Policy Exercises in the IIASA European Case Study

Draft for comment

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ACKNOWLEDGEMENTS

A Policy Exercise is obviously a collective process. As will be clear in the paper, its success depends highly on everyone involved in the process, both on the organisers' and on the participants sides : many people deserve special thanks.
In this case, the chairmen of both workshops have played an active role in the challenge of an adventurous procedure. Core scientists have also taken a risk, and devoted time and creativity to make their workshop a success (when design permitted).
The team, secretary and leader of the European Case Study have had a lot of merit in hosting the experimental exercises, feeding them with their research material, and taking the challenge of ensuring invitations and logistics of the exercises : quite a challenge, which turned out beautifully.
As several scientists in the IIASA Environment Program also did, they have contributed a lot in the process.
The two invited facilitators, faced with a design that was sometimes too experimental, did a very good job under high pressure.
Finally, the participants's motivation, knowledge and ideas has been what gave life to the scenarios, which is, after all, the essence of the Policy Exercise.

1. INTRODUCTION

Long time horizon, high complexity and uncertainty, elusive decision making processes have been generally recognized for at least 15 years as dominant and challenging features of environmental problems. Several methods (large scale models [réf], scenario writing [réf], "gestion patrimoniale" (de Montgolfier, Natali et al. 1987), AEAM (Holling ?),...) have been used or developped over the years in efforts to address the problems raised by these characteristics. In 1986, a group of scientists proposed the concept of Policy Exercise as a new methodology which may open new possibilities in this field (Clark 1986). The basic concept of the Policy Exercise is to transfer and adapt to the field of environment methods and experiences of strategic gaming from the military (Brewer 1986, Toth 1986). This paper is intended to present an experience in designing and running Policy Exercises, for methodological discussion.

The exercises presented here were organized in the framework of a IIASA study titled : "Future Environements for Europe"(Stigliani 1989). The study, part of the IIASA Biosphere Project (Clark 1986) pursued three objectives :

- to characterize the large scale tranformations of the environment which could result from plausible scenarios on the socio-economic developement of Europe in the next 50 years,
- to describe and evaluate the potential effectiveness of possible policies to manage the long term and large scale interactions between the future environment of Europe and its environment,
- to identify research and monitoring priorities aiming at producing policy relevant information on environmental transformation.

This exploration of possible future environments for Europe was broken into three related tasks :

Task 1 : To prepare scenarios of human developement activities over the next century, joining unconvential forecasts of population, agriculture, energy, and industrial development.

Task 2 : To draw on the best existing scientific knowledge for synoptic assessments of the possible environmental

- to identify issues of particular relevance for further progress of the study,
- to learn more, from observation of the process, about how policymakers approach long term issues, so as to help make tasks 2 and 2 as relevant as possible,
- to launch cooperation between scientists and policy makers on the study.

The exercise was also an experimental one, aimed at :

- getting feedback on the Policy Exercise concept from members of the committees,
- testing the concept with a particularly long term, large scale, and broadly defined set of issues,
- testing various workshop techniques, for the design of subsequent Policy Exercises.

2.2. Design, preparation and process

The scientists in the European Case Study had spent a lot of time and efforts studying possible scenarios for the future environments of Europe. Their work was put together into a rather bulky scenario (approximately, 100 pages), covering essential aspects of socio-economic developement and themes of future environmental concern which had emerged from the study so far. The scenario was written with a touch of fiction, describing the development and environment of Europe from the point of view of an observer in 2050, and explaining the evolutions which had resulted in the 2050 situation. Participants who read a scenario inevitably tend to challenge it; the basic concept of the exercise was to channel this spontaneous process into a structured procedure, allowing the discussion of the scenario to be as productive as possible, and avoid the interminable debates on details usually observed under such circumstances.

The scenario was given to the participants before the exercise. At the beginning of the workshop, they were invited to express their challenges to the scenario. These were sorted in two types :

- challenges on the information, on the science, on the form of the scenario, etc.,
- challenges on the acceptability of the state of the European environments presented in the scenario.

effects of such developments, leading to scenarios of environmental transformation.

