World Meteorological Organization

Global Water Partnership

THE ASSOCIATED PROGRAMME ON FLOOD MANAGEMENT

Global Coordination

CONSULTATIVE MEETING ON BUILDING PARTNERSHIPS

(Geneva, 19-20 February 2002)

FINAL REPORT

APFM Report No. 3

CONSULTATIVE MEETING ON BUILDING PARTNERSHIPS

WMO Headquarters, Geneva, 19 – 20 February 2002

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1. OPENING

1.1 The meeting was opened at 10h30 on Tuesday 19 February 2002. It was chaired by Dr Arthur Askew, Head of the Technical Support Unit (TSU) of the Associated Programme on Flood Management (APFM). The agenda of the meeting is represented by the table of contents of this report. The names and addresses of the participants are recorded in Annex 1.

1.2 The main aims were set out as being:

(a) to discuss the broader environment within which the APFM was being developed, leading to a discussion of specific topics central to the purpose of the Programme, as a basis for finalizing texts describing Integrated Flood Management (IFM);

(b) to review the concept of partners within the APFM, as a basis for identifying potential partners for future work.

2. CURRENT STATUS OF THE APFM

The meeting briefly reviewed the origins and past development of the APFM, reference being made in particular to the Coordination Meeting held in November 2001 and the need to produce a Conceptual Report for submission to the APFM Steering Committee within the following four to six weeks.

3. THE BROADER ENVIRONMENT

3.1 Past high-level conferences

3.1.1 The meeting was provided with various texts extracted from the reports of past high-level conferences in which reference was made to water resources management and to flooding. The conferences concerned were:

- United Nations Water Conference (Mar del Plata, 14-25 March 1977);
- International Conference on Water and the Environment (Dublin, 26-31 January 1992);
- United Nations Conference on Environment and Development (Agenda 21) (Rio de Janeiro, 3-14 June 1992);
- Second World Water Forum (The Hague, 17-22 March 2000);
- International Conference on Freshwater (Bonn, 3-7 December 2001);
- Second Session, Preparatory Committee for the World Summit on Sustainable Development (New York, 28 January - 8 February 2002).

3.1.2 It was noted that in 1977 the UN Water Conference drew attention to the need for “integrated planning of water management” and devoted some attention to “flood loss management”. It referred to the need to “make prevision for the zoning and management of flood-prone lands with due regard to the economic and social consequences of the different uses” but made no mention of the integration of flood management with water resources management.

3.1.3 Fifteen years later, the Dublin Conference placed a lot of emphasis on “integrated water resources development and management”, but there are very few references in its report to flooding. Those that do exist are linked with the need to assess flood risk, although flood warning and preparedness systems as called for as part of national sustainable development plans.

3.1.4 This balance of interest carried through to the Rio Summit where again floods are mentioned in relation to water resources assessment and the impact of climate change.

3.1.5 Reference was made to the International Conference on Water and Sustainable Development held in Paris in March 1998.

3.1.6 The Ministerial Declaration adopted in The Hague on the occasion of the Second World Water Forum strongly advocates integrated water resources management (IWRM), but makes no reference to floods as being included in this. However, the Ministerial Thematic Session on Managing Risks specifically referred to the challenge of including, as part of IWRM, the prevention of floods and droughts from becoming disasters. This is to encompass spatial planning and land use planning, taking into account the interconnections within ecosystems.

3.1.7 There are no references, either to IWRM or to floods, in the Ministerial Declaration adopted in Bonn. However, the Bonn Recommendations state that “Decision-making mechanisms under uncertainty should ensure flexibility to respond to both rapid onset disasters and long-term changes to water resources. Risk management should be an integral part of water resources management. This should include establishing close co-ordination beyond the water sector”.

3.1.8 The Bonn Conference has been recognized as a significant input to the preparations for the World Summit on Sustainable Development, but it remains to be seen as to what attention will be paid to IWRM and flood management in Johannesburg.

3.1.9 The above references serve to illustrate the extent to which water as a resource and floods as a hazard have been treated as two separate factors. Even the “integrated” in IWRM is rarely taken to include floods. This justifies yet again the aims of the APFM to promote flood management as a component of IWRM.

3.1 Other Associated Programmes

3.2.1 The meeting was informed of the other Associated Programmes of the GWP, which may have a potential interest in collaborating with the APFM and the links that are being developed with these. Annex 2 provides a list of all current APs and brief information on the ten APs that were contacted or whose contact person is a member of the APFM Interim Steering Committee.

3.2.2 Some APs have proposed to coordinate with the APFM various activities such as the development of training and information modules for local governments, the development of a flood management module for a Master degree programme in IWRM in southern Africa, and participation in various regional activities.

3.3 Related activities of other programmes

3.3.1 The International Hydrological Programme (IHP) of UNESCO, the International Strategy for Disasters Reduction (ISDR), the Flood Hazard Research Centre (FHRC) and the Human Dimensions Programme on Global Environmental Change (IHDP) were the other organizations represented at the meeting.

3.3.2 The representatives of these organizations briefly presented the work of their respective institutions and, wherever possible, highlighted areas of common interest to, and activities that could be carried out in collaboration with, the APFM.

Profiles of each organization - including their activities of particular relevance to the APFM - are included as Annexes 3 to 7.

4. CONSIDERATION OF THE DRAFT CONCEPT PAPER

4.1 Principal topics for discussion

As a prelude to discussing the Concept Paper and its summary (see 4.2 and 4.3 below), the meeting held a very free exchange of views on four key issues, as recorded below.

(a) IRBM, IWRM and IFM

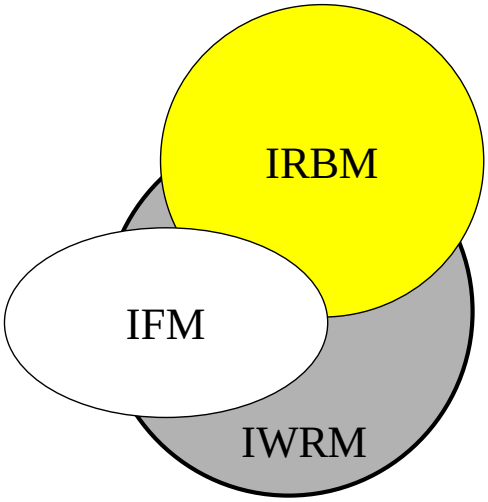
(i) Integrated River Basin Management (IRBM) can be taken to include all coordinated activities which take the river basin as their defining area of interest.

(ii) Integrated Flood Management (IFM) is a useful term, but it needs to be defined and, within the APFM, it is taken to refer to flood management within a context of Integrated Water Resources Management (IWRM), where IWRM is as defined in GWP Note No. 4, namely "IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems".

