The Master Plan for the Management of Watercourses in Norway

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Summary

By 1980 approximately 60% of the total hydro-power potential of 174 TWh in Norway had been developed. The Government therefore found it essential to consider the exploitation of the remaining watercourses in terms of a larger perspective, contrary to the earlier project-by-project policy. This led to the preparation of a Master Plan for Water Resources, a national management plan based on a set of economic, social and environmental considerations. The Master Plan covers 310 watercourses and 770 hydro-power project alternatives.

The Master Plan states which projects should be considered first for a licence when development is necessary. It also specifies which watercourses should preferably be reserved for other uses than hydro-power development. In spring of 1985 the Master Plan was presented to Parliament and approved.

Introduction

In the spring of 1985 the Government presented The Master Plan for Water Resources in Norway to the Storting (Parliament). The Master Plan can be described as a national coordinated plan for the management of watercourses. The Plan includes a great number of watercourses and for each of them a hydro-power project was worked out. Subsequent impact analyses were then carried out, taking into regard a number of other user interests in the watercourse. The hydro-power projects and the results of the subsequent impact analyses were presented in individual reports on watercourses. A summary of all the individual reports from one county were then presented in a county-report. On the basis of the reports on watercourses, comments received and additional professional evaluations, a main report was prepared. This main report, together with the comments received, in turn formed the basis for the report to the Parliament.

The main report presents a national plan for the management of watercourses based on a set of economic, social and environmental considerations.

The main objective of the Master Plan was to provide the basis for taking a standpoint on which watercourse could be used for power production and which could be used for other purposes. Furthermore the plan was to present to Parliament a proposal for a priority grouping of hydro-power projects for subsequent consideration for licence. In spring of 1985 the Master Plan was presented to Parliament and approved.

Background

Industrial development in Norway started with the development of watercourses for hydro-power production and the production of hydro-power has thus led to economic growth and prosperity. Until quite recently the watercourses were regarded as an almost unlimited resource for power production. By 1980, however, approximately 60% of the total hydro-power potential of 174 TWh had already been developed. The hydro-power development has taken place on a project-by-project basis without a coordinated priority plan on a national

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level and in the last

10-20 years the conflicts with other user interests in the watercourses have been progressively greater (Figs. 1 to 6). User interests as environmental protection and fishing were brought more into prominence (Gunnerød and Mellquist, 1979). The Government therefore found it essential to consider the exploitation of the remaining watercourses in a larger perspective, contrary to the earlier project-by-project policy. These considerations led to the preparation of the Master Plan for Water Resources (*Stortingsmelding* No.54, 1979-80).

The Master Plan preparation process was started in the early 1980s by the Ministry of Environment in cooperation with the Ministry of Petroleum and Energy, and the Directorate of Water Resources. Ideally, the Master Plan should cover all those watercourses economically exploitable for hydro-power production, which had not yet been developed or permanently protected. Finally the Master Plan was designed to cover 310 watercourses of all sizes, distributed all over the country (*Stortingsproposisjon* No.130, 1981-82; *Miljønytt*, 1984), and altogether 460 hydro-power projects including a total of 770 alternatives were included (*Stortingsmelding* No.63, 1984-85; *Stortingsmelding* No.53, 1987- 87).

User Interests

Development of watercourses will directly affect a large number of users. In addition, the development will have various indirect effects on the watercourse itself and the surrounding natural environment. The scenery connected with the watercourse is a characteristic feature of Norwegian landscape. Thus if the flow of water is reduced, or removed entirely, this also changes the landscape. Gradually, the increasing need for recreation has become an important factor to be considered when evaluating how a watercourse should be exploited.

For the Master Plan 16 user interests/topics for study were defined. These were:

- hydro-power
- nature conservation (including flora)
- outdoor recreation
- wildlife
- fishing
- water supply
- protection against water pollution
- preservation of ancient monuments
- agriculture and forestry
- reindeer cultivation
- prevention of flooding and erosion
- transport
- formation of ice and the temperature of the water
- climate
- mapping and data
- regional economy

Impact Analyses

For each watercourse and hydro-power project the impact on the defined user interests were assessed and the result presented in the reports on watercourses. In order to create a professional basis for the evaluation in these reports, 3,500 studies were conducted on different areas of interest. In addition, the existing literature on the actual watercourses was studied. Each Environmental Impact Assessment (EIA) was based on the data from watercourses, the hydro-power project and the defined user interests. The EIA procedure followed a standardised scheme for all watercourses to ensure comparability.