Task 3 : To seek and identify what kinds of responses European society might employ, and evaluate how long these responses would take to achieve specified levels of mitigation.

Task 1 and 2 combined the efforts of a Scientific Committee gathering experts from around Europe, and of small group of IIASA scientists. They produced :

- an overview of the major environmental problems facing Europe, and of the possible interactions between them,
- a more in-depth exploration of a number of focused issues pertaining to the more general agenda so defined.

In 1987, this part of the work was already well advanced, but the part of the study on possible policies had hardly begun. At that stage, a Policy Committee was recruited, and it was decided to resort to the Policy Exercise methodology. The paper will briefly describe the various workshops, their design, their preparation, some of their results, and methodological analysis and conclusions.

2. THE NOVEMBER 87 EXERCISE IN LAXENBURG[1]

2.1. Aims

The first exercise was run on November 24, 1987 at IIASA in Laxenburg. It lasted one day, the first of a two days joint meeting of the Scientific Committee and of a not yet complete Policy Committee. It gathered approximately 20 participants, plus some observers. The major aims of the exercise were :

- to elicit feedback from policymakers on the scenarios developed in tasks 1 and 2 of the study,

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[1] This exercise was chaired by Pr Di Castri; it was designed and facilitated by the author, and organized by the European Case Study staff. A detailed report of the exercise is available as a working document[Mermet, 1987 #113].

Challenges of the first type were set aside for technical discussion with scientists and authors in the second day of the meeting, out of the workshop. Challenges of the second type served as the basis for the workshop.

Each participant retained the one such challenge he felt was most compelling. Each was then in turn invited to propose and elaborate in detail a set of policies to change the outcome of the scenario. This set of policies was then evaluated and discussed by the rest of the group. Each such "move" took about 50 minutes to complete. The facilitation was quite directive, and aimed primarily at eliciting as detailed and explicit policy proposals as possible from the participant on the "hot seat", and at avoiding unproductive controversies.
The workshop was taped, and notes taken, so that it could be easily documented.

2.3. Methodological teachings

On the whole, the one day workshop was considered a good experience by participants (actually, they virtually all came to the June 88 exercise). There seemed to be a consensus that the Policy Exercise approach was feasible and promising. Participants offered many suggestions on which aspects of the methodology could be improved, and on possible modifications.
The main use of such an exercise is to convey to policy makers the findings of a future studies substantive research project and, the other way around, to provide scientists in such projects a high density input from knowledgeable and experienced policy makers. The simulation aspect appears here as rather secondary, the structured discussion of a scenario being the most important feature of the exercise. The future history approach was judged interesting by the participants, but should have been explained more thoroughly, the presentation techniques (including sending material more in advance, but also good communication and meeting presentation routines) should be much better in the future. Also, the scenario based work should be in clearer (and in more clearly justified) relation with formats more familiar to the decision maker.

However, the exercise generated a certain tension which became manifest at the meeting on the second day. Part of it can be attributed to the workshop design, and more precisely :

- to the dissymetry in the roles given to policy makers and to scientists, resulting in the latter having a much more passive role, and in limited communications between the two groups,
- to the large number of participants for a workshop in which only one participant at a time could "play", and this for significant stretches of time.

This has led to abandon, in the next exercise, the concept of separation in principle between scientists and policy makers, and to reduce the number of workshop participants.

3. THE BADEN, JUNE 1988 EXERCISE[1] : OVERALL PRESENTATION

3.1. Aims

Encouraged by this first experience, a second exercise was organized in June 1988. It lasted two days; the participants were again the members of the Scientific Committee of the study and of the Policy Committee, this time complete. The meeting, held in Baden, was residential (a feature which proved extremely useful considering the high pressure involved in the procedure, and the level of interaction expected from participants). The main objectives were :

- to generate insights on concepts and options for environmental policies for the very long term,
- to explore policy aspects in several long term environmental problems identified as important by the study,
- to further develop the methodology of Policy Exercises.

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[1] This exercise was chaired by Dr Ginjaar, chairman of the Policy Committee of the study. It was organized by the European Case Study staff. Design and substantive preparation were carried out by the author. The facilitators were N.Sonntag, P.Weller, and the author. A detailed write-up of the exercise exists as an unpublished working document[Mermet, 1989 #114].

