The original concept of the focus group technique involves a unidirectional flow of information: from participants via the organisers to the client. In contrast, most focus group applications likely to be implemented by/for the EEA would emphasize the involvement of participants into a larger project, such as the state of the environment and outlook report. This means that participants (both the main clients of the EEA and the group of other users) function not only as a simple information source, but they also expect feedback on the outcome of the sessions, the use of the information and recommendations they provided, etc. Nevertheless, the general features and procedures of the focus group technique remain valid. They are presented in this annex.

Focus groups belong to the large family of qualitative research methods. As such, they use guided group discussions to generate a rich understanding of participants' experiences and beliefs. Focus groups draw on three of the fundamental strengths that are shared by all qualitative methods: (1) exploration and discovery; (2) context and depth; and (3) interpretation. For each of these three general strengths, focus groups emphasise the specific features that stem from collecting qualitative data through group discussions.

Qualitative methods are especially useful for exploration and discovery. Focus groups are frequently used to learn about either topics or groups of people that are poorly understood. Because the group itself can carry on a conversation about what interests its members, it is possible for the organisers to start a discussion even when they know very little about the topic. Focus groups are one of the few forms of information acquisition where the organisers can learn a lot without really knowing what questions they exactly want to raise. Experience with focus group applications shows that exercising less control over the groups will lead to wide-ranging, haphazard discussions. However, in some cases this may be exactly what the organisers want when their goals are exploratory and they probe a yet unfamiliar field.

Context and depth help the organisers and thus the clients understand the background behind participants' thoughts and experiences. Focus groups get at these complex influences by encouraging participants to investigate the ways that they are both similar to and different from each other.

Another feature of qualitative methods explicitly present in the focus group technique is interpretation. These techniques provide an understanding of why

events tend to unfold the way they usually do and what are their implications. In focus groups, the participants want to understand each other: How can two seemingly similar people have very different experiences? How can two apparently differing people share very similar views and beliefs? These are the kinds of encounters that make participants interested in finding out about each other, and those discussions provide organisers with the interpretive insights that they are seeking.

Focus groups enhance these general characteristics of qualitative methods by engaging participants in a discussion and create a process of sharing and comparing among them. If a focus group session is running well, the participants will do the work of exploration and discovery for the organisers in a lively group conversation. Similarly, participants will not only investigate issues of context and depth but will also generate their own interpretations of the topics that come up in their discussions.

By comparing the focus group technique to the best-known contemporary research method, the survey questionnaire, the following observations can be made. Both surveys and focus groups are techniques for gathering information from people. In both cases, the organisers select the interview topics, and the survey respondents or focus group participants provide the data. Once the data are collected, it is up to the organisers to analyse this information and relate the results to the original research questions. However, there are some differences as well. In surveys, there are well-defined sampling procedures that rely on statistical formulas. In focus groups, the organisers use their judgment to select participants who meet the needs of a particular project. Surveys use a fixed set of questions, and every respondent is asked exactly the same questions, with exactly the same set of predetermined response options. Focus groups allow considerable flexibility in how questions are asked from group to group; in addition, the nature of the responses is inherently up to the participants themselves. When it comes to analysis, surveys lend themselves to numerical summaries that reduce the data to tables and figures. The analysis of focus groups, however, involves a more subjective process of listening to and making sense of what was said in the groups.

A key distinctive feature of the focus group technique compared to any form of interview is that by using group discussions to generate data in a focus group, organisers learn a great deal about the range of experiences and opinions in the group. They do not, however, learn all that much about each specific individual as in interviews. For example if a focus group consists of six people discussing some five questions for a total of 90 minutes, each participant will be peaking for 3 minutes per question, on average. As a result, the amount of data that one can obtain from each individual participant will necessarily be limited. Even the briefest individual interview produces far more data about a single person than one would get from an equivalent group interview.

2. Participants and procedures

Focus groups are initiated by a client who commissions an organising team to design and implement a project for a well-defined expectation. Even when the groups are intended to explore a new field, they are still focused on the organiser team's interests. In essence, focus groups are special occasions devoted to gathering data on specific topics. A fair amount of planning goes into focus groups. The organising team determines not only what the questions will be but also who will attend the group. Rather than attempting to observe behaviour as it

naturally occurs, focus groups create concentrated conversations that might never occur in the 'real world.'

In focus group sessions, it is up to the organisers to create a set of group dynamics that serves their objectives. The client who commissioned the focus group project can assign different leadership styles for the moderator and the organisers can create an agenda through the topics in the session guide. Depending on the project objectives, the group discussion may be relatively unstructured and open-ended with the moderator facilitating the participants' wide-ranging explorations of their thoughts and experiences. Alternatively, the client may prefer to have the moderator lead a more structured discussion that provides depth and detail on exactly the questions central to the client's interest.

In designing a specific focus group project, the following tasks need to be resolved:
— define clearly the objectives and function of the focus group project;
— determine the size of the project and the strategy for its implementation (number and size of sessions, tasks and required size of the organizing team);
— identify the possible range of participants (target groups and information sources);
— design the data collection procedure (topics, main thread of the group discussion, key questions through the thread; data recording: note-taker, audio or video recording);
— plan and prepare the analysis and reporting process (excerpts or full transcripts, coding and/or sorting schemes, synthesis and conclusions; report to whom, in what form).

It sounds more than obvious, yet ignoring this basic rule often causes trouble: the project objectives must be clearly set. The client and the organisers must have a clear and shared understanding of what the project is supposed to accomplish. This should guide all subsequent decisions designing and implementing the project. The design process outlined above will inevitably raise the following questions:
— Can the project be implemented by using in-house resources, or does it require outside experts?
— Who should be involved as participants and how to engage them?
— Will the focus group sessions work better with larger groups (more than 8-10 participants) or smaller ones (up to 8 participants)?
— Does the given project require more group sessions (7 and above), or is a smaller number of sessions (up to 6) is sufficient?
— Does the client require an oral presentation, or is there a detailed written report needed?

The key decision to make jointly by the client and the organisers in designing a project concerns the arrangement of sessions. Typical focus group sessions in which participants discuss a relatively simple, well-focused topic would be completed in one session that last about 2-3 hours. More complex topics may require half-day or full-day sessions. Many projects have arranged a series of 4–6 sessions, each taking about three hours, which required participants to gather once a week for several weeks. It depends on the nature of the project and the relationship between the client/organisers and the participants whether committing a full day to a session is possible or regular meetings over several days or weeks is the more practical solution.

For most conceivable focus group projects to be arranged for the EEA, full-day or longer sessions are likely to be the practical solution. First, participants have a special relation to the Agency and have often stakes in the project to which they are expected to contribute. This makes it possible to commit them for a day or two to participate in a session. Second, the geographical spread of participants and the need to travel to the session venue makes it necessary to organise sessions in a condensed form.

Ideally, in the moment of conceiving and agreeing on to do the project, the client and the organisers should define the ultimate products from the project and the purposes that these products will serve. Who is the final report for? What kind of objectives will the report serve? The project should be designed with the final report in mind that will be useful to the client and worth the investment.

3. Implementation

The first step in planning a focus group project is to think through the process as a whole. Regardless of the size of the project and the circumstances of its implementation, the four main steps of a focus group project are planning, recruiting participants, moderating the sessions, and analysing the assembled data and reporting the project results.

Planning a focus group project
The overall plan for the focus group project is developed in close collaboration with the client. This provides an opportunity to double-check whether the focus group technique is really the most appropriate one for the client's objectives and to refine the client's expectations regarding the outcome of the project and the content of the final report. The planning stage produces a general blueprint for the whole project, but leaves sufficient flexibility for modifications should the need arise.

The most important items to resolve in the planning process are the following:
— define the objectives and expected products of the project;
— define the role of the client in the whole process;
— estimate personnel and staffing resources;
— Prepare the timeline for all project activities
— identify the relevant range of participants in the project;
— prepare the questions for the session guide;
— develop a recruitment plan to commit participants;
— choose the venue and time for the sessions;
— prepare a plan for the data analysis;
— develop an extended outline for the final report.

The timeline for the planning process can vary considerably, depending on both the size of the project and the size of the organizing team. One recommended way to determine the difficulty of the planning process is to prepare a provisional timeline. If planning this timeline turns out to be easy, then the rest of the planning process is likely to be equally straightforward. In the opposite case when the action-participant-timing issues are difficult to sort out, then this is a clear sign that more precise specification of the project with the client is required and more time for planning will be needed.

It is clear from the above that it is crucial to allow adequate time for thoughtful discussions between the client and the organisers in the planning stage. The principal decisions that the client will need to make include the project's objectives, the resources made available for implementation, the questions for the

session guide, and the expected final product(s). Depending on the nature of the project, the client may also need to endorse the recruitment plan, the choice of moderator(s), the logistics for the group sessions, and whether some additional input should be used at the sessions. This means that the client and the organizing team need a clear understanding of each other's roles and responsibilities.

Recruiting participants

Developing a recruitment plan is a key step in the planning process. Therefore it is important to devote sufficient time and effort to recruitment, even for small projects. The special tasks during the recruitment phase are the following:

— identify the target group;
— demarcate segments within the target group;
— define the appropriate composition for each discussion group;
— elaborate competence and exclusion criteria for individual participants;
— draft invitation texts and attachments providing background information about the project;
— contact potential participants;
— develop a follow-up procedures that will ensure that invitees will attend.

Recruitment can be a tedious and time-consuming process for focus group projects involving representatives of the general public. In the case of the EEA, the range of potential participants is relatively well defined, even if it can be large and diverse for some projects, such as the state of the environment and outlook report. Regular contacts between the EEA and the invitees and connections beyond the given focus group project minimize the risk most common to focus groups in general, namely that invitees who promised to participate would not show up after all. EEA and European Union regulations also provide the framework for resolving another delicate issue in the recruitment, which is whether participants should receive honoraria and, if so, how much.

Moderating the focus group sessions

Focus groups are by definition moderated small-group discussions. Guiding the participants' discussions and steering them in the planned direction is certainly the most exciting part of the process. These small-group discussions provide the data to answer the questions raised by the client. But effective discussions require a well-structured set of good questions, successful recruitment of the appropriate participants and a good moderator who can strike the right balance between the pre-defined guidelines and the spontaneously evolving group dynamics.

The moderator's role can be very different in focus group projects. In many cases, the moderator is a member of the organizing team and works with the client to design the project from its inception. In other cases the moderator is an independent professional specifically hired by the client or by the organisers to facilitate the focus group sessions. In either case, the following issues have to be resolved regarding the moderator's role and the moderating style:

— specify the role of the moderator;
— determine whether one or more moderators will be needed for the project;
— prepare specifically trained moderators or hired professional moderators for the sessions;
— draft the questions for the session guide;
— identify external input to be used in the sessions;
— specify the client's involvement in the sessions (presence, active vs. passive);
— organise the logistics for the session: meeting room, recording equipment, etc.;
— decide about field notes generated by the moderator or an assistant.

The most crucial part of the project for the moderator is the session in which the small-group discussion takes place. There is often a trade-off between selecting a member of the organising team to become the moderator and bringing in an external professional moderator. In the first case, the quality of the discussions may suffer while in the second case insufficient understanding of the project objectives is a serious risk. Even when the moderator is hired explicitly for this limited role, his or her responsibilities extend beyond the actual moderation. Before the sessions start, the moderator needs to understand what the goals of the projects are, who the participants are, and what are the key ideas and objectives behind the session guide. Ideally, the moderator should take part in developing the session guide. The moderator is also an important source of information by reporting his/her observations in the debriefing that follows each session.

Analysing and reporting results. As indicated in the planning step above, it is crucial to conceive the whole project with a clear vision of the final product. The best way to keep the project on target, to avoid collecting irrelevant data or taking the analysis in the wrong direction is to keep in mind all the time what needs to be in the final report.

The analysis phase starts by reconfirming the scope and purpose of the project. This fosters reporting the most relevant results in the most useful form to the project's client. Any well-conceived focus group project, irrespective of its size, is likely to produce a large amount of data that must be tallied, assessed, interpreted, and summarised. The analysis and reporting phase involves the following activities:

— assess the amount of time devoted to analysis;
— sort all field notes, debriefing protocols, tapes, transcripts, and other data;
— process and analyse the data to derive the key conclusions;
— synthesise the results of the analysis according to the structure of the final report;
— write the final report;
— present the final report and the key results to the client.

The time required for the analysis varies considerably from project to project. It largely depends on the complexity of the issues addressed in the project and on the characteristics of the final report.

