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# **REPORT ON MISSION ON FLOOD ACTION PLAN FAP 10 (Module 3)**

**10 March - 10 April 1997**

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**Jim Elliott**  
**Bureau of Meteorology, Australia**  
**Report to Danish Hydraulic Institute**  
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## Introduction

This report covers the first of two one month missions to Bangladesh for the Danish Hydraulic Institute (DHI) as part of Module 3 of FAP10 and describes activities and outputs during the period 10 March to 10 April 1997. The activities are reported against the various tasks identified as part of the consultancy as defined in the Operating Agreement between Danish Hydraulic Institute (DHI) and the Bureau of Meteorology. This includes a description of the progress achieved on each task, the output, and recommended future action in the context of the plans and objectives for Module 3 as expressed in the Plan of Operation and the revised Logical Framework Matrix for the project.

The tasks to be undertaken during the two missions were:

- Task (a) Review of the Flood Warning Manual prepared by the World Meteorological Organisation (WMO) expert Dr Peter Walsh
- Task (b) Review Flood Warning Messages prepared by the project
- Task (c) Review and refinement of other flood information products
- Task (d) Review and final establishment of dissemination system through radio and TV
- Task (e) Prepare specifications and review the work for an alternative test of dissemination through a Non-Government Organisation (NGO)
- Task (f) Review and final preparation of an Action Plan for the Flood Forecasting and Warning Centre
- Task (g) Prepare a long term plan for nationwide flood warning development in Bangladesh
- Task (h) Develop a yearly review procedure of flood warning dissemination for the Flood Forecasting and Warning Centre
- Task (i) Workshops on flood warning dissemination
- Task (j) Liaise with Disaster Management Bureau including DMB-expatriate
- Task (k) Reporting (including mission reports)

### **Task (a) Review of the Flood Warning Manual prepared by the World Meteorological Organisation (WMO) expert Dr Peter Walsh**

The review comments prepared on this manual are included as Appendix 1.

There has still not been any comment on the manual from a GOB agency and there was only limited opportunity to encourage this. A meeting of the FAP-10 "Steering Group" was held on March 6 (before my arrival) but the agenda did not include a specific item on the manual. The previous meeting of this group decided that the National Project Director (NPD) would convene a meeting of "a core group of selected officials" preferably before the end of March to finalise a number of issues. Although not specifically mentioned it was assumed this would include the manual. A later meeting of the group on March 20, that I attended, again deferred further discussion on these issues (including the manual) to this special meeting to be called before the end of March. Unfortunately it has not been possible to have this meeting while I am in Dhaka and the plan now is that the Chief Engineer, Hydrology, BWDB, will call a meeting in the last few days of April to consider a number of outstanding Module 3 matters,





including the manual.

In discussions with the Disaster Management Bureau (DMB), both with the expatriate consultant (Tom Wolters) and the officials, I have encouraged review and comment on the manual and they have been planning to hold an internal meeting to discuss this and the flood warning messages before the meeting (now) at the end of April. I was hoping we could reach an agreed position before the meeting. This should still be the aim.

### **Future Action**

My impression is that few (if any) officials have read the manual, which I find disappointing. I fully support the objectives behind the manual as Dr Walsh originally proposed and, as I hope my comments convey, see that the manual in its present form is very close to a final form. My comments do not involve any major changes and, I hope, should be able to be accommodated fairly readily. It is not clear to me just what the process will be from here. On the basis of my experience with the preparation of the Australian manual, and the need for there to be strong local ownership, I believe the preferred approach would be to form a small working group (2-4 people) from BWDB, DMB (and others?) to oversee the final preparation. This would include final editing, decisions on style, etc. It may be that local consultants do the work, but the final responsibility should be with this local working group. If this is not acceptable, then the local consultants used to date have demonstrated a strong capability in this area and I would expect that they would be able to produce an acceptable final version.

Whatever the process, comments from the involved agencies is an essential input. While I, or some other expatriate consultant, could produce the next version (even the final version) of the manual, this is definitely not the preferred way to proceed. It would result in virtually no ownership by the local agencies and so would have very little influence in bringing about the changes in attitude needed.

The meeting in late April should be encouraged as strongly as possible to take on this local ownership of the manual in whatever way is most appropriate for Bangladesh. I recognise that what may work in Australia may not be possible here but there must be a local "sponsor" to take on the role of finalising the manual as discussed above and in the comments. I would be happy to assist in whatever way possible in this process, either during the second part of my mission, or remotely to the extent that I am able in between then and now.

### **Task (b) Review Flood Warning Messages prepared by the project**

Review comments prepared on the 3 model messages are attached at Appendix 2. Apart from a few minor word changes there were no significant changes that were considered to be essential and I believe the messages should be approved for immediate use by the FFWC for this coming flood season.

Attempts at getting formal GOB approval have proceeded in parallel with progress on the manual as above but, despite taking every opportunity to stress the importance of getting this approval, the messages will now not be considered until the meeting in late April. Just how the use of these messages will be integrated into the roles of the different players in the total

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warning system for Bangladesh is still evolving and expectations should not be too high for this first flood season. I would expect that it will take some time before the full effectiveness of the messages throughout all levels of the system can be achieved.

### **Future Action**

I formed the impression that there was a need to sort out some of the detail as to how the messages were going to be used within the FFWC. My assessment was that this would be best done after formal approval to proceed and would like to have spent some time with them to assist with this. I feel this will still need to be done (see also comments on links with TV).

In the original planning for FAP-10 the evaluation of the effectiveness of the warning messages was included as one of the tasks of the Local Consultant. I understand that these plans have been put on hold for the time being. I would support the need to do this evaluation this flood season if at all possible (as was planned for the 1996 flood season). The Local Consultants used to date have produced very good quality results and, if they are available, would be a good choice to continue in this role if the activity is approved.

### **Task (c) Review and refinement of other flood information products**

This task has not been completed. The existing products are the Daily Flood Bulletin and Forecast Statement and Flood Reports at various frequencies. In addition to the new flood warning messages, a number of other flood information products have been proposed only. These are intended to complement the flood warning messages to provide a range of flood information products at different time scales to meet the needs of the various user groups. A description of the proposed products was included in the Flood Warning Manual distributed in November 1996 but have received no comment to date. Some comments on both the existing and proposed products are provided in Appendix 3.

### **Future Action**

The key to any review or refinement of either the existing or proposed products is a good understanding of the user requirements. To meet this need the original plan was for the Local Consultant to provide the necessary training and support to FFWC staff to work with customer agencies to update and review their needs based on experiences in the 1996 monsoon season, and to report on the need for any changes. When it was apparent that no flood warning message dissemination was to take place in the 1996 monsoon season this plan was amended and the situation with regard to product refinement was to be reviewed in November. This seems to me to have been the best way to proceed and, if possible, this original plan should be followed, but effectively transposed to 1997.

Whatever is done, the starting point should be a clear summary of client needs. The work planned for the Local Consultant included training FFWC staff in how to go about this. If funding for this is still available and staff have sufficient time this should still take place. Discussions with FFWC staff indicated that they had some ideas for changes and a keenness to test them this coming flood season. I wasn't able to judge how well developed these ideas were and did not see any new product designs, but I would be careful about introducing any



new product before a full review. Rather than revise all of the products together, it may be more achievable to consider only one (or a few) product(s) and go through a process of client survey, product design and testing and evaluation, this flood season if possible. This will illustrate the process to be followed and help develop the necessary skills so that FFWC staff can undertake this work themselves during the next non-flood season(s).

The skills needed for a Local Consultant would include some background in marketing, client service, etc, but a good awareness of the nature of the flood forecasting and warning operations in Bangladesh will also be invaluable. Any approach would involve first undertaking a market survey of existing clients to determine their attitude to the current range of products and any possible new products. This might also include assessing the potential for new clients including the possibility that some (eg NGO's) may be prepared to pay. This would best be done under the guidance of a local consultant familiar with the agencies and the way the disaster management system works in Bangladesh. The approach followed might include segmenting the market into different user types and considering the information needs of the different groups. This information could be gathered either through workshop(s) with users or a questionnaire approach. Local advice would be needed here. On the basis of the output of this process new products could be designed. Any new products would need to be consistent with the requirements of the Standing Orders for Disasters.

