FINAL REPORT

EUROPEAN FORESTRY COMMISSION

Jaca,
Spain,
4-15 July
1994

Working Party on the Management of Mountain Watersheds

Nineteenth session

Food
and
Agriculture
Organization
of
the
United
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I. INTRODUCTION

1. The Nineteenth Session of the European Forestry Commission's Working Party on the Management of Mountain Watersheds was held in Jaca, Spain, from 4 to 8 July 1994 at the kind invitation of the Government of Spain. The working meetings took place at the Jaca Conference Centre, and were followed by a study tour organized by the Host Government, illustrating integrated watershed management, torrent and avalanche control, and forest hydrology in Northern Spain from 11 to 15 July. The agenda, timetable and study tour programme are given in Annexes A, B and D.

2. The Session was attended by 50 delegates and observers from sixteen EFC member countries: Austria, the Czech Republic, France, Germany, Greece, Hungary, Israel, Italy, Norway, Poland, Portugal, Rumania, Spain, Sweden, Switzerland, and the U.K., and from one non-European country: Japan. The list of participants is given in Annex C.

3. The Chairman of the Working Party, Mr B. Saillet, France chaired the discussions together with the two Vice-Chairmen, Mr L. Rojo, Spain and Mr W. Kraus, Germany. Mr T. Michaelsen of FAO's Forest Conservation, Research and Education Service, Secretary of the Working Party, ensured coordination of the meeting, which was greatly facilitated by the efficient arrangements made by the Spanish Institute for the Conservation of Nature ICONA. The study tour was also organized and conducted by ICONA in collaboration with the regional forest services.

4. Mr B. Saillet welcomed the participants from EFC member countries and overseas observers. He recalled that the Working Party with its 42 years was one of the oldest FAO working groups, and that its work included both technical and socio-economic aspects of watershed protection, and the livelihood and safety of watershed populations. The presence of 16 European member countries and Japan was proof of the relevance of and present interest in the work of the group. The Working Party is of course first a statutory intergovernmental body under FAO's European Forestry Commission, and as such it is composed of Government administrators. However, the group provides ample opportunity also for field practitioners and researchers/scientists (especially through IUFRO) to participate in the debates and exchange of information. The Chairman noted with satisfaction the many between-session activities which had taken place since the 18th Session at Oberstdorf. A special welcome was extended to the delegations from Eastern and Northern European countries participating despite of the unsuccessful efforts to secure financial support for collaboration with Eastern European countries as a follow-up to the Strasbourg and Helsinki Ministerial Conferences on Forest Protection in Europe.

5. Mr José Ramón Lopez, on behalf of the Regional Government of Aragón, welcomed the participants to Jaca and Aragón. The region was affected by the general migration away from rural areas, and a big challenge to Government was the management of land use changes and proper rehabilitation and land husbandry of abandoned agricultural land in watershed areas.

6. Mr J.P. Lanly, Director, Forest Resources Division, FAO, welcomed the participants on behalf of the Director-General of FAO, and thanked the Government of Spain for the kind invitation to host the Nineteenth Session and ICONA and the Regional Government of Aragon for the organization of the session and the logistic support provided. He thanked Mr Saillet for having provided competent and effective leadership to the Group since his election at Oberstdorf. Together with forestry in general, watershed management and torrent control had become issues to be discussed by politicians and the media. This provided a major challenge to foresters - men and women - who may have chosen this profession for what it used to involve, namely being alone, working in the forest, and not being confronted with the public and the media. In contrast, politicians were by the very nature of their task sensitive to public opinion, but their mandates had much shorter durations than those required in forestry and in the restoration of mountain ecosystems. The 18th Session at Oberstdorf had been held just after the United Nations Conference on Environment and Development UNCED. Two international processes related to UNCED were of particular interest to the Group i.e. the Strasbourg and Helsinki Ministerial Conferences on Forest Protection in Europe, and the follow-up to Chapter 13 of Agenda 21 "Managing Fragile Ecosystems: Sustainable Mountain Development". Mr Lanly concluded by noting the

many activities in which the Group had been engaged since Oberstdorf and reminded of the importance of the arid and semi-arid zones, where rainfall is more erratic but also more torrential. He informed the Group about the recent adoption by the FAO Committee "Silva Mediterranea" of the Mediterranean Forestry Action Programme. Finally he congratulated Mr G. Fiebiger, representing Subject Group 1.04 Natural Disasters of the International Union of Forest Research Organizations IUFRO, for the preparations made for the joint in-session FAO/IUFRO Symposium.

7. Mr A. Barbero, Deputy Director General of ICONA welcomed the participants on behalf of the Host Country, Spain. He noted that this was the second time in ten years, since he had also had the honour and pleasure to welcome the Group to the 14th Session at Torremolinos in 1984. He further conveyed the welcome of the Director General of ICONA who at this time was fully engaged in launching the annual forest fire control campaign. Forest fires in 1994 had already commenced and were having devastating effects including loss of human lives. Mr Barbero reminded the Group of the watershed management work carried out by ICONA in close collaboration with provincial forest services. This work had been on-going for more than a century. The aims are not only to save natural resources from degradation, but also to save people's lives and livelihood. Today the general orientation is towards sustainable development in the rural areas, with tourism as an important source of income. In conclusion Mr Barbero thanked FAO for its continuing support to the Group and to the Government of Spain and wished the participants a successful meeting.

Mr Barbero then declared the Nineteenth Session officially open.

8. The Working Party adopted the proposed agenda and timetable given in Annexes A and B.

II. NATIONAL REPORTS

9. Delegations of the following countries presented national reports (in chronological order): Germany, Austria, the Czech Republic, Spain, France, Greece, Israel, Italy, Japan, Norway, Poland, Rumania, Sweden, and Switzerland.

10. Mr A. Göttle presented the national report of Germany. Watershed management is of vital importance in Alpine areas for flood and avalanche control. In the Federal Republic of Germany avalanche and erosion control is mainly the task of the Free State of Bavaria being responsible for the northern Alpine area. The Bavarian Alpine region covers a total area of about 4 750 km^2, the length of torrents is about 12 200 km. Through the "Programme 2000 - Torrents and Avalanches Control" the Bavarian administration has planned all necessary protection measures against Alpine natural hazards. The annual expenditure for maintenance and protective measures of these torrents and their watersheds amounts to DM 40 million. In 1989 a research project of "Run-off and Erosion in Mountain Watersheds" was started. In 1992 this was followed by further research work on "Integrated Protection Perspective on Torrential Risks" and "Analysis of the Dynamics of Avalanches by Geographic Information Systems".