For some interests the area was described prior to development, that is to say, the value of the area was charted. In this work there was a standardised criteria for estimating the value of the area with respect to type value, special quality and reference value (*Stortingsmelding* No.68, 1980-81).

The impacts were in the first evaluation found to be best expressed by using quantitative terms as small, great, very great, etc. Later on, the impacts were transformed into quantitative terms for comparing with the cost of the hydro-power project. The impacts were fixed using a scale ranging from -4 to +4, with -4 for very serious negative impact and +4 for very large positive impacts. In the case of certain user interests, hydro-power development may have considerable negative as well as positive effects. This relates, for example, to agriculture and forestry. But for other interests like nature conservation, outdoor recreation and wildlife, the impacts are always negative. Fig. 7 shows the phases of evaluation and the classification system used.

On the other side, it is relatively simple to value a hydro-power project and in the Plan all projects were directly comparable. This implies uniform presentation, cost estimates based on the same data, and the same method for carrying out the calculations. In the Master Plan the limit for economically exploitable hydro- power was fixed at projects which would produce power that cost

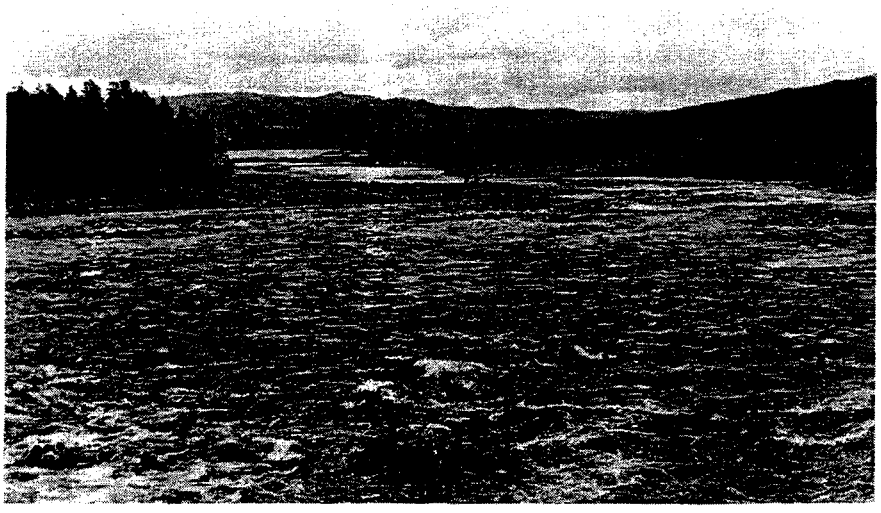

Fig. 1. Norwegian river not developed for hydro-power production.