A decision is needed on the extent to which the original plan as developed, and with (I understand) funding support available for a Local Consultant, will continue. If so, then this original plan should proceed with consideration to some of the above. If required, I would be prepared to draft a specification for the work and could review the outcome when I return in September. If a lower key approach is all that can be supported then I will include some workshops with staff on this as part of the return mission.

#### **Task (d)    Review and final establishment of dissemination system through radio and TV**

This task was not completed to the point of **final establishment** but was progressed as far as possible. From a technical viewpoint I was advised that the system had been installed and tested in September. Apart from a need to install a card in one of the BTV computers, the main hurdles were administrative, in particular a need to meet with BTV to finalise details of the products and transmission protocols etc. This meeting could only be arranged through the BWDB (at the appropriate level). To try to progress this a briefing paper (Appendix 4) was prepared for the Chief Engineer, Hydrology, with copies to Director General, WARPO and Director, Surface Water Hydrology II outlining the background to the issue, attaching all the relevant correspondence, and indicating the action to be taken. The issue was discussed at a meeting between the Chief Engineer, Hydrology, the Director Surface Water Hydrology II, FFWC staff and FAP-10 on April 8. There was clearly a variety of levels of awareness of what was being planned and just how far it had proceeded, and FAP-10 was asked to provide the Chief Engineer with a briefing note. It was not clear whether or not he (or others) had seen the earlier briefing paper.

## **Future Action**

The action remains as set out in the paper at Appendix 4 and rests with BWDB.

### **Task (e) Prepare specifications and review the work for an alternative test of dissemination through a NGO**

A proposal and specification for this work have been prepared (Appendix 5). I will look forward to reviewing the outcome of the work when I return in September.

### **Task (f) Review and final preparation of an Action Plan for the FFWC**

The starting point for this task was the draft outline prepared by Dr Walsh and circulated for comment in March 1996. No comments have been received to date. The purpose of the plan and the requirements under the new Standing Orders for Disasters was discussed with FFWC staff and we had two meetings to discuss and review the contents. My aim here was to establish some starting point with them as it is essential that they take ownership for its preparation and maintenance. Following these discussions I have prepared a further draft to leave with the staff for further consideration (Appendix 6). The majority of the words are as in the original draft but this draft should now provide a common starting point for me and the FFWC staff to work from when I return in September.

## **Future Action**

A copy(ies) of the draft should be provided to FFWC staff as promised for their further consideration. I also suggest that a copy be provided to the Chief Engineer (Hydrology) and copied to Director Surface Water Hydrology II, reminding them of the history of the preparation of the document, why it's needed, the work done so far with the FFWC staff, and seeking their formal support to the final preparation of the plan and its content.

The actual process of preparation involves first agreeing on the structure (chapter headings, appendices, etc) and then mechanically assembling the information. I have started to do this using the present outline. There is no reason why this work can't continue in my absence, but the reality may be that the demands of flood operations will override.

Assuming there is formal support to proceed as planned some form of workshop on the plan might be useful. This needs further thought as the plan is linked with other activities such as product development and refinement, and longer term planning to some extent, so any workshops need to integrate these activities to use the time efficiently. Tasks such as the preparation of a long term plan (Task G) and the establishment of an annual review process (Task H), including product review and refinement, could be integrated into establishing a strategic planning **process** for the centre, rather than the preparation of single plans. I think this would be a preferred way to proceed, but it needs further thought in terms of practicality, achievability, how it fits with other planning processes in BWD, etc. The Action Plan, being more operationally oriented, is not an obvious part of such a planning process, but is related and needs to be integrated. The assistance of a Local Consultant here would be useful,



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particularly in regard to the annual review of warning effectiveness. I need to give this some more thought, but any reactions at this stage would be appreciated.

**Task (g) Prepare a long term plan for nationwide flood warning development in Bangladesh**

Include in second mission

**Task (h) Develop a yearly review procedure of flood warning dissemination for the FFWC**

Include in second mission

**Task (i) Workshops on flood warning dissemination**

The content and outputs from the earlier workshops were reviewed and appeared to be very comprehensive, including one on Flood Warning Communication and Dissemination. The need for a further workshop on this with FFWC staff was not apparent. I did think some form of 'refresher workshop' concentrating on the plans for new messages and the radio and TV dissemination would be of potential use but, without the formal approval, the environment didn't seem to be suitable. If the NGO's are to become more involved here, such a workshop may be of benefit to them and this might be useful once this trial formally proceeds.

**Future Action**

My involvement in any workshops of course will have to wait until the second mission. One possibility is to run a workshop based around the trial exercise with the NGO's and use the results of that to provide further training to both NGO's (maybe including others that didn't participate in the trial) and the FFWC staff. I will come prepared for this but it will ultimately depend on the outcome from the NGO trials.

**Task (j) Liaise with DMB including DMB expatriate**

We had several meetings with the DMB expatriate (Tom Wolters) and discussed various issues concerning coordination between our respective programs, in particular the work in FAP-10 on "grass roots" dissemination. In particular we discussed their role in the preparation of local action (or response) plans and how these should inform the FFWC in their interpretation of flood information into the warning messages. The need for this to be done is certainly appreciated, however this is a large task and we should expect that it will be some time before this aspect of the DMB role develops to any significant extent with their current level of resources. Tom visited SWMC at our invitation to gain a first hand appreciation from SWMC staff of the sort of information available from the models and a representative from FFWC explained their daily forecasting operations. This seemed a useful visit.

Through Tom, I met the Director General of DMB and, at his request, gave a briefing to

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senior DMB staff on flood warning in Australia, any relevant lessons for Bangladesh, and aspects of FAP-10. As I had no prior notice I had made no preparation, but nevertheless I think the exercise was appreciated and I was impressed by the interest of the staff and the DG in what FAP-10 was doing. I encouraged them to look at the flood warning manual and the model messages, which they undertook to do. I also suggested that they visit the FFWC when possible to gain a firsthand appreciation of where the warning products originated, the flood modelling, etc. As an initial stage of this a visit to SWMC was arranged but was cancelled owing to other pressures (only Tom came from DMB as above). I suggest they be approached again through Tom to have such a visit to better appreciate the modelling capabilities available. Ultimately a visit to FFWC is preferred but this may be more difficult to arrange and SWMC is a neutral venue.

### **Future Action**

I undertook to communicate with Tom from Australia and will pass on some contacts and information sources for DMB use. Unrelated specifically to FAP-10, we discussed the possibility of a study tour to Australia for DMB officials to visit groups concerned with the management of cyclone and flood hazards and I undertook to put together a suggested program. This will be communicated direct to DMB but I will also advise FAP-10 of developments here.

### **General Comments**

The work done to date in Module 3 has created virtually all of the elements needed to achieve its objectives; implementation through the GOB agencies however has obviously proven to be difficult. From the opportunity I had to review the work done and the progress achieved I consider the approaches that have been followed to be well considered and appropriate, with much being achieved. I hope my input can add to this work. I have attempted to make the comments with as much empathy as possible with the local scene and trying to appreciate some of the practical and political difficulties faced in Bangladesh. Despite best efforts however it is likely that I have not always understood the background to all of the previous work and so some of the comments may not be as well informed as they ideally should. I have identified what I see to be further action on each of the tasks I was set. Some of this activity can proceed between now and September as is considered appropriate; other tasks can be done when I return. I look forward to some guidance from DHI on whether or not the action proposed is considered appropriate so that I can be as prepared as possible for the next mission.