11. Mr W. Rachoy presented the national report of Austria. About 62% of the national territory are torrent - and avalanche - watersheds and areas affected by erosion. In the high mountain regions, such as Tyrol, these areas constitute 90% of the territory. Natural hazards are mitigated through land use planning and through technical and biological control measures. The Forest Technical Service for Torrent and Avalanche Control with, currently, a total of 1 620 employees within the Ministry of Agriculture and Forestry had been carrying out this work for the past 110 years. Over the last four years project planning has been based on the concepts of integrated amelioration and ecosystematic management of watersheds. At the moment there are 1 200 projects under implementation with a total annual budget of about 1 600 million Austrian Shilling. Recently the safeguarding of the multiple functions of forests had become an essential activity. About 160 000 ha of forests have to be restored in the next decade. Presently there are projects under way in 30% of this area.

12. Mr J. Krecek presented the national report of the Czech Republic. Mountain watersheds in the Czech Republic represent an area of 8 267 km^2 or about 10% of the national territory. At present surface

waters of the mountain regions are used to supply about half of the nations demand for drinking water. The regions involved are mostly fully forested, and about one third of the Czech forests are located there. The report provides an overview of the historical development related to mountain forests, the present situation concerning forest hydrology and headwater control, the situation of mountain forests in a new environment, and the need for a public debate and for multidisciplinary research on the rehabilitation of mountain watersheds. Two workshops on the protection of mountain watersheds in Central and Eastern Europe had been organized in the Czech Republic in 1993 as a follow-up to Strasbourg Resolution 4. A main conclusion had been the recognition of the need for multipurpose and multisectorial management developed on a regional basis in a national debate including all interested parties: Government, private forest owners, municipalities, local business activities, NGO' and the general public of the region.

13. Mr E. del Palacio and Mr L. Rojo presented the national report of Spain. Since the 18th session of the Working Party in 1992 progress on forest hydrology restoration and watershed management has been satisfactory, thanks to the collaboration between ICONA and the forest services of the autonomous regions. This collaboration is formalized through letters of agreement and involves national financial contributions covering 50% of the costs. Reafforestation during 1993 covered an area of approx. 26 000 ha, whereas torrent control works included 143 466 m^3 of check dams as well as 13 417 m of longitudinal river training structures. Conservation treatment and improvement of protective vegetative cover extended over approx. 28 000 has. The preparation of watershed restoration projects continued with an annual investment of 60 million pesetas. Several types of watershed protection and rehabilitation works are eligible for funding under various rules and regulations of the European Union.

14. Mr J.M. Stephan presented the national report of France. After four years of drought the last two years have been marked by natural disasters related to an abundance of precipitation producing flood events with a return period of 100 to 300 years. The report provides a detailed account of recent natural disasters, new institutional arrangements, concrete action in the mountains, the management of mountain forests, and international cooperation.

15. Mr A. Vouzaras presented the national report of Greece. The prolonged drought periods over the last decade had led to an analysis of ways in which water yield from watersheds could be increased by manipulating the forest cover. Socio-economic development over the last forty years had led to a general decrease in grazing and in the collection of wood and forest scrub for fuelwood and fodder. As a consequence there had been a build-up of highly flammable forest litter. However, manipulation of the forest cover offered only limited opportunities to increase water supply without seriously affecting the long term stability of the forest and soils.

16. Mr N. Leiderman presented the national report of Israel. Water management in Israel is closely connected to the prevailing natural conditions: hot mediterranean climate, large arid and semi-arid areas in the south and soil conservation problems caused by run-off water and floods in the winter time. The Land Development Authority of the Jewish National Fund is an Israeli agency for land development and afforestation. It is also entrusted with all activities related to soil conservation, drainage, erosion control and expanding available sources of water.

17. Mr S. Puglisi gave a verbal presentation of recent institutional arrangements related to watershed management in Italy.

18. Mr H. Marui gave a presentation illustrated with slides of torrent control work in Japan.

19. Mr H. Haga presented the national report of Norway. This contains an account of recent developments related to water management, planning for river protection, studies on erosion and sediment transport, flood estimation and dam safety measures, of the River System Simulator (a computer-based simulation system for multi-purpose planning and operation of river systems with special emphasis on hydropower and its environmental effects), and of the preparation of natural hazard maps for land use planning. Concerning mountain forest a research note by Mr J.I. Holten of the Institute for

Nature Research on the "Effects of climate change on plant diversity and distribution in the Fennoscandian mountain range" was attached to the national report.

20. Mr K. Sporek presented the national report of Poland. On the recommendation of the meeting of the Eastern and Northern Sub-group on follow-up to Strasbourg Resolution 4, held in Prague in May 1993, a national conference on "Environmental threats to the Western Sudeten Forests" had been held in Swieradów, Poland 9-10 June 1993. Eighty people had taken part in the meeting including representatives from the Czech Republic, Norway and Denmark. The proceedings had been published.

21. Mr V. Lazar presented the national report of Rumania. Inventories carried out over the past 25 years show that over 60% of the stream network of the country is of a torrential nature. In order to limit the negative effects of torrential phenomena the "National Programme for Watershed Management" was adopted in 1976 for the period 1976-2010. In new legislation (1991) special attention is given to soil erosion control through rehabilitation of land currently under agriculture, but which is unsuited for cultivation. In the coming years special measures will be required for the restoration of ecosystems affected by erosion, landslides or contamination including 600 000 ha of agricultural land and complex torrent control works on 7 500 km of the network of torrential rivers.

22. Mr P. Kjellin presented the national report of Sweden. As a follow-up to Strasbourg Resolution 4 the National Board of Forestry and the County Forestry Boards in Northern Sweden were working on a project which aims at defining the border along the mountains above which permission for final felling normally will not be granted because of the risks involved in establishing a new forest. The project would be concluded by July 1995. The defined border, some 5 000 km long would probably be considered preliminary for some years with adjustments made as necessary. Personnel have been trained in the identification of key habitats and the floral, faunistic and cultural heritage. This training was considered particularly important for mountain forests. Some 40% of the Swedish mountain forests with a production capacity exceeding 1 m^3/ha/year were protected as national parks, nature reserves and crown forest reserves.

23. Mr P. Greminger presented the national report of Switzerland. The Swiss forest service had been planting deforested areas for the last 100 years. Mountain forests which had been poorly managed during the last century were now in stable condition and their effectiveness as a protection against natural hazards had increased. In order to ensure the multiple functions of forests a new forest law had been enacted in 1993. With this new law it would be possible to maintain Swiss forests both quantitatively and qualitatively. Financial support through the Swiss Federal Forest Agency in 1993 had been 40 million SFrs. for silviculture in unstable forests, 50 million SFrs. for technical measures to protect people and infrastructure, 65 million SFrs. to deal with forest damages, and 5 million SFrs. for planning. Main problems to be solved include: utilization of the wood growth potential, effects of heavy storms and bark beetles, long term effects of air pollution, non profitable forest enterprises, increase the productivity of forest enterprises, improve the awareness of non-wood benefits and public relations, and better marketing of wood products.