(iii) The English language word "flood", as used in APFM, includes both "crue" and "inondation" in French and "crecidas" and "inundacion" in Spanish: the first as a natural rise and fall in flow and as a source of water; and the second as a natural hazard. Therefore, the ambiguity of the word "flood" in English is helpful to the IFM concept by making it more inclusive. However, it presents us with a challenge in defining terms and avoiding sliding into one of the two directions to the detriment of the other. It also poses real problems for translation into French and Spanish, and possibly other languages.

(iv) The possible occurrence of extreme events should be borne in mind when drawing up IFM plans. Therefore, IFM should not reject measures such as evacuation drills, flood rescue plans, etc., - although these fall outside the direct ambit of IWRM. Such a rejection would jeopardize the integrity of FM.

(v) The following illustration captures the essential thinking of IFM:



(vi) Floods, and the vulnerability to floods, pose threats to sustainable livelihoods. APFM should try to emphasize the role of IFM in development planning, poverty reduction, etc., because poverty increases vulnerability to floods. IFM should aim at maximizing the positive impacts and minimizing the negative impacts of floods and, thus, contribute to poverty reduction.

(vii) APFM should not disregard existing practices in flood management, but should highlight the benefits that could be gained through the adoption of IFM. It should be recognized as part and parcel of the evolution of flood management practices.

(viii) Finally, the best means of defining IFM is to develop its concepts and principles and put them into practice and **not** dwell too long on theoretical definitions.

(b) Institutional arrangements for flood management

(i) The institutional "structure" should be seen as important, even vital, to the success of IFM - provided that "structure" is taken to include not only the institutions but also their interaction/cooperation.

(ii) Institutions (their design, framework, etc.) should be perceived as tools required to achieve the ultimate goal of IFM.

(iii) Recognition should be given to the fact that the development and implementation of hazard (disaster) mitigation and water resources management practices were not integrated in the past, which led to problems that now necessitate a new integrated approach.

(iv) At the core of integration is effective communication across institutional boundaries. Such communication can only take place if there is a perception of common interest.

(v) We should seek for "good"/"sound" practices in integration.

(c) Stakeholder involvement

(i) Governments are responsible for flood management strategies at the higher level. They are also responsible for ensuring accuracy in the implementation of plans.

(ii) NGOs could be responsible at the local level for the facilitation of community participation in decision making through community-based awareness creation programmes and training programmes. They could also act as the nodes through which community plans/decisions are channeled to the higher level.

(iii) APFM should encourage public participation, adoption of the participatory decision-making approach, etc. However, it must be recognized that the degree of participation will differ from region to region.

(iv) Ostrom[1] has found that it is necessary to have, among users of a common property resource, the following:

- Common understanding of the problem
- Common understanding of alternatives for action
- Common understanding that the transaction costs for cooperation are lower than the benefits from collective action
- Common perception of mutual trust and reciprocity

These conditions can be applied to govern participatory management at any level, even globally.

(d) Economic aspects of flood management

(i) IFM must encompass both the positive and negative consequences of flooding. Quantitative and qualitative indicators to assess the positive impacts of floods need to be developed, so that both the positive and negative consequences can be presented in comparable terms. For example: populations affected for good or ill; lives lost and lives saved/improved; damage estimates as well as net benefits of using floodplain land; and the flood as a water source.

(ii) Water should be recognized as a social, cultural and economic good. APFM should avoid highlighting the aspect of "water as an economic good" as this could lead to a misinterpretation where a situation of "prices always work and nothing else does" arises.

(iii) If APFM is concerned with trying to avoid floods being seen only as disasters, how suitable is it to consider socially acceptable risk? On the other hand, if governments are to provide the legal framework (eg. the redistribution of tax payers' money) and take on the role of facilitator/evaluator of, for example, inter-sectoral integration, then such analyses cannot be disregarded.

(iv) Similarly, there needs to be a clear understanding of "who should bear the cost of flood management", because it is difficult to plan and even more difficult to implement plans without financial backing.

(e) Knowledge

(i) The acquisition and flow/dissemination of knowledge is essential, not only for the development and application of sustainable policies and practices, but also for ensuring the true participation of all stakeholders.

(ii) The practice of introducing new technologies/practices to a region without first obtaining a good picture of the prevailing local technological base, indigenous knowledge and

[1] Ostrom, E. 1992. The Rudiments of a Theory of the Origins, Survival and Performance of Common-Property Institutions. In Making the Commons Work-Theory, Practice and Policy, edited by D.W. Bromley. San Francisco: ICS Press.

managerial practices should be discouraged. In other words, it is dangerous to "parachute" in a technology, such as traditional structural flood mitigation methods, on the assumption that it is universally suitable.

(iii) The identification of the APFM as a resource centre/clearing house for flood management data is indeed welcome, and its role in this context needs to be developed. The need for such a central coordinating body stems from the fact that the data entered in the numerous flood databases that already exist is not uniform, is spatially and temporaly fragmented, and varies in reliability. APFM should distinctly portray itself as a 'reference centre' as opposed to a 'central collector'.

(iv) It is worth encouraging organizations, which currently compile/reference data on past major flood events, to develop their database formats so that they include broader sets of information on aspects such as vulnerability and water resources.

4.2 Concept paper

4.2.1 The meeting recalled earlier discussions of the purpose to be served by the concept paper. The original intention was to issue a 10 to 15 page paper which could be used to introduce the concept of IFM to a wide audience and serve as an initial guide as to what application of IFM meant in practice to those who wished to take the matter further.

4.2.2 Dr Colin Green was thanked warmly for the work he had put into the second draft of the concept paper that was before the meeting. Many of the comments made at the First Coordination Meeting in November 2001 had been incorporated, but the wish to limit the total text to 15 pages had made it difficult to keep the desired balance. In addition, the discussion and concepts recorded under 4.1 above need to be reflected in the Concept Paper. It was clear that this could not be achieved at the same time as maintaining the original intentions for the Paper and limiting its size.

4.2.3 As a consequence, it was recommended that the current draft of the Concept Paper be developed further, without a specific page limitation, so as to encompass the concepts raised under 4.1. This would then also permit the inclusion of brief references to the various structural and non-structural options/techniques available for managing floods and flood plains as both resources and hazards. This would provide a text which might be considered as a “first edition” of what would become a continually evolving report. It could serve as a source for producing documents on APFM intended for more specific audiences and papers expanding on specific topics, such as economic analyses in support of IWRM encompassing IFM. The immediate need for a statement on IFM would be met by the summary paper discussed under 4.3 below.

4.3 Summary paper

4.3.1 There is a need for a brief paper summarizing the concept of IFM that can be used in a brochure, included in the APFM web site and attached to other documents. Accordingly, the TSU presented the meeting with a first draft compiled from various sources.