### **Acknowledgments**

I would like to express my gratitude for all of the assistance and advice provided from DHI and Surface Water Modelling Centre staff during my stay in Dhaka. The staff in all of the various agencies I visited were without exception helpful and cooperative and contributed to making my assignment here professionally very satisfying. To them I also express my thanks. Finally for his continuing assistance, advice and friendship I would like to acknowledge the input of Mr Noorullah who, in addition to guiding me through the Bangladesh system, made my stay in Dhaka a most fulfilling and pleasant experience.



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# REVIEW OF FLOOD WARNING MANUAL

## INTRODUCTION

The Flood Warning Manual for Bangladesh has been developed as part of Module 3 of FAP10. These comments are provided as one of the tasks of the consultancy mission undertaken 10 March to 10 April 1997. The version taken as the latest was that dated 24 September 1996. It appeared to be the same as that held in the diskfile 'fldwarnman.wpd' with the exception that the wording of the acknowledgements was slightly different and the paragraph numbers also were very slightly different - this appeared to be more as a result of a re-ordering than anything else. The paragraph numbers referred to here are those as in the hard copy dated 24 September 1996.

The purpose of the manual, as stated in the Foreword, is essentially to *'assist elected representatives, policy makers, officials and others who contribute to the development of strategies for flood management in their tasks'* as well as *'guidance to anyone who has a role in flood warning and flood response activities'*. To be effective in this role, it is not only the **content** of the manual that is important but also the **process** of its preparation and subsequent promotion, as this can significantly influence the commitment and support of the involved agencies. The comments offered here are primarily on the manual content, however these are first prefaced by some general remarks on my understanding of the process so far.

## PROCESS

It is noted that preparation of the manual has involved considerable local input as well as support from expatriate consultants, but to date there has been no significant comment from the local agencies. It was obviously intended that this input be provided, a need which is strongly reinforced in these comments as being vital to the success of the manual. Preparation of the manual should not be considered complete until this input has been received.

Again just to reinforce what has no doubt been emphasised during the preparation of the manual so far, the concept of 'ownership' of the manual is the key to its success. In many respects this can be more important than getting the content exactly right. In preparing the Australian manual a lot of effort was invested in seeking as wide a range of comments as possible. This ~~is~~ fact delayed the process of preparation but was considered to be well worthwhile. The way in which this is done will depend on the local situation, but it is recommended that careful thought be put into this process. In addition to senior representatives of central agencies it can also be useful to involve 'field' personnel, and to ensure that all agencies with some stake in the system are involved.

After the manual is published, the job of 'selling' it to those for whom it was intended is also an essential part of the process. This first needs a sponsor agency, or a consortium of agencies, to manage and drive this process. In Bangladesh this would probably come from within the BWDB and DMB. In the case of the Australian manual, two of the authors ran workshops on



the manual in all States with local input from the Bureau of Meteorology as the national flood forecasting agency. The workshops were attended by local emergency management personnel, flood forecasting staff, and representatives of local government agencies and the media in some cases.

To be consistent with this approach, it is important that the final manual is seen as a local product and that the final style and wording used matches local needs. Therefore the comments offered concentrate on the overall content and structure of the manual, presentation style, and comments on individual paragraphs, with very few editorial comments (spelling, wording, etc) being offered. This will still be needed but is best done as part of a local editing process.

## OVERALL CONTENT AND STYLE

As an overall comment the manual is an excellent document that has captured the essence of what is considered to be best practice in conceptualising flood warning as a total (flood) warning system considered so necessary if flood warning is to achieve its full effectiveness as a flood mitigation strategy. The inclusion of descriptive material on the flood problem in Bangladesh and the roles of the different agencies makes the manual quite self-contained. The content is considered complete with the only addition suggested being perhaps a final chapter to summarise the content again and to re-make the primary point that it is a *total* system.

In its present form the manual is a combination of guiding principles, information describing the flood warning system as it now operates in Bangladesh, including descriptions of system products, and comments that are more recommendations than anything else (see for example 4.26 which talks about a need to redesign bulletins and 5.21 on the need to undertake more field surveys). The balance between principles and descriptive content is about right, but it is not considered appropriate to include recommendations (see also the comments from WMO on an earlier draft). Furthermore it should be assumed that the manual, once finalised, will not be revised for some years. Therefore material that will date quickly (for example the number of forecast points) should not be included.

The wisdom of combining forecast interpretation and the design of warning messages into one chapter (Chapter 4) is questioned. This approach seems to be the result of using the definition of the FFWRs as provided in Chapter 2 in which both elements are combined under the heading of interpretation. This may be appropriate for the current stage in the development of the Bangladesh flood warning service where the majority of the interpretation is done centrally, however as the service matures and more interpretation is done at the local level, there may well be advantages in treating the two elements separately. At this stage the two elements remain in the one chapter but it is suggested that a restructuring of the chapter is still needed. An attempt at doing this is provided in Attachment 1.

The Foreword describes the language used in the manual as being 'non-technical'. This is ultimately a matter of judgement against an appreciation of the likely audience, but in my view the language used at least in some sections of the manual, is not as 'non-technical' as it might need to be. It is often difficult for those working in academic and professional fields to consistently write in such a 'user-friendly' form and it is recommended that a local journalist

be asked to also review the wording once finalised. The same problem was experienced in preparing the Australian manual and the use of the 'boxes' was an attempt to distill out in simple terms what was the essential message in each section; the idea being that this might be all that some will read. Assuming that this style was adopted for the same reason here, more attention needs to be paid to ensuring that the boxes do in fact contain the right words (which I don't think they do in many cases) and that the wording in the boxes is clear and simple. This is not easy but is considered to be worth the effort. Again a local journalist would be useful. A test could be that a document constructed of just the wording in the boxes should be able to stand alone and make sense.

## **SPECIFIC COMMENTS**

The following comments are made against specific paragraphs in each of the chapters of the manual.

### **Chapter 1. The Flood Problem in Bangladesh**

Para 1.18 - ... prepared for the **flood** (not disaster)

Para 1.19 - Suggest that the connection between the Water and Flood Management Strategy and the Flood Warning Manual (or at least flood warning) be made more strongly.

Paras 1.22-1.25: These paras could all come under the heading 'Types of Flooding'.

Para 1.23: suggest that '.... but **would** not ....' be changed to '...but **may** not ...'

Paras 1.23 & 1.24: The concept of an average flood recurrence interval (eg 3 years) is often confused to mean that the flood will only occur every 3 years. The wording here is probably OK but there may be a potential for misinterpretation by some parts of the target audience.

Para 1.24: This seems to accept that some lives will be lost. Perhaps it would be more optimistic to reword the second sentence to "It inundates some urban areas and the risk of some loss of life is much higher.....".

Table 1: This is a good table, but the layout could be improved. The reference to colours needs to be updated with whatever turns out to be the final position on the use of marker poles etc.

To make this chapter more complete, some mention of a different types of flood damages could be included, making the point that flood warning is only addressed at the avoidable component of the total potential damages.

### **Chapter 2. The Total Flood Warning System**

Suggest that the opening box include:



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What is Flood Warning?  
Why is Flood Warning Needed?  
Why is a Total Systems Approach Necessary?  
How can the Effectiveness of Flood Warnings be Assessed?

The use of the terms “Total Flood Warning System” and “Flood Forecasting, Warning and Response System” need to be rationalised as they both mean essentially the same thing. A way of doing this would be to keep the title the same to emphasise the ‘totality’ of the approach, but alter the current para 2.2 to:

“The Water Resources and Flood Management Strategy of Bangladesh has given particular emphasis to the development of forecasting and warning services. Effective flood warning requires a total systems approach. ~~It cannot be treated as a simple process.~~ It is a system with a number of components each of which is essential for achieving the goal of flood warning - reduction in damages. It is also a process which involves coordinated activities by many agencies and people. The components of this total system make up what is ~~often~~ referred to as a Flood Forecasting, Warning and Response System (FFWRS). This term will be used to describe the system throughout this manual.”

Effectiveness is **ultimately** determined by the proportion of the potentially avoidable loss and damage that was avoided, which is influenced by the effectiveness of each of the components of the total system.