For a typical project, the analysis begins by reviewing the field notes and/or protocols of the debriefing sessions prepared after each group session. For simple projects, these documents might be sufficient for drafting the final report. For more complex projects, especially those involving about five or more sessions, the analysis will also include a detailed evaluation of the content of each session by listening to the audio recording or by reading detailed session notes or transcripts.

The time needed for writing the report per se and for presenting it to the client depends on the client's requirements. Several types of reports are commonly used: written only, oral only, or both written and oral. The effort needed for a written report also depends on how widely the client intends to circulate it. Requirements for a data- and fact-oriented report for internal use differ substantially from a report intended for wider distribution or formal publication.

It is important to recall at this point that planning and implementing a focus group project takes much more than simply running the small-group sessions. In most projects, the time required for moderating the session is far less than the time spent on the preparatory and follow-up activities. In addition to the excellent session moderation, it is fundamentally important that the client and the

organisers specify the right questions, identify the right participants, and have well-conceived plans for analysing the data. A successful focus group project requires careful attention to all of these issues.

4. Resource requirements

Compared to all other participatory integrated assessment methods, projects using the focus group technique can be implemented at a relatively modest cost. The costs of designing and preparing a focus group project, conducting and evaluating one or two experimental runs can be considered as fixed costs. The moving costs are determined by how many real sessions are actually needed and how expensive the logistics are, such as travel costs, meeting facilities, honoraria to participants, etc.

5. Selected and partially annotated literature

Most focus group applications are not reported in the open literature because they contain confidential business information or they are simply not interesting to a broader audience. Many focus group projects do not even produce a written report. The organising team makes a detailed oral presentation of the results to the client and thus the project is completed. The literature list below contains some good introductory literature on the concept and implementation of focus groups.

Krueger, R. A., *Focus groups: A practical guide for applied research.* SAGE Publications, Newbury Park, California, 1988.

This book is an excellent introduction to the focus group technique. It presents the conceptual foundations first. Then the book outlines the process of how to conduct a focus group project starting with the conceptualisation and question formulation. The moderator's role and style as well as the treatment of participants are given special attention. The description of he process closes with advice regarding the analysis and reporting of focus group results. The book devotes special chapters to applying the focus group technique in special situations and in consumer research.

Goldman, A. E., and McDonald, S. S., *The group depth interview: Principles and practice.* Prentice Hall, Englewood Cliffs, New Jersey, 1987.

Marshall, C. and Rossman, G. B., *Designing qualitative resea*rch. Sage, Thousand Oaks, California, 1995.

Merron, R. K., Fiske,M., and Kendall P. L., *The focused interview*, Free Press, New York, 1990.

Merron, R. K. and Kendall, P. L., 'The focused interview', *American Journal of Sociology* 51, 1946 pp.541–557.

Morgan, D. L., 'Focus groups', Hagan, J., and Cook, K. S. (eds.), *Annual Review of Sociology* (Vol. 22), Annual Reviews, Palo Alto, California, 1996, pp.129–152.

Morgan, D. L., 'Focus groups as qualitative research', Sage, Thousand Oaks, California,1997.

Greenbaum, T. L., *The practical handbook and guide to focus group research*, Heath, D. C., Lexington, MA, 1988.

Bertcher, H. J., *Group participation*, Sage, London, 1979.

Annex 3: The adaptive environmental assessment and management (AEAM) method

1. Objectives and main characteristics

The main purpose of the AEAM method is to provide a flexible, adaptive approach to environmental planning, assessment, and management. The AEAM method draws on a variety of modelling techniques to capture the essential biophysical and economic interactions, on policy analytic techniques to generate alternative policies, and on decision analytical techniques to evaluate policy consequences. Its procedures emphasise a sequence of interactive workshops whose purpose is to combine the strengths of expert, managers and policy-makers so that relevant knowledge is focused on policy questions leading to adaptive decision-making.

The workshop procedures and the qualitative and quantitative methods provide an effective way for the scientists and experts involved to develop a coherent expression of their understanding and coherent advice to the manager and administrator. Alternative policies emerge that are qualitatively different from those previously devised and an effective range of comprehensible choice is provided for decision.

A comprehensive albeit simple computer model is developed to analyse the policy problem. Sub-models are the parts of the full model. They are chosen to include variables, which interact tightly in a complex manner and at similar scales of space and time. The goal is to divide the problem into such sub-models so that relatively little information needs to be communicated between them. Those interconnections are absolutely key because they produce many of the unexpected policy effects as social, economic, resource, and biophysical aspects combine. They generate those surprises, crises and opportunities that cause so much trouble in resource and environmental management. These surprises come to light as sub-models are linked at the AEAM workshops and the implications of cross-scale and/or cross-sectoral effects are revealed.

In every workshop some of the experts push to represent their sub-model in exquisite detail. They are understandably motivated by scientific interests and not by policy ones. But that leads to a level of complexity and detail that typically prevents linkage of sub-models. This problem can be resolved by using the so-called ‘looking-outward matrix’. It is based on asking experts about what he needs from other experts’ sub-models for his own. That leads to a matrix that identifies the variables and units needed by each sub-model from others. Hence the interconnections between the parts are identified from the start. Reading the table one way identifies the inputs that a sub- model will receive. Reading the other way identifies the outputs that others require. In addition, each sub-group knows the actions that need to be incorporated and the indicators that have to be generated. The definition of inputs and actions and of outputs and indicators goes a remarkable distance in defining the contents and scale of each sub-model. And it gives an overview of the structure of the system that usually provides a better order and focus the research and policy effort.

Every AEAM project attempts to build a common conceptualisation of the problem among workshop participants. Workshops are used to structure the problem into its component parts. Each part comprises of characteristics, which interact at similar scales of time and space. These component parts become sub-models in the computer simulation model. Thus, each sub-model represents a constituency of knowledge about the problem. Much of the focus of activity at the workshop is designed to examine the interconnections between the sub-models. These interconnections are often neglected or insufficiently understood. Thus they form the principal source of surprises, crises and opportunities.

It is the construction of the computer model, rather than the model itself, which provides the substance of the AEAM process. In fact, models constructed at workshops are often discarded and never used again. If a similar problem is encountered, a new model is constructed. Nevertheless, models developed through the workshop process are sometimes used to represent the scope of the discussions during the workshops. The model provides a way of communicating the findings of a workshop.

The model is used to anchor the complex, and often elusive, nature of a problem into something substantive. The model provides a 'straw man' for criticism at subsequent workshops, rather than a tool for prediction or extensive analysis. The purpose of modelling is to advance the ability of workshop participants to appreciate the utility of different management options and to generate new options.

2. Participants and procedures

The organisation and implementation of an AEAM project involves four groups:

The project team
The 'project team' includes one or more representatives of the client organisation that wants to perform an assessment or to design and evaluate alternative policies concerning a natural resource or environmental problem. The problem could be as narrow as management of a specific fisheries or wildlife population or as broad as a regional analysis of a major development project that has broad social, economic, environmental, and resource consequences. In the case of the EEA, the agency would be the client and senior EEA staff responsible for the subject area would become members of the agency's project team.

The workshop staff
This is the group of four to six analysts who jointly have backgrounds in a number of different resource disciplines, are familiar with a spectrum of analytic modelling and policy analysis techniques, and have the expertise and experience to facilitate and guide groups of people in workshop settings.

The core planning group
This group consists of the leader of the 'project team' (project Chair), perhaps one or two of the senior staff members (to represent the client institution) and the workshop staff (to represent the implementation side). Their responsibility is to plan and set the sequence of activities, to identify institutional opportunities and problems, and to identify key participants in various institutions — experts, managers and policy people. The project Chair and workshop staff lead and guide the workshop(s).

The participants
The 'participants' are the experts, managers and decision-makers, typically from a number of institutions, who have key roles to play in technical or decision aspects of the problem. They are the ones invited to the first workshop. It is their professional expertise and experience that are orchestrated to produce a first cut model of the problem that is used to assign priorities for the information and data needs, model development and policy analysis.

The sequence of activities starts with a scoping session of one or two days involving only the core planning group. The problem is explored in some detail in order to develop an initial bounding of the problem: actors, actions, indicators, variables, spatial extent and resolution, time horizon and resolution. This scoping exercise is taken only that far as it is necessary to identify key participants and information needed for the first workshop. Responsibilities are assigned for the collection and organisation of existing information, for selection and invitation of participants and for organisation of the workshop itself.

That first workshop usually follows within two months after the scoping session. It takes five days and involves a dynamic process that moves from establishing the policy framework (actions and indicators), to interdisciplinary identification of variables, space and time and the interconnections between them, to development of sub-models by disciplinary groups, and finally to exploration of policy and information questions. The result is a set of priorities for information, for modelling, analysis and policy design, together with responsibilities to address those needs.

The first workshop is typically followed by a two to three-month period of independent work of the modelling team and leading to a second workshop with the same people to produce a refined analysis, model and policies, and priorities for subsequent steps. Again periods of independent work follow, paced and ordered by other workshops. Some of these are designed only for technical people in order to subject the work to criticism and to expose it to a larger technical audience who often have significant advisory roles in policy-making. Later workshops focus on a larger community of managers, decision-makers, and citizens. Throughout this process, the rules are to make everything as transparent as possible, to provide an interactive environment, and to modify the analysis, models and evaluation as new questions and suggestions emerge.

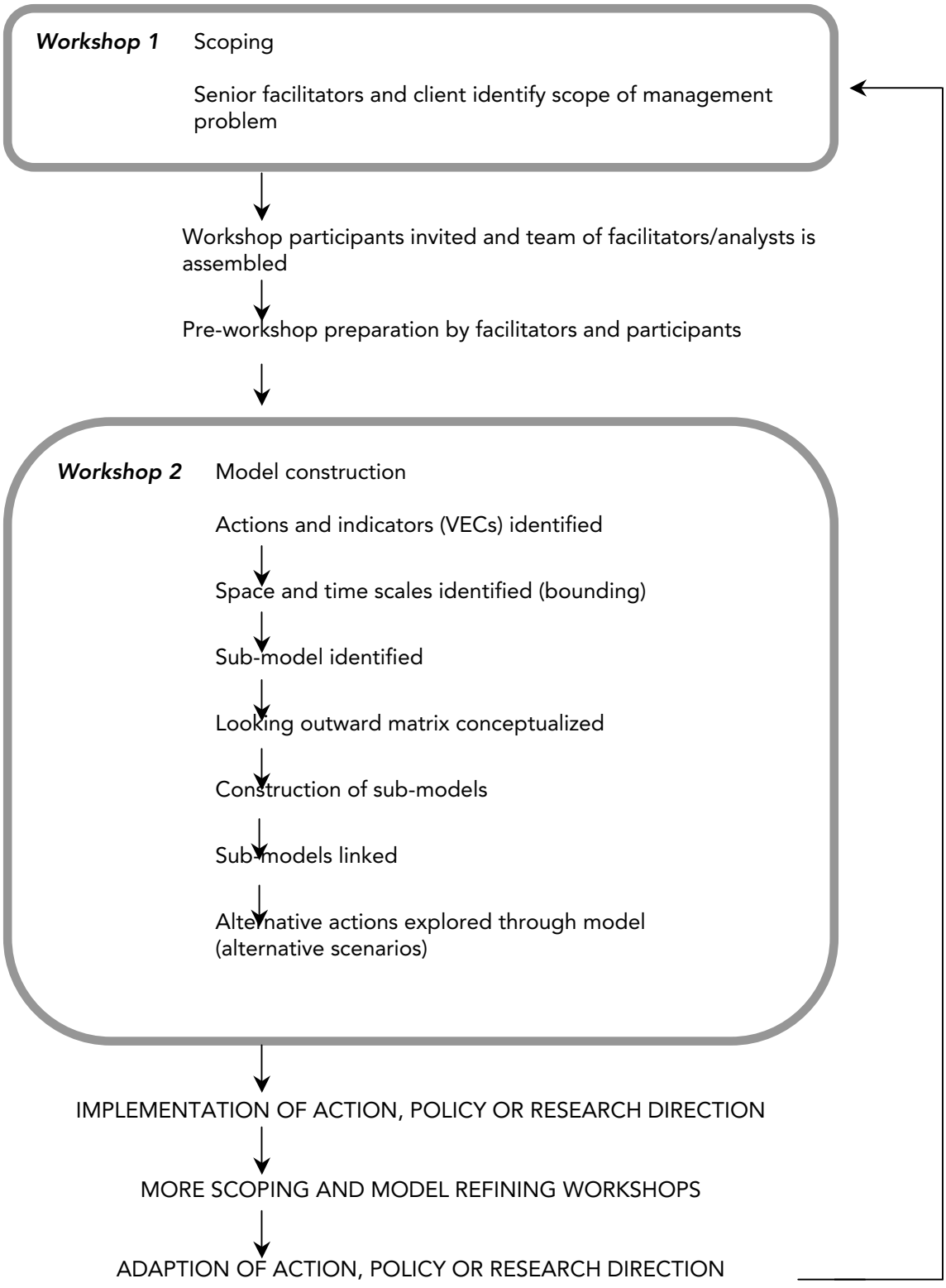
Numerous projects (see Section 5) using the AEAM method indicate that a small but flexible organisation involving the tightly organised core team and the more loosely integrated participants can address not only simple but also highly complex resource and environmental problems. A great synergy effect occurs through the network of participants that reduces the project costs, accelerates communication, and provides an early warning of problems. Innovation and learning are encouraged by the rhythm of intense short periods of interdisciplinary and policy analysis, interspersed with independent consolidation; the scheduling and focus of each workshop set the deadlines and pace.