III. EROSION CONTROL IN MOUNTAIN WATERSHEDS

24. Mr F. Combes presented his document: Before and after, or the time dimension of mountain watershed behaviour. Three examples were presented to illustrate long term watershed development: (a) Revegetation of black marls, (b) Torrent control of the Maurienne torrent, and (c) Geological causes of torrential phenomena in the Bourg Saint Maurice torrent. The three examples illustrate the need to treat each torrent as an individual case, and torrent control techniques must be adapted to each particular problem. Man, forests and geology represent three different time scales, with geology being much longer than the two others. Time may turn out to be an ally or an enemy in different cases, but it must be taken into account. At Bourg Saint Maurice where (geological) time is against us the forest is estimated to be assured about 10 000 years of peaceful existence. This is not negligible on a human time scale.

25. Mr Y. Crosaz presented Soil protection using vegetative material. The marls represent a particularly difficult case of revegetation in the Mediterranean area. Research has concentrated on finding the most effective types of vegetation, on methods of establishment of these on sites affected by soil erosion, and on the measurement of the influence of vegetation on surface soil erosion. Species include grasses, legumes and other. Geotextiles have been extensively tested.

26. Mr G. Dalla Fontana presented A GIS approach to the evaluation of hydrological effects of land use changes at basin scale. A distributed hydrological model, developed as a GIS module, was used to evaluate the hydrologic effects of land use changes in the Sarca de Campiglio watershed (23 km^2) in the Italian Alps. The model computes rainfall excess based on the Curve Number procedure. Local excess is then transformed into discharge to the basin outlet using e cinematic approach based on a synthetic channel network derived from Digital Terrain Models. The model was validated using 21 flood events recorded at the basin outlet since 1981.

The hydrological effects of past land use changes in the Sarca watershed were analyzed based on four raster land use maps (37 866 cells) produced from aerial photographs taken in 1954, 1970, 1983 and 1989. Future land use changes from a further expansion of urban areas and ski runs were evaluated with specific reference to two scenarios which correspond to a more conservative and a less conservative planning hypotheses.

27. Mr V. Lazar presented the paper authored together with Mr I. Clinciu entitled Contributions to the study on the dynamics of the sedimentation of dams related to small catchments with varying degree of forest vegetative cover. Retention behind a total of 73 check dams, with heights varying from 2 to 8 m was followed with time intervals ranging from 2 to 16 years. This has allowed for the establishment of a relationship between the sedimentation of check dams and the degree of forest cover on the watershed. The established correlation represent further proof of the hydrological and erosion control functions of forests.

IV. MANAGEMENT AND RESTORATION OF ARID AND SEMI-ARID ZONES

28. Mr V. Gomez made a presentation on Mechanized land preparation for forest plantations in arid lands. The document provides a description of mechanized land preparation techniques presently being used for reafforestation in Spain. The various techniques have been grouped according to the slopes on which they are applied i.e. slopes less than 25-30% and slopes above 25-30%.

29. Mr G. de Aranda and Mr R. Currás presented their document entitled Forest-hydrological restoration for the protection of populated areas against flash floods in arid and semi-arid zones in South-Eastern Spain. South-Eastern Spain has a semi-arid to arid mediterranean climate. At the same time the costal zones have a higher than average population density and an advanced stage of rural and industrial development. Many urban areas are situated in the natural water courses, which, due to the intensive precipitation and the short time of concentration of surface run-off, has disastrous effects on these towns. The document describes various forest-hydrological measures adapted to the different urban situations through the application of hydro-technical protection works and restoration of the vegetative cover.

30. Mr A. Gioda gave a presentation on the Valorization of horizontal - mist - precipitation on the Canary Islands using technology developed in the Chilean and Peruvian deserts. Development of arid zones, which cover one third of the tropics, remains a challenge especially in the mountains. The examples presented on "fountain trees", on the interception of horizontal precipitation by nets, and the protection and utilization of vegetative formations related to clouds (cloud forests and mist oasis) is part of a strategy for sustainable development of these zones. Such measures are part of rural history such as the use of "fountain trees" on the Canary Islands. In addition, they also constitute economical and locally adapted techniques in Northern Chile and in Peru. The nets, used as mist traps, constitute a free and renewable source of water, a technique which could be introduced in the Canary Islands.

V. FOLLOW-UP TO RESOLUTION 4 OF THE STRASBOURG CONFERENCE ON FOREST PROTECTION IN EUROPE: "ADAPTING THE MANAGEMENT OF MOUNTAIN FORESTS TO NEW ENVIRONMENTAL CONDITIONS"

31. Mr B. Saillet recalled the recommendations made by the Working Party at Oberstdorf. These had included the acceptance by the Group to contribute to the implementation of Resolution 4 under the international coordination by Portugal. Three sub-groups had been established: one for Central, Eastern and Northern Europe; one for the Alpine Region; and one for the Mediterranean. Four common project areas had been identified: (1) Indicators of the stability of forest ecosystems (in collaboration with the European Union), (2) Inventory of natural - or near natural - forests and definition of minimum management required, (3) A coordinated research programme with the relevant Subject Groups of IUFRO, and (4) International exchange of scientists working on mountain forest management. At Helsinki the report of the International Coordinator had been accepted and the lead role of the Working Party in the implementation of Strasbourg Resolution 4 had been confirmed.

32. Mr Rui Silva, International Coordinator for follow-up, to Strasbourg Resolution 4, agreed with the presentation of the Chairman. Following the acceptance by the Working Party at Oberstdorf a dynamic process of meetings (about 12 international meetings), questionnaires, exchange visits, revision and enactment of legislation, etc., had taken place. However, mountain forests were still high on the political agenda and in the public debate and most of the work was still ahead.

33. Mr C. Chauvin, on behalf of the Alpine sub-group, recalled the international meeting on mountain forests in Grenoble, April 1993, and the exchange visits which were taking place in the informal group on Indicators of Stability, in which France, Germany, Italy, Switzerland and Slovenia were taking part. Collaboration had been obtained from the International Centre for Alpine Environments (ICALPE), and from the European Forestry Institute (EFI). An informal group on Minimum Forest Management Requirements had made good progress, whereas the coordinated research programmes and the exchange of scientists, proposed in Resolution 4 had made little progress.

34. Mr J. Krecek, on behalf of the Central, Eastern and Northern European sub-group, recalled the international meetings which had been convened and hosted by the Czech Republic, including the Second International Conference on Headwater control in 1992 and the two meetings on the protection of mountain forests in May and November 1993. Countries with economies in transition were still undergoing profound economical and political changes. Threats to mountain forests included extreme environmental pollution and excessive logging. In several countries it would be necessary to initiate a national multisectorial debate about the objectives of forest management, to improve monitoring and research, as well as national legislation. The Czech Republic was presently working on a new forest law and a new water law. Support from national and international NGOs was essential due to the very limited financial resources available to Governments.