Para 2.3: Suggest that ‘flood impacts’ be replaced by ‘assessment of flood impacts’ or ‘knowledge of flood impacts’.

Para 2.6: This para could be made more “timeless” by replacing the present version with: “Flooding in Bangladesh can cover almost 90,000 sq km (see Figure 1). It will never be possible to provide accurate forecasts of river levels at all points on the river systems so some extrapolation will always be necessary. Nevertheless useful warnings can still be provided to allow appropriate response measures to be taken and, with regular review, the forecasts will continually improve.

Para 2.8: It is particularly important to understand the **needs** of the system first. ?

Para 2.9: Stakeholders Table - should be ‘Disaster Management Bureau’ not ‘Bureau of Disaster Management’.

Para 2.15: Not appropriate in a manual like this.

Para 2.16-2.17: Should make the point that flood response planning is used to guide the design of the total system, in particular the flood forecasting needs.

Para 2.20: Another possibility here is to use the anniversary of a particularly significant flood to raise flood awareness.

The first 'box' is more about why flood warning overall is needed - the messages are really the means to achieving these benefits.

Para 4.11: Only include this when the marker posts and pamphlet are accepted as national policy.

There could be more discussion under the heading of interpretation concerned with the need to establish flood intelligence systems at the local level to assist future interpretation. This will take time to establish to a useful level but the manual should be anticipating this need.

Para 4.19: The design of the flood warning message would more logically come before construction (para 4.12--)?

Para 4.21: The attitude to what is made public depends very much on the local situation, however we have found that there are groups in the public that can use this early, but often inaccurate, warning advice and we are trialling a so-called "Flood Watch" system which is based solely on meteorological outlooks/forecasts.

Para 4.22: Instead of "loss of life is unlikely", it may be better to say "the risk of loss of life is lower".

Para 4.23: Instead of "some loss of life is likely to occur", it may be better to say "the risk of loss of life is quite high".

Para 4.24: Couldn't a catastrophic flood also exceed the level of the top of the Red Band?

Para 4.26: Wording not suited to a manual.

## **Chapter 5. Dissemination and Communication of Warnings**

The text in the box after 5.1 would be more appropriately presented as a stand alone paragraph. The essential point is captured in the last sentence which is all that needs to be highlighted.

The box after 5.2 might be better placed at the very start of the chapter.

Para 5.4: Change "he must interpret it" to "it must be interpreted to put ....". Change "responded" to "respond".

Para 5.6: Figure 2 is considered inappropriate for a manual such as this and is more suited to an academic paper.

Para 5.8: Communication of the message via different channels can assist to reinforce the message and provide confirmation, however it is very important that the same message is being communicated and that there is no competition.



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Para 5.10: This table needs to be consistent with the 'Stakeholders' table on page 13. The latter also includes a role in dissemination for the Ministry of Information, Deputy Commissioners and TNO's and Bangladesh Red Crescent for example.

Paras 5.15-17: These are really points under para 5.14.

Para 5.21: Reword to suit a manual.

## **Chapter 6. System Review and Improvement**

Para 6.1: Referring to the wording in the box, suggest it should be "appropriate" not "affirmative".

Para 6.6: The following box repeats part of the content of the earlier box - this needs to be rationalised.

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## APPENDIX 1: Attachment 1

*Note: The file 'altch4' follows this page. It is not included here because of some problem with the tab setting.*



## Chapter Four

### Interpretation and Design of Warning Messages

#### The Interpretation of Flood Forecasts

##### Why is there a need to interpret forecasts ?

- 4.2 Flood forecasts only provide information about the peak **height** of water at river level forecast stations on the main rivers. To be meaningful, the forecast must be converted into a warning that says how far the water will spread overbank from the river (submerged area) and how much (depth) there will be in this area.

##### Whose task should it be to interpret the forecast ?

- 4.5 Ideally the forecast message should be interpreted at the local level. However, the full operational procedures for interpretation of flood forecasts at the District and Thana level need to be developed. Recent developments in technology now make it possible to use inexpensive computers and software to prepare local level flood intelligence systems and maintain communication links between national and local levels.

#### The use of Flood Marker Posts

- 4.6 Flood warnings without information on areas and likely depth of inundation lose some of their significance. The introduction of marker posts provides guidance on the likely level of flooding and helps villagers to interpret the warning messages. The marker posts are colour banded according to the severity of the flood and the warning messages advise to which colour band the flooding will rise. An illustrated pamphlet is available in Bengali.

#### The Design of Warning Messages

##### What do we mean by a flood warning messages?

A flood warning message tells the public and particularly to people at risk:

**When** the flood is likely to occur,

**What** is the nature of the flood,

**Where** the likely impact of the flood will occur in a given locality, and

**How** people should respond to protect themselves from flood hazard.

It is **issued** by a credible and official source.

- 4.1 A warning message converts forecast flood levels, by using simple language, into terms easily understood by those at risk from flooding. It provides information about what is likely to happen when and in which specific areas. It also provides threatened people with advice on what to do before and during the flood.

they may ignore messages of unusual floods because of their confidence in their ability to cope.

- 4.11 The flood warning produces different responses within parts of a society. Any long term flood warning, if these were ever to be issued, may prompt Bangladesh traders to hoard essential commodities and thereby provoke a rising price -spiral. It is, therefore, important to consider what secondary reactions may be created by warning messages. People show more solidarity during a time of crisis. As there might be some theft and looting, people may need to form vigilance teams.
- 4.13 The target audience includes 'combat' agencies who ideally require slightly more technical information than the general public to get prepared for rescue operation.

#### **Message Construction:**

##### **How do we construct Messages ?**

Flood warning messages must stand out and stand alone.  
 Flood warning messages should be simple, clear and persuasive.  
 They should convey all the essential information for people at risk.  
 They should tell people what to do to protect themselves from flooding.

- 4.14 The construction of messages for flood warning appears to be very simple. But, production of an effective message requires collaboration among people with different skills - communication, psychology, sociology and artistic.
- 4.16 Messages must be presented in a simple language and contain the appropriate information. They must be presented in a form which persuades people to act. They should contain words and images which appeal to human emotions.

Separating Flood Watches and Warnings from the routine daily forecasts and bulletins gives them a high profile. This elevates and establishes Watches and Warnings as important and highly significant messages requiring prompt action.

- 4.17 A crucial aspect of message construction is easy comprehension by the vulnerable people. In Bengali, for example, there is no standard terms which can distinguish between flash flood and monsoon flood. In a peasant society with a very low level of literacy, messages in standard Bengali may not be understood by even a majority of the audience. Thus, construction of messages requires a great deal of attention. Ideally they need to be constructed in as many dialects as possible.
- 4.15 A standard (model) form of message may be helpful. But as the media use may be different and target groups or users are also dissimilar, a number of standard forms are likely to be more useful. These should be reviewed periodically to assess their relevance as the recipients provide feedback on their value, effectiveness and comprehensibility and in the context of changing nature of flood. Feedback from media reporting can be useful



in improving the quality of message.

- 4.20 " Messages are often effective through their latent content, the way they are presented or because of the medium used. Both apparent and latent messages and their presentation should stress action.
- 4.18 The messages should include words as well as maps and visual images wherever possible. But at the same time they should be **simple** and **short**. For effective broadcast, messages need to be **short enough to read aloud in no more than 45 seconds**. The form and content of messages should vary slightly from medium to medium. The level of uncertainty of the event or lack of information should be clearly indicated. A set of model messages appears in Appendix 3. [To follow when approved]
- 4.19 There should be proper prioritization of information in the message. Most important **items** must receive proper emphasis and appear early in the message.

An effective flood warning should include the following:

- O Header/Title to highlight flood location, date and time of issue.
- O Name of Issuing Authority.
- O Ordering information in terms of importance.
- O Description of the areas likely to be flooded (include when possible probable depth).
- O Time for next warning.
- O Sources of advice and assistance.