3. Implementation

The implementation of an AEAM project (Figure A.1) begins with a first workshop attended by a small group of participants representing knowledge experts, managers, and policy makers. Typically about ten participants attend this scoping meeting. With the help of an experienced AEAM workshop facilitator, participants in this workshop identify the broad dimensions and nature of the environmental

management problem. A list of participants is put together for invitation to subsequent workshops that includes those who have scientific or management expertise in various aspects of the problem and possible management strategies.

Figure A.1: Procedural steps of an AEAM project



The scoping meeting is usually followed by a five-day workshop follows, which may involve up to 50 participants. Policy and research options are explored through the construction of a computer simulation model. The next phase after the model-building workshop is a period of independent research, involving collaborating individuals and participants, aimed at filling the gaps in knowledge and perspective identified. Depending on the complexity of the problem at hand, additional workshops may follow to clarify technical details raised during the model-building workshop. The model itself is sometimes also used to give further insight into the effectiveness and interrelationship of alternative policies.

The five-day model-building workshop often turns out to be difficult to implement. The intensity of the workshop generates enormous intellectual and emotional stress for participants and facilitators, which often reduces the productivity and effectiveness of the workshop. An additional problem is the difficulty of getting policy-makers and experts to stay in the same place at the same time for a period of five days. In practice many of the valuable resource people and policy makers are unable to attend the full five days.

In order to overcome these problems, the model-building workshop is often divided into two- or three-day sections. The period between the workshops is used for evaluation and preparations for the next workshop. This innovation of staged workshops has led to more productive interaction at workshops, and to the construction of better models. Discussion material resulting from the first workshop is typically distributed for review by participants during this time. It is important, however, to ensure that the time interval between the first and second workshop is sufficiently short to enable continuity and the sustained participation of workshop attendees.

Another important innovation has been the introduction of the concept of 'valued environmental components' (VECs) as a means of scoping the extent of the problem. In an early session of the first workshop, participants prepare a list of important features or services of the resource or environmental systems they are concerned with. This is the VEC list. In the next step, participants identify actions and processes that interact with VECs, this will be the so-called action-VEC matrix. The VECs are used as a guide in the construction of 'hypotheses of effect', conceptual links between alternative actions and indicators. The links provide the framework for the construction of the computer model, as well as for documentation of scientific evidence for and against a particular link. The hypotheses of effect provide not only a conceptual focus, but also the context for relevant research.

The 'hypothesis of effect' approach in the AEAM procedure has also meant that a computer model of the whole management problem is not always necessary. Only the most interesting or uncertain portions of the problem need to be modelled. Computer models can be used for exploring particular links in a hypothesis, or for integrating all the hypotheses. In addition, experts and other resource persons can be brought in to address specific links or specific hypotheses.

While the hypothesis of effect approach usually leads to more efficient use of resource persons and more effective documentation of existing knowledge, it sometimes results in an increased fragmentation of the problem. The loss of a holistic view of the problem among participants endangers the ability of the AEAM procedure to fully explore the range of alternative policies.

The lack of reliable data, or in some cases of any data, makes many problems difficult to model. The AEAM procedure has also been used in such situations to build conceptual models, which provide insights into the problem. Such workshops have proven successful in bringing together alternative viewpoints in a non-adversarial setting.

The key to a successful AEAM project is good organization and preparation among four groups:
— the 'client' (represented by a project team);
— the 'workshop staff' (4–5 trained facilitators and analysts);
— the core planning group (senior analysts and client staff);
— the participants.

Success is determined, to a large degree, by the ability of the workshop facilitators and the client to identify the general features of the problem and ensure the participation of the right invitees at the scoping meeting. Each participant at the workshop needs to be prepared in terms of what will happen at the workshop, and regarding his/her contribution based on the expertise in relation to the problem.

The success of an AEAM project, in terms of scrutiny of alternative management policies or research directions, is dependent on sustained and continuing involvement of participants. The most important skill the facilitator must have is the ability to draw out the imagination, expertise and enthusiasm of participants.

The most successful AEAM projects have been those, which explore policy and management alternatives prior to the introduction of a new policy or research direction. Attempts to use AEAM to evaluate or justify projects already under way, especially those with substantial committed financial and emotional capital, have been generally unproductive. In the EEA context, most promising candidates for AEAM applications would be exploratory projects in close collaboration with Directorate-General for the Environment, Nuclear Safety and Civil Protection, to prepare new information for policies or regulations. Newly added items to the state of the environment and outlook report could also be processed by a small-scale AEAM project and then integrated into the report.

The experience with large-scale applications of the AEAM method, in terms of numbers of agencies and participants, has shown that large applications are not only costly, but often turn out to be unnecessary. On the other hand, small-scale applications are often found to be ineffective. Such workshops tend to reinforce dogma and bury hidden assumptions and agendas deeper, and do not lead to critical appraisal of alternative assumptions and perceptions concerning the management problem. The most successful workshops are ones, which involve 40-50 participants, who represent a broad spectrum of expertise and constituency. Nevertheless, the right size of the workshop always depend on the nature of the problem and the institutional, policy, and management structure associated with it.

Successful workshops include representatives of all constituencies, interests and expertise in relation to the problem. A broad spectrum of attendees leads not only to enriched workshop discussions culminating in a better model, but also to more credible workshop products. It is particularly important to include a mixture of both experts and managers at a workshop. Experts are needed to keep the managers and policy-makers honest, while the managers are needed to keep the experts relevant. The attendance of public interest group representatives or

politicians can also lead to the inclusion of public perception of the problem in the model building, and in the evaluation of alternative management policies. Three classes of products are often identified at the conclusion of an AEAM workshop:

— reports and presentation packages;
— computer models;
— intangible products of communication and insight.

The output emphasised by most AEAM proponents is the intangible product of enhanced communication and understanding among workshop participants in relation to a particular problem. Accordingly, the AEAM method is identified as a process- rather than product-oriented methodology. The intangible benefit most appreciated by participants is a new insight into a particular problem and a holistic overview. Typically, participants come away from a workshop endowed with a sense of new meaning about their own activities in the context of the problem. In terms of the AEAM philosophy, participants will be better prepared for unexpected future events, which are both inevitable and unimaginable.

Applications of AEAM have always overtly tried to use visual methods to communicate, synthesise and summarise ideas and perspectives. Workshops often include short presentations by a participant of a particular idea or research activity. Workshop facilitators help through advice on visual aids and flip-chart summaries. Many AEAM projects have also included the production of slide shows, or subsequent presentations and discussions of the model. Reports of workshops are produced in a highly structured manner aiming at clarity of presentation.

4. Resource requirements

It is clear from the above that people are the most critical resource to successful applications of the AEAM method. The expertise of participants and the quality of their participation, rather than computer hardware or software, determine the success of an AEAM workshop in examining alternative management strategies. While it is the participants who determine the limits of an AEAM project in exploring the nature of and the possible range of solutions to a problem, it is the skill of the facilitators that determines how much is actually achieved. The facilitator is therefore crucial to maintaining a non-adversarial setting, and for extricating the knowledge, expertise and experience relevant to the better understanding and management of the problem.

Compared to other participatory methods, an AEAM project is a relatively expensive enterprise. The ultimate cost depends on how much external expertise needs to be hired for a project. If in-house models and/or modellers can be made available, they could work together with a usually external group with AEAM experience. Such arrangement could substantially reduce the costs. The usual minimum external requirement is some AEAM expert staff and workshop facilitators. The main cost items include the workshop costs (number and size of the workshops required for the project), the workshop organisation and facilitation costs, and the costs of the modelling and analysis team to do the necessary work between the workshops and to prepare the final reports.

5. Selected and partly annotated literature

Holling, C. S., (ed.), *Adaptive environmental assessment and management*. John Wiley and Sons, Chichester, 1978.

This is the classic book on AEAM by the team around C. S. Holling developed and experimented with early versions of the AEAM approach. The book provides a detailed presentation of the conceptual foundations, procedures and various modelling techniques adopted. Thorough discussions lead interested readers and future practitioners through some introductory text on ecosystem dynamics, the main phases of the AEAM procedure, the criteria to use when choosing the assessment technique, the associated requirements for simplification to foster understanding, and the evaluation of policy options. Detailed case study presentations provide additional insights and sources of ideas for future applications. The list includes the spruce budworm and forest management problem in Canada, managing the salmon stock in the Pacific, resource and environmental conflicts arising from tourism growth in Obergurgl, Austria, and broader regional development issues in Venezuela.

ESSA (Environmental and social systems analysts), Review and evaluation — adaptive environmental assessment and management, Environment Canada, Vancouver, 1983.

This collection of essays take a thorough look at the experience accumulated in the first years of applying the AEAM technique to a diverse range of environmental and natural resource management problems.

Clark, W. C., Jones, D. D., and Holling, C. S., 'Lessons for ecological policy design: a case study of ecosystem management' *Ecological modelling 7*, 1979, pp.1–53.

Walters, C. J., 'An interdisciplinary approach to development of watershed simulation models', *Technological forecasting and social change 6*, 1974, pp. 299–323.

Posey,C. (1982) AEAM upon AEAM: adaptation options (1982 Spring), International Institute for Applied Systems Analysis, Laxenburg, Austria

Annex 4: Simulation-gaming techniques

1. Objectives and main characteristics

Simulation-gaming techniques involve a mixture of various elements of a game, and a simulation or analogue, and some aspect of reality. This mixture provides the context in which people play roles and make decisions pertinent to these roles. Definition of roles can lie anywhere in the spectrum from abstract/symbolic to realistic. Constraints on decision-making behaviour can be a priori prescribed in pre-specified rules or may emerge during a simulation-gaming exercise as a result of roles interacting with each other.

Simulation-gaming techniques usually include some kind of a scenario or model. They also reproduce aspects of the environment within which the decision-making roles have to be performed. In the course of simulations or games, participants assess the relevance of these aspects from the perspectives of their assumed role. As in the case of role definition, elements of a simulation can be defined on a continuum from abstract/symbolic situations to fairly realistic situations.

The essence of the simulation-gaming techniques is the interaction of decision-makers within a simulated environment. The central and distinctive nature of simulation gaming is the evolving decision-making behaviour of players in their assumed or assigned roles. In the course of an exercise, learning involves changes in or reinforcement of the understanding and perceptions of the role-players. Simulation-gaming differs from most other learning situations in that it is non-linear in character. There is no pre-defined sequence of steps leading to production of any given outcome. This is true even in those cases where the exercise has a well-defined objective stated in terms of knowledge or skills to be learned.

The complex nature of interactions between the scenario or model and the players means that it is impossible to predict how an exercise will unfold. Intuition and the use of value judgments can be as important as expertise or rational behaviour. The interaction of these diverse bases for decision-making is in marked contrast to the ordered approach that characterises formal educational settings, and the scientific and analytical approach. It is the mixture of diverse bases for decision-making and the possibilities inherent in their interaction that give simulation-gaming its potential richness as an exploratory and/or learning environment. In addition to obtaining accepted and habitual answers to problems, simulation-gaming provides opportunities for developing new insights, which can lead to innovative responses to problems

All decision-making is ultimately concerned with the future. Decisions are either responses to changes or attempts to initiate a change. If there were no possibility of change, decision-making would be redundant. Simulation-gaming techniques give participants the opportunity to develop an awareness of the impact that their decisions and those of others can have on the process of change. The development of such awareness takes place in an environment where responsibility for decisions and their consequences interacts with decisions made by other players. Simple learning is replaced by a process of exploration in which the learner assumes the responsibility for what is learned. In this sense, the

participant in a simulation-gaming exercise becomes the authority rather than submitting to authority.