4.3.2 The meeting reviewed the draft and provided comments which were used to produce the version attached as Annex 8 to this report.

5. FUTURE ACTIVITIES

5.1 The TSU briefly explained future activities foreseen for the implementation phase of the APFM, with the condition that these items are provisional and should be further elaborated by the end of the inception phase.

5.2 The participants offered the following comments, amongst others:

(a) The APFM should take some responsibility for compiling/disseminating information on past flood disasters, the challenge will be to contribute to integration or make optimal use of existing flood databases, most of which have been developed separately and contain fragmented data in terms of both time and region.

(b) As indicated under 4.1 (e) (iii) above, the APFM will need to address the question of how to act as an international focal point on flood problems.

(c) In the implementation phase, coordination with other initiatives should be stressed, such as with Phase VI of the IHP of UNESCO, in which various activities may be implemented jointly.

(d) Establishment of multi-lateral and/or basin-wide flood management agreements may be adopted as an ultimate goal of APFM

6. APFM PARTNERS AND THEIR CONTRIBUTIONS

6.1 The meeting was briefed on the importance of partnerships to the GWP and the expectation that the APFM would form its own set of partners as a means of achieving its own aims and, at the same time, assisting other projects and programmes to achieve theirs.

6.2 The term “partner” can be interpreted in many ways and so an explanation of the various forms that partnership within the APFM could take was tabled to assist discussions. This was found to be useful and the version attached as Annex 9 to this report was developed as an outcome of these discussions.

6.3 The representatives of WMO, UNESCO, ISDR, IHDP and the FHRC informed the meeting of their activities relevant to the APFM, as summarized in Annexes 3 to 7. Each expressed an interest in their agency/programme being associated with the future work of the APFM and agreed to advise the TSU within the near future of the form that their partnership with the Programme might take.

7. VIRTUAL CONFERENCE

7.1 The secretariat briefly introduced the idea of organizing a virtual water conference (VC) on IFM within the framework established by the Third World Water Forum Secretariat. It was also mentioned that holding a VC was essential to the process of convening a live session at the Third World Water Forum in March 2003.

7.2 The participants offered the following comments:

(a) The idea of holding a VC in two phases was endorsed. The first phase would invite opinions on the summary concept paper as a basis for identifying the topics to be discussed in the second phase. The second phase would be organized more intensively to discuss concrete measures based on real flood management practices.

(b) Note was taken of the past experience in this regard of ISDR and their plans for holding another VC in the near future with which that of the APFM might be linked.

(c) It was the common experience of the participants that it is difficult to obtain active discussions in virtual conferences. Hence, organizing the VC in an effective manner will be

a real challenge and it will be important to give it an attractive title and content, and issue explicit invitations to participate to as wide a group as possible.

8. CLOSURE

The meeting closed at 16h00 on Wednesday 20 February 2002.

ANNEX 1

WMO Headquarters, Geneva, 19 – 20 February 2002

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ANNEX 2

WMO/GWP Associated Programme on Flood Management

CONSULTATIVE MEETING ON BUILDING PARTNERSHIPS

GWP ASSOCIATED PROGRAMMES (APs)

1. Floods are a component of the hydrological regime and floodwaters are an essential part of the water resources of a region. As with other aspects of water resources, any action in relation to floods should be designed so as to minimize their potential for damage and to maximize their benefit to society and the environment. They must therefore be included in any scheme for Integrated Water Resources Management (IWRM). What is more, this calls for the integrated management of both water and land; for it is the changing landscape and society's continued encroachment onto the floodplain that exacerbate the flood problem.

2. In view of the value of flood waters as a source of water supply and recognizing the impact of major floods on agricultural and urban areas, this AP has strong links with most others. One major objective of this project is therefore be to ensure close coordination with the relevant activities under the other APs, for example by studying land management issues and considering the cultivation of flood resistant crops and irrigation systems.

3. A full list of the current APs is attached. Some were identified as potential partners of the APFM and were contacted in order to coordinate possible activities to be carried out in cooperation with them. A brief summary of these APs is presented below.

INBO- Developing and Strengthening River Basin Organizations

4. The overall goal of the Associated Programme is to upgrade and support the development of organizational initiatives for integrated water resources management in river basins/lake basins/aquifer level. The four main outputs are:

- direct cooperation established between existing, future or pilot water basin organizations through twinning agreements;

- mobilization within existing basin organizations of professional support capacities to facilitate the development of new basin organizations and the debate on their management options;

- a synthesis of available knowledge and know-how of best practices, preparation of recommendations or guidelines and drawing-up of training modules;

- the networking of water documentation systems to share and provide access to useful institutional, legal, economic and technical information at the international level.

ICLEI - The Water Campaign For Local Authorities

5. The mission of the ICLEI Water Campaign is to build a world-wide movement of local governments with their stakeholders who are together committed to achieving tangible improvements in the sustainable use of fresh water resources by protecting and enhancing local watersheds, reducing water pollution, improving the availability and efficiency of water and environmental sanitation services, and promoting public health. The main activities are:

- Municipal Water Agenda
  water use and pollution within the municipal corporation using a modified EMS approach

- Community Water Agenda
  involving community stakeholders in water management decision-making and action

- Watershed Agenda
  using local watershed boundaries to improve local water management enhancing local governments' role in regional watershed planning.

CAPNET - International Network for Capacity Building in IWRM

6. As an AP of the Global Water Partnership, CAPNET fosters human resources development for IWRM. It focuses on education, training and applied research, and encourages partnerships and networking at national, regional and global levels. CAPNET's objectives will be achieved through networking, awareness creation, training and education, and development of relevant materials/tools.

7. Although UNDP and The Netherlands are the initial sponsors of CAPNET, other multilateral, bilateral, non-governmental and private sector organizations are encouraged to join this multi-country, multi-donor undertaking.

Waternet – a regional network for education, training and research on IWRM in Southern Africa

8. WaterNet is a regional programme designed to build and strengthen regional capacity for the integrated management of water resources in the Southern African region through education, training and research. WaterNet started its activities in September 1999.

9. WaterNet facilitates the development of a Professional Courses Programme and a regional Modular Master's Programme. It also promotes regional research activities and the creation of an Association for Professionals in IWRM.

Mainstreaming Gender in Integrated Water Resources Management

10. Mainstreaming gender in IWRM - the Gender and Water Alliance Partners that have been involved in gender mainstreaming in the Vision to Action consultations and documents agreed in The Hague to form an alliance that will continue to assist implementation of the World Water Vision and Framework for Action on the ground. The Gender and Water Alliance is a network of persons and organisations representing all levels (from policy to grassroots) in the regions of Latin America and the Caribbean, Middle East, Africa, Europe, South Asia and East Asia.