35. Mr Rui Silva, on behalf of the Mediterranean sub-group mentioned the four main areas of concentration namely (1) the study of the functions of mountain forests, biologic, economic, protective, and the all-important issue of fire control; (2) forest management types, agro-silvo-pastoral systems included; (3) restoration of mediterranean forests; and (4) joint pilot and demonstration projects. The sub-group had taken advantage of the June 1994 meeting of Silva Mediterranea at Larnaca, Cyprus. A major problem faced by several countries was the lack of a forest management tradition.

36. Following the opening statements of the Chairman of the Working Party, the International Coordinator and the sub-group leaders, a first round of discussion took place. It was agreed that the question of financing of national as well as international activities and initiatives remained by and large unresolved; the sub-groups should work towards national and international norms, indicators, principles etc., which can be incorporated into national practices, rather than towards producing joint prescriptive manuals. The groups should gradually become more ambitious and ensure a place for mountain forests in the general national debates on forests.

37. The national S4 report of Switzerland was presented by Mr Greminger. The principles of Switzerland's new Forest Law coincide with those of S4. National groups on mountain forests are active with regular meetings taking place "indoors" as well as "outdoors". Publications on mountain forests have been prepared for researchers as well as for practitioners.

38. Mr Göttle presented the national S4 report of Germany. There is presently good collaboration between foresters and groups representing ecological concerns, and between foresters and politicians. Research programmes on mountain forests are active. However, it will take another two to three years before budgets and manpower presently absorbed by general questions related to forest damage and forest health will be available for questions related more specifically to S4.

39. The national report of Austria on S4 was presented by Mr Rachoy. Work was being carried out within the principles of S4 and the Alpine Convention. The overall objective was to maintain efficient management of agriculture and forestry in the mountains for rural communities. A series of provincial conferences were being held in order to stimulate local debate and ensure adequate information.

40. Mr Haga and Mr Beheim presented the national S4 report of Norway. The linkages which exist between watershed management and forestry in central and southern Europe do not exist in Norway. The country had been represented at Strasbourg and Helsinki, but not by people working in watershed management. Presently private forest owners were free to carry out several activities not permitted in the environmental laws. The Water Resources Act, administered by the Ministry of Industry and Energy is being revised and will become more "watershed oriented".

41. Mr. J. Mintegui referred to the national debate on protection of mountain forests in Spain. It was important to realize that the protection of mountain forests is about "protection of forests which protect us". The basic issue is therefore protection of human lives and livelihoods.

42. Mr Kjellin reported on follow-up to S4 in Sweden. The new forest policy of 1991 was clearly influenced by S4. There are no problems with the overall goals, but there is some discussion on how to reach them. Mountain forests, although of limited importance in the national economy, were very important for regional development, conservation of biological diversity and tourism. Generally no exotic tree species were allowed in mountain forest management. Important legislation related to mountain forests included the Forest Act and the Nature Conservancy Act.

43. Mr Krecek presented the national report on S4 of the Czech Republic. Research and monitoring had shown only limited climatic changes. Acid deposits had been the important factor causing mountain forest damage. The question was now how to restore watershed forests. No clear link between water quality and forest cover had been established.

44. Following the national reports on S4 a second round of debate took place. The Working Party confirmed the acceptance of responsibility for S4 under the coordination by Portugal. This arrangement had been welcomed and endorsed by the Helsinki Conference. However, in order to continue people were needed and the Chairman of the Working Party therefore requested, and obtained, confirmation of the availability of the International Coordinator, Mr Rui Silva, Portugal, and sub-group leaders, Mr C. Chauvin, France, and Mr J. Krecek, the Czech Republic. It was further agreed that the Working Party should follow closely the overall institutional arrangements being made for follow-up to Strasbourg and Helsinki and in preparation for the Third Ministerial Conference on Forest Protection in Europe to be held in Portugal in 1997. Expert level meetings were also taking place with the first one, on indicators for sustainable forest management having been held in Geneva in June 1994, and the second scheduled to be held in Turkey in January 1995 in relation with the 27th session of the European Forestry Commission. Follow-up to S4 should continue as an Item on the Agenda and in the Programme of Work of the Working Party.

45. Mr T. Michaelsen presented the document Sustainable mountain development in the wake of UNCED. The major outcome of the United Nations Conference on Environment and Development (UNCED) consists of five negotiated and agreed documents and conventions, viz. the Rio Declaration

on Environment and Development, the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all types of forests, Agenda 21, the Framework Convention on Biodiversity, and the Framework Convention on Climate Change. Agenda 21 constitutes the action framework for the world community in practically all fields related to environmental protection and development. It consists of 40 chapters, which have been described as "the road map and a guide for business and Government policies and for personal choices into the next century". Issues related to mountains are the subject of a full chapter, namely Chapter 13 entitled "Managing fragile ecosystems: sustainable mountain development". The designation of a number of organizations or inter-agency mechanisms as Task Managers, for various chapters, issues and programme areas of Agenda 21, had been instituted to facilitate the task assigned to the UN Inter-Agency Committee on Sustainable Development (IACSD) of coordination by using the comparative advantage and knowledge base of the organizations so designated. The overall objective is to ensure collaboration and cooperation in the follow up to, including reporting on, the implementation of Agenda 21 by the United Nations system. FAO has established a Steering Committee on Environment and Sustainable Development to, among other things, coordinate follow-up for the chapters and activities of UNCED for which FAO is responsible as Task Manager. For Chapter 13 a Focal Point in the Forestry Department has been designated (the writer) and an Interdepartmental Mountain Group has been established with the participation of nine technical and development divisions in addition to the Forestry Department. In order to formally initiate inter-agency cooperation FAO convened the first ad hoc Inter-agency meeting on follow-up to UNCED Agenda 21, Chapter 13 in Rome on 21-22 March, 1994. The meeting agreed that it would be necessary to make a special effort to move fragile mountain ecosystems and the "Mountain Agenda" higher on the international and national development agendas, and it proposed a series of activities aimed at achieving this. FAO, as Task Manager, was requested to seek donor support for preparatory consultations within a steering committee, and a series of regional workshops leading to a World Conference on Sustainable Mountain Development to be held in early 1997. The Working Party has a central role in the region with regards to UNCED Agenda 21, Chapter 13. It is the only permanent inter-governmental forum which deals entirely with mountain related technical and institutional matters; its mandate include all European FAO member countries and it is therefore an important forum for the participation of Central and Eastern European countries.