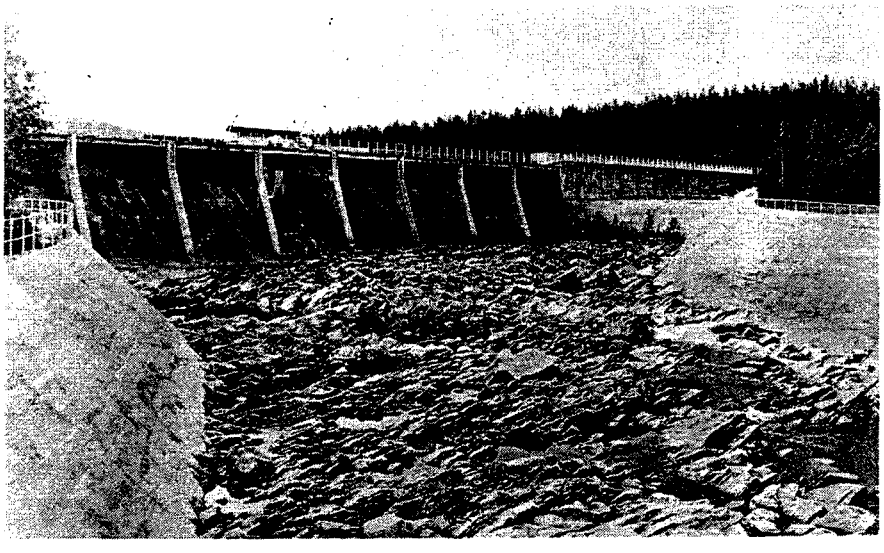

Fig. 2. Regulation dam and river basin without water, Norway.

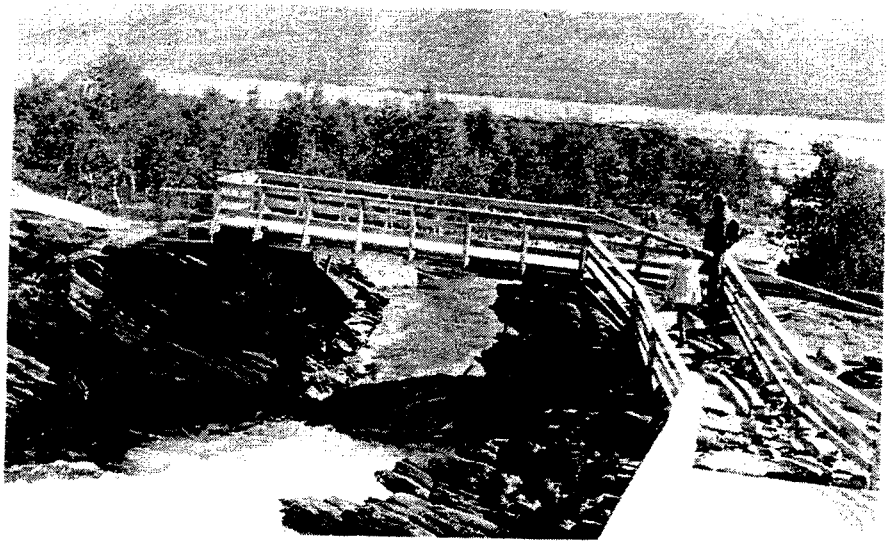

Fig. 3. Outdoor life and recreation are significant interests in the watercourses.

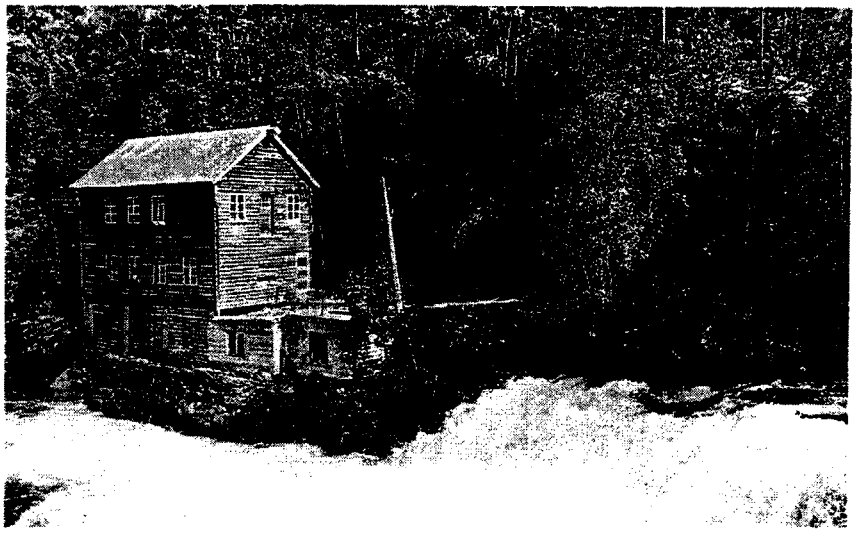

Fig. 4. Old sawmill, closely linked to the river, Norway.