11. The Alliance will advocate change on the ground in areas such as gender sensitive information sharing, networking and capacity building. The Alliance aims to make a concerted and

sustained effort to bring gender and equity perspectives into integrated water management. It wishes to ensure that agreed principles are put into practice for meaningful participation of women and men irrespective of age, status, income, culture or religion in dialogue and decision making as an integral dimension of design, implementation, monitoring and evaluation of all IWRM legislation, policies and programmes.

Women Professionals in Water Management: Fellowship Programme

12. The Programme addresses the problem of the limited number of female professionals in the water sector through a targeted fellowship programme. It is designed to enable women to participate in water management courses and training programs. The Programme's main activities are:

- Selection, administration and co-ordination of fellowships for female professionals. Provision of logistical and technical support to women awarded with fellowships. Development of specific tailor-made courses for female professionals working in water management.

- Active dissemination and development of gender analysis concepts and tools as applicable to water management.

- Development of a network of female professionals working in water management.

- Development of interdisciplinary water management training and course opportunities in Southern institutions.

- The first fellowship students started their courses in September 2000.

The Mediterranean Hydrological Cycle Observing System: MED-HYCOS

13. MED-HYCOS aims at providing a scientific basis and a framework for co-operation in water resources monitoring, assessment and integrated water resources management at community, river basin, national and regional levels.

14. MED-HYCOS contributes to the understanding of the dynamic of hydrosystems and to their interaction with climate - global change - and with the environment - impact of human activities - to optimize management strategies and to encourage intersectoral sharing of water resources data and information for development and natural capital management.

15. MED-HYCOS is designed to increase the capacities of the National Hydrological Services as the principal data producers on national and regional level. In this manner MED-HYCOS contributes to effective water resources assessment and monitoring in the Mediterranean region.

The Southern Africa Hydrological Cycle Observing System (SADC-HYCOS)

16. The objective of the SADC-HYCOS is to enhance the effectiveness of real-time and near real-time hydrological monitoring across the SADC region and national water resources management. Phase I of SADC-HYCOS terminated in 2001. Six principal outputs are foreseen during Phase II, expected to be launched in 2002:

- Widespread access to, and use of, real- and near real-time products of river information by water managers and other stakeholders at national, regional and global scales

- Enhanced data analysis modules within the HYCOS system which add value to raw data and express river information in formats easily conducive to applied water management

- Assumption of joint and several responsibility for the existing and expanded HYCOS system by SADC and by individual countries, with the necessary capacity in place to do so.

- A fully effective SADC HYCOS Regional Center, evolving from the existing HYCOS Pilot Regional Center

- An expansion (in accordance with national interests, sustainable capacities and priority gaps) of the number of river monitoring sites equipped with intelligent sensors and satellite transmission, covering additional key monitoring sites within the SADC region not equipped during Phase I

- Integration into the existing HYCOS system of near real-time information based on rapid processing of river information derived from monitoring sites upgraded with data-loggers, with appropriate rapid data transfer procedures in place within national monitoring agencies.

SAWINET - Southern African Water Information Network

17. SAWINET is an Information Network on Integrated Water Resources Management. It is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the German Agency for Technical Cooperation (GTZ), with the support of the Global Runoff Data Centre (GRDC) at the Federal Institute of Hydrology. The content of SAWINET presently focuses on three cross sectoral issues: water policy and legislation, valuation of water in alternative use contexts, and institutional development. SAWINET is being developed in cooperation with the Southern African Water Partnership.

GLOBWINET - The Global Water Information System

18. GLOBWINET provides information on:

- Transboundary river basin organisations,
- Water law and legislation,
- National water administration,
- The water resources situation.

19. To date, two regional networks have been developed under the umbrella of GLOBWINET:

- the Southern African Water Information Network - SAWINET
- the German Water Information Network - GEWINET.

ANNEX 2, APPENDIX

LIST OF THE CURRENT APs

INBO - Developing and Strengthening River Basin Organizations

ICLEI - The Water Campaign for Local Authorities

CAPNET - International Network for Capacity Building in IWRM

Waternet - a regional network for education, training, and research on IWRM in Southern Africa

Mainstreaming Gender in Integrated Water Resources Management

Women Professionals in Water Management: Fellowship Proposal

The Mediterranean Hydrological Cycle Observing System: MED-HYCOS

The Southern Africa Hydrological Cycle Observing System: SADC-HYCOS

SAWINET - Southern African Water Information Network

GLOBWINET - The Global Water Information System

Flood Management – Global Coordination

The Ground Water Management Advisory Team (GW-MATE)

Sanitation Connection - An Environmental Sanitation Network

Water Utilities Partnership for Capacity Building (in Africa and South Asia)

East and Southern Africa Support Network for Participatory Hygiene and Sanitation (PHAST)

Water and Sanitation Program

International Programme for Technology and Research in Irrigation and Drainage (IPTRID)

WCA-InfoNET: Information Service on Water Conservation and Use in Agriculture

ANNEX 3

ACTIVITIES OF WMO OF RELEVANCE TO THE APFM

1. Aspects of flood management are reflected in several programme activities of WMO. In the Programme on Forecasting and Applications in Hydrology, hydrological modelling and forecasting techniques are applied for the mitigation of water-related disasters and in particular to floods. This includes expert advice on flood forecasting and hazard assessment as well as the planning of meetings on flood management in different regions of the world. One expert meeting on flood management and flood plain management was held in 2001 in Region II (Asia). A workshop on Flood Forecasting and Hydrological Warning Systems was also held in 2001 in Region III (Central America) and Region IV (North America).

2. In the Working Group on Hydrological Forecasting and Prediction of WMO's Commission for Hydrology (CHy), four experts are tasked to produce guidance material on short-term hydrological forecasting, medium-to long-term forecasting, risk management and probable maximum precipitation and flood estimation. Likewise, a project on risk management is in its early planning phase focussing on southern Africa.

3. From a flood management viewpoint the development of a Management Overview of Flood Forecasting Systems (MOFFS) by WMO is noteworthy. The objective of MOFFS is to rapidly identify and highlight deficiencies in the facilities and performance of individual flood forecasting systems, in order that appropriate management actions may be taken to improve flood forecasting systems prior to the next flood event.

4. The World Hydrological Cycle Observing System (WHYCOS) aims to support the real-time acquisition, storage and dissemination of mainly hydrological data and information which can be used for flood forecasting and disaster preparedness and prevention activities. WHYCOS is implemented in a series of regional projects. Some of the projects in planning and implementation are in: the Hindu Kush Himalayan region to build up a flood information system (in progressing planning phase); the Mekong River Basin to support flood management (in collaboration with the Mekong River Commission); in Southern Africa the second phase of SADC-HYCOS is expected to have flood forecasting as one focus; and La Plata Basin (Region III) where a Memorandum of Understanding on Flood Management was signed with the La Plata Basin Commission. All these regional projects also aim to develop forecasting products and include a strong capacity building and support component for the concerned National Hydrological Services.