The flexibility involved in most simulation-gaming techniques means that the initial definitions of roles and scenario can be stated in minimal terms providing a set of reference points for role-players rather than imposing constraints upon them. In the course of playing the game, progress of an exercise is not determined solely by the outcome of models containing the designer's perceptions of relationships and their nature. This means that outcomes are not solely the result of feeding new quantitative data into a set of equations. The flexibility built into the structure means that the importance of changes in values of variables is equal to that of the possibility of change in the nature of relationships between variables.

The use of models that embody the perceptions of people involved in the design process introduces participants to possible implications of decision making based on the use of their perceptions in an interactive situation, enabling implicit assumptions to be examined in a dynamic setting. When the exercises are used in an educational setting, they allow students to gain insights into the perceptions of the designer into decision-making.

2. Participants and procedures

Given the immense diversity of simulation-gaming techniques, it is impossible to provide a general description of the participants involved and of the procedures in which they interact. Therefore, a sub-field in simulation-gaming, free-form gaming has been selected to provide a comprehensive overview of a game process.

Brewer and Shubik (1979) define a free-form game as:
… a scenario-based game in which opposing teams of human participants are confronted with a generally realistic situation or problem and work out responses both to the situation and to moves made by their opponents.
The initial development of free-form manual games was directed toward the examination of political, diplomatic and military issues that arise in the course of international conflict. Military games, being developed particularity during the late 1950s and early 1960s, represent an attempt to integrate intangible or non-quantifiable political and social factors into strategic planning.

These games are designed to provide a forum for key officials in relevant fields to discuss ideas, examine controversial programs, objectives and policies, and develop new approaches to the resolution of anticipated future problems. The purpose of the games is to prepare the players for future research, analysis and operational responsibility by sensitising them to alternate points of view, by encouraging creative and innovative thinking about problems that defy treatment with traditional analytic methods. Other uses for the games include training, teaching, operational gaming (e.g. policy formation, dress rehearsals, and gaming for sensitivity analysis), experimentation and futures studies.

The five basic phases of the manual free-form game include preparing, starting the conflict, playing, exploring branches and ending play. The games are designed to represent a plausible future conflict situation, and are played in teams under the direction of a control or referee group. free-form games generally involve conflict situations between sets of human opponents, but can also be adapted to play out conflicts between human development and the environment. The game scenario serves as a description of the background events which have contributed to the development of the conflict and which act as a source of

information during the play of the game. Each team decides on its moves in response to the moves taken by the other teams, information in the scenario and directions from the control group. The control team serves to coordinate the actions and reactions of the teams during the game.

Preparation for the game includes specifying its purpose and collecting data for use in the scenario, the game itself, and for ready reference during the game. Preparation includes developing the scenario as well as checking it to insure that it is both interesting and plausible. The scenario is then given to the players together with operational instructions, which also include clear objectives. The time required to prepare the players for the game session varies, but it is generally a function of the expertise of the individuals selected to participate.

The start of the conflict may occur in one of two ways. It may be part of the scenario itself (i.e., the scenario presents the teams with an emerging or ongoing conflict situation and they make decisions in an attempt to resolve it), or the conflict may be introduced in response to preliminary moves by the opposing teams. deLeon (1981) describes the former case as the 'scenario goad' and recommends it for players who are less experienced with the subject matter. In the latter case, the teams move in response to conditions set in the scenario but the control group takes an active role in interpreting and directing their moves to provoke the desired conflict, crisis or confrontation. deLeon (1981) terms this case as the 'control goad' and cautions that it may cause the players to see the control group as their major adversary during the game.

The number of moves in the actual game play may vary. Each team formulates its own moves after considering its alternatives, objectives and constraints. The time involved in formulating a move depends on the purpose and structure of the particular game. The moves may be submitted to the control group in a detailed and formal format or in a less formal format, which includes a statement of intentions, actions taken and requests for information.

While the control group is reviewing the moves submitted by the players, the teams have an opportunity to collect intelligence, consider their next moves and prepare contingency plans. This is a time when the teams are able to examine branch points. Branch points are defined as the logical development of courses considered seriously by one of the teams but not actually submitted as a formal move. These branch points can be analysed either during the game by outside analysts or recorded and included in the detailed post game analyses.

The endplay may occur in different ways. Endplay may have been set after a specific number of moves determined prior to the commencement of the game. game ends when the players have depleted all of their resources. The control group can end the game, or the game may come to a natural end agreed upon by all participants.

The role of the control group is to review all of the moves submitted by the teams and determine the likely outcomes of their interaction. The control group has the authority to question a decision or actually prevent any individual or team from making a move. The general outline of the functions of the control group is the following:

(1) highest echelon political control of each team (and so of the game); (2) adjudication of the credibility, relevance, and materiality of the plans submitted by the teams; (3) evaluation of operational and logistics feasibility of plans and

moves; (4) evaluation of move outcomes; (5) supply of the finished end-product of combat intelligence to the teams, based partly on team collection activities, at the appropriate suspense times; (6) maintenance of the 'pacing' (realistic time, space, and decision scaling) of the game; and (7) maintenance of the 'integrity' of the game (e.g., so that destroyed bridges are not crossed immediately. The control team also is assigned the role of nature (i.e. fate), that is, to determine everything not explicitly treated in a game's scenario or assigned to the participating teams.

The players are selected according to the various skills and perspectives they can contribute to the game. It is important to recruit competent professionals as players. This situation is analogous to that in chess or other games, when inferior players tend to consolidate their own bad habits rather than being stimulated to improved or inspired play. In any collective intellectual endeavour the results cannot be expected to be any better than those who produce them. The players' role is to make decisions regarding alternative choices in an attempt to resolve the conflict. They submit their moves to the control group, but they are allowed to challenge the directives of the control group.

Scenarios are explicitly used as part of the free-form games. The scenarios employed in free-form games are usually complex, elaborate and fully articulated. They represents an account of a potential context or situation and are designed specifically for use in the game. In a given game, the scenario informs the participants what has happened and describes the environment in which it happened. It thus represents the initial conditions of some situation and provides time-based clues to indicate the most likely sequencing and interaction of events. The scenario should circumscribe the bounds and structure for the game context as explicitly as possible and in a manner that exposes all the terms of reference for easy perusal by all participants. The scenario should not violate common sense and should be credible, consistent, intellectually satisfying (i.e. interesting enough to hold the players attention) and plausible (e.g. no unexplained leaps). Since scenarios rely heavily on verbal depiction, they are accessible and easily altered. They are tentative and contingent and, in this sense, they are future oriented.

Technical support is utilised in free-form games for four basic purposes. First, many free-form games use technical support to manage data collected during the games. Second, the control team may require computer models and simulations to rapidly assess the outcome of moves. Finally, technical support should be used to provide the participants with a vivid sense of the whole scenario. The use of maps, drawings, graphs and pictures will make the scenario even more accessible to all of the participants. Calculations concerning the outcome of interactions may also require technical assistance.

The formal feedback procedure commences once the game is officially concluded. At this time, the control team produces a summary of the game. During a subsequent debriefing process, the game is discussed with all of the participants. They recapitulate the game's key features and try to determine what has been learned and if the initial purposes and goals have been realised. This feedback process includes a detailed criticism of the scenarios, the dynamics and the institutions and individuals involved. The feedback or 'analysis phase' can be broken down into three categories: outcome-oriented analysis, special analyses and follow-on work. More than one of these methods may be used simultaneously.

Free-from gaming techniques are directed toward better management of phenomena which are too complex to be precisely described or quantified and thus defy treatment by traditional scientific research methods. The biggest

strength of the free-form games is that they allow for the use of all available political and scientific information through the control group, and yet they can still include the elements of human decisions and judgements. These are also important requirements in the study of future collisions between human development and the environment, i.e., in the phase of developing outlooks in the state of the environment and outlook production process. In this context, the main advantage of a free-form game application would be the exploration of the propagation processes of an environmental crisis situation (such as the BSE problem) into many possible directions and of the ways different agencies responsible for specific aspects of the problem would interact to manage the crisis.

The scenarios employed in the free-form gaming technique are verbal descriptions that are both accessible and mutable, and not embedded in a computer-based model. Hence, they allow for complex problems and less likely (but perhaps more important) conflicts and events to be considered. Further, free-form games provide a framework within which experts in fields relevant to the problem can systematically apply and pool their individual ideas and techniques. As a result, gaming is conducive to allowing participation of individuals from different sectors, disciplines and nationalities.

The biggest weakness of the free-form gaming approach is the difficulty of attaining replicable results. games are not considered 'scientific' because they tend to generate too much unsystematic information for post-game analysis and provide few effective means for analysis. Data collection, measurement and analysis are not advisable during the course of a game because they disrupt the momentum and bias the outcomes.

3. The general design process of simulation-games

Problem definition

The design process always starts with the preparation of a detailed problem statement. This document is intended to determine why a game is needed, who is the client, what are the main objectives to be accomplished. The purpose can range as wide as exploring strategic development options in a high-level government agency, testing various marketing strategies in a company, introducing or teaching a concept or practicing what was learned in a school or university environment. The problem definition document should state in general terms what kind of explorative or instructional goals are expected the players of the game to achieve. These objectives typically include exploring new problems, gaining information or knowledge, acquiring new behaviours or skills, understanding new concepts, and making greater use of one's individual or institutional potentials. In teaching-training exercises, learning objectives state what the player of the game will be able to do after playing the gaming-simulation that they weren't able to do before playing the game.

The problem statement should also be clear about the subject matter of the simulation-game. This is sometimes referred to as the 'model' or the 'referent system'. This delineates the object of the game that is the piece of the 'real world' the simulation attempts to mirror. It is the machine, system, process, or theory that participants will come to better understand by playing the game. Therefore, the object is the subject matter content of the simulation. It is important that every member of the design team who will be involved in developing the gaming-simulation has a clear understanding of the referent system being imitated.

The problem definition document should also clarify the intended audience for the simulation-game. It is not necessarily the client who commissions the exercise. It is important that the game developers have a clear vision of the end users and customers throughout the development process. No successful design is possible without a clear identification of the client or a target audience and their key characteristics. Examples of key characteristics include: institutional setting, legal and/or administrative procedures in strategic decision games, and age, gender, educational background, computer literacy, work experience in teaching-training games..

The problem definition document should also consider the context of using the game. The main question is under what conditions will the game normally be used: repeatedly or only once, with or without a skilled game moderator, in a single session or in several sessions days or weeks apart.

Practical constraints
Before plunging into the development activities, an inventory of available resources should be taken because they will crucially affect the gaming possibilities. These constraints include the financial resources available for game design, construction and testing, available time for game development and for playing the game. Many games, especially the teaching-training types, use paraphernalia. Therefore, the materials required for the game (e.g. game pieces, paper and cardboard products, computer hardware and software, training rooms) and associated costs should also be considered.

Conceptual map
Simulation-games are intended to provide an inspiring environment for joint exploration of a problem (strategic games) or to convey a 'message' to the players (teaching-training games). In either case, the system, its components, characteristics, roles, linkages, themes, issues, or problems to be emphasized should all be clearly defined and elaborated.

To better visualise and define the relationships between the model's features and external forces, game designers often 'map out' the respective relationships. This can be done on a blackboard or a flip chart by mapping the key features of the model in the centre of the board/paper and the external forces around the periphery. Different types of lines can indicate the nature and strength of the linkages.

Gaming considerations
A diverse set of techniques is available in simulation-gaming. They include a large array of elements ranging from role types to procedural steps, which can be, assemble in creating a new game. In the design phase, game developers often consider possible modifications of existing games, they take ideas from different games and put them together.

The game structure refers to the game's key activities, order of play, and openness of communications. Three general types of structure include linear (individuals play the same roles, with similar resources, and attempt to achieve the same goals), radial (individuals roles are different, are played out in a scenario or social process), and interactive (individuals play multiple roles in an open free-flowing scenario).

The game structure is closely related to the style of the game, the level of abstraction used, the geographic and social scale, time horizon, game

management constraints, desirable protocols and administrative forms. Another related element is the players' relation to each other: are they working in groups or individually, in coalitions, or playing multiple roles. These features determine the nature (emotional or intellectual character) and the intensity (highly concentrated or with some slack) of the players' involvement and are tightly linked to the staging of the game: room requirements, warm-up exercises, free or controlled style of communication and game facilitation, the learning principles, the required number of playing cycles, the complexity of single cycles and the complete procedure.