3.2. Design

The basic design of the exercise rested on the following considerations :

- the question addressed by the European Case Study is so broadly defined that it defies a homogeneous coverage; at that stage it appeared that, within the broad synoptic structure it had constructed, the study was providing particularly interesting results on some more narrowly (relatively!) defined topics;
- after obtaining feedback on a very inclusive and very general scenario in the previous exercise, it seemed useful to elicit reactions of policy makers on much more focused, more clearly stated and surprising policy problems highlighted by the study;
- the method of Policy Exercise still was at a point where it seemed safe and fruitful to experiment with workshops of limited scale; also, it was decided to retain the feature of "only one discussion at the same time", in order to allow for full documentation. Only small groups, as the previous exercise indicated, can operate under this principle without frustrating participants.

For these reasons, the exercise consisted in six separate workshops, each one being like a miniature Policy Exercise, with its own topic, design, preparation, workshop session, and report. Additional benefits expected from this choice were the opportunity to get more methodological insight from the variety of workshops than from a big one, and to limit the risks of failure inherent in a rather adventurous procedure.

Although each workshop was to have its distinct procedure, they would all share the same basic design. Each workshop was to gather between six and ten participants, roughly half of them scientists and the rest policy makers, with one facilitator for each workshop. Each workshop would be prepared with the help of one participant : a scientist in the study (or in the committees) very knowledgeable on the topic of the workshop : the "core scientist". He and the organizer together would produce a basic scenario outline and the initial situation to be presented to the participants. The core scientist and the facilitator would essentially play the role of the core group in the design of a larger scale exercise(Toth 1986). The main process of the workshop would be for participants to

propose policies on the situations proposed, and for the core person (with some help of the entire group) to revise the scenario outline and propose further situations, and so on. The procedure for this interaction was different for each workshop, for it had to fit the problems simulated.

3.3. Preparation

Preparation began with meetings among European Study and other IIASA staff, to identify the most interesting policy dilemmas raised by the study so far. Eligible topics were those on which the study provided interesting information, and which constituted questions which will have to be addressed by policy makers. Being "gameable" was a synthetic indicator for the practical purpose of the exercise. A dozen eligible topics were retained.

With these and the basic workshop design in hand, the next preparation tasks were :

- to contact potential core scientists and discuss the possibility, as well as the topic of the workshop they might aggree to help prepare and run,
- to contact and meet personally most participants of the exercise, in order :
  * to explain the procedure, and make sure that the participants knew what they could expect, what would be expected from them, and that they agreed,
  * to discuss the possible topics, and consult on the ones considered most interesting,
  * to ask what kind of information and insights the participants expected from the exercise, in order to make the exercise as focused and stimulating as possible.

These consultations allowed to choose finally the topics for the six workshops.

The next phase of preparation consisted in further discussions between the organizer and each of the core scientists separately. These discussions led to a point where it was clear to both what had to be prepared in terms of scenario, and what the workshop procedure would be.

The final preparation was done in the two days preceding the exercise, when the core scientists could come to the Institute, and the details of the planned scenario basis could be worked out with the occasional help of IIASA scientists. In the same two days, the facilitators also had come to the Institute, and could discuss the detailed procedure for each workshop. This was a time of very intense challenge and quite fruitful improvisation for all involved.

3.4. The overall exercise program

The first morning of the exercise was devoted to a breefing of all participants, and to separate meetings of the Scientific Committee and of the Policy Committee of the study. The main aim of these was to revive and clarify the expectations of everyone, and to build a shared intellectual agenda for the workshops.
The first afternoon, three workshops were run in parallel, and three more the second morning.
The last afternoon was devoted to a plenary meeting in which one raporteur from each workshop could present its main findings, and all participants could discuss the outcome of the meeting.

4. THE BADEN EXERCISE : WORKSHOP TOPICS, PROCESSES, FINDINGS, AND TEACHINGS

In the following part of the paper, a brief presentation of each workshop will be given, with the main question the workshop was addressing, its procedure, some substantive results as examples when appropriate, and methodological teachings.