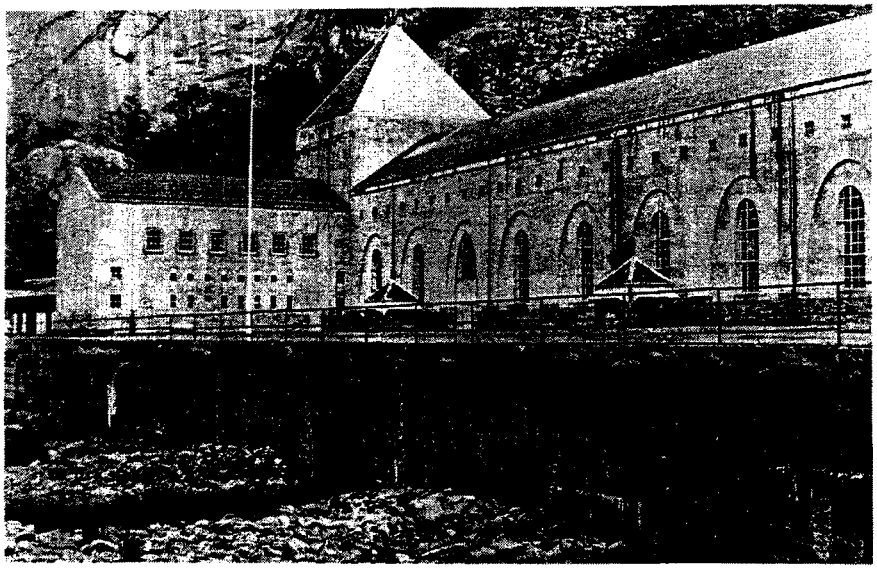

Fig. 5. Old Norwegian hydro-power station now considered as an ancient monument.

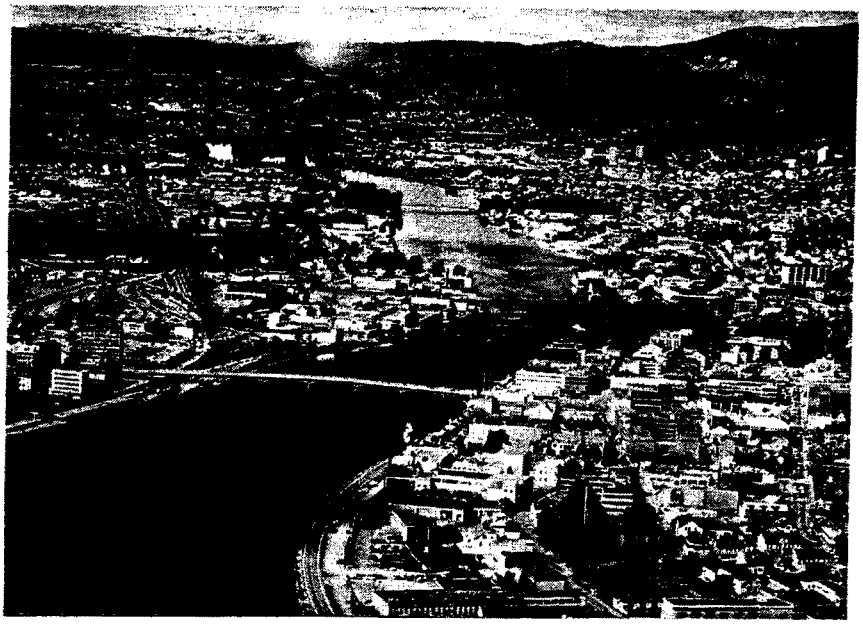

Fig. 6. The Drammen River, Norway, developed for hydro-power production with environmental considerations.