46. Mr J.G. Sempere presented his document entitled: Proposal for the development of a European Network of "Experimental Mountain Watersheds". A comparative analysis is made of different recent studies, plans and projects on integrated watershed management with different objectives. Assuming water to be the limiting factor for sustainable development the watershed is considered as an aggregate of sub-watersheds in a prioritized sequence of actions leading to the integrated planning and management of a territory and its natural resources. Decisions made at UNCED on the conservation and management of resources for development and expressed in Agenda 21 have been taken into consideration. A proposal is made to the Working Party to promote an integrated approach covering environmental, socio-economical, technical, legislative and administrative aspects in an adequate number of short and medium term "experimental projects". These projects should allow for the application of research and best practices, evaluating their effectiveness and disseminate their results, thus constituting a data bank which may be used in successive projects. Special attention is paid to the pre-testing and simulated development of projects.

47. In addition to the plenary sessions listed in the timetable, an informal meeting of heads of delegation was held with Mr Lanly, Director FOR, on Tuesday 5 July. In his introduction Mr Lanly stressed the inter-governmental nature of the Working Party as a subsidiary body of the European Forestry Commission. This provided the group with a permanent institutional framework, which in the past had not always been fully utilized. The Working Party was a forum at the service of all European mountainous countries where practitioners and researches could exchange views and experiences, and through the participation of observers, also benefit from experiences in other continents. The heads of delegations agreed that this permanence was important and to ensure that the Chairman of the Working Party participate more actively in the EFC. The meeting also agreed that the scope of work of the Working Party had undergone continuing revision, and should continue to do so, in order to retain its "core" membership, but at the same time respond to on-going concerns of a technical and political nature. In this connection, it was considerable desirable to formulate a "mission statement" of the Group

to be revised as and when needed. The Group should follow international development related to its mandate and serve as a source of technical advice to Governments not only at the technical, but also at the policy level.

VI. FAO/IUFRO SYMPOSIUM: PREVENTION OF NATURAL DISASTERS, RESEARCH AND TECHNICAL ASPECTS

48. Mr G. Fiebiger, Deputy Leader of Subject Group S1.04 Natural Disasters chaired the symposium, assisted by Mr T. Michaelsen, Deputy Leader of the same Subject Group, Mr H. Marui, co-chairman of Working Party 03 Landslides and Stabilization and Mr A. Göttle, co-chairman of Working Party 01 Torrent Erosion and Control.

49. Mr M. Meunier presented his paper entitled An update on the methods for the study of torrential flows. Torrential mudflows behave in ways which depend, simultaneously, on the main "body" of the flow, on which fine particles and clay have a dominating influence, and on the "head" of the flow, which is predominantly stony, and therefore behaves in a way similar to granular flows. Granular torrent flows are still subject to intensive study since their behaviour is unstable and therefore unpredictable. Torrential mudflows are beginning to be better understood and their flow behaviour is by now reasonably well understood, both in uniform as well as in variable and transitional situations. Knowledge about the laws of similarity also permits a more rigorous utilization of reduced models. Finally, the field scale models derived from this knowledge, can be used to determine approximately the rheological parameters of the mudflow "body".

A good deal of progress is still required, however, in our understanding of torrential flows be they granular or mudflows with a coarse head or hyperconcentrated flows. Several researchers all over the world are presently occupied with these questions, but it appears that much work will still be needed before practitioners will have adequate and easily applicable tools available.

50. The paper authored by Mr D. Zakov and Mr I. Marinov entitled Evolution of the compensation gradient in the "Rogenski Potok" torrent was introduced by Mr Michaelsen. In view of the great complexity involved in determining the compensation gradient the engineer often resorts to already existing gradients formed under similar conditions. The present study took place in one of the most eroded regions of Bulgaria, close to the town of Melnik. The Rogenski Potok torrent is representative of the torrents in the region. The catchment area is about 160 ha. In the principal stream bed 20 structures (6 check dams and 14 sills) were constructed between 1975 and 1981.

The investigations were carried out in 1979, 1983 and 1994. The gradient reaches 7.0% close to the lowest check dam (the last one to be constructed) where it has remained constant. With time, however the average gradient increases. If, for example, in 1979 the minimum value was 2.2%, in 1983 it had become 3.5% and in 1994, 4,0%. The measured evolution of the compensation gradient enables us to apply a mean gradient related to future control structures of 5.0%.

51. Mr F. Lopez Cadenas presented his paper entitled Flash floods in mountain areas, calculation methods, prevention and mitigation of effects. Towards the end of the 1980s the Spanish Ministry of Public Works started to apply the hydro-meteorological calculation methods to determine peak flows developed by J.R. Temez. The method is a variation of the Rational Formula supported empirically through a large number of measurements in mountain watersheds. The Rational Formula is used because it expresses in a simple manner the relationship between the calculated peak flow and the determining or contributing factors. Expected peak flow Q = CxIxA/3.6xK, where Q (in m3 per second) is the peak flow corresponding to a certain return period; I (in mm per second) is the maximum rainfall intensity for the time of concentration; C is the run-off coefficient, and A is the area in ha. The coefficient K is required because the Rational Formula assumes that net precipitation is uniform in time and space, which leads to an underestimation compared to the real values. The paper deals with the calculation of the rainfall intensity factor I, the run-off coefficient C and the correction factor K for Spanish conditions.

52. Mr Göttle read the paper authored by Mr S. Kostadinov entitled Hydrological regime in a torrential watershed of a hilly-mountainous region of South-East Serbia. The torrents are characterized by distinctive unsteadiness of hydrological phenomena. The Ljestarska Dolina is the left tributary of the Juzna Morava in the hilly-mountainous region of South-East Serbia. It is a typical torrent with a dry period during summer and autumn. Due to unfavourable natural conditions (soil, vegetative cover, topography, precipitation pattern) the watershed has an unfavourable run-off regime. Continuous stream flow occurs only during the first five months of the year and in December, whereas in the remaining six months run-off occurs only after heavy and intensive rains in the form of waves containing up to 80% of the total annual run-off. The paper analyses the flood waves in the Ljestarska Dolina during the period 1980-88. The research showed there is a high correlation of all parameters of sediment transport in the wave with maximum water discharge. Correlation coefficients range between $R=0.85$ and $R=0.96$. Sediment transport research has shown that there is a high correlation between annual characteristics of sediment transport and the pluvial-erosion index (a new parameter), as well as between the annual specific transport of bedload and total sediment, and the annual specific suspended sediment transport.

53. Mr W. Kraus introduced his paper entitled Influence of constructional elements on sediment transport. The Wiessach torrent in Miesbach county south of the Tegernsee lake was trained at the beginning of the last century in order to float timber needed for the salt works at Rosenheim which started operations in 1810. The river Mangfall and its torrents were straightened and these conditions still prevail. Because of existing housing and other infrastructure along these watercourses complete natural conditions cannot be restored. However, structures have been improved in an attempt to obtain different velocities, water depths, assorted material on the stream bottom etc., to improve conditions for plant and animal life. Shortly after these improvements a major flood event occurred and in order to prove that the excess sediment deposits of this event were not due to the renaturlization works collaboration was obtained from the University of the German Armed Forces in Munich, the leading institution in Germany for bedload transport problems. Model simulations showed that it had been the nature of the event rather than the structural modifications which had led to the large amounts of sediment deposits. A second question was the influence of constructural elements on sediment transport, when and under which conditions will this be significant? This research work is still on-going. A description of the methodology is presented.