#### **Flood Warnings Phases:**

- 4.22 The three categories of flood intensity- Medium, Severe and Catastrophic- have increasingly severe impacts and require different forms of public advice. They, with the addition of the Flood Watch (alert) to agencies, form the basis for a series of phased flood warning messages.

A system of phased warnings has the following advantages:

- O Agencies can be alerted before public warnings are issued allowing them time to make preparations to disseminate warnings and to respond to the warning.
- O Warnings can be targeted to those most at risk. Those who will only be affected by a greater flood are warned in later phases.
- O Advice in the messages can adapt to the changing impacts of a worsening flood as it affects more people and creates greater areas of inundation.

The system of phasing in Bangladesh has four elements:

### **Flood Watch**

- 4.23 The first phase is an *Alert* called 'Flood Watch' issued to 'combat' and other relevant agencies. It usually provides 24 hours earlier notice than a publicly issued flood warning and enables them to mobilise their resources and to make other preparations. It is particularly valuable to those organisations carrying out the dissemination process. No public warnings are issued or disseminated as the flood forecast is only provisional.

### **General Flood Warning (For Medium Flood)**

- 4.24 This is the first level of public warning. It corresponds to the *Blue Band* on village flood marker posts. Flooding would affect farmers and others living in low lying areas and on land adjacent to rivers. It would cause some economic loss and damage to property but would not be too extensive or serious. Loss of life is unlikely as the affected populations already have some flood response preparedness since they experience flooding on a regular basis, about every 3 years.

### **Severe Flood Warning**

- 4.25 This would be issued as river levels continue to rise affecting larger areas and those parts of the population less familiar with flooding. It corresponds to the *Red Band* on village flood marker posts. It inundates some urban areas and some loss of life is likely to occur. Economic and property damages would be significant. This scale of flooding is likely to be experienced every 6 years on average. Warning messages contain guidance on flood response actions.

### **Widespread Flood Warning (For Catastrophic Flood)**

- 4.26 This would be issued when an extremely serious flood, comparable to 1987 & 1988 impacts, is expected to occur. It corresponds to the *top of the Red Band* on village marker posts, which is close to the level of the maximum historic flood. Many parts of the population would be affected and significant damage caused. Many people, especially those living in urban areas, are unlikely to have recent experience in coping with a flood. Warning messages contain advice to those affected on what action they need to take.



Warning messages are also addressed to those suffering flooding from earlier phases as they experience an extended period of flooding with increasing impacts.

### Stand Down

- 4.27<sup>n</sup> This new message is issued to indicate that the immediate threat of flooding is over. It is based upon forecasts that rivers will fall below Danger Level and are not expected to rise above it again in the next few days/week/2 weeks.[BWDB to advise on time scale].

### Other Information Products

- 4.4 The separation of warnings from the other products requires a redesign of the existing information bulletins. These, which are based on a WMO guide form a suite of more functional and attractive products comprising a Daily Rainfall and River Digest, a Daily Flood Bulletin and a Weekly Flood Bulletin. Full details are given Table 2 and Appendix 2.

**TABLE 2 - DESCRIPTION OF PRODUCTS ISSUED FROM FF&WC**

TITLE OF FFWRs PRODUCTS	TIME SCALE OF PRODUCT CONTENTS	URGENCY & TIME OF ISSUE FOR PRODUCT	"EXISTING" PRODUCTS
Daily Rainfall & River Digest	IMMEDIATE PAST Recent (last 2-3 days, incl. current day's readings)	PRIORITY Issued during morning	(Bulletins (Summaries (Forecasts
1 Daily Flood Bulletin 2 Weekly Flood Bulletin (Provisional data only)	RECENT PAST Includes Immediate Past extended to past week for Bulletin	PROMPTLY 1 Issued during afternoon 2 Issued within 24 hours of end of week.	
1 River Forecasts 2 Watches & Warnings 3 Stand-downs	FUTURE  Upto 3-days ahead of day of issue	HIGHEST PRIORITY & RAPID (min delay) 1 Issued during morning 2&3 Immediate issue	



<p>Flood Reports</p> <ul style="list-style-type: none"> <li>- monthly,</li> <li>- annual</li> <li>- special</li> </ul>	<p>HISTORIC PAST</p> <p>Historical Record</p>	<p>LONG TERM</p> <p>[Monthly issued within 4 weeks of month end Annual 2 months after end of monsoon]</p>	<p>Flood Reports</p> <ul style="list-style-type: none"> <li>- weekly</li> <li>- monthly</li> <li>- annual</li> <li>- special</li> </ul>
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**APPENDIX 2****Review of Flood Warning Messages****Purpose**

To provide review comment on the three model flood warning messages attached.

**Background**

2. These messages have been prepared after the receipt of feedback on the original set of nine messages as prepared through workshops with FFWC staff and consultants (WMO and Local Consultants). They constitute a reduced set of messages proposed for use by the FFWC this flood season for dissemination through radio and TV, as well as through the DMB. As such they will provide, for the first time, a set of 'stand alone' flood warning messages issued as a specific product of the FFWC. The messages have been distributed to the members of the Steering Committee for comment and consideration. So far (March 1997) no comment has been received.

**Considerations**

3. In making these comments the following have been noted:

The messages are 'models' only; the detailed wording will need to be adapted to suit the particular flood, stage of flooding (rising, peak, falling), etc. It is the structure and style that is important.

The reference to the marker poles will obviously only be included in those messages targeted at areas where the poles have been introduced as part of the four pilot studies; more general wording will be required elsewhere.

The decision to not include particular action statements is noted, as is the concern not to imply too high a level of accuracy.

The development of the FFWRS is still at a relatively early stage and so it should be accepted that the messages will evolve in detail as the total system evolves more fully.

It is assumed that the same message will be transmitted simultaneously to all forms of the media, but that TV will also receive additional graphic-based products, in particular a map of the flooded areas etc (see separate review comments).

Links with the flood warning response process (through DMB) have not yet been fully developed at this stage, but will eventually influence the wording as response capabilities change.



## Comments

4. As a general comment, the messages are considered to provide an excellent basis on which to build a more effective flood warning dissemination system for Bangladesh, within the context of the Flood Forecast Warning and Response System described in the Flood Warning Manual for Bangladesh. Their development has followed current practice standards and has been very thorough, involving as many of the stakeholders as has been practicable. The general form, content and structure of the messages meets the recommended design standards. Some more specific comments follow for consideration.

5. When there are many of the Districts (and Thanas) in flood, the opening statement of the messages as proposed could be quite long and risks losing the desired impact. It would be better to design the opening statement so that it was always short and sharp, irrespective of the extent of flooding. Something like "***A Warning of Severe Flooding was issued at <time> on <date> by the BWDB Flood Forecasting and Warning Centre***". Then go on to talk about which Districts and Thanas are going to be affected etc.

6. While a long message may not be a problem for the TV presentation when it will be accompanied by a map showing the areas affected and some form of scrolling through the list of Districts/Thanas will occur, dissemination of the same message by radio may pose some difficulties. When the same message is read out over the radio, it may help the listener if the Districts were grouped into some logical order that would allow a listener to anticipate when/if their area is affected. Perhaps the four river basins now used in the Daily Flood Bulletin could be used to group the Districts and within those groups the Districts be read out in order of upstream to downstream as far as possible. Such a grouping may also prove useful for TV.

7. There is a need to consider the situation when there will be simultaneous flooding of a different severity (General, Severe, Widespread and Very Severe) predicted in different Districts and/or Thanas. This could require a need to prepare up to 3 messages according to the different types of flooding; ie Severe Flooding in some Districts, General Flooding in others, etc. When supplemented by the map presentation on TV a person in a particular area should be able to readily identify their area and the flood severity predicted. For someone wholly dependent on the radio for this information however there could be a risk that they may only hear one of the messages (the first) and so not become aware of any mention of their District in any subsequent message.