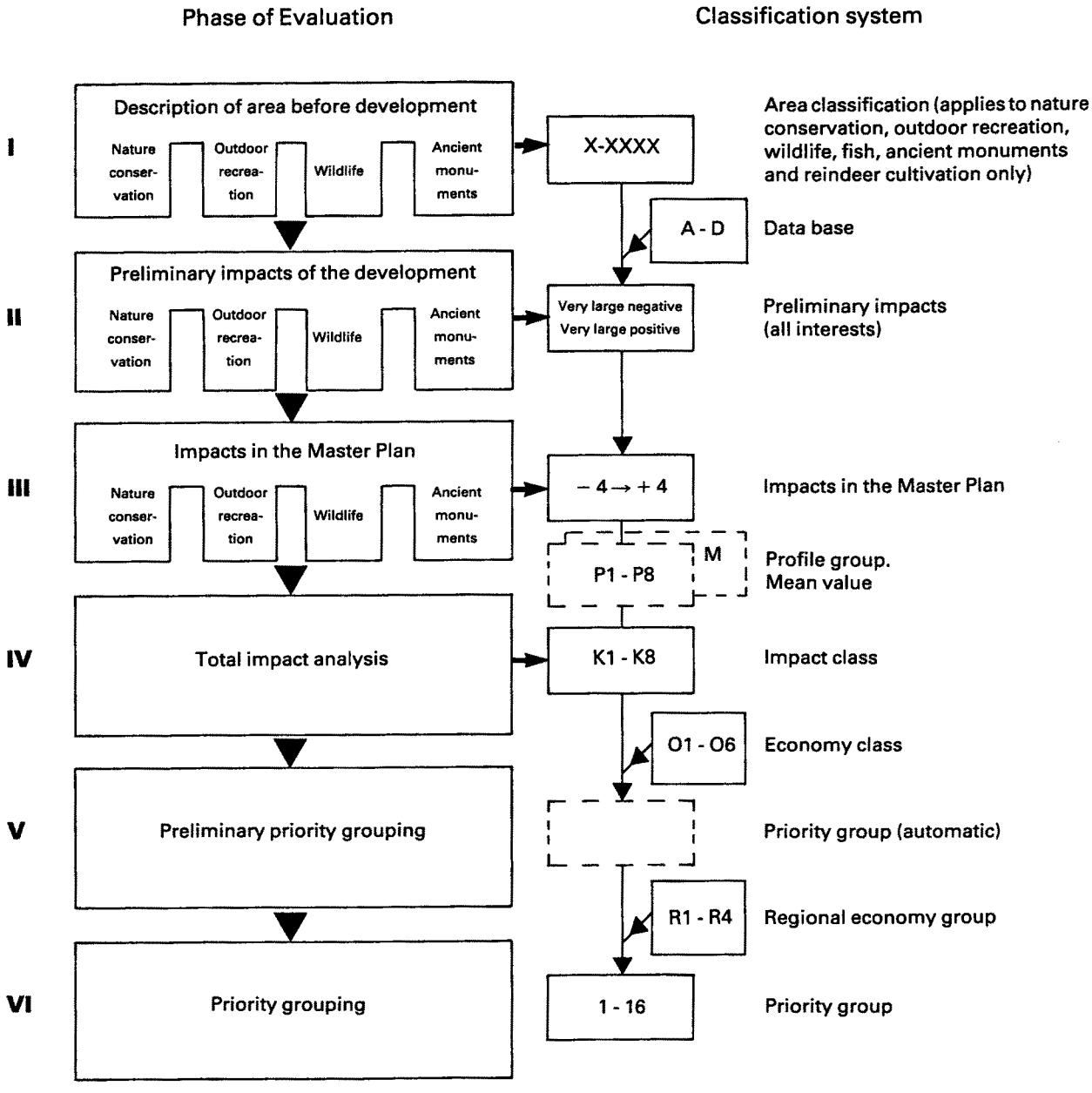

Fig. 7. Classification system in the Master Plan seen in relation to the phase of evaluation of the different projects.

more than power from a solid fuel or nuclear power plant. The limit was fixed at 300øre per kilowatt/hour.

The Reports

In the work on the Master Plan the main effort was directed at the preparation of the individual reports on the watercourses. These reports, totalling 285 in number, were presented as individual impact analyses with a uniform content for each watercourse and hydro-power project.