The central component of the game design process involves finding the appropriate forms to represent each feature or element of the game's object. The main design elements available for getting various features in the game include scenarios, roles, procedures and rules, external factors, symbols, accounting systems. By adopting, modifying and mixing these elements, games acquire their own 'language' and each game has its own symbolic structure as a result. The complexity and characteristic of the game structure should be clearly defined (physical appearance, visual aids). The rules and procedures of games may be rigid, specified as requirements to orderly play or only partially existent. The steps of play show the complexity of playing a game (information flows within the game, records about them, time scale, duration of a cycle).

Concept report
A concept report prepared by the designer before the game construction is very useful. It should be a statement of the reality to be conveyed or objectives to be achieved through the game. It should also state who will review the concept report, in which phases of the game development, and how potential disputes will be solved. Having a carefully prepared and reviewed concept report usually results in smooth construction process.

Pre-player activities
These involve supplementary activities that usually accompany the game design process. The list includes specification of project management procedures like reports about various components, to whom, client's approval, etc. In some cases the different components of games must be separately designed and/or constructed and then assembled and tested. This process also needs thorough elaboration. Finally, clients and game developers should agree on what kind of reports are to be made about these processes to the client and whether approval is required.

Testing the game with players
The culminating phase of the game development process is testing. Testing procedures and criteria depend largely on the objectives and nature of the simulation-game and vary accordingly. Most games cannot be claimed as valid unless they have met the 'Rule of 10'. This means that the game must be run in at least ten live game sessions, the last three of which required no changes.

4. Resource requirements

Similarly to other participatory assessment techniques, the costs of a Simulation-Gaming project depend on the complexity of the problem to tackle and the preferred ways of implementation. Relatively simple free-from game projects could be accomplished at modest costs by hiring a good and skilled professional for a few months. Alternatively, more complex and ambitious game development projects might keep a team of several specialists busy for over a year. In either

case, intensive communication between the client and the game developer(s) is indispensable, which must be considered in the time budget of the client organisation as well.

5. Selected and partly annotated literature

(A) FREE-FORM GAMES

Affisco, John, F., and Chanin, Michael, N. (1990), 'An empirical investigation of integrated multi-criteria group decision models in a simulation/gaming context', *Simulation and gaming* 21(1), pp. 27–47.

This article prospects two models of group decision making that integrate mathematical and behavioural concepts. Further, the results of an empirical test of these two integrated spatial-proximity multi-criteria decision-making-problem-solving technology models are presented. The performance of these models is compared to the performance of a non-integrated multi-criteria model for two strategic operations decisions: plant location and process selection. The empirical test utilised free simulation methodology and was conducted in the context of the Business Management Laboratory simulation game. Results include the finding that both the integrated and non-integrated models generally described choices more accurately than a random process did. Findings relating the performance of the integrated models to that of the non-integrated model were mixed. For the process selection decision, one integrated model, TOPSIS-PST, outperformed the others. Additional results indicate that the number of decision criteria might be a critical factor to consider when selecting a multi-criteria decision-making model. Finally, the study showed free simulation to be a valuable methodology for the study of multi-criteria decision-making.

Lowell Bruce Anderson (1993), 'A heterogeneous shoot-look-shoot attrition process', *Simulation and gaming* 24(3), pp. 277–293.

Shoot-look-shoot attrition generally refers to cases in which the shooting side has (or can be adequately modelled as having) sufficient coordination among its shooters that it can assign any particular shooter to engage any particular target, engagements occur in succession, the shooting side can assess the results of each engagement before being required to fulfil succeeding assignments, and the shooting side can assign shooters who have not yet made an attack (or who are capable of making another attack) to engage only those targets that either have not yet been engaged or have survived all prior engagements against them. This article describes formulas used to simulate such shoot-look-shoot attrition processes in deterministic combat models.

Tomikura, Masaya (1998), 'Problems of designing GLOBAL simulation/games', *Simulation and gaming* 29(4), pp. 456–461.

GLOBAL simulation-games are role-playing exercises, simulating processes of international negotiation. If a GLOBAL simulation/game is conducted under a 'perfect' grand design based on well-formulated 'predictions' prepared by a group of modelling experts, the GLOBAL simulation/game may become just a repeated prediction or even a repeated 'belief' shared by this particular group of experts. Therefore, it seems preferable and more suitable to the nature of GLOBAL simulation/games to create a future scenario and to construct a design based on flexible conditions. To do so, the actors to be included in the simulation1game should be dependent on the emerging situation in the real world.

Quanjel, M. M. H., Willems, A. J., Talen, A. N. (1998) 'Crisislab: Evaluation and improvement of crisis management through simulation/gaming', *Simulation and gaming* 29(4), pp. 450-455.

In the field of disaster management, people realize that some kind of preparation on a disaster is necessary. The current management exercises lack realistic interaction, objective measurement of performance, structured feedback, and the building of shared mental models. At these points, simulation/games can generate added value. That is why Crisislab has been developed.

Rosenom, T., and Kofoed, Lise Busk (1998), 'Reflection in learning processes through simulation-gaming' *Simulation and gaming* 29(4), pp.432-440.

This article deals with the problems of changing the culture and values of persons involved in organizational or technological changes. The results of two learning experiments in 'experimentaria' are discussed. It is concluded that the 'experimentarium' seems to create a higher level of self-respect and respect for other person's skills and knowledge as well as a suitable environment for organizational learning. A higher level of feeling secure can be the result that will add to a better working environment.

Vissers Geert A. N. (1998), 'Studying organisational dynamics', *Simulation and gaming* 29(4), pp. 409-419.

The idea of process is prominent in organization theory but less so in research. Limited access to organisations is a likely explanation, particularly because process analysis often requires detailed data. Experimental research may provide the necessary data, if only a method is used that allows the situation under study to change as a result of actors' behaviours. Simulation/gaming meets this criterion. It allows for registration of interaction processes, and it enables experimental control of factors of interests. The method can be used to study organisational processes in detail and to explore how these processes are influenced by organizational strategies. In this article, results of process analysis derived from a simulation1game of a house-building company are presented.

Shigehisa Tsuchiya (1998) Simulation/gaming as an essential enabler of organisational change. *Simulation and gaming* 29(4), pp.400-408.

To cope with drastic changes and ambiguity, many companies are now trying to flatten their organisational structures, because a flat organisation can sense its customers' needs and respond quickly to changes in the markets. To flatten its organisational structure, a company has to loosen its couplings, giving its subsystems autonomy, and let them make their own decisions. However, autonomy without a clear central direction will only result in chaos. Commensurability provides central direction indispensable to a loosely coupled organisation. Simulating/gaming can facilitate organizational change by improving the commensurability of interpretative frameworks.

Nimet Beriker, Daniel Druckman (1996), 'Simulating the Lausanne Peace Negotiations, 1922-1923, power asymmetries in bargaining', *Simulation and gaming* 27(2), pp. 162–183.

The negotiation leading to the historic Lausanne Peace Treaty provides a setting for exploring the impacts of different power configurations on bargaining behaviour symmetric and asymmetric coalition structures existed on two key issues in the talks, passage through the straits and the question of civil fights for minorities. A content analysis of the transcripts showed some differences in bargaining behaviour between the two power structures. These structures were simulated and compared to a third condition, bilateral negotiations between parties of equal power. Opposing negotiators in the symmetric parties condition were more satisfied with the outcome, achieved faster resolutions, disagreed less, and made fewer competitive statements during the discussions than negotiators from these countries in the coalition conditions. Both similarities and differences were found in the comparison between the processes and outcomes in the actual and simulated negotiations. The results have implications for designing structures that improve negotiations and illustrate some advantages of experimental simulation.

John K. Butler, Jr. (1996), 'Two integrative win-win negotiating strategies', *Simulation and gaming* 27(3), pp. 387-392.

A theoretical foundation is developed for a negotiating role-play. Two integrative (win-win) negotiating strategies, logrolling and bridging, are discussed The dual concern model provides a conceptual perspective for comparing and contrasting the two strategies. Refocusing on underlying interests is seen as the condition that differentiates bridging from logrolling. Existing role-playing exercises with logrolling or bridging potential are briefly described.

Schwalbe, Stephen, R. (1993) 'War gaming: in need of context', *Simulation and gaming* 24(3): pp. 314-320.

Because of the accelerated pace of change in the world's political environment since 1985, war game scenarios quickly became obsolete. Rather than rewrite computer programs to accommodate another conflict somewhere else that eventually will become obsolete by the changing nature of world events, it is recommended that computer programmers write software establishing world environments (known as 'contexts') in which player-derived scenarios are installed just prior to game execution. Advantages include greater credibility of the war game to its participants, thereby enhancing the quality of participation, and a new source of inputs regarding future paths to war for military intelligence analysis and exploitation. Suggested war game contexts include the Korean Peninsula, the Middle East, the Balkan Peninsula, and border or ethnic wars between republics of the former Soviet Union.

Kalff, D. J. A. (1989) 'Strategic decision making and simulation in Shell', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 51–61.

This paper describes an experimental programme in Shell designed to involve management teams in the building of simulation models of the strategic decisions they face. First the organisational context is sketched in which the experiments are being conducted. Second some characteristics are outlined of the strategic problem large institutions in general and Shell in particular face. From this outline conclusions are drawn as to the new requirements strategic decision-making processes have to meet. Subsequently the role model building and simulation can play to improve these processes is explored by means of the description of a representative experiment. Concluding remarks are devoted to some of the barriers that have been encountered and to ways to overcome those in future projects.

Borawitz, W. C. (1989) 'Wargaming', in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*. Pergamon Press, Oxford, pp. 115–126.

In this paper the command post exercises are described that have been supported by the Soltau war game. A number of positive and negative aspects as a result of the experience with the aforementioned exercises are discussed. As it is well possible to use war gaming techniques for training we look ahead to planned developments within the Netherlands regarding the computer-assisted command post exercises.

Klabbers, Jan H. G., and van der Waals, Barbara (1989) 'From rigid-rule to free-form games: observations on the role of rules', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*. Pergamon Press, Oxford, pp. 225–234.

At the 1986 and 1987 ISAGA conferences the user-oriented taxonomy of games and simulations has been introduced and explained. In this paper we report on some adjustments, which concern the rule-base of games/simulations. Reflecting on the

respective positions of game designer, game operator and players, it has become evident that notions like free-form, rigid-rule and frame game may have different meaning for each of them. Therefore we have made further inquiries on rules in social systems and on the rule-base of games/simulations. The results are summarized in the discussion about game components versus strata of social systems.

Arai, Kiyoshi (1989) 'A simple method of scenario-making: two Japanese cases in community planning', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall,D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*. Pergamon Press, Oxford, pp. 235–240.

In order to cope with planning in a situation where we cannot see what is the issue and what logic aspects are interrelated, scenario-making is a useful tool to break through the situation. This is because a scenario-making process should imply a learning process. We tried to develop a simple method and performed two experiments. The method is a sort of free form game, similar to Delphi, and is based on a methodology to pursue a concrete and compatible scenario. People concerned with the planning process are divided into a core-group and participants. It is expected that a core-group should play a role of a controller and that participants should improve a scenario structured firstly by the core-group. Two experiments show that this method could be useful for a group of people to make clear their situation in a relatively short range of time.

Andriessen, Daniel G. (1995) 'Policy simulation and crisis management: the harsh winter scenario', Crookall, D., and Arai,K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed*. SAGE Publications, Thousand Oaks, pp. 101–110.

In a joint effort, the Dutch Ministry of Home Affairs and KPMG Management Consultants used policy simulations to help develop and apply crisis scenarios. To clarify this use of policy simulations the author explains some aspects of crisis management in The Netherlands, then describes the purpose of crisis scenarios and the use of policy simulations in developing and applying them. As an illustration a brief description of the first scenario that was developed and of its results will be given. This description is based on an evaluation of the simulation performed by Jaap van Lakerveld of the University of Leiden.

(B) OPERATIONAL GAMES

Prohaska, Charles R., and Frank, Ellen, J. (1990) 'Using simulations to investigate management decision-making', *Simulation and gaming* 21(1), pp. 48–58.

Management researches are always in search for new controlled environments from which they can gather data. This article proposes the use of total enterprise simulations as a research setting for studying management decision-making. Using INTOP, the authors present examples of analyses that were conducted from a database generated from the responses of executive MBA participants. Using a multiple regression, policy-capture approach, differences in the decision-making strategies between groups are examined. Also discussed is an approach to developing a performance criterion that may be used when testing hypotheses regarding managerial decision-making effectiveness. The authors conclude that total enterprise simulations represent a research setting that warrants further exploration.