5. The connection between climate variability and hydrological extremes is reflected in the World Climate Programme – Water (WCP-Water). This programme is jointly implemented by WMO and UNESCO and aims to provide hydrological information for decision making and the management of hydrological extremes in particular floods and droughts. Mainly through WCP-Water, WMO also participates in the Dialogue on Water and Climate, jointly initiated by the World Water Council (WWC) and the Global Water Partnership (GWP). This activity aims to develop awareness and preparedness to develop adequate policies and associated management strategies to mitigate negative effects of climate variability and change, where floods are amongst the high priority aspects.

6. The Tropical Cyclone Programme (TCP) of WMO aims to assist member countries in upgrading their capabilities to provide better forecasts of tropical cyclones, related flood and storm surge forecasts and more effective warnings. In addition, the establishment of national disaster preparedness activities is encouraged. In this programme, the direct linkage between effective meteorological forecasting and flood forecasting is extremely important, and the hydrological components in the TCP aim to support member countries in developing and improving their flood forecasting and disaster preparedness services.

7. Flood related activities of WMO are supplemented by specialized publications such as the *Comprehensive Risk Assessment for Natural Hazards (WMO/TD No. 955, Geneva 1999*) and a report on *Forecasting Dangerous Hydrological Phenomena – Activities and Technologies of Hydrological Forecast Centres (in preparation).*

8. In addition to its own programme activities, WMO cooperates with other regional bodies in hydrological forecasting such as the UN Economic and Social Council for Asia and the Pacific (ESCAP) and the Asian Disaster Preparedness Centre (ADPC). UNESCO and WMO jointly implement the programme "Hydrology for Environment, Life and Policy" (HELP), which aims to provide a framework for the development of sustainable policies and management strategies. The policy development component in integrated water resources management is also the main motivation for WMO to contribute actively to the aims and objectives of both the WWC and the GWP.

9. The Technical Cooperation Programme (TCO) assists member countries develop and implement regional projects and programmes in the areas of meteorology, hydrology, the environment and related issues through appropriate political and economic support from members. The TCO's Emergency Assistance Fund – called the "WMO Disasters Assistance Fund for Meteorological and Hydrological Services" – was established with the purpose of assisting members rehabilitate and restore observing networks, data collection and processing facilities, etc., in cases where natural disastes have severely disabled the meteorological and/or hydrological infrastructure.

10. The Public Weather Services Programme of the World Weather Watch (WWW) strengthens the capabilities of WMO Members to meet the needs of the community through the provision of comprehensive weather related services, with particular emphasis on public safety and welfare.

11. WMO has also developed tools that could be used for effective flood management. For example, the Management Overview of Flood Forecasting Systems (MOFFS) is a useful tool to identify and highlight deficiencies in the facilities and performance of individual flood forecasting systems.

12. The Hydrology and Water Resources Programme financially supports the following regional training courses focusing on operational hydrology and water management.

(i) The Latin American Course on Operational Hydrology (Caracas, Venezuela)
(ii) The Postgraduate Course on Applied Hydrology and Information Systems for Water Management (Nairobi, Kenya)
(iii) The Course on Hydrological Forecasting (Silver Spring, U.S.A.)

ANNEX 4

OVERVIEW OF UNESCO'S FLOOD MANAGEMENT ACTIVITIES

1. The International Hydrological Programme (IHP)

The International Hydrological Programme is the major instrument of UNESCO to carry out its water-related activities. After the successful International Hydrological Decade 1965-1974 conducted by several UN agencies, IHP was instituted in 1974 under the aegis of UNESCO, where its Secretariat has been located ever since. It is an intergovernmental programme with 160 Member States. Every two years the IHP Intergovernmental Council meets to set policy guidelines and to make major decisions on its implementation. The Fifth Phase of IHP has concluded very recently and the Sixth Phase has just started. The plans for the successive phases are made in full consultation with the Member States and reflect the current needs of the countries; that is, it remains relevant.

The Fifth Phase (1996-2001), IHP-V, designated *Hydrology and Water Resources Development in a Vulnerable Environmen*t, set out to stimulate a stronger interrelation between scientific research, application, and education. The emphasis was on environmentally sound integrated water resources planning and management, supported by a scientifically proven methodology. The Sixth Phase of IHP (2002-2007), IHP-VI, designated *Water Interactions: Systems at Risk and Social Challenges*, is based on the fundamental principle that freshwater is as essential to sustainable development as it is to life and that water, beyond its geophysical, chemical, biological function in the hydrological cycle, has social, economic and environmental values that are inter-linked and mutually supportive. Some of the interactions to be further investigated or to be focused include those between: (i) surface water and ground water; (ii) atmospheric and terrestrial part of the hydrological cycle; (iii) fresh water and salt water; (iv) global watershed and river reach scales; (v) quantity and quality; (vi) water bodies and aquatic ecosystems; (vii) science and policy; and (viii) water and civilization

The flood management activities carried out under IHP-V related mainly to the urban environment plus some specific interventions such as in the case of the floods in Mozambique, while in IHP-VI, specific focal areas on *Extreme events in land and water resources management, on Methodologies for integrated river basin management and on Urban and rural settlements* have been opened. These three focal areas will contain aspects relevant to APFM.

2. Flood Management- related activities

New paradigms for the successive phases of IHP

It has been recognized that the traditional, technical approach in water management, has progressively been completed by multidisciplinary, holistic approaches integrating the social, political, institutional and environmental dimensions. Consequently, UNESCO saw that the design of the goals, methods and outputs of IHP plans reflect the above-mentioned evolution. In that perspective, UNESCO in the last years has developed activities focusing on:

- non-structural, cross-cutting approaches and tools for flood mitigation
- integration of societal factors in flood-related vulnerability analysis
- flood management information systems

- public participation in flood mitigation and control, including (early) warning systems
- involvement of users in the design and implementation of mitigation-related solutions & policies
- development of post-disaster feedback analysis ("lessons learned")

Some activities illustrating UNESCO's approach

Events:
- "International Workshop on Non-structural Flood Control in Urban Areas (Sao Paulo, Brazil, April 1998). Congregated over 60 specialists from all over the world.
- "Participatory processes in water management", UNESCO Conference, VITUKI, Budapest, June 1999.
- Workshop on "Mitigation of Flood Hazards in Urban Areas", Stockholm Water Symposium, August 1999.
- "Early warning systems for the Lower Mekong Floods", Mekong River Commission Conference, Phnom Penh, Cambodia, February 2002

Publications:
- "Fighting floods in cities" and "Fighting flood in neighbourhoods", UNESCO-The Netherlands cooperation in framework of IDNDR, 1995.
- Proceedings of the International Workshop on Nonstructural Flood Control in Urban Areas, 1998.
- "Guidelines on nonstructural measures in urban flood management", Technical Documents in Hydrology No. 50, IHP, UNESCO, 2001
- "Public participation in the design of local strategies for flood mitigation and control", Technical Documents in Hydrology No. 48, IHP, UNESCO, 2001

Missions & Technical Assistance:
- "Flood management information systems & Involvement of communities in flood mitigation", Post-floods assistance mission to water authorities in Mozambique, 2001 (including "lessons learned" mission to Hungary and France)
- "Vision for the Volga River and the Caspian Sea", Basin-wide, interdisciplinary approach and prospective planning for sustainable development, starting 2002.