54. Mr J. Mintegui and Mr J. Robredo introduced two papers entitled Evolution of the various "Hydrological Methodologies" used in Spain as tools for the Agro-hydrological restoration and management of mountain watersheds, and Design of an elementary distributive model for the analysis of the behaviour of a watershed. The first paper presents in a concise manner the objectives guiding the use of different "methodologies" over time in order to describe the characteristics of mountain watersheds in need of forest-hydrological restoration. Special emphasis is placed on those employed in Spain during the last ten years, from the "Integrated methodology to determine sediment production in a watershed" presented to the Working Party in Torremolinos in 1984, to the present day experimental use of distributive models which have been developed recently. The objective is to demonstrate the principal characteristics of each "methodology" with special emphasis on its practical application in the description and analysis of each particular watershed, as a basis for the preparation of the corresponding project of watershed restoration. The second paper presents the model, and its validity testing through its application in a 14 000 ha watershed upstream of the river gauging station at Camposolillo (Léon, Northern Spain).

55. The paper authored by Mr T. Mizuyama and Mr R. Fukuhara entitled Sediment transport by flash floods was introduced by Mr H. Marui. Experiments were carried out with a small flume to observe the mechanisms of sediment transport especially at the flash flood head using the gradients where immature debris flows appear when the flow is steady. It was found that in the area sediment was transported like debris flow. Sediment concentration and shapes of the heads were directly measured and analyzed using video tapes. The study asserts that flash floods have to be considered more importantly as one of the major hazardous elements of debris flows.

56. Mr P. Bouvet presented his communication entitled Monitoring of slope movements in Haute-Savoie, problems and points of interest. Three recent examples have permitted to distinguish better

between: (a) the interest in having accurate data for the quantification of the evolution of landslides and to make the necessary decisions, and (b) the difficulties and limitations related to such measurements and their analysis. The three examples described are (1) a rock slide in the county of Samoëns, (2) a boulder slide in the county of des Houches, and (3) a large land slide dominating the village of Plateau d'Assy.

57. Mr J.D. Spaak introduced his paper on Measures taken to foresee and prevent the Séchilienne landslide (Isère, France). The "Ruins of Séchilienne" situated 20 km south of Grenoble in the valley of the river La Romanche are threatening to collapse. After about 10 years of measurements various movements signal the possibility of a slide of the magnitude of 2 to 3 million m^3, endangering national highway 91. An even bigger landslide (10 to 30 million m^3) is suspected in the medium term. This could lead to the formation of a dam causing difficulties upstream at Saint-Barthélémy de Séchilienne, which would eventually, rupture and result in serious flooding downstream reaching the urban area of Grenoble. The paper describes the measures taken concerning early warning and the works carried out or projected in order to prevent such a disaster.

58. Mr M.J. Haigh presented the paper co-authored with J.S. Rawat, M.S. Rawat, S.K. Bartarya, and S.P. Rai entitled Interactions between landslide activity and forest cover along new highways in the Kumaun Lesser Himalaya, India. New highways in the Lesser Himalaya are often associated with serious hillslope destabilization. Detailed morphometric research conducted along the new Almora (Lower Mall) Bypass and the Kilbury Road, Nainital in 1985 and 1990 revealed no direct correlation between tree cover upslope and landslide activity, perhaps because of an association between forest cover and steeper slopes. However, there is a strong association between landslide outfalls onto the roadbed, landslide associated variables such as hight of the roadcut, reduced forest cover downslope of the road, and the undermining of the roadbed by downslope erosional and landslide activity. Landslide debris which overfalls the roadbed, subsequently cleared from the roadbed by shovelling over the road edge, creates large, unstable screes of debris in active landslide zones. These screes, which smother the forest and surface vegetation downslope, help generate new instabilities which, frequently, expand to threaten the roadway.

59. Mr V. Lazar introduced the communication prepared with Mr N. Clinciu on Mountain watershed management as a component of forest-ecological restoration of the environment. In order to illustrate the implications of Strasbourg Resolution 4 an attempt was made to place the knowledge related to watersheds in the broader framework of ecological restoration of the environment. This is done by showing first that torrents are nothing but "disturbed" segments of the environment. Torrent erosion disturbs the balance of natural processes and the hydrological imbalance thus created constitutes an aggressive process working against the natural environment. The authors demonstrate the relation between torrential watershed management works and the geographic units in which these phenomena have appeared. Emphasis is placed on hydrotechnical works because: (1) the relationship between such works and the environment has previously been largely ignored, (2) there is a tendency to either minimise or exaggerate the importance of these works in forest-ecological restoration works. The above is illustrated by a wealth of photographic documentation covering the main areas of torrential watersheds in Romania before and after their restoration.

60. Mr H. Marui gave an illustrated presentation on landslide prevention and control in Japan.

61. A video session was held including presentations by Austria, France and Israel on flash floods, torrent and avalanche control, and rehabilitation of arid lands.

VII. RISK ZONING AND WARNING SYSTEMS

62. Mr A. Hurand presented his communication entitled Analysis of natural risks in mountain areas and preventive action programming. The example of the Ariège watershed in the French Pyrenees. Through the example of an investigation conducted in the Pyrenean range (the area of Ariège), the paper describes how natural hazard levels are evaluated in each site known to be exposed to natural disasters

(torrential floods, landslides, rockfalls, avalanches) and the values (infrastructure and other) on-site and downstream affected by the event. An action programme of prevention and protection is then established with priorities falling into three groups: informative risk maps, land use regulation and watershed maintenance, and new equipment for protection.

VIII. PLANNING AND SOCIO-ECONOMIC ASPECTS

63. Mr M. Romani presented a communication entitled Forests and the World Bank. The changing policy of the World Bank concerning the financing of forestry projects and especially concerning the utilization of primary forests was discussed, as well as the relationship between bank lending in the forestry sector and national level strategies formulated within the framework of National Environment Action Plans, National Forestry Action Plans, or eligible for financing under the Global Environment Facility (GEF).

64. Mr A. Kertész gave a presentation on the application of Geographic Information Systems for the management of mountainous watersheds. GIS methods are now widespread in landscape management. They are also well suited for the management of mountain watersheds. Watershed management requires the storage of information about the watershed to be presented in the form of thematic maps to enable the user to make decisions as quickly as possible. Maps needed include topography, climate, soils, vegetation and land use, settlements, etc. This offers a good opportunity for GIS operations like the selection of specific areas by map overlays. The paper provides an overview of possible applications and gives an example, using ARC-INFO, of a small watershed. A digitized map series and some operations are presented to show the applicability of GIS methods. Suggestions are made to introduce standardized GIS methods in the management of mountain watersheds.