8. Rather than a separate message for each type of flooding, an alternative is to have a separate message for a suitably sized region/area that covers all current flooding, whatever the level/severity, in that area. This may be easier for the recipient to digest. Such a message could either group all Districts with a particular type of flooding together or to describe the level of flooding for each District in "hydrological" order. The area chosen could be each of the four river basins currently used for the Daily Flood Bulletin.

9. The possibility of being able to get some confirmation of the information in the message is important. The potential for this will depend on the development of other aspects of the total FFWRs but the inclusion of a statement such as: "***Further advice is available***"

from your local ...." is considered a useful addition to each of the messages.

10. The wording of the description of the flooding and the impacts could be "tightened up" but is not important at this stage as this will vary with each flood and can be improved with experience. At present there is not a sufficiently clear separation between what is happening (the flood) and the impacts. This will need some attention.

11. The model message for Catastrophic Floods should include a reference to the 1988 flood where possible. This seems to be the "reference flood" and, assuming that many of the recipients of the warning may not have moved since then, there should be sufficient "community memory" to make this reference useful. This reference would be made in place of "close to recorded levels" in the current model.

12. In view of the concerns about giving the impression of too much certainty in the warnings, more use of the words 'may' or 'could', instead of 'will', in describing the flood impacts is recommended.

13. Some small word changes are suggested as follows (new words in bold italics):

#### *All Messages*

In the boxed part of the message referring to radio and TV, the suggestion is to change the sentence to read "..... Flood Warning IMMEDIATELY and **repeat** hourly on ..."

#### *Severe Monsoon*

In the third last para it should read " Roads, railways, embankments and bridges are likely to be washed **away or** damaged."

### **Recommendation**

14. It is recommended that

- (i) the three messages be issued as models for warning messages to be used by the FFWC for the 1997 flood season;
- (ii) in the short term (before the start of the flood season) the suggested word changes (para 13) and the changes in para 9, 10, 11 and 12 be considered;
- (iii) in the medium term (after the 1997 flood season) following a review of the experience of one flood season, consider the value of the suggestions in para 5 and 6, and
- (iv) in the longer term consider the suggestions in paras 7 and 8 along with any other reviews of the effectiveness of current warning messages.

Jim Elliott, Consultant to DHI (March 1997)



## REVIEW OF OTHER FLOOD INFORMATION PRODUCTS

### Introduction

In addition to the new flood warning messages, a number of other flood information products have been proposed. These are intended to complement the flood warning messages to provide a range of flood information products at different time scales to meet the needs of the various user groups. The WMO consultant felt that the current range of products did not fully satisfy the recommended range of products in WMO Technical Document No 598 "The Roles of Meteorologists and Hydrologists in Disaster Preparedness". He considered the current products difficult to interpret and did not sufficiently distinguish urgent information from the routine (refer Progress Report of Third Mission). To address this shortcoming the following range of products was proposed (refer Appendix 2 of Flood Warning Manual):

Daily Rainfall and River Digest  
River Forecasts  
Flood Watches and Flood Warnings  
Daily and Weekly Flood Bulletins  
Flood Reports

The current products have been reviewed and some comments noted as below. Some reactions to the suggested range of products to be developed by FAP10 are also included. These comments can form the basis for further discussion with FFWC staff on the products when appropriate.

### Current Products

#### (a) River Situation Report

This is a standard product. In Australia we have something very similar although it is prepared for more rivers and is therefore grouped by river basin (as for the rainfall situation report). This could be considered here, although it is noted that all stations for the same river are together. A graphical (map based) presentation would make interpretation easier (for some users) as is foreshadowed in the new products proposed.

#### (b) Rain Situation Report

Similar comments for (b) above. Comparison of the accumulated total with the average monthly total is a good idea. A further development of this idea is to compare the monthly totals with historical deciles to put the current month into a more comprehensive historical perspective. This approach is used by the Bureau of Meteorology in Australia in the context of drought assessment amongst other uses. Further details can be provided if required.

### (c) Rainfall and River Situation Summary

As has already been noted, there is not sufficient separation between current and forecast information, nor the highlighting of the more important information. The proposed new products, including separate warning messages and the map presentations, will address this shortcoming.

### (d) Statistical Summary

This product provides more data on past river and rainfall than the other bulletins and presents this in a form that places the current conditions in the context of historical data by the use of comparisons with maxima and average statistics. Presumably there are agencies that need the data in this form. The inclusion of the quantitative river level forecasts in a summary like this would be expected to be useful. Another index that can be useful to some is an Antecedent Precipitation Index (API), or some other form of catchment moisture index. API can be used to assess the significance of any forecast rainfall in terms of likely flooding. As such it is of most use to flood forecasting agencies (ie internal use) but other indices like this can be used by other agencies with an interest in water management. This might be discussed with potential clients when the design of any new products is undertaken.

## Proposed Replacement Products

At this stage these products are only hypothetical so it is impossible to make any detailed comment. The following comments are made using the description of the products included in the draft flood warning manual.

### a) Daily Rainfall and River Digest

*A2.4 This replaces the former Bulletin and precis information in the other more detailed products. It highlights significant events from the last 24 hours and provides a concise summary of overall conditions for rapid dissemination to key Government Agencies and Officials, who need to see early in the day a short and highly explicit summary. The content focuses on key statistics and changes in order to draw attention to, for example, significant quantities of rainfall, new areas of flooding and rivers approaching Danger Levels.*

### Comment

It is assumed that this product is proposed to be issued daily throughout the year, compared with the Daily Flood Bulletin which is issued only during the monsoon season. The description of this product suggests that it will be highlighting flooding information amongst other things, so the target group for each product needs to be decided carefully as there is a potential for some duplication/confusion at times when both products are issued, particularly in cases when they both go to the same address..

The extent to which it is proposed that the information from other products is precisised is not clear. While there is value in only highlighting 'significant events', there is also value in having



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a product that provides all of the data (uninterpreted) to the user and allow them to make their own interpretation. A product similar to the present rainfall and river bulletins should be retained.

Any product that includes information and/or analysis of rainfall information needs to be checked with any similar product issued by the Bangladesh Meteorology Department for consistency and to avoid any duplication.

**b) River Forecasts (Quantifying future expectations of the state of the rivers)**

*A2.5 Forecasts are primarily for use by technical departments who need a comprehensive set of data and can interpret basic facts for use in their own area of responsibility and activity and who do not need interpretations and guidance. This product is also for issue early in the day and is issued throughout the year to other agencies. It is not for general release to the media. In addition to forecasts of future river levels, even when flooding is not likely, it provides a fuller statistical summary (than the Digest) of recent river and rainfall conditions. The content would be similar to the current Statistical Statement.*

**Comment**

The value of this product will depend on the particular user group. Particular care should be taken to ensure that the receiving agency does in fact have the capability to interpret the information as there is always a risk that the information could be misused. This will be more critical during times of flooding when the opportunity (temptation) for other agencies to provide warning-type information is high. This should be avoided at all times.

To include river level forecast information along with a 'fuller statistical summary' will make this a comprehensive product (also quite large). The ultimate value will depend on there being a defined user group that needs this combination of information. This should be determined after some analysis of potential groups but it may be that a separate river forecast product (without the statistical summary) will be useful.

The current Statistical Statement (assuming this is the 6AM and 9AM rain and river combined summary issued now) is seen as a valuable summary and will be part of this product as proposed. As is implied elsewhere, more use could be made of graphics to illustrate the current (and forecast) status.

**c) Daily & Weekly Flood Bulletins**

*A2.7 They meet a DMB requirement for information to issue to UN Agencies and Embassies. They are also for supply to those donor and commercial organisations that have indicated a willingness to pay for receipt of this information.*



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A2.8 *Daily Bulletins are issued throughout the monsoon season to advise on the state of the rivers. Weekly Bulletins are issued only during a flood event to provide information on the magnitude of the flood and its impact. They contain provisional and early estimates of impacts and are not therefore suitable as record documents.*

**i) Daily Flood Bulletin**

*This interprets data from the field into a user friendly form using maps of rainfall, thanas currently at warning stages or experiencing flooding (using colour to indicate severity). They also contain a general out look for the next few days indicating whether flood conditions are likely to worsen or improve.*

**Comment**

The purpose here seems to be to just provide a summary of the current flood status in map form. As such it could be considered a pictorial form of the current narrative version (Rainfall and River Situation Summary). This shouldn't be too difficult to produce using the current software, although presentation using colour may be difficult if it is required in any quantity. A further consideration here will be how the product is to be transmitted, for example colour wouldn't be suited to fax transmission.