Planned and on-going activities 2002-2003 IHP-VI Focal Area 2.1 Extreme events in land and water resources management:
- Workshop and CD-Rom on the application of trend detection methodologies of high quality runoff data sets as a follow up to joint WMO/UNESCO December 1998 workshop/ publication May 2000 (in collaboration with WCP-Water and FRIEND);
- IHP contribution towards the Dialogue on Water and Climate (in collaboration with WCP-Water and HELP);
- Support for FRIEND participants at the International Conference on Flood Estimation, Berne, Switzerland, March 6-8, 2002;
- Establishment of an expert group to develop a strategic plan for the study of extreme events, including taking into consideration the recommendations of the Berne Conference;
- Activities recommended by expert group on extreme events (in collaboration with FRIEND and WCP-Water);
- IHP representation at the Second Steering Committee meetings of WCP-Water, Geneva, January 23-25, 2002, where the following decisions were taken:

    - The production of the CD ROM and the testing of trend detection methodologies using both GRDC and FRIEND data sets in collaboration with the Netherlands initiative on Dialogue on Water and Climate.
    - Regional FRIEND groups were encouraged to provide analyses of high/low flows for GEWEX Continental Scale Experiment (CSEs) background assessment of existing data sets.

- Acceptance of the contribution of selected HELP basins (San Pedro, Thukela, Walawe) towards the case study component of the DWC.
- A session entitled Changes in Climate-Related Hydrological Extremes in Vulnerable Basins was proposed for the EGS-AGU-EUG Joint Assembly, Nice, France, April 2003. This special session would focus specifically on assessing inductions of change in the frequency and magnitude of climate-related natural disasters and hydrological extremes in basins vulnerable to natural disasters. Specific criteria of interest include indications of change, courses (e.g. climatic variability, land use change), impacts of change, assessments and adaptive strategies for extrapolation elsewhere.
- An expert workshop on the Hydroclimatological Considerations in the Frequency Analysis of Floods and Droughts, late 2003, hosted by the University of Barcelona, Spain.
- The tabling of the topic "Selective Disaggregation of Data Bases for the Testing of Uncertainty of Outputs in Less Data Rich Basins" as future activity of WCP-Water linked with climatic variability. The planned activities connected with climate-water-health, and climate-water-risk management in agricultural practices will be re-considered at the 3rd Steering Committee meeting. And

- Contribution towards the International Symposium on Hydrological Extremes Theoretical and Applied aspects of Forecasting and Computations, St Petersburg, October 2003.

ANNEX 5

UNITED NATIONS INTER-AGENCY SECRETARIAT FOR THE INTERNATIONAL STRATEGY FOR DISASTER REDUCTION AND ITS CONCERN WITH FLOOD MANAGEMENT

The International Strategy for Disaster Reduction, which was adopted at the Programme Forum for the IDNDR held in July 1999 and endorsed by the ECOSOC and the General Assembly, constitutes the framework for the activities of the United Nations system in the coming years. The main objectives of the strategy are:

(a) to enable communities to become resilient to the effects of natural, technological and environmental hazards, thus reducing the compound risk posed to social and economic vulnerabilities within modern societies; and

(b) to proceed from protection against hazards to the management of risk, by integrating risk prevention strategies into sustainable development activities.

The mandate of the ISDR is to increase the profile of disaster reduction by limiting or avoiding social and economic losses and build disaster resilient communities. This endeavour can be best achieved by bringing people and organizations from various relevant sectors together in a multi-disciplinary, and inclusive professional relationship. The ISDR Secretariat plays a bridging and facilitating role to pursue the principles outlined in the "*Framework for Action for the implementation of the ISDR*" (endorsed at the third Task Force meeting in May, 2001)

The Secretariat of the ISDR is promoting the objectives of the Strategy, through a range of functions which include the formulation of policies in respect to disaster reduction, inter-agency coordination, advocacy and the promotion of increased awareness of the importance of disaster reduction. In this context the Secretariat engages the Inter-Agency Task Force (IATF), its 4 Working Groups and also maintains links with UN organizations, regional institutions, the scientific community, the public and private sector, civil society organizations and the media.

Relevant activities for the APFM:

- The backstopping of the Inter-Agency Task Force on Disaster Reduction (IATF) established pursuant to UN General Assembly resolution 54/219 and Secretary General's report 54/497, in order to serve as the main forum within the United Nations system for devising strategies and policies for the reduction of natural hazards and to identify gaps in disaster reduction policies and programmes and recommend remedial action;

- The promotion of Disaster Reduction as an integral part of sustainable development (environment protection, social and economic development), both in substance and partnership. The aim is to include disaster reduction as an element for sustainable development in the Johannesburg WSSD agenda and follow-up Programme for Action, as well as a cross cutting issue in all other relevant areas of action (poverty eradication, human settlements, ocean, climate, fresh water, mountain protection, combating desertification and drought, etc.);

- The process to review and monitor progress in countries and regions on the achievements of disaster reduction. The results will be presented in regular reports and processed in a database format and available for retrieval and analysis on the web site. The trend analysis in this reporting process will help countries and agencies to improve their internal strategies and institutional plans and activities in the area of disaster reduction;

- The Working Group on Risk, Vulnerability and Impact Assessments, chaired by UNDP, has identified four priority areas of action to concentrate on. To enhance broad participation and effective co-ordination of information management and dissemination, one task manager was been assigned for each sub topic: 1) Indicators (task manager: ICSU); 2) Review of practices on the application of tools for risk/vulnerability/impact assessments at the local level (UNCHS-Habitat); 3) Improving Global Disaster Impacts Data (the World Bank); and 4) Webpage (ISDR/UNDP).

- The ISDR Early Warning Programme, including the activities of the Working Group on Early Warning convened by UNEP, which serves as a body of knowledge on early warning, to support a continuous dialogue and 'best' practices, particularly in developing countries, and works on the improvement of the effectiveness of existing coordination mechanisms among international and regional agencies, together with, and between, individual national scientific and technical agencies responsible for early warning;

- Other relevant activities include the elaboration of risk reduction methodologies and guidelines, as well as the revised and expanded disaster reduction terminology, and the ISDR Secretariat disaster reduction and awareness raising campaigns.