They each contain an introductory chapter on natural resources and society, another chapter on the different uses and interests connected with the watercourse, a chapter on hydro-power projects, a fourth chapter on the effects of development, and finally a chapter summing up the conclusions and giving a statement of impact in qualitative terms. The reports also contain topic maps. Up to 10 maps

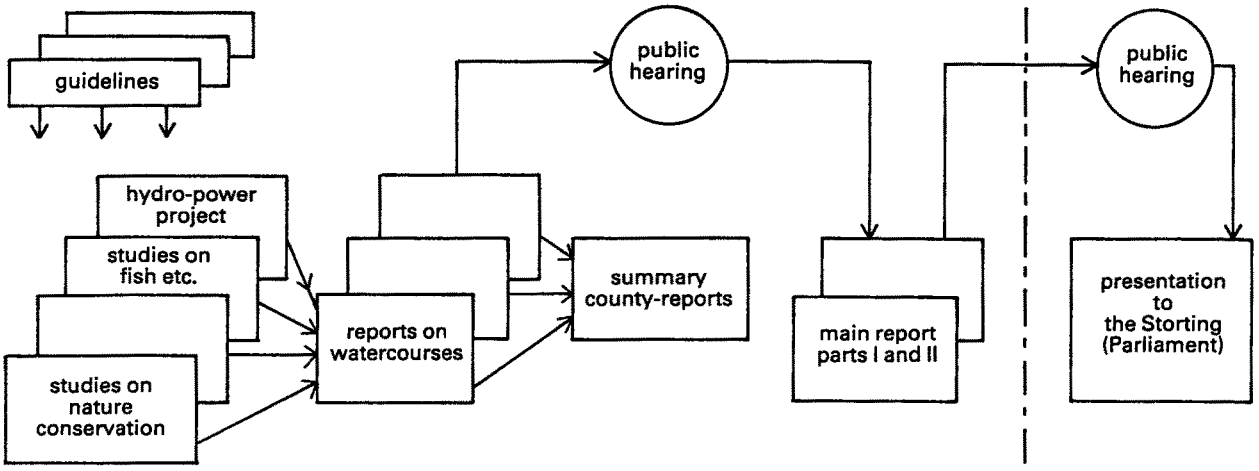

Fig. 8. The Master Plan, phases of reporting.

are enclosed with each report, indicating settlement municipal boundaries, and areas of expected conflicts with the different users.

Public Participation

It was considered particularly important to ensure that all affected parties were given the opportunity to read the reports and submit their comments. The municipalities, local interest organizations and relevant developers received both individual reports on watercourses and finally the Master Plan for comments. Fig. 8 shows the phases of reporting.

The main conclusion is that those agencies who provided comments tended to agree with the impact analyses presented in the reports.

Sorting into Groups

The impact analyses in the reports on the watercourses were preliminary, since they were made on a basis of each watercourse and hydro-power project seen in isolation. In the Master Plan all the interests were evaluated collectively for a large number of projects and the results compared for the purpose of setting up an order of priority for different projects in relation to each other.

After evaluating and weighting the different user interests affected by a project, it was possible to undertake a total evaluation (Carlsen and Wenstop, 1983). In order to achieve a division into groups and categories, all projects were placed in an impact class ranging from 1 to 8 and an economy class ranging from 1 to 6, as shown in Fig. 9. The projects were then placed into 16 priority groups. Projects with the best power plant economy and the least negative effects on other user interests were placed in the first of the priority groups. The 16 priority groups were then divided into 3 categories.

Catalogue 1. Projects, all of which can be considered for a licence immediately. Groups 1 to 5.

Catalogue 2. Projects which may be exploited for hydro-power production or used for other purposes. Groups 6 to 8.

Catalogue 3. Projects not relevant for hydro-power development due to the large degree of conflict with other users or because of the high cost involved. Groups 9 to 16.

Fig. 9 illustrates the consequences of development.

The list of priorities was then presented to Parliament and approved in 1985.