4.1. Management of water resources in an era of climatic change[1]

Question

How does the possibility of major changes in the hydrology of a large watershed affect current water resources policy? What kind of policies can best prevent the negative efffects of such changes?

Procedure

A skeleton scenario is prepared on the basis of possible future hydological events made plausible by the existing forecasts of climate modifications, and by the record of extreme hydrological events on the Pô river in the last 50 years. Only the initial situation is presented to participants. They react by proposing a policy (without assuming roles defined in advance). The core scientist presents the next event in the scenario, modified by the policies adopted. Participants react to this new situation, and so forth. The course of events and teachings of the exercise are discussed at the end of the exercise, extracting from the process what participants and facilitator consider sustantive findings.

Some substantive findings

a) When considering long time horizons, water conservation policies tend to dominate water storage (damming) policies. If both are eventually necessary, it is preferable to start with the first because they have much longer leading times, and create positive, instead of negative, irreversibilities in the evolution of water management systems.

b) It is not possible to consider watershed management over the long term without using both smaller and larger scale scenarios. For the smaller scale, the exercise indicates that farming uses and the strategies of "grassroots" rural commmunities are very important, difficult to predict, cannot be anticipated through "macro"

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[1] **Core scientist : Pr M.Falkenmark; F.Brewer contributed in the final preparation; facilitator : L.Mermet.**

farming or forest policies alone, and should be the subject of specific exercises.

On the "macro" scale, one of the issues made salient by the exercise is whether water quality and ressources will be managed in a competive or in a cooperative context between the various regions of Europe.

Methodological teachings

a) Of all six workshops, this one rated best with participants. Some important factors were :

- knowledgeable and very motivated core scientist, participants with complementary points of views and good understanding of the issue;
- the simple, but "technical" scenario baseline provided by runoff figures was credible, and created a clear and stimulating discussion framework;
- good preliminary "phasing" between core scientist, leading Policy Makers and the facilitator made quite directive facilitation very effective.

b) An important feature of this workshop - and of some others in the series - is the fact that "moves" remained at a middle degree of precision between making "decisions" (ex : institution *x* builds a dam at site *y* on year *a*, spending $*b*) and completely general discussions. The moves indicated policies, that is to say, general orientations to be implemented in a non directly controlled way, but with a tangible impact. That these moves were specific enough to illustrate credibly differentiated policies along a time line, and "deconcretized" enough to escape the impasse of having to aggregate countless sharply defined decisions in a very broadly described framework, was considered a very important feature, both in terms of methodology, and in terms of substance, as an indication of the jump of level which exists in the real world between environmental policies and decision making.

4.2. What future for rural areas of Europe marginalized by economical development[1]?

Question

Many rural areas of Europe are becoming marginalized by economic development. What may be the long term dynamics and environmental consequences of such evolutions? What kind of policies could prevent or mitigate them?

Procedure

A scenario of a possible evolution of North Yorkshire (GB) from present to 1998 is presented by the core scientist. This scenario is driven by socio-economic evolutions. Participants are encouraged to choose between several possible policy options. After thorough discussions, one is chosen. An updated 2015 situation is proposed to participants by the core scientist and facilitator, and is discussed in depth.

Some substantive findings

a) The workshop revealed how intensely the denial of the acceptability of such evolutions - although they are undeniably taking place today - overdetermines and limits current policy options.

b) The workshop made visible that both decision makers and scientists operated under the assumption that the public and administrative pressure for environmental protection was bound to stay or increase everywhere in Europe over the long term. But it also showed that this would not necessarily be the case. Regions currently considered "on the right track" environmentally may well be left under strong menaces and without environmental vigilance in a few decades. Such possibilities have significant impications on the design and viabiliy of long term environmental policies formulated today.

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[1] Core scientist : M.Chadwick; raporteur : L.Chabason; facilitator : L.Mermet.

c) Social policies and environmental (and more generally, rural planning policies) are currently two seperate fields of public policy. The exercise made clear that the social crises now largely restricted to urban areas may well extend themselves to rural areas, for instance in the form of "deconcentration ghettos". In the natural and cultural context of Europe, this could lead to very serious concerns.