ANNEX 6

THE INTERNATIONAL HUMAN DIMENSIONS PROGRAMME ON GLOBAL ENVIRONMENTAL CHANGE (IHDP) AND INTEGRATED FLOOD MANAGEMENT

IHDP is an international, non-governmental and interdisciplinary research programme, founded by the International Council for Science (ICSU) and the International Social Science Council (ISSC) in 1996. IHDP fosters high quality research to address the most pressing questions on the human dimensions of Global Environmental Change (GEC). These involve how individuals and societal groups:

- contribute to
- are influenced by and
- mitigate and respond to

changes that take place on local, regional and global level. These changes affect the quality of human life and sustainable development on a world-wide scale. IHDP's work is guided by a Scientific Committee and co-ordinated by the IHDP Secretariat, located in Bonn, Germany. The four core research projects of IHDP have their own International Project Offices spread out around the world.

There are not so many activities within IHDP which would have Integrated Flood Management as a major focus but there are some cross-cutting themes and research projects which may be of relevance. The overarching aspect is of course that the research we foster has a strong link with some type of global environmental change. This not only includes climate change, but also large-scale land use changes and other widespread phenomena. The global water cycle itself is now under so much human influence that one can start to discern changes in it across many regions and possibly even on the global scale. In situations of managing floods according to the approach of IFM, IHDP researchers could provide input on the additional uncertainties related to flood frequency and intensity stemming from future climate change and land use changes, the increased vulnerability that this would bring for human population, and possible adaptation strategies.

Perhaps most interest to the APFM are some activities in the Land Use and Land Cover Change (LUCC) project (www.geo.ucl.ac.be/LUCC). This project aims to improve understanding of the dynamics of land-use and land-cover change and their relationships with global environmental change. It has a very interdisciplinary agenda and works with case studies, development of models and integrative analysis. Climate change, food production, availability and quality of water are among the issues addressed by the project. LUCC has a number of endorsed projects listed at their website, one of which is "Societal and Institutional Response to Climate Change and Climatic Hazards: Managing Changing Flood and Drought Risk" led by Tom Downing at Oxford.

The Global Environmental Change and Human Security (GECHS) project (www.gechs.org) strives to provide interdisciplinary and integrative perspectives on the relationships between environmental change and security. It uses a working definition of human security that connects the theoretical with the practical. Human security is achieved when and where individuals and communities:

- have the options necessary to end, mitigate, or adapt to threats to their human, environmental, and social rights;
- actively participate in attaining these options;
- and have the capacity and freedom to exercise these options.

Issues such as the role of co-operative agreements over water management, effects of land degradation and global warming on human life and security are some of the areas addressed.

The **Industrial Transformation (IT) project** . (http://www.vu.nl/ivm/research/ihdp-it) strives to understand the societal mechanisms and human driving forces that could facilitate a transformation of the industrial system towards sustainability. The main areas of research include: "Cities" - where the aspects of water and transport come to the fore; “Food production and consumption systems”. Food production and consumption systems consume significant proportions of water. In addition, food production activities are most often located on flood plains.

For similar reasons the **Global Environmental Change and Food Systems (GECAFS)** project (www.gecafs.org) which is a joint project with the International Geosphere-Biosphere Programme (IGBP) and the World Climate Research Programme (WCPR) may be of interest for the APFM. This project is just in the process of launching regional research projects and key issues will be identified at the first workshops in 2002. The focus of the Asian project will be the rice/wheat production systems in the Indo-Gangetic region.

The **Water Joint Project** (WJP) of the four Global Environmental Change programmes (IHDP, IGBP, WCRP and DIVERSITAS) is still only at the earliest planning stage and possible links would have to be explored at a later stage.

ANNEX 7

FLOOD HAZARD RESEARCH CENTRE AND ITS WORK IN FLOOD MANAGEMENT

The Flood Hazard Research Centre is an inter-disciplinary centre and a world centre of expertise in the socio-economic assessment of flood management options. It is very much focused on policy relevant research. The 'Blue', 'Red' and 'Yellow' manuals, prepared at the Centre, form the basis of the economic appraisal of flood and coastal defence projects in the United Kingdom. The Centre also took a lead role in preparation of the Ministry of Agriculture, Fisheries and Food's Flood and Coastal Defence Project Appraisal Guidance: 3 Economic Appraisal. In turn, the Centre has undertaken more than 40 cost-benefit analyses of flood alleviation schemes, including of Metropolitan Paris, on the Yangtze, in Hungary and Argentina.

The Centre also prepared the thematic review on flood control, together with the annex on the economic appraisal of flood alleviation options, for the World Commission on Dams. Recently, it developed for the United Nations Environment Programme a methodology for assessing vulnerability to flooding. It led the EUROFLOOD project for the European Commission.

Recent research projects have included:

- Assessments of the effectiveness of flood warning systems
- An international comparison of institutional and funding strategies for flood management
- A comparison of insurance and compensation strategies for flood losses in different countries
- An assessment of the benefits of telemetering rainfall gauges
- An assessment of the social impacts of flooding
- An evaluation of health and other impacts of flooding on households
- The development of methods to incorporate the uncertainties associated with climate change into decision making

Earlier work has included:

- A reliability engineering analysis of flood warning systems
- Post-Project appraisal of flood alleviation schemes
- The development of methods of evaluating the indirect benefits of flood alleviation schemes
- An assessment of willingness to pay to reduce the risk of flooding from sewers
- The possible use of economic instruments in catchment management

It has developed a number of tailored software packages for assessing the benefits of flood alleviation schemes; for coastal protection projects; and also to enable Multi-Criteria Analysis to be used to explore the consequences of adopting different options.
In the UK, the Centre has undertaken many studies for the Ministry of Agriculture, Fisheries and Food; the Environment Agency and the National Audit Office. Outside of the UK, it has undertaken studies in Ireland, Portugal, France, Hungary, Egypt, Yemen, Iran, India, Bangladesh, China, South Africa and Argentina.

In addition to postgraduate courses, it runs a series of training courses for the Environment Agency, and also two open training courses on the project appraisal of flood and coastal defence projects, one specifically covering the UK and a wider course that takes a global perspective. In addition, it has mounted a series of tailored courses, most recently for the Taihu Basin Authority in China.