65. The application of Geographic Information Systems to forest hydrology restoration and to agro-hydrological management of mountain watersheds was presented by Mr J. Bartolomé. The combination of geo-referenced geographic information and a powerful database makes Geographic Information Systems (GIS) a very useful tool in the agro-hydrological management of watersheds. Often a great number of thematic maps are required (climate, topography, soils, land use, etc.) in order to determine land suitability for proposed actions such as reafforestation for protective or productive purposes, soil conservation on farm land, establishment of improved pastures, etc. which all have to fit into the overall watershed plan for soil and water conservation. Classical methods of manual transparent map overlays for obvious reasons forces the decision maker to deal with simplified information, whereas a GIS permits a more detailed analysis.

As an example of GIS application the case of the agro-hydrological management of the Grandas de Salime dam is presented. This dam is shared between the Spanish provinces of Asturias, Lugo and Leon with a watershed of 176 677 ha. Some considerations concerning the advantages and drawbacks of GIS are also presented.

66. Mr L. Rojo presented the Spanish Watershed Management Project Data Base. This is basically a national planning tool developed by ICONA to deal with a large number of watershed programmes and projects subject to financing from the European Union, the Government of Spain, and Provincial Authorities. Much of the work is contracted out to private companies and consortia.

IX. PROGRAMME OF WORK OF THE WORKING PARTY

67. The Working Party agreed on the following activities to be carried out in preparation of the 20th session in 1996:

(a) Continue the work on the application of Geographic Information Systems to Watershed Management, Restoration of Mountain Ecosystems and to national policy and decision making related to Watershed Management and Mountain Forest Management. (Report to be prepared by Mr. Göttle , Germany).

(b) Continue the work related to the follow-up to Resolûtion 4 of the Strasbourg Ministerial Conference on Forest Protection in Europe. The Group decided to continue with the three sub-groups established during the 18th Session at Oberstdorf under the leadership of Mr. Rui Silva, Portugal. The three sub-groups will be led by Mr Krecek, the Czech Republic for Eastern and Northern Europe, by Mr Chauvin, France, for the Alpine sub-group, and - to be confirmed - Mr Montero, Spain, for the Mediterranean sub-group.

(c) A special one-day FAO/IUFRO Symposium should be included in the Agenda for the 20th Session. 50% of the time available should be dedicated to the special topic of ..... (to be determined when host country of next session is known) whereas the remaining 50% should cover work of various Subject Groups of IUFRO related to the programme of work of the Working Party.

(d) Special reports on the activities of the Working Party should be prepared in relation to international agreements such as the International Convention to Combat Desertification, the Alpine Convention, and the Mountain Charter of the Council of Europe. (To be prepared by Mr Stephan, France).

(e) A special report will be presented concerning progress on the implementation of agreements related to UNCED Agenda 21, Chapter 13 (Mountains). (To be prepared by Mr Michaelsen, FAO).

The Working Party decided to present the agenda of the 20th Session as a list of topics to be further refined when the host country had be decided on. The list of topics to be considered includes:

- New challenges related to technical solutions in view of environmental as well as social considerations.
- Restoration of degraded lands in mountain regions, involving technical, environmental and social aspects.
- Silviculture of mountain forests.
- Indicators concerning sustainable mountain forest management, including indicators for the conservation of biological diversity.
- Impact of forest road construction in mountain areas.
- Restoration of eroded flysch landscapes.
- The effects of forest fires on soil degradation in watersheds.
- Evaluation of cost-effectiveness of torrent control works.
- Improve public information systems in order to ensure local support, including financial contributions to watershed restoration and torrent control works.
- The effects of acid rain and other aspects of forest protection and its influence on physical as well as socio-economic aspects of watershed management.
- Integration of torrent control structures in the landscape.
- Minimum requirements of mountain forest management.
- Technical analysis of the construction and management of sedimentation basins and open checkdams.

- Sustainable mountain development from the special point of view of watershed management, including social aspects.

- Technical improvements of torrent control works related to the aspects of environmental compatibility and landscape values.

The heads of delegations elected the following officers of the Working Party: as Chairman, Mr Leopoldo Rojo, Spain; as first Vice-Chairman, Mr Josef Krecek, the Czech Republic; and as 2nd Vice-Chairman, Mr Albert Göttle, Germany.

The Working Party welcomed the offers in principle to host future meetings from Bulgaria, Hungary and Norway. The Working Party requested FAO to make further contacts with the three countries for the 20th Session in the near future.

The Working Party recommended to coopt as Associate Vice-Chairman a delegate from the host country to be identified.

The Working Party recommended that the duration of the 20th Session and the related study tour be reduced in order to allow more people to participate in the study tour. To the extent practical the agenda as well as the study tour programme should reflect the specific conditions of the host country.

ANNEX A

AGENDA

1. Opening of the session
2. Adoption of the agenda
3. National reports

4. Erosion control in mountain watersheds:

   a. Watershed soil movements and erosion processes - cartography, research results, evaluation, mathematical models, torrential and sediment erosion
   b. Vegetation cover influence on erosion and water balance - cartography, evaluation, research, mathematical models, the effects of environmental factors on the hydrological role of vegetation cover

5. Follow-up to Resolution 4 of the Strasbourg Conference on Forest Protection in Europe: "Adapting the management of mountain forests to new environmental conditions"

   a. Institutional arrangements following the Helsinki Ministerial Conference
   b. Action taken by national Governments concerning legislation and financial support mechanisms for the protection of mountain forests
   c. Technical aspects of the management of mountain forests and their protective role
   d. The role of the Working Party in the follow-up to UNCED Agenda 21 Chapter 13 "Managing fragile Ecosystems: sustainable mountain development"

6. FAO/IUFRO Symposium: Prevention of natural disasters, research and technical aspects

   a. Hydraulics and torrent hydrology
   b. "Flash floods in mountain areas, methods of calculation, management and mitigation of effects"
   c. Landslides and large mass movements
   d. Snow and avalanche control

7. Management and restoration of arid and semi-arid zones
8. Risk zoning and warning systems

9. Planning and socio-economic aspects

   a. Institutional aspects of watershed management
   b. Planning methodology, socio-economic development and intersectorial relations, economic evaluation
   c. Integrated approaches: the application of Geographical Information Systems

10. Programme of the Working Party
11. Election of officers of the Working Party
12. Date and place of the 20th session and special symposia
13. Other matters
14. Adoption of the report
15. Closing of the session

ANNEX B

TIMETABLE

Monday, 4 July

09.00	Registration
10.15	Opening of the 19th Session of the Working Party
11.00	Coffee break
11.15	Adoption of the agenda. Secretariat information
11.30	National reports and special cases
13.00	**Lunch break**
16.00	National reports (continued)
17.00	Erosion control in mountain watersheds:

a. Watershed soil movements and erosion processes - cartography, research results, evaluation, mathematical models, torrential and sediment erosion