**ii) Weekly Flood Bulletin**

*This replaces the current weekly flood report and provides a summary of key information and events for the past week, taken from the Daily Flood Bulletins. It also makes extensive use of graphical presentation techniques.*

**Comment**

This report is not produced regularly at present but on an irregular basis during times of severe flooding to provide briefing to Ministers and senior officials. The report (sample of 13 July 1996) consists of a narrative summary of the flood situation in each of the four major river basins and an outlook (headed Observation) for the next week. A summary of those Districts and associated Thanass that are flooded is also included. It shows a plot of the water level at a key site in each river basin from the start of the flood season (1 May) compared with (presumably) minimum, median and maximum value hydrographs to provide the historical context. Plots of the water level at more stations, but just for the week of the report, are also provided.

This appears to be a very useful product. It provides a good summary of the current state of the rivers in both graphical and narrative form. As such it would be expected to meet the needs of the intended audience. It may also meet the needs of a range of technical and non-technical agencies who are influenced by river flooding, although being at a weekly frequency it would have limited operational value. It would have utility more in planning future activities requiring a longer than daily lead time and appears sufficiently different to the daily products to remain potentially useful. Care should be taken in designing any future product like this to ensure it

remains distinctive.

Since the quantitative river forecasts only go out to 3 days it is not appropriate to include such quantitative forecast information in a product issued weekly. The use of the historical minimum, median and maximum values could be considered for inclusion to provide something about possible future conditions in this time frame.

**e) Flood Reports**

*A2.9 These documents describe the flood event "for the record" and are therefore prepared after the event only when more detailed and accurate information is available. They provide an authoritative record of the flood event and contain the same information as the current reports for:*

- i) Monthly*
- ii) Annual*
- iii) Special*

**Comment**

**(i) Monthly Report**

**(ii) Annual Report**

The sample report used for these comments was that prepared for 1996.

This report provides a wealth of factual information about the flooding in terms of the rainfall and river level data observed during the year. This is presented in a variety of tables, maps and hydrograph plots. As such the report becomes a valuable resource for later analysis and as a record of this data. Presumably the raw data is also archived elsewhere.

Analysis of the rainfall includes comparisons with historical normals. This could be extended to include a more detailed frequency analysis of the data if, and as, the length of record available permits. The maps presented are useful although the isopleths are often shown at odd intervals - it would be better if the interval was more regular.

The major area where the report could be improved is in performance assessment. There is an analysis of the technical forecast accuracy, which is useful, but nothing at all on assessing the value of the work done in terms of it being a public service. This is really the focus of the development of the service through Module 3 of FAP-10 in particular and is the ultimate test of its value. This aspect of performance however is the most difficult to assess and this criticism should not be taken as something particular to Bangladesh. However as the focus is moving more toward the total systems approach through the concepts in the flood warning manual etc, it is important that some attempt is made to include something in the annual report on the services aspects. Noting that 1996 was the first year when it was possible to issue so-called thana-wise warning messages (refer page 3), some analysis of the number of thanas



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flooded compared to those forecast to be flooded, as a function of forecast lead-time, may be a start. The development of other simple indicators is something that could be addressed through workshops with FFWC staff.

Flood damage analysis is confined mainly to damages to BWDB projects. Extending this to include other forms of damage including, if at all possible, something about the impact of the floods on people in the different areas would be a useful extension of the report. This could be presented on a thana basis and would gradually help to build up a picture of those areas with a higher flood risk than others which would assist in future planning. Again the sort of information that could be collected here may be something that is further developed through workshops.

Any feedback received from other agencies would also be valuable to both demonstrate the value in which they hold the service, but also to assist with future planning within the proposed total systems approach.

The technical forecast accuracy figures are presumably for the entire flood season and so include recessions and periods when the flow does not vary greatly. While this is valid, it can be misleading and consideration could be given to using other statistics besides the mean absolute error. This statistic has a clear meaning to the forecaster, but statistics such as the coefficients of efficiency, persistence and extrapolation may be worth considering in future. It may also be of interest to only calculate these measures on the rising limb of the hydrograph, or to consider the period just before the Danger Level is reached to test how well the model performs for these more critical periods of the flood.

### **(iii) Special Flood Reports**

An example of this type of report is that prepared for the floods of North Bengal in 1995. The scope and content of these type of reports is determined by the terms of reference and will naturally vary from case to case. The reports may well cover aspects of flooding outside the scope of operation of the FFWC and so it is not possible to be too prescriptive about the content of the report. From a flood warning perspective the important areas will include the technical aspects of the forecasting, but the service performance aspects must also be addressed. Shortcomings in the flood warning service provided should be highlighted along with the successes.

Where these reports cover a range of flood mitigation activities it is important to try and address all of the components in as integrated a manner as possible. With respect to flood warning, the relationships between flood forecasting and any operational management of flood management structures may be an example of the inter-relationship between activities. The floodplain management goal should be to encourage as full an integrated approach as is practicable and these reports should encourage this at every opportunity.

The report on the North Bengal flooding of 1995 provides a very useful model for this type of report and includes examples of most of the above points. The terms of reference did not specifically address the flood warning operations during the event and so this aspect was not reported in detail, although very useful recommendations on improving flood warning services



were included.

## APPENDIX 4

## TECHNICAL MEETING

## FAP10 MODULE 3

## EXPANSION OF FLOOD FORECASTING AND WARNING SERVICES

## Background Paper on

**Link Between FFWC and Bangladesh TV****Objective**

To ensure that the technical and organisational links between the Flood Forecasting and Warning Centre (FFWC) of the Bangladesh Water Development Board (BWDB) and Bangladesh TV (BTV) for disseminating flood warning information is on a sound operational basis for the 1997 monsoon season.

**Background**

It is planned to disseminate new flood warning information to the Disaster Management Bureau (DMB) and the radio and TV during the 1997 monsoon season. This requires a robust link between the FFWC and BTV. Progress toward establishing the link is summarised as follows (refer attached correspondence):

**On 15 May 1996 the Secretary of the Ministry of Water Resources wrote to the Director General of Bangladesh TV explaining the need to establish the link and seeking his cooperation.**

This letter was forwarded to the National Project Director on 23 May 1996.

The Principal Consultant for FAP10 wrote to the DG BTV to arrange the technical establishment of a radio link between FFWC and BTV on 30 June 1996. BTV replied on 3 July 1996 agreeing to the installation.

The link was subsequently installed and tested and the National Project Director (NPD) was advised on 15 September 1996.

**Action Required**

As explained in the letter to the NPD of 15 September 1996 the following action is still outstanding

- (a) a new graphic card is to be mounted in the PC at BTV - this matter is under

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control and will be completed during the visit of a DHI specialist (Dr Anders Kilding) during April;

- (b) the precise design of the messages/pictures to be broadcast needs to be finalised - the suggestion is to hold a meeting between BTV, FAP10 consultants and BWDB staff where these details can be finalised;
- (c) there is a need to formalise the operating agreement between FFWC and BTV into a final transmission agreement - this is a matter between BTV and BWDB.

In addition the following actions should also be considered:

- (d) the correct operation of the radio link needs to be verified as it has not been tested since it was initially installed in September 1996 - this will require the assistance of radio technicians from the BTV.
- (e) it needs to be confirmed that FFWC staff who will be involved in the preparation and transmission of the information across the link are sufficiently familiar with its operation and are satisfied that the link is robust - consideration should be given to involving FFWC staff in any testing and a program of test transmissions should be designed and run before the start of the flood season.
- (f) a plan to adequately maintain the link should be established and properly resourced - this needs discussion between BWDB(FFWC) and BTV and may require the provision of a small budget to fund maintenance staff call-out time and any spares considered necessary.