Over the years, the Centre's research has extended between flood management into all aspects of catchment management. Work has included:

- Drought management and risk sharing
- The economic assessment of improvements in river water quality
- Willingness to pay for improvements in drinking water services
- Losses from interruptions in potable water supply
- Institutional aspects of irrigation management
- Perception and preferences for river corridors, and of river water quality
- Economic assessment of sewerage schemes and of no-dig techniques
- Best practices in integrating land and water management
- Public participation
- Dam safety management
- The economic assessment of the benefits of streamflow gauging
- Coastal zone management and climate change
- The possible use of tradable abstraction licences
- The benefits of alleviating low flows in rivers
- The lessons to be learnt from the privatisation of the sewerage and water companies in England and Wales

In 2000, the Centre was granted a Queen's Anniversary Award for Further and Higher Education.

ANNEX 8

A SUMMARY OF INTEGRATED FLOOD MANAGEMENT (IFM)

A. INTRODUCTION

1. Recent years have seen a continuation of the steady rise in loss of life and damage caused by floods. Understandably, the response has been to call for increased efforts to protect life and property. However, given the density of population and level of investment on flood plains, such protection can only be achieved at great cost and often at the expense of denying the productive use of flood-prone land. Furthermore, small and medium sized floods can be a vital source of freshwater and can bring other benefits to the community and the natural environment.

2. Consequently, a new approach is needed, referred to here as Integrated Flood Management (IFM) in which consideration is given to the positive as well as the negative aspects of flood waters and to the valuable resource that is represented by the flood plains that these waters occupy on occasion.

3. IFM is therefore to be seen as flood management in the context of Integrated Water Resources Management (IWRM).

4. The term “flood” includes here all rises in water level and not only those that lead to an overflow by water of the normal confines of a stream, referred to in English as “flooding”.

B. RATIONALE FOR AN INTEGRATED APPROACH TO FLOOD MANAGEMENT

5. The Global Water Partnership defines IWRM as: “a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

6. IWRM is based on the recognition that any single intervention has implications for the system as a whole. More positively, integrating management means that we may achieve multiple benefits from a single intervention.

7. The approach to flood management should be in the context of sustainable development, with a particular emphasis on poverty reduction.

8. Settling on flood plains has enormous advantages, as is evident from the very high densities of human settlement in, for example, The Netherlands and Bangladesh. Disaster mitigation by restricting the occupation of floodplains and wetlands limits the potential of these lands for socio-economic development.

9. Therefore, the objective in IFM is not simply to minimise the losses from floods, but to maximize the efficient use of the catchment as a whole. In this, an increase in occasional flood losses can be consistent with a long-term increase in the efficient use of flood-prone land. This reflects the adoption of the IWRM approach.

10. The whole hydrological cycle should be considered rather than differentiating between droughts, floods and water resources.

11. IFM should be founded on a broad concept that uses a combination of policy, regulatory, financial and physical measures which focus on coping with floods, recognising that they can never be fully controlled and can indeed have beneficial impacts.

C. Basic requirements for IFM

12. The aim of IFM is to put in place well-functioning integrated measures for flood management.

13. For this, the linkages between various relevant sectors become very important. In this sense, a sectoral management approach must be avoided. Thus, the most important key will be co-operation and co-ordination across institutional boundaries, noting that the mandates of many institutions will either cover only part of the river basin or extend well beyond the basin boundary.

14. At the core of integration is effective communication across institutional and disciplinary boundaries, which will take place only if there is a perception of common interest.

15. Another key is adopting a participatory and transparent approach which includes a representative range of stakeholders in the decision making process. The degree of public participation can differ from region to region.

16. However, it cannot be assumed that such stakeholder involvement will necessarily result in a consensus. Therefore, a methodology for managing conflicts, possibly a formal system of conflict resolution, needs to be developed.

17. Various levels of complexity should be recognized when integrating activities of concerned organizations, and simplistic solutions should not be recommended.

D. Approaches

18. The emphasis on flood management within the context of IWRM, will be on the adoption of flexible structural and non-structural solutions suited to each flood-prone region (characterized by their various physical, social, cultural and other aspects), recognizing the importance of evaluating differing options and their relative advantages and disadvantages.

19. Non-structural measures to be considered will include, for example:

    (a) development of integrated land and water planning policies, including:
        (i) catchment management policies, incorporating source control;
        (ii) re-zoning of flood plains;
        (iii) development of appropriate legislation.

    (b) flood risk assessment;
    (c) assessment of socially acceptable risk;
    (d) flood forecasting and early warning, involving both Hydrological and Meteorological Services;
    (e) public awareness and emergency preparedness;
    (f) use of economic tools, such as compensation or flood insurance.

20. Structural solutions will be considered within a holistic approach, where they can be shown to be effective in economic and social terms and form part of an integrated approach to water management within the river basin.

21. Four basic requirements arise in managing floods within the context of IWRM, namely:

(a) management of the whole water resource;
(b) clear links between catchment management functions;
(c) a wide perspective which allows the situation to be viewed as one of opportunity and not just as a problem;
(d) adoption of multi-functional and multi-beneficial solutions.

22. The three main elements of catchment management (water quantity, water quality, and the processes of erosion and deposition) are inherently linked. Exploiting these linkages may lead to synergies. A wider perspective, such as that advocated by IWRM (considering groundwater and surface water), is required to take advantage of these potential synergies.

E. Major challenges to be overcome

23. If flood management is to be carried out within the context of IWRM, river basins should be considered as systems. Socio-economic activities, land-use patterns, hydro-geomorphological processes etc., need to be recognized as constituent parts of these systems.

24. A consistent approach needs to be applied to all forms of possible intervention.

25. Optimal solutions are difficult to define and apply in the face of uncertainty, including the additional uncertainty from global environmental change and non-stationarity. The challenge is, therefore, to seek for a response that is flexible and can be adapted to changing conditions.

26. In this context, a major challenge will be how to develop a consensus on the question of funding of overall activities when flood management is one of the main objectives, and to do this through dialogue among stakeholders.

ANNEX 9

WMO/GWP Associated Programme on Flood Management

PROJECT PARTNERS

Level 1: WMO, GWP and GWP RTACs and potentially some other international bodies or initiatives: *partners whose work is linked very closely with the APFM and which have, or can be expected to obtain, funding for their activities. Those who fund directly the APFM are considered as "funding partners".*

Level 2: UNESCO, ISDR, etc.: *partners who undertake activities, some of which are related closely to those of the APFM, and who can be expected to undertake some joint projects with the Programme.*

Level 3: FHRC, CRED, etc.: *partners who can be expected to work with the APFM and attend its meetings as appropriate, APFM funds may be used on occasion for engaging them in an advisory capacity.*

Level 4: National Hydrological Services and other national or regional institutions: *partners which have indicated a willingness to cooperate with the APFM. The TSU will maintain contact, usually by e-mail and fax, and they will be limited to provide information to the APFM. APFM funds will not normally be spent on their activities.*

Level 5: Other Institutions and individuals: *not considered as "partners" but whose names are held in the data base of "contacts" and who can be invited to provide information to the APFM and participate in its activities and who are kept informed on developments from time to time.*