Pray, Thomas, F., Gold, Steven (1991) 'Goal setting performance evaluation with different starting positions: the modelling dilemma', *Simulation and gaming* 22(4), pp. 476–489.

Computerised business simulations have long been used as a pedagogical tool in business policy courses. Student teams are charged with managing a hypothetical firm and are required to establish goals, strategies, and then implement their business plans. A review of 10 popular strategy-oriented games showed that most do not formally incorporate goal

setting as part of the simulation model and all of the games had teams start with identical financial and operating statements. This article proposes a methodology that permits (a) individual team goal setting as a part of the computer model and (b) firms to start with different financial and operating positions. The methodology presented allows administrators to begin the simulation with each firm having different financial and operating characteristics. Firms then select their objectives and goals from a list and establish weights and priorities for each objective. A statistical algorithm, based on Chebyshev's inequality theorem, is then used to partition each firms' goals and results into three levels of difficulty: low, high, and medium. The procedure evaluates the extent to which the firm achieved its goals, the relative difficulty of the goals set by each firm, and makes a comparison to other firms in the industry.

Russon, Manuel G., Chang, S. J. (1992) 'Risk aversion and practical expected value: a simulation of the St. Petersburg game', *Simulation and gaming* 23(1), pp. 6–19.

Daniel Bernoulli's classic St. Petersburg paradox is revisited in an attempt to resolve the intriguing issue; how should individual risk preference be differentiated? The authors argue that, unlike what is implied by the paradox, the fact that no person would pay a large sum of money in order to win a large payoff with a very small probability does not imply that all individuals are risk averse. The authors design a large-sample experimental test where the St. Petersburg game is simulated. The simulation results imply that the mathematical expectation of uncertain outcomes is not realised when associated with asymptotically diminishing probabilities. In such a case, it appears that there exists a 'practical expected value' that is different from the theoretical expected value. The former, not the latter, must be used to determine individuals' attitude toward risk.

Dolin, Eric Jay, Susskind, Lawrence E. (1992), 'A role for simulations in public policy disputes: the case of national energy policy', *Simulation and gaming* 23(1), pp. 20–44.

Consensus-building techniques have been used successfully to resolve many public policy disputes. A major obstacle to consensus building, however, is the unwillingness of disputing parties to come to the negotiating table. A relatively new method of accomplishing this is to invite the parties to participate in a simulation of the conflict they want to resolve. Such simulations are designed to show that policy deadlocks can be overcome if the disputants change the way they negotiate. In November 1988, the MIT-Harvard Public Disputes Program, in association with the American Energy Assurance Council (AEAC), ran the 'National energy policy simulation'. This 23-hour crisis simulation brought together many of the stakeholders involved in the national energy policy debate in the United States. Partly as a result of the simulation, the parties agreed to sponsor a far-reaching effort to forge a consensus on a national energy strategy for America. The energy policy experience is evidence that simulations can help bring disputing parties together to resolve their differences. The experience with this and related simulations provides key lessons for subsequent simulation design.

Mergen, A. Erhan, Pray, Thomas F. (1992), 'Modelling total quality elements into a strategy-oriented simulation', *Simulation and gaming* 23(3), pp. 277–297.

This article reviews the rudiments of total quality management (TQM) and describes algorithms for integrating many of the key elements into a strategy-oriented simulation. Specifically, the modelling of three key TQM components is described in detail. These include: (a) an increased focus on customer need and satisfaction, which involves altering the demand equation in the model to include product failures and developing a quality-focused customer survey; (b) continuous improvement and process capability modelling, which entails integrating quality prevention activities, statistical quality control procedures, and Taguchi loss function into the model; and (c) adding competitive benchmarking options in which teams can assess who is 'best' in the industry and use this information to aid in goal-setting and continuous improvement activities.

Wolfe, Joseph (1993), 'On the propriety of forecasting accuracy as a measure of team management ability: a preliminary investigation', *Simulation and gaming,* 24(1), pp. 47–62.

It has been suggested that a management team's forecasting ability serves as the major evaluation standard in business games. This suggestion is explored through an examination of the field's empirical research and a laboratory exploration. Little support was found for the use of the criterion as suggested. Forecasting accuracy increased over time but, for the poorer performing companies, good management was not unequivocally associated with accurate forecasts, and low forecast errors were not systematically associated with high profits.

Beazley, Hamilton and Lobuts Jr., John (1998), 'Systems and synergy: Decision making in the third millennium', *Simulation and gaming,* 29(4), pp. 441-449.

The objective of 'systems and synergy' is to increase the participant's understanding of the dynamics that affect organisational performance to improve his or her decision-making capabilities. Decision-making is facilitated and judgment is improved when managers have a Systems understanding of the interrelationships of organizational dimensions that affect performance. systems and synergy is designed to enhance that understanding through exposure to Bolman and Deal's four frames of reference for viewing and understanding organizations: structural, human resource, symbolic (cultural), and political.

Rouwette, A. J. A., Etienne, Fokkema, Eppie, van Kuppevelt, Hans H. J. J. and Peters, Vincent A. M. (1998) Measuring MARCO POLIS management game's influence on market orientations. *Simulation & Gaming* 29(4): 420-431.

The MARCO POLIS management game was developed to introduce employees of housing associations to new market conditions. After the game was developed in 1991, it has been used more than 15 times. On most occasions, the game was judged to be highly successful in making the demands of the new situations clear. This article examines in depth the results of a game run with 49 participants.

Joldersma, Cisca and Geurts, Jac. L. A. (1998) 'Simulation/gaming for policy development and organizational change', *Simulation and gaming,* 29(4), pp. 391-399.

The theme of the 1997 conference of the International Simulation and Gaming Association (ISAGA) concerned simulation1games for policy development and organizational change. The conference aimed at bridging the gap between the gaming discipline and the policy and organization sciences. In academic and professional journals on policy, strategy, and organizational change, very few articles can be found on successful application of these kinds of simulation/games. Here, a brief overview is given of simulation/games for policy development and organisational change, based on an analysis of about 60 contributions to the proceedings of the 1997 ISAGA conference. In particular, this article considers the contributions that have been selected for publication in this special issue of *Simulation and gaming: An international journal.*

Mailles, Stephanie and Batatia, Hadj (1998), 'Measuring the accuracy of prediction in a simulated environment', *Simulation and gaming,* 29(2), pp. 173-192.

Prediction is an important cognitive activity in any decision-making process. For dynamic process control tasks, this activity is crucial, but studying it in a real-life environment is difficult. This article describes how a computerised simulation was used to study prediction in a complex environment. Using the simulation, the effects of many factors on the accuracy of prediction were successfully measured. These factors are mainly the nature of the task, the method of presentation of the information, the number of repetitions of a specific task, and the length of the time taken for prediction. Three different tasks and four distinct interfaces were used in the simulation. Prediction was found to be significantly affected by all of the factors except the number of repetitions. Surprisingly, no learning effect was observed throughout the accomplishment of the various tasks.

de Vreede, Gert-Jan, van Eijck, Daniel T. T. (1998) 'Modelling and simulating organisational coordination', *Simulation and gaming*, 29(1), pp. 60-87.

Coordination is a key issue in the design of organisational structures and processes. In this article, the authors propose a body of concepts that support the modelling and computer simulation of organisational processes and organisational coordination. Based on these concepts, three aspect models are described that each highlight different (coordination) aspects and facilitate a multi-perspective analysis of an organisation — processes and their coordination: the interaction model, the process model, and the actor model. A case study is used to illustrate these concepts and aspect models. Furthermore, a way of transforming the concepts into a computer simulation is formulated. Experiences show the potential applicability of the modelling concepts. Finally, directions for further research are indicated.

Raninarayan, S., Strohschneider, Stefan, Schaub, Harald (1997) 'Trappings of expertise and the pursuit of failure', *Simulation and gaming*, 28(1), pp. 28-43.

This article explores some of the basic shortcomings and fallacies of managerial behaviour in dynamic situations. In a laboratory study, 20 groups of three participants each, all with an education in business management, were observed while trying to manage a computer-simulated industrial organisation called Manutex. This is an interactive simulation of a small garment factory. For most groups, this problem proved to be extremely difficult. The analysis of the problem-solving process and the strategies that the participants employ show that several typical mistakes were responsible for the groups' difficulties. These mistakes are integrated into a number of generic behaviour patterns and uncontested basic assumptions that guide action. The participants' difficulties are not due to insufficient managerial knowledge or cognitive, limitations Rather, they stem from an incorrect use of the available knowledge, a tendency to avoid risks and reduce uncertainty, and a motivational process directed at sheltering the subjective sense of competence.

Muldoon, Jr., James P. (1995), 'The model United Nations revisited', *Simulation and gaming*, 26(1), pp. 27-35.

For over 50 years, students have organised, conducted, and participated in a simulation of international organisations. This sophisticated simulation of current international affairs, called the 'Model United Nations' (Model UN), is facing unexpected challenges and new opportunities. The challenges before the Model UN programme include closing the 'reality gap' between the Model UN and its real-world counterpart and finding ways to increase the involvement of the academic and education professional communities. The opportunities for the Model UN programme include an increasing global reach to countries in Africa, Latin America, Asia, and Eastern Europe and the infinite possibilities for enhancing the learning experience of the Model UN through application of telecommunications and other information technologies.

Eldredge, David L., Watson, Hugh J. (1996), 'An ongoing study of the practice of simulation in industry', *Simulation and gaming*, 27(3), pp. 375-386.

This study constitutes the third in a series of ongoing surveys of the use of computer simulation in US industry. It explores such issues as which organisational groups develop and use simulations, the computer hardware and software used, and the level of usage of advanced simulation techniques. The benefits, effectiveness, and future of simulation in industry are also examined. A comparison of these findings with those of the previous two surveys identifies trends in simulation practice.

Kenkel, Phil, Wingender, John R., Tilley, Daniel S. (1996), 'Designing an international joint venture negotiation game', *Simulation and gaming*, 27(3), pp. 316-331.

The success of developing a 'Joint venture simulation' game to model the common management problems encountered in the negotiation and management of an international joint venture is evaluated. The business simulation game was designed to communicate abstract concepts such as partner rapport, transfer price conflicts, and marketing disagreements to executives of state-owned agribusinesses in Indonesia. The study examines the actions of the Indonesian agribusiness executives during the game relative to the learning objectives.

Mautner-Markhof, Frances (1989), 'The reality, management and simulation of complex systems', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 24–37.

This paper on the reality, management and simulation of complex systems addresses: the characteristics and stability requirements of complex systems, the mechanisms by which complex systems create order out of chaos or fluctuations; cooperation and competition; innovation and control for the management of complex systems: the role of negotiations, information and technology; limitations on the knowledge and analysis of complex systems; simulation as the third reality: its necessity and constraints.

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van Linder, Bart (1989), 'Switcher: an organisation support system for improving reflective competence', pp. 72–80, Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall,D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford.

This paper provides a short introduction of the game 'Switcher' and discusses its basic concepts. The game is designed to give people more insight in their sometimes dominant model(s) of organising; the problems these models can cause and how to cope with them. After the introduction we show how the concept of a user-language can be used for game design. Thereafter we give answers to questions like: What are models? Are there different kinds of models? Can we switch from one model to another? Are there different kinds of switches and/or different levels of modelling? Is switching related with competence? In the last paragraphs we discuss Switcher as a frame-game and as a computer communication network. We finish with a review of the game session we ran at the conference.

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van der Meer, Frans-Bauke and Roodink, Ton (1989), 'Social simulation of organising and organisational change', pp. 81–89 in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford.

In social simulation the core processes are generated by human participants, engaged in social interaction, constrained by initial and boundary conditions, but not by role prescriptions. By appropriate tuning of these conditions the simulation can be induced to be a valid reflection of real life organisations on the structural and process levels. With respect to improving competence in dealing with problems of organisational change and managing implementation processes the method can be used in different modes: as a research setting, as a method and setting for training and education, and as a tool in shaping implementation strategies. The method is especially fit to identify unintended or unexpected consequences of change projects in advance, to help finding ways to deal with these, both for management and other organisation members, and to investigate the processes at hand systematically.

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van Mens, Maarten (1989), 'PACT', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 90–97.