Methodological teachings

a) As the previous one, this workshop has shown convincingly how a very long time horizon can enrich the framework in which environmental policy choices are considered.

b) It has also shown that it is possible to do useful work on long term environmental policies based on a socio-economic, qualitative, scenario skeleton. Such work relies on sound historical, geographical, economic, or geopolitical research.

c) For the workshop results to be as useful as possible, the broad lines of the scenario produced in the workshop interaction might be "reenriched" in details, data, and maybe translated int possible concrete, local, consequences.

4.3. Energy choices and acid precipitations[1]

Purpose

To allow participants to familiarize themselves with the IIASA RAINS model, its bases and capabilities. To experiment on the methodological problems raised by a PE based on a computer model.

Procedure

A microcomputer running the model was available in the room. The levels of acid deposition predicted by the model if current policies are continued were demonstrated to the participants. Their task was to propose more ambitious policies; these were discussed,

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[1] **Core scientist** : R.Shaw; **raporteur** : ; **facilitator** : L.Mermet.

and a set of desirable policies was chosen. These were translated by analysts, through expert judgement, into emission figures fed to the model. Running the model showed the reductions in acid deposition one could expect from the policy proposed by the participants.

Teachings

The workshop has underlined a number of difficulties in running a policy simulation based on a computer model :

- participants need lots of time and explanations before they can accept and use a complex model. In return, if these are provided, they will become more receptive to the model and its results;
- it is very difficult and arbitrary to translate qualitative policy discussion (for instance, a workshop) into emission (or any other) figures;
- the presence of the computer in the room goes with problems of its own :
  * one mistake in entering the data is enough to jeopardize the results of using the model;
  * printing tends to be noisy and disturb the work;
  * model runs, even when comparatively short, are still too long if they stop the group process.

This leaves 3 options for further model-based Policy Exercises.

- The first would be to center the exercises on the model, making the understanding and good use of it by policy makers the main purpose. This can certainly be a useful addition to the usual techniques for introducing models to Policy Makers. When this option is retained, the workshop's design will have to be optimized in that direction, and become quite different from Policy Exercise with a more investigative spirit.
- The second option is to run a Policy Exercise operating at 3 levels at a time :
  * the bio-physical model,
  * a precise knowledge of policy instruments and their applications,
  * a more global scope on the general policy scene.

This leads to the kind of very large protocol proposed in the early stages of the Biosphere Project(Toth 1986) and experienced in the Forest Study(Duinker, Nilsson et al. 1989).

- A third option, preferable in my view, would be to make the Policy Exercise independant from, but complementary to, the use of the model. Proposals to operationalize this option still have to be worked on.

4.4. Long term forestry management and the possibility of a shortfall in the wood supply[1]

Question

How could the possible global or continental environmental problems in Europe identified in the European Case Study affect long term forest management? What would possible surprises be?

Procedure

The basic material for the workshop was provided by the IIASA Forest Study. A scenario was prepared by an external expert associated with that project. The scenario described a 2020 hypothetical situation. The workshop process was planned in the following way :

- presentation of scenario,
- discussion of the basic hypotheses in the scenario,
- discussion on the possible policies which, if implemented between 1990 and 2020, could have prevented the situation proposed,
- choice of several possible alternative 2020 scenarios,
- preparation of a 2050 scenario based on these initial situations (or only one of them if time was too short),
- final discussion.

Some findings

The further one looks into the long term, the less it seems feasible to treat forestry as an autonomous sector. At the same time, the time scale of forest policies extends much further into the

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[1] **Core scientist : J.Kreysa; facilitator : P.Weller.**

long term than that of most, if not all, other policies, and the forest sector has very strong internal logics. The workshop underlined quite clearly these apparent contradictions. It also underlined that possible surprises could alter very much the future evolution of European forests, but that the more elaborate scenarios discussed at the workshop, as is often the case, were quite conventionnal.