- Before and after, or the time dimension of mountain watershed behaviour (**F. Combes**)

b. Vegetation cover influence on erosion and water balance - cartography, evaluation, research, mathematical models, the effects of environmental factors on the hydrological role of vegetation cover

- Soil protection using vegetative material (**Y. Crosaz**)
- A GIS approach to the evaluation of hydrological effects of land use changes at basin scale (**G. Dalla Fontana**)

18.00	Management and restoration of arid and semi-arid zones

- Mechanized land preparation for forest plantations in arid lands (**V. Gómez**)
- Forest-hydrological restoration for the protection of populated areas against flash floods in arid and semi-arid zones in South-Eastern Spain (**de Aranda G. and Currás, R.**)

19.00	End of day's session

Tuesday, 5 July

10.00	Follow-up to Resolution 4 of the Strasbourg Conference on Forest Protection in Europe: "Adapting the management of mountain forests to new environmental conditions"

Tuesday, 5 July (cont'd.)

a. Institutional arrangements following the Helsinki Ministerial Conference

b. Action taken by national Governments concerning legislation and financial support mechanisms for the protection of mountain forests

c. The role of the Working Party in the follow-up to UNCED Agenda 21 Chapter 13 "Managing fragile Ecosystems: sustainable mountain development"

- Sustainable mountain development in the wake of UNCED (**T. Michaelsen**)

13.00 **Lunch break**

Afternoon Field trip in the vicinity of Jaca

Wednesday, 6 July

10.00 Proposal for the development of a European Network of "Experimental Mountain Watersheds" (**J.G. Sempere**)

10.15 FAO/IUFRO Symposium: Prevention of natural disasters, research and technical aspects

a. Hydraulics and torrent hydrology

b. "Flash floods in mountain areas, methods of calculation, management and mitigation of effects"

c. Landslides and large mass movements

d. Biological and hydro-technical means of watershed restoration and torrent control

e. Snow and avalanche control

13.00 End of session

13.30 Reception at the Townhall of JACA

16.00 FAO/IUFRO Symposium (Cont'd)

17.15 Coffee Break

18.00 Video Projection

19.00 End of day's session

20.30 Cocktail offered by FAO at Hotel OROEL

Thursday, 7 July

09.30	Video projection
10.00	Valorization of horizontal -mist- precipitation on the Canary Islands using technology developed in the Chilean and Peruvian deserts (**A. Gioda**)
	Contributions to the study on the dynamics of the sedimentation of dams related to small catchments with varying degree of forest vegetative cover (**N. Lazar and I. Clinciu**)
10.30	Risk zoning and warnings systems
	Analysis of natural risks in mountain areas and preventive action programming. The example of the Ariège watershed in the French Pyrenees (**A. Hurand**)
11.00	Planning and socio-economic aspects
	Integrated approaches: the application of Geographical Information Systems
	Application of Geographic Information Systems for the management of mountainous watersheds (**A. Kertész**)
	Application of Geographic Information Systems to forest hydrology restoration and to agro-hydrological management of mountain watersheds (**J. Bartolomé**)
	The Spanish Watershed Management project data base (**L. Rojo**)
13.00	**Lunch break**
16.00	Field trip in the vicinity of Jaca

Friday, 8 July

10.00	Programme of the Working Party, election of officers of the Working Party, date and place of the 20th session and special symposia
12.00	Other matters
13.00	**Lunch break**
16.00	Adoption of the report
17.00	Closing of the 19th Session of the Working Party
21.00	Dinner offered by ICONA at Hotel OROEL

ANNEX C

LIST OF PARTICIPANTS
LISTE DES PARTICIPANTS
LISTA DE PARTICIPANTES

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ANNEX D

PROGRAMME OF STUDY TOUR

Monday, 11 July - VALLES DE HECHO Y ANSO. Watershed Management

08.30	Leave Jaca by bus (Hotels)
11.00	Zuriza (Valle de Ansó), Linza Forest Management
13.00	Monasterio de Siresa
14.00	Lunch at the "Casa Forestal" de Hecho.
16.00	Selva de Oza
17.00	Guarinza (Valle de Hecho) Zones not subject to management
18.00	Leave for Jaca Dinner and overnight in Jaca (Hotels Oroel and Galindo)

Tuesday, 12 July

08.00	Leave Jaca (Hotels)
12.00	Arrival at Pont de Suert
12.00-14.00	On-going and completed forest hydrology restoration works in the Watershed of the Noguera Ribagorzana River
	In the principal Water Course
	- River channeling of the Pont de Suert River
	- Check dams 1 and 2 for retention and flood dozing
14.00-16.00	Lunch at Hotel-Restaurant Montsant (N-230. Km 131) Vilaller
16.30-19.30	Torrent Senet
	- Panoramic view of control works from the road.
	In the River Llauset
	- Open closing check dam Nº 1 and the River channeling system until the confluence with the river Noguera Ribagorzana
	- Check dams and river chanelling work

- The system of confluence of the River Llauset, with the Noguera Ribagorzana, regulating the two rivers in ordre to regulate sediment movement

20.00 Dinner and overnight at Viella. Hotel Túca (Viella)

Wednesday, 13 July

Works of forest hydrology restoration in the Watershed of the River Garona (Valle de Arán)

09.00-14.00 Valle del río Inyola, till the confluence with the Margaridas torrents.

- Stabilization works in the water course and deposits.
- Reafforestation and correction works in the Margaridas torrents.

Valle del río Valarties, till the water intake.

- Retention check dams and channeling work of the main river course.
- Avalanche control works in the Resec torrent.
- Channeling of the principal stream bed in the vicinity of Arties.

14.00-16.30 Lunch in Arties

17.00-19.00 Valle del Río Negro, until Hurno.

- Retention check dams on the main stream bed.
- Avalanche control works in Coma de Corno.
- Reafforestation and avalanche retention works.

20.00 Dinner and overnight in Viella. Hotel Túca

Thursday, 14 July

09.00 Leave Viella towards Guadalajara

14.00 Lunch en route

18.00 Arrival in Sigüenza. Free time for visit of the towns.

21.00 Dinner and overnight in the National Park of Sigüenza.

Friday, 15 July

Reafforestation works for mountain watershed restoration in the continental mediterranean climate of Guadalajara

09.00 Leave the National Park of Sigüenza.

Friday, 15 July (cont'd)

	Various stops en route
14.00	Lunch in Cogolludo
18.00	Alcalá de Henares. Free time for the visit of the town.
21.00	Dinner and overnight in Hotel El Bedel.

Saturday, 16 July

09.00	Leave towards the airport Madrid-Barajas
10.30	Airport Madrid-Barajas
11.30	Railways station Madrid-Chapmartín
	End of Excursion