In a process of organisational change NMB Bank decided to use a gaming approach to explore the issues of a less hierarchic more decentralised organisational concept and to support a change of culture. The aim is to become a more professional, more productive,

competitive and innovative organisation. This is supported by a parallel development of new infrastructures. The game PACT was developed as a simple language to describe working processes and exchange information; a carrier for the new organisational concept; a tool to redesign working processes; and a way to mobilise knowledge and skills within our organisation.
PACT is designed as a chess game. NMB uses it to illustrate and explore the consequences of a new (automation and communications) infrastructure, at the same time it is introducing the possibilities and consequences of an industrial, logistic approach to banking. It is a generic freeform game; a shell that can be translated to demonstrate and stimulate discussions about all sorts of organisational concepts. PACT needs a well-defined organisational concept translated into simple rules for application, good process descriptions and a mixed audience of skilled and experienced company personnel to play.

Dekker, Dolf (1989), 'MIDAS: an awareness game on innovation management', Klabbers, J. H., Scheper, G. W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, p. 98.

Innovation is currently one of the main issues in management practice. Managers are reluctant however to start an innovation programme. They feel uncomfortable in taking such a high-risk decision because they don't know how to manage innovation processes. Therefore, a powerful tool is needed to motivate managers and their staff in taking the decision to initiate an innovation programme.
In this paper such a tool, an awareness game on innovation management, is presented. Its objective is to give managers the feeling that innovation can be managed. This is done by:

1. making managers discover that the way in which they normally manage the new product process will not meet future goals of the organisation;
2. decreasing the fears and anxieties about innovation by giving them an experiential learning exercise in the steps and techniques used in innovation processes;
3. making managers aware of the factors which influence the innovation process and allowing them to experiment with decisions which foster (or block) the innovative climate in the organisation;
4. starting a structured discussion whether or not to innovate and establishing the requirements for an effective programme.

Coote, Alan and Loveluck, Clive (1989), 'Ghosts in the machine: a computer-aided simulation/game to explore the relationships between strategic policies, tactical action and organisational cultures,' in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D., (eds.) (1989), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*. Pergamon Press, Oxford, p. 99.

This paper discusses the development and use of 'Ghosts in the machine' — a flexible, interactive computer-aided simulation/game designed as an aid to management development. The authors discuss the rationale behind the game before outlining how it was developed and suggesting different ways in which it may be used and adapted to suit a variety of user needs.

Schulein, Peter (1989), 'Crisis gaming for research and training', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 106–114.

In business, management games have been played for a long time, although most applications have been in the financial or economic area. Within FEL-TNO, management gaming is confined to controlling an organisation in times of crises. Crises gaming consists of handling complex decisions in a short time period, based on incomplete and/or unreliable data.
Players of a crisis game do not play against an opponent, but try to survive in a supervisor controlled (mostly hostile) environment. An extra dimension is added by allowing the players to define the management structure they will play in themselves. This allows the

comparison of different structures. Besides research into the design problems of such a game, the following aspects are being studied:
- how organisations can be described and modelled formally;
- in what way crises can be studied and defined;
- how management can be defined and modelled;
- in what way unreliable data should be handled;
- how leadership can be defined, and how people should be prepared for it.

An application of the research effort is the development of a crisis game for the Royal Netherlands Air Force Staff College. Our experience in designing and developing this game will be discussed.

Freeman, James M. (1989), 'Goal-setting and business gaming', in Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D., (eds.) (1989), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 127–136.

Goal-setting is a vital stage in the corporate planning process — goals being the means by which an organisation's long-term objectives are operationalised. A rigorous goal-setting discipline is necessary for effective implementation of the strategic plan — the resulting network of goals acting as a model of the organisation's strategy over the planning period. The study, described, confirms the value of business gaming as a medium for improving goal-setting competence. Analytical findings support the case from work motivation theory, of a positive linear relationship existing between level of goal difficulty and corresponding task performance.

Bates, Erica, Christopher, Elizabeth and Moore, Barry (1989), 'Australian rehearsal technique', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T., and Crookall, D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 155–160.

Simulation-gamers in Australia use the Australian Rehearsal Technique (ART) to improve the competence of decision makers in business and government. In ART the game producer develops a scene which models a decision-making process, selects volunteers to play the characters in that scene, and sometimes appoints a director to organise the cast and present the drama. The director and players stage a rehearsal of the scene. The other participants form an audience and are given cards setting out some aspect of the scene that they specifically observe. The producer returns to the stage at critical moments to stop the rehearsal and involve the audience as commentators. The debriefing process thus takes place throughout the simulation, which gives it a greater impact. Because the theatrical nature of the simulation is emphasized, players can distance themselves more readily from the characters they play and are less defensive about any analysis of their decision-making behaviour. People who prefer to be speculative observers rather than active participants have important roles to play as members of a critical audience.

Sackson, Marian V. (1989), 'An expert system that simulates group decision making in a stochastic environment and exhibits learning', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 189–202.

The objective of the expert system model development was to provide an experimental environment to test its decision-making capabilities as it simulated group decision makers. The expert system acquired knowledge dynamically as it reacted to a stochastically changing environment during three simulated years of competing in a business game environment. The experiment intended to provide a preliminary understanding of the methods by which an expert system analyses strategic scenarios and develops operating decisions as well as contributes to the growing interest in the applicability of expert systems to business decision making.

Cecchini, Arnaldo, 'Threat and negotiation in gaming and simulation', Crookall, D., Greenblat, C. S., Coote, A., Klabbers, J. H. G., Watson, D. R. (eds.) (1987), *Simulation-gaming in the late-1980s*, Proceedings of the International Simulation and Gaming Association's 17th International Conference, Toulon, France, 1–4 July 1987. Pergamon Press, Oxford, pp. 297–306.

It is an attempt of classifying the different types of conflict using Rapoport interpretation and criticism of the theory of games. Particular emphasis will be given to the role of threat and negotiation as communicative and simulation strategies within the various types of conflicts and also to the opportunity, illustrated by examples, to apply to these conflicts not so much the techniques of game but those of play where simulation and communication play an essential role.

Mackie, Drew (1995), 'Gaming sustainability', Crookall, D. and Arai, K. (eds.) (1995), *Simulation and gaming across disciplines and cultures, ISAGA at a watershed*. SAGE Publications, Thousand Oaks, pp. 45–52.

At the 1992 ISAGA conference in Edinburgh, the author demonstrated a similar game that explored a simple model of local economies and how these might be made more sustainable. This model has now been expanded to include the environmental and community aspects of sustainability in a 'three capital' model.
The Edinburgh game has been updated to encompass the new model. This chapter looks at the process of developing the model and its accompanying game. It also raises issues relating to the simulation of complex subjects and the reactions of public service clients. This is not a theoretical chapter but an expedition through the real-world jungles and deserts of public policy and the use of 'thinking models' and games to chart unknown regions.

(C) TEACHING–TRAINING GAMES

Klein, Ronald D. and Fleck Jr., Robert A. (1990), 'International business simulation/gaming: an assessment and review,' *Simulation and gaming*, 21(2), pp. 147–165.

Can international business (IB) simulation/games play a significant role in filling the need for students who understand IB concepts? This article reviews the gaming literature to identify gaming's strengths and weaknesses to determine the roles that simulations con play in IB pedagogy. It then reviews the existing IB simulation games to determine what each game can or cannot contribute to the teaching of international business. Potential adapters can then select the simulation that best fulfils their course requirements.

Wheatley, Walter J., Roberts, Ralph M. and Einbecker, Richard C. (1990), 'A complex simulation and community involvement yield an award-winning capstone experience', *Simulation and gaming* 21(2), pp. 181–189.

Simulations afford students opportunities to apply newly acquired skills to actual 'real world' simulations, and experiential activities involving community executives can enhance these 'real world' experiences to an even greater degree. This article suggests such experiential activities, including labour negotiating, banking and financial bargaining, Security and Exchange Commission reporting, and Board of Directors' briefings. This combination of complex simulation and experiential activities involving local community executives received the 1988 SME Manufacturing Engineering Award for unusually significant and innovative coursework.

Diehl, Barbara J. (1991), 'CRISIS: a process evaluation', *Simulation and gaming*, 22(3), pp. 293–307.

Good educators constantly seek curricula materials and learning experiences that have clearly delineated attributes and proven effectiveness. This article provides an evaluation of

the processes involved in the simulation/game CRISIS. Despite its age, this simulation/game remains an excellent, topical, short, relatively simple, interdisciplinary, non-computer experiential activity for conveying a realistic 'gestalt' and providing a basic understanding of the complexity of international political relations. This is evidenced by results of multivariate analysis of the responses of 146 participants from five major discipline areas to a highly reliable 12-scale Simulation Evaluation Instrument, and by content-analysis of their open-ended responses concerning the game's strengths and weaknesses. The author discusses the management implications of the latter and provides game follow-up suggestions for enhancing learning.

Costigan Lederman, Linda (1992), 'Debriefing: toward a systematic assessment of theory and practice', *Simulation and gaming,* 23(2), pp. 145–160.

Experiential learning in the educational context incorporates real-life-based processes into the educational setting in order for them to be used and scrutinised. The heart of these sorts of learning experiences in the post-experience analytic process, generally referred to as the debriefing session. This essay focuses on the debriefing process as it accompanies one form of experiential learning, simulations and the games. It provides a review of the existent literature on debriefing, an analysis of the debriefing process, and effective strategies for its use. It provides an analysis of the process, identifies its components and essential phases, and presents a systematic approach to the assessment of the conduct of debriefing sessions.

Williams, Edgar L. (1993), 'Computerised simulation in the policy course', *Simulation and gamin,g* 24(2), pp. 230–239.

Is there a difference between policy courses that use a computer simulated management game (Havsim) and those that do not use such a tool (NOSIM)? Survey results reported here suggest that there are factors that differentiate the two groups. The factors reviewed included demographic information regarding availability of computing resources, and information regarding reasons for use or non-use of a computer simulation. On the 265 responses received results of stepwise discriminant analysis suggested that there was no conclusive difference between the Havsim and NOSIM groups but that there was a difference between those who have never used a simulation and those who have stopped using a simulation.

Herz, Bernhard and Merz, Wolfgang (1998), 'Experiential learning and the effectiveness of economic simulation games', *Simulation and gaming,* 29(2), pp. 238–250.

Kolb's theory of experiential learning provides a natural setting to evaluate simulation games. In this article, an experimental design is developed to test whether economic simulation games support the learning process corresponding to Kolb's experiential learning cycle. The empirical results indicate that simulation games support the four learning stages more efficiently than traditional teaching methods.

Wilkenfeld, Jonathan, Kraus, Sarit, Holley, Kim M. (1998), 'The negotiation training model', *Simulation and gaming* 29(1), pp. 31–43.

Decision-makers, particularly in crisis situations, are often overwhelmed by the amount of information they must analyse in relatively short time periods and are often unable to identify optimal outcomes. This article argues that the employment of simulation techniques based on a sophisticated decision support system facilitates the identification of utility-maximising strategies. The negotiation training model and its negotiation support system GENIE are discussed in this article, and preliminary results based on simulation runs are reported.

Wolfe, Joseph and Crookall, David (1998), 'Developing a scientific knowledge of simulation/gaming', *Simulation and gaming,* 29(1), pp. 7–19.

This article first speculates on why such little progress has been made regarding the effective application of educational simulation/games. It suggests that the field's eclectic foundation has been a virtue for its development but a vice regarding its rigorous assessment. The article then outlines the antecedents for generating a practical and cumulative body of literature, concluding with a number of recommendations as to how the field might accelerate the rate at which its literature accumulates.

Applegate, John S. , Sarno, Douglas J. (1997), 'Futuresite: an environmental remediation game-simulation', *Simulation and gaming,* 28(1), pp. 13–27.

'Futuresite', a game simulation, was developed to stimulate and inform public participation in the highly controversial environmental cleanup decisions affecting a former nuclear weapons facility in the United States. Meaningful public participation demands an understanding of the technical, financial, and political constraints on the cleanup process. The primary purpose of the game simulation was to present information concerning the environmental contamination, health hazards, and potential future uses of the facility in a readily comprehensible format. An additional purpose of Futuresite was to encourage cooperation and consensus building in making actual remedial plans for the facility.

Baker, Ann C., Jensen, Patricia J. and Kolb, David A. (1997), 'In conversation: transforming experience into learning', *Simulation and gaming,* 28(1), pp. 6–12.