Methodological teachings

a) The discussion of the initial scenario was considered interesting by the participants, especially since the author of the scenario was there for in depth clarifications and explanations. It used up a good part of the workshop's time. The scenario appeared quite efficient to convey findings of the Forest Study to participants. The discussion was also considered successful in allowing the discussion of external and internal factors in the future of forests.

b) The rest of the workshop was considered less satisfactory : the planned procedure was too complex for the short time allocated. Also, maybe actual simulation was not necessary if a good discussion of a well prepared scenario could do the job! This experience suggests that the various ways to make a group work from a scenario all have their merits, but they often mix badly : too much procedural sophistication can be counter-productive.

4.5. Economic policies to control CO2 emissions[1]

Question

What are the pros and cons of possible economic instruments that may be available in the next decades, to curb CO2 emissions? How could such instruments be efficiently promoted by a limited group of countries?

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[1] **Core scientist : J.Theys; facilitator : M.Sonntag.**

Procedure

The basic design of this workshop was very simple, inspired from creativity techniques. The only element of scenario proposed (supported by some elements of context and discussion agenda) was that the workshop should be considered as a fictitious expert group meeting in 2010. The purpose was to provide a setting to help participants step out of the dubious reasonableness of the "up-to-date" ways to discuss the topic in 1988, and approach it in the broader light of possible futures. The process was planned to be similar to that of a clearly focused discussion meeting, with a possibility for the facilitator to use the scenario base to help the group stay on track, and not to get stuck in parallel debates, or in the current context of the CO2 debate.

Methodological teachings

The workshop did not go quite as planned for several reasons :

- an misunderstanding on the procedure between organiser and core expert affected the process,
- a scenario on possible facts of climatic change was added to the initial setting, pulling the group to a very unfocused discussion of climate change problems,
- once this move away from the proposed situation was started, most of the discussion was on the technical aspects of the CO2 problem, and it became almost impossible for participants to think in a "futurist" mode,
- one of the participants, who had prepared a document on a possible tax reform could not attend the exercise that day, and introduced the topic in another workshop, depriving this one of its main contribution!

This example shows

- that various scenario techniques should not be mixed,
- that simulation exercises are very vulnerable to people, group, or logistic problems,
- that preparation and coordination is crucial and requires compatible views between the most active participants and the facilitator,
- that simulation exercises (especially with high level, unaccustomed participants) imply a very directive style of facilitation; which in turn requires :

* experience in using such style, and a clear determination to do so,
* that the procedure be clearly justified to the eyes of the participants (and of the facilitators),
* that design and preparation should be simple, solid and coherent.

4.6. Chemical time bombs[1]

Question

In the European Case Study, W.Stigliani has shown several possible processes leading to the surprising and dangerous release of chemical toxics from polluted environments [réf]. How could such surprises be anticipated and prevented? How can policies be prepared to deal with problems not yet known, if one accepts the possibility of complete surprises? How could monitoring systems be designed for that purpose?

Procedure

The idea behind this exercise was to place the participants in the same situation of ignorance and uncertainty which decision makers meet at the early stages of real "surprising" problems. A scenario was prepared by two scientists; it involved a fictitious but plausible environmental problem; it comprised a general social and environmental context, and a series of events to be discovered only gradually by the participants. The initial episode is introduced to the participants, who suggest whatever policies they consider as appropriate under the cicumstances. The core experts answer their questions, and move forward the clock of simulation as decisions are made, and as natural processes described in the scenario occur.

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[1] Core scientist : W.Stigliani and J.P.van des Borgh; facilitator : P.Weller. An account of this workshop has been written by the core scientist[Stigliani, 1989 #4].

Some findings

a) The simulated process replicated in many ways the characteristic features of environmental surprises in the recent past, such as the emergence of the acid deposition problem, or the problems of mercury in the James Bay dam water.

b) Anticipation, or early detection of unanticipated problems cannot be reached through the (unfeasable) systematic monitoring of all conceivable parameters. The issue is rather vigilance, which raises at the same time difficulties in terms of social processes (for instance : creating problems is not very popular with decision makers), and in terms of technical and financial organisation. If monitoring systems produced good information on emerging environmental problems, this information would be lost on most national environmental management policies, which are already saturated with information on fully blown problems alone. Vigilance can, and will be exercised only in a context of high quality, and demanding treatment of environmental problems in general; it is reserved to countries or regions with ambitious environmental policies.
Provided this condition is fulfilled, the way to implement vigilance has been the object of animated discussion. In light of the scenario, some proposals were considered more promissing by participants :