Conclusions

The Norwegian experience in hydro-power development over the last 80 years has shown that development on a project-by-project basis is not satisfactory in providing sound environmental development. The new Master Plan approach is more in accordance with the current changes in policy towards greater integration through water management planning. This new concept of water planning focuses on a broad range of user interests for the watercourses. Even with a well organized EIA-process there is need for a national plan to set

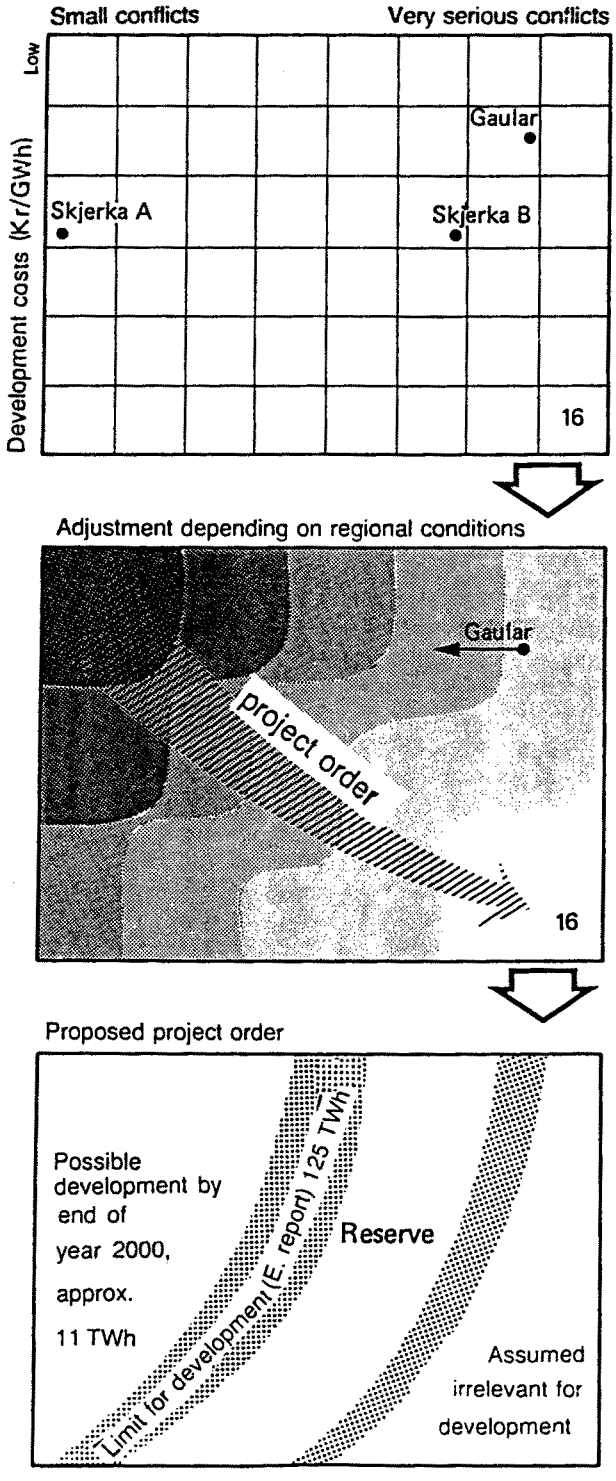

Fig. 9. Consequences of development.

priorities in project development. In the Master Plan for Water Resources the priorities are based on a set of economic, social and environmental considerations.

Experiences with the Master Plan process have shown that the plan is not only a tool for setting political priorities. Documentation made in the planning process has proved to be valuable in water management planning at the county and municipal level, and in subsequent stages of the licensing procedure for hydro-power projects. Conditions established in, and information from, the Master Plan will be of particular value throughout the scoping process for individual EIAs.

In April 1987 the Plan was re-examined and followed up for the first time with adjustments. A lot of projects in Category 1 are now under consideration for licence, while watercourses in Categories 2 and 3 are under consideration for other purposes or permanent protection.

The Master Plan is neither a Protection Plan nor a Development Plan. It states which projects should be considered first for a licence when development is necessary. It also specifies which watercourses should preferably be reserved for other uses than hydro-power development. It serves to present concrete proposals for further administrative procedures. The Master Plan has become an effective tool in the management of watercourses in Norway.

References

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