To transform experience into learning, reflection that often occurs through the medium of conversation is necessary. Specifically, we focus on conversation in debriefing and processing sessions following simulations and games as opportunities for transforming experience into learning. We suggest approaching debriefing sessions with a redefined role of the facilitator as one who has profound respect for the wisdom and voice of each participant and an openness to surprise and personal learning. Careful attention needs to be given to creating a hospitable and receptive space to hold and nurture the debriefing conversations. Specific contextual considerations in creating that space include making a conscious effort, attending to concerns of perceived safety, moderating the energy level, confronting conflict in ways that are growth promoting, valuing and encouraging the integration of the head and the heart of each participant, and valuing reflective listening as highly as active speaking.

Neal, Derrick J. (1997), 'Group competitiveness and cohesion in a business simulation', *Simulation and gaming,* 28(4), pp. 460–476.

This study investigates the relationship between the groups' competitive disposition, group cohesion, learning, and economic performance within the 'Markstrat2' simulation. To investigate the role of competitive disposition, the methodology required that the industries be created with a specific structure rather than the more commonly adopted random formation approach. The results show that individual competitive disposition is not significant in explaining the economic performance. However, a strong correlation was found between the level of group cohesion and economic performance. The impact of this factor could be detected early in the simulation, and in 80 % of cases, the team leading its industry in the simulation at the halfway stage was able to maintain the advantage until the end of the simulation. A positive association was also established between levels of individual self-assessed learning and economic performance.

Keys, J. Bernard (1997), 'Strategic management games: a review', *Simulation and gaming,* 28(4), pp. 395–422.

This article describes seven currently available management games commonly used in the strategic management course within colleges and universities. The games reviewed have had sustained use through several editions. All are now scored by a microcomputer and use up-to-date computer technology. Five tables are included summarising the dimensions 'of the games reviewed. The tables summarise for the seven games the factors categorised as the external environment and industry factors, marketing variables, production variables,

and financial variables. Variables included by all of the seven games are first reviewed in each table, then unique variables are itemized for each game. This review suggests that management games are becoming much more robust and much more strategic since the review of games in this journal in 1987

Wolfe, Joseph (1997), 'The effectiveness of business games in strategic management course work', *Simulation and gaming*, 28(4), pp. 360–376.

The variety and user-friendliness of computer-based games available to the strategic management instructor has increased, although the number of commercially available games has fallen due to a number of factors. Based on the criterion of objectively measured learning outcomes, the various games studied over the years produce genuine results and results that are superior to those obtained via the case approach, which is the major alternative teaching strategy. Far less research has been conducted on game-facilitating factors that lead to effective learning outcomes in a business game environment.

Chakravorty, Satya S. and Verhoeven, Penelope R. (1996), 'Learning the theory of constraints with a simulation game', *Simulation and gaming*, 27(2), pp. 223–237.

This article describes the theory of constraints, an approach for enacting a process of continuous improvement that focuses on the factors that limit a system's performance. A user-friendly simulation game to teach the theory of constraints is discussed. The authors think that practicing managers as well as students of management can benefit from the theory as a useful conceptual framework for improving business performance and can benefit from interaction with the simulation game to reinforce the theory's principles. The game has been played by practitioners and academics at conferences sponsored by the Avraham Y Goldratt Institute and has served as an active learning tool for students in graduate and undergraduate operations management classes.

Cabaniss, Roy E and Williams, Michael R. (1993), 'Simulation-game: The political futures game', *Simulation and gaming*, 24(3), pp. 376–383.

Basic data:
Objectives: Teach price theory; illustrate how a futures market operates; predict outcomes of current political races.
Target audience: People interested in predicting political races, academics and students interested in political science, futures markets or price theory.
Playing time: 40 to 50 minutes at the first session and 7 to 15 minutes per session thereafter for a minimum of five sessions.
Debriefing time: 20–50 minutes.
Number of players: 10 to 50.
Materials required: Trading slips of two different colours. Lotus scoring template is optional for those who want to study market operations in detail (not necessary for a basic run of the game). Template available upon request; mail the authors a 3.5-inch disk.
Equipment room set-up: Chalk or white board for recording quotes during play. Clear area in the front of room for use as the trading area.

Christopher, Elizabeth (1989), 'Talking heads', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, p. 161.

The purpose of the game is to make players more aware of the range of factors that affect the conduct of a business meeting of people from different cultures. It is intended to take several hours and debriefing runs throughout the game. The number of players may vary from about 6 to 13 and 'extras' may function as critical observers. Players assume roles as national managers of an international company. They have two tasks: (1) to make recommendations concerning proposed changes for Saito corporation; (2) to recommend a single corporate language for Saito's international dealings. All players are given the same

general scenario and individual role instructions, which require them to adopt certain positions. Thus ostensibly at the conference table they discuss ramifications of the proposed organizational changes — but they all have hidden agendas.

Teach, Richard D. (1989), 'Designing an intercultural business simulation', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, p. 162.

The theme of this paper is to design the framework for a computer run business simulation that incorporates both corporate and national cultural variables in a way that dominates the more traditional bottom line outcomes. The major issues are to define the cultural variables, determine how to measure the different responses to the cultural variables and how to structure this simulation in order that the cultural sensitivities can play the dominant role. The game is to be computerised and can be played in a series of distinct cycles over some length of time in several short periods. Thus, the game could be used in a university course.

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de Vries, Bert (1989), 'Learning about electric power planning: a gaming approach', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D., (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 292–299.

This paper discusses the development of electric power modelling from supply- and technology-oriented to more integral, culture-oriented approaches. This development is illustrated within the framework of individualist-historicist/rationalist-structuralist dichotomies. Next, the simulation model Future Voltage on electric power planning is described in terms of performance criteria, levels of variables and input-output formats. Experiences with Future Voltage in university curricula are briefly discussed. The model has proven to be an effective learning tool. Extension towards a utility-oriented management game is the next phase, to be carried out in a joint Dutch-Indian research project.

Meerts, Paul W. (1989), 'Diplomatic games', Klabbers, J. H. G., Scheper, W. J., Takkenberg, C. A. T. and Crookall, D. (eds.), *Simulation-gaming: On the improvement of competence in dealing with complexity, uncertainty and value conflicts*, Pergamon Press, Oxford, pp. 340–347.

The author tries to answer the question: are games useful as a means to train people for the diplomatic service? If yes, what kind of games are most suitable? How to build them, practice them, evaluate them?
To train a professional diplomat, is to prepare him/her for a career with an abundance of value and interest conflicts, uncertainty (in public and private affairs), and complex relationships between people and institutions.
As a diplomat is a representative of a country or a group of countries, the essence of his work is defending the interests of those he represents. These interests are very complex and cover a broad scope of issues.
In view of the complexity of a diplomat's work it is worth while to enhance his competence by training him/her to deal with difficult situations involving a broad variety of issues and factors like politics, trade, development, security, culture, law and human rights.

Morgenstern, Douglas (1987), 'Artifice versus real-world data: Six simulations for Spanish learners', in Crookall, D., Greenblat, C. S., Coote, A., Klabbers, J. H. G., Watson, D. R. (eds.), *Simulation-gaming in the late-1980s*, Pergamon Press, Oxford, pp. 101–109.

Concepts from general systems theory are posited to elucidate the relationship between the simulated and target environments. Four classroom simulations which make use of 'creative abstraction' to achieve this correlation are described. These are *new identity*, a role-play with some simulation features, the *arbitrary marketing survival game*, which demands strategic interaction under intentionally frustrating conditions, *infiltration paranoia*, which calls for

cooperation under difficult circumstances, and the *two-country simulation*, which tests participants' ability to negotiate. All of these are short-term simulations set in abstract or invented Hispanic countries. In contrast, Encuentros and No recuerdo are computer simulations (still in development) which combine fiction with a real-world setting.

McMahon, Laurie and Coote, Alan (1987), 'Qualsim: an approach to help managers establish quality assurance mechanisms', Crookall, D, Greenblat, C. S., Coote, A., Klabbers, J. H. G., Watson, D. R., (eds.), *Simulation-gaming in the late-1980s*, Pergamon Press, Oxford, pp. 213–217.

' This paper describes a simulation (Qualsim) that is simple in structure and that was developed specifically to enable management developers to help senior managers from the health service in the U.K. to establish formal quality assurance systems. The background to the development problem is discussed, together with a description of the simulation itself and the context in which it can best be used. Consideration is also given to applications of the simulation for managers who work in settings other than health care.

Teach, Richard (1987), 'Desirable characteristics and attributes of a business simulation', Crookall, D., Greenblat, C. S., Coote, A., Klabbers, J. H. G., Watson, D. R., (eds.), *Simulation-gaming in the late-1980s*, Pergamon Press, Oxford, pp. 229–234.

This paper reports the results of a three hour workshop that reviewed the basic premises of a computer generated business simulation and the efforts of that workshop to design a new hierarchical, multi-functional simulation.
The workshop participants reviewed the evaluation process for the players of simulations and for the performance of the teams. Great differences in opinion existed between Americans and Europeans on the performance evaluations and criteria.
In the simulation design phase, a game that had two levels of hierarchy, top management at one level and marketing and manufacturing at a second level, was developed. The designed simulation will require extensive negotiations between the two operational divisions, marketing and manufacturing and between each division and top management. Top management will control the operating divisions by the setting of budgets and goals. Extensive forecasting and planning will be required of all levels.

Teach, Richard D. (1992), 'Global changes in business and economics', Crookall, D., and Arai, K., (eds.), *Global interdependence: simulation and gaming perspectives,* Springer Verlag, Tokyo, pp. 259–262.

Abstract. The winds of change are blowing on the earth. While there are unseen forces at work, many are known. The biggest change is the recognition that it is the market place and not command economics that drives economic activity and growth. As global markets grow, there will be room for many entrepreneurial endeavours. One can expect to see some equalization of economic well-being across the economically-advanced nations, and more countries being admitted to this club. Simulation and gaming will play a major role in training the managers and planners of the future.
It may be trite to say, but the only two sure things about the future are that (1) it will occur and (2) it will be different. If one reads the prognostications of only a few years ago and compares the forecasts with current reality, they have been little better than the science fiction writers of the 1930s and 40s. The future is coming but we do not know what it will bring.

Ichikawa, Arata, Mukuda, Minoru and Inaba, Hideo (1992), 'Strategic decision making in business gaming', Crookall, D., and Arai, K., (eds.), *Global interdependence: Simulation and gaming perspectives,* Springer Verlag, Tokyo, pp. 279–286.

Abstract. Almost every decision-making player in business games in the classroom environment is interested in the final financial status, such as the profit of their company, rather than the attainment of the strategic business goals which their professors expect them to implement through their decision making. Although profit is the most important

measure for decision makers in real business, it should be noted that they will find the available options and select from them according to their business strategy. Thus, consistency in decision making could be equally as important as profit to measure the managerial ability of players. In using business games in classroom settings, we should stress that decisions be based on the chosen business strategy, in which case the focus on profit maximization can decrease. In this paper we will show that the goals of business games can be both profit maximizing and decision consistency.

Coleman, Douglas W. (1995), 'An extended simulation/game for ESL composition', Crookall,D. and Arai, K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed*, SAGE Publications, Thousand Oaks, pp. 14–19.

An outline is presented in terms of the three major elements of a language-learning simulation: simulated environment, structure, and reality of function.
Consider the following two situations for foreign language practice, one in which an environment is not simulated and the other in which it is. In the first situation, which is more accurately a kind of role-play, two students (A and B) participate. Learner A is told to imagine that she is waiting for a bus. Learner B is told that he must approach a stranger and ask for directions in the target language. Note that B has not been told where he must go. How often does a person ask for directions without first having a definite destination in mind? Note that no matter where B asks A how to get to, A really has no information about how to get there and therefore must make something up.

Druckman, Daniel (1995), 'The educational effectiveness of interactive games', Crookall, D. and Arai, K., (eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed*, SAGE Publications, Thousand Oaks, pp. 178–187.

For almost a decade the National Research Council's Committee on Techniques for the Enhancement of Human Performance has examined a wide variety of approaches that make strong claims for improving performance. The results of our work are reported in a series of books published by National Academy Press. Among the approaches examined recently were role-playing exercises and interactive games. These techniques were considered in conjunction with team-building interventions, both of which are often accompanied by enthusiastic testimonials about their effectiveness for enhancing learning and performance. The results of a review of the research literature suggested that team-building exercises have stronger effects on morale and cohesion than they do on actual performance and thus raised questions about the impact of games on conceptual learning. The review in this chapter focuses on games used primarily for educational purposes, and draws implications for effectiveness from the results of evaluation studies. In the concluding section, the author also raises issues concerning fidelity or realism, an important design consideration for games that attempt to simulate real-world environments.