- the creation of an incident registry system,
- the further development of data and sample banks,
- chemicals mass balances book-keeping (production-usage-disposal) on an international scale

Methodological teachings

In this workshop, the most productive features have been the scenario, and the fact of exposing the participants to a rather prolonged state of uncertainty and ambiguous perceptions of the problem at hand. They have provided a framing and a stimulation of the discussion which have had very positive effects on the discussion which occupied the second half of the workshop. Moves and their effects in the scenario have helped to show the difficulties of anticipating on environmental problems; subsequently, all ideas and proposals in the discussion appeared in a quite different, contex-

tually richer light, against the background of the surprise situation just experienced.

5. THE BADEN EXERCISE AFTER THE WORKSHOPS

5.1. Evaluation of the exercise

Of the six workshops, three can be considerd quite successful, one, rather successful, and two, testing experiments of the methodology. However, participants left the two days meeting with a very positive overall evaluation. The substantive findings and the evaluation of the methodology were discussed in depth at the plenary session of the second day. Of this discussion, only methodological observations will be retained here; they can be gathered around two themes.

The first is the intensity of the experience : "so much in two days!". Participants noted that they were "put to work", the density of interactions, the convergence of efforts. They found the scenario approach useful, the preparation and the facilitation satisfactory. It seems they have "enjoyed themselves", and found the discussion, the "learning process", very stimulating. As a group, they recommend further development of the method.

They also expressed suggestions and wishes (the first two coming several times) :

- allocating more time for a workshop,
- repeating workshops (or exercises) to deepen insights, to better grab connections between issues, ...,
- propose more unconventional scenarios in some of the areas,
- better packaging of scenarios,
- introduce quantitative backing up of the scenarios produced by the exercises,
- involve bigger groups, some types of competences having lacked in some workshops (the most notable being economists and policy analysts).

In terms of substantive findings, it seemed participants had all found an opportunity, in the process, to further actively their own intellectual agenda. The chairman proposed a set of concluding

remarks on substantive and methodological findings of the exercise. The following quotation offers pleasing methodological perspectives : "the exercise has made it clear that the potential surprises in the Future Environmental problems of Europe are linked as in a network, and the flexible connections between the various workshops in the last two days suggest a good alternative to the notion of global model, or to excessively global scenarios".

5.2. Documenting and analysing

Past the stimulation of the event, the organisers were left with fifteen hours of recording, many paperboard sheets, piles of notes taken in a hurry as the intense meeting proceeded. Some meeting give the impression that the conclusions are known before they start. This meeting did not. It produced a bulk of complex material which proved very difficult to organize. The reports and conclusions presented at the plenary contained many good observations, ideas, insights, and conclusions, but were hard to present directly to an audience lacking the benefit of the process and scenario material they were based on. Just after the exercise, the facilitators spent about a day debriefing the process, largely in writing, especially on the methodological teachings. To start the substantive analysis, two of the facilitators spent two weeks over the next two months trying to synthetise the findings of the exercise, an one of them spent additional time writing a summary report of the meeting [réf]. The result of this first effort was rather disappointing, mainly because in the process of summarizing, most of the intellectual stimulation of the process, and most of the diverse findings generated by the framework (the "gems in the ore") were lost, leaving only the framework, design, and basic scenarios, which had already been there at the start. Several months later, the organiser spent three weeks putting down a complete write-up of the exercise, based on the initial scenarios, on pad and paperboard notes, on debriefing notes by the facilitators, on some of the recordings(Mermet 1989). After this was done, accounts such as this and other papers could be written. One of the core scientists also wrote an account on the substance of the workshope he had been involved in, based on the recordings and his scenario preparation notes. At this stage, the material produced by the meeting can still not be said to have been completely evaluated and analysed.

These difficulties had not been fully anticipated at the onset of the exercise. They do indicate clearly that the material produced by a Policy Exercise is difficult to document, analyse, and translate into a product for the participants, and a fortiori, for audiences not associated with the exercise. More specifically :

- it is very time consuming to document fully the exercise,
- all organisational biases (budgets, meeting organisation routines, scientists agenda overload, ...) work against a realistic evaluation of the time actually necessary for the analysis of the PE material,
- shortcuts trying to summarize and synthetise the material before documenting it fully are at risk of loosing the best findings,
- a strong intellectual challenge is involved in the analysis of PE material, because it is very rich, complex, very heteroclitous (in particular, going from details to very general statements); in short, the problems the Policy Exercise methodology tries to address (complexity, mix of disciplines and scales,...) carry over to the analysis of the material the workshops produce.

To overcome these difficulties, further exercises should strive to satisfy three conditions :

- allotting the post-workshop phase enough time and resources,
- including documentation as a major dimension of exercise design; it should be adequate and appropriate to the aims clearly specified when planning for the exercise,
- a Policy Exercise is a method, a procedure; it should be meant to support and complement, not to replace, research on management of the long term, complexity, uncertainty, ..., aspects of environmental management; a given exercise should thus be clearly connected with the appropriate fields of research which can provide appropriate (or at least, tentative) frameworks for the analysis of the material it produces.

These conditions were hardly fulfilled in the experimental exercises led so far is excusable : the priorities were process design and exploration of the concepts potential and limits. Not including them in further exercises would be a serious problem.

6. CONCLUSION

It seems fair to say that the exercises in the European Case Study have been rather successful, and quite productive in methodological teachings. In the above presentation, most of these have been introduced with the experiments which produced them. For discussion of PE methodology, the teachings should be separated into two categories :

- technical indications (for instance : "when using a model in an exercise, be sure to give participants enough time to understand its operation, capabilities, and discuss its assumptions and structure"), which apply only to some types of exercises, or to the detailed design of exercises,
- orientation findings, which apply to all exercises (or at least, to many), and which are important already at the onset of planning to organize an exercise.

Technical indications accumulate gradually as more experimental exercises are carried through. They should be documented along with the presentation of workshops, and discussed in team work between policy exercise designers. They are part of the capital of know-how shared by the network of scientists working on Policy Exercises. The following conclusions concern themselves only with orientation findings, which should be integrated in full in the development of the methodology.

a) Policy Exercises can be a useful and applicable methodology for research projects and policy processes concerned with environmental problems involving :

- long time horizons,
- high levels of uncertainty and potential surprises,
- a great complexity, especially due to multiple stakeholders, multiple scientific disciplines involved,
- the convergence of difficulties occuring at very different geographic and organisational levels.

b) Possible contributions of PEs include :

- the ability to evaluate policy options in a dynamic framework, taking into account the time dimension often underrated by other approaches,

- the ability to evaluate problems put forth by scientific research, and policy options to address them, in the framework of the complex situations within which these policies will have to be formulated and implemented,
- the diversification, deepening, stimulation, of dialogue between policy makers and scientists on long term, large scale problem,
- the capacity to offer an active procedure and clear framework to integrate material produce by natural sciences on the one hand, social sciences on the other hand, and by various research fields between each of them.

c) In terms of the methodological terms of reference of Policy Exercises, the experiments in the IIASA European Case Study suggest or confirm that :

- careful, and even intensive, preparation is a key factor in the success of a Policy Exercise, and has to involve the participants of the workshop at an early stage,
- this does not necessarily impose a very long, or very heavy procedure, but introduces strong conditions on key participants motivation, organizers involvement, definition of exercise topic and purposes, etc...,
- a great variety of procedural designs are potentially useful; they have to fit narrowly the particular topic being treated in the exercise; this "under measure" procedure requires informed design and facilitation,
- the exercise is not over at the end of the workshop; on the kind of problems addressed, no procedure can be expected to produce a result in the way a machine produces an object; an extensive phase of documentation and analysis of the material produced should be planned for at the onset of the exercise, both in terms of time and resoureces allocation, and in terms of intellectual and editorial documentation and analysis framework,
- a Policy Exercise is, in many ways, a more demanding and vulnerable procedure thant most more traditional formats; it should be used for the kind of problems and procedural needs which cannot be met by the latter; this factor should be taken into account at all stages of planning, and results in the need for motivated participants, and good methodological know-how from the organizers and facilitators.

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