### **Recommendation**

That the NPD/Chief Engineer convene a meeting between FAP10, BTV and BWDB to finalise the products to be transmitted across the link (see (b) above). This meeting could also initiate action to address (d), (e) and possibly (f) above.

That the procedure and timing of the formalisation of the transmission agreement be discussed between the NPD/Chief Engineer and BWDB management.

30 March 1997



## **TRIAL OF DISSEMINATION OF WARNING INFORMATION THROUGH NON-GOVERNMENT ORGANISATIONS Proposal for a Consultancy Study**

### **Purpose**

To initiate a consultancy study to test the dissemination of flood warning information through a sample of non-government organisations (NGO's) during the 1997 monsoon season.

### **Background**

The current plan of operation indicates an intention to test the dissemination of warnings through NGO's during the period June to mid-September.

The joint GOB/DANIDA review concluded that there was a need to undertake a quick analysis of the feasibility of dissemination to the population and institutions through a few major NGO's active in the Northern regions (refer draft report of Review dated September 1996), recommending that findings should be ready before the end of 1996 with implementation before the 1997 monsoon season.

In their report of the work on Phase 3 (Development and Training) of Module 3 (Kamal and Islam, November 1996) the consultants referred to the potential of using NGO's in warning dissemination. In particular they suggested that NGO's specialising in disaster management had a potentially greater role to play in providing flood warnings to vulnerable people and that other NGO's working in the field of poverty alleviation may find that disaster management has a more crucial role to play than was normally recognised.

A number of NGO's have shown a strong interest in flood warning. The Credit Development Forum (CDF) agreed to host a workshop on flood warning dissemination and other NGO's (Bangladesh Rural Advancement Committee (BRAC), Association for Social Advancement (ASA), Palli Karma Sahayak Foundation (PSKF), Gonosaystha Kendra (GK), Comilla Proshika, Eco-Social Development Organisation, Thakurgaon) have found that flood warning has a potential role in their activities.

Consideration could be given to adjusting Phase 4 of the Local Consultant's (Dr Kamal) work on Module 3 for this feasibility study to be undertaken, noting that some savings are possible as no further work is to be done on the four pilot studies as originally planned.

### **Proposal**

That Dr Kamal be approached formally to undertake the study. Initial informal approaches

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indicate that he would be available for this work and it is understood he was planning to undertake similar work independently if funding could be found. A full specification of requirements is included in a separate document.

The original Phase 4 specification for the Local Consultant included a range of tasks associated with reviewing the effectiveness of warnings issued during the 1997 monsoon season as well as other tasks. It is considered to be important that this work on effectiveness monitoring be completed in some form, but in close collaboration with DMB, and that any additional work involving the NGO's be integrated into this overall work plan as far as possible within the available budget.

### **Recommendation**

That Dr Kamal be approached to undertake this work in accordance with the specification attached, but integrated as far as practicable within the scope of the original work proposed for Phase 4 to ensure a meaningful assessment of the effectiveness of the new warning messages can still be undertaken.

Jim Elliott  
Consultant to DHI  
24 March 1997



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# **TRIAL OF DISSEMINATION OF WARNING INFORMATION THROUGH NON-GOVERNMENT ORGANISATIONS**

## **Specification of Requirements for a Consultancy Study**

### **1. Introduction**

The role of NGO's in flood warning dissemination was raised in the initial set of tasks contained in the Inception Report (refer A3.4). As part of the specification for Local Consultant input to Phase 3 of Module 3, the consultant was asked to review this role with NGO representatives. The role of NGO's was seen as important by the joint GOB/Danida review, this review concluding that there was a need to undertake a quick analysis of the feasibility of dissemination through a few major NGO's active in the Northern regions and recommending that findings should be ready before the end of 1996 with implementation before the 1997 monsoon season. The specification for the local consultant input was modified (September 1996) to include the preparation of draft proposals and a feasibility study to involve 2 or 3 NGO's in dissemination for review.

In their report of the work on Phase 3 (Development and Training) of Module 3 (Kamal and Islam, November 1996) the consultants identified the potential of using NGO's in warning dissemination. In particular they suggested that NGO's specialising in disaster management had a potentially greater role to play in providing flood warnings to vulnerable people and that other NGO's working in the field of poverty alleviation may find that disaster management has a more crucial role to play than was normally recognised. They found also that a number of NGO's have a strong interest in flood warning. The Credit Development Forum (CDF) agreed to host a workshop on flood warning dissemination and other NGO's (Bangladesh Rural Advancement Committee (BRAC), Association for Social Advancement (ASA), Palli Karma Sahayak Foundation (PSKF), Gonosaystha Kendra (GK), Comilla Proshika, Eco-Social Development Organisation, Thakurgaon) have found that flood warning has a potential role in their activities.

### **2. Issues**

It is assumed that the planned dissemination of the flood warning messages as developed by FAP10 is approved and that these messages will be disseminated through radio and TV as well as through DMB and other official channels during the 1997 monsoon season.

The dissemination of warnings through NGO's is to be seen as complementary to the more 'official' system through BWDB/FFWC and DMB and so any testing and evaluation should be undertaken in a coordinated manner with that official system and the agencies involved. Clearly it is very important that the same message be used.

### **3. Items to be Addressed in the Trial**

- 3.1. Evaluation of Effectiveness      The trial to evaluate the overall effectiveness of this form of dissemination through field evaluation of the impacts in the community. This should include as far as possible an assessment of the relative effectiveness with the 'official' system. Were different groups reached by each method etc.
- 3.2. Complement to Official System      Any impacts on the operation of the official system at the local level should be assessed, in particular any concerns that the different systems are not seen as being complementary and reinforcing. This would need to be assessed in coordination with DMB.
- 3.3. Impacts on NGO operations      The impacts (positive and negative) on the NGO operation should be examined. This should cover both the impacts of any additional workload arising from the requirement to disseminate information as well as the impact that the warning information had on the NGO's normal operations. Suggestions for improvement should be reported. This will include aspects of the communication of the message as well as the its content and presentation.
- 3.4. Impacts on the FFWC      Any significant impacts on the FFWC should be identified. This should include the impacts of any feedback provided from the NGO's in the field to the FFWC if appropriate. Any suggestions for improvement on any aspect of this form of dissemination should be reported for consideration in any future implementation.
- 3.5. Further implementation      The trial should aim to make recommendations on the potential for a more widespread implementation of this form of dissemination as part of the future growth of the warning service. This will include recommendations on which NGO's to target for future expansion.
- 3.6. Budget Implications      Additional costs (if any) involved with using the NGO's in this way should be identified. It was noted earlier that some NGO's have indicated a willingness to pay for improved flood information so the potential for receiving payment could also be explored.
- 3.7. Further Promotion      The study should consider strategies for further recruitment of NGO's if the outcome is positive. This will include recommendations on what publicity and promotion activities should be undertaken to publicise positive outcomes from the trial both for improved"



dissemination as well as potential benefits to the NGO's.

#### **4. Outline of Tasks**

The final design and conduct of the trial to address the above items is the responsibility of the consultant and the following outline of possible tasks is provided for guidance only.

- 4.1 Select 2 or 3 NGO's and the floodprone area to be addressed for each in the trial.
- 4.2 Provide selected NGO's with initial familiarisation of the role of flood warning in flood management in Bangladesh, the local flood warning system including the different products but in particular the warning messages.
- 4.3 Explain available flood information products. Discuss and confirm products to be delivered (warning messages only) and establish delivery mechanisms in coordination with the FFWC.
- 4.4 Provide training in product interpretation as considered necessary.
- 4.5 Consider the value of establishing feedback systems to the FFWC and establish as necessary
- 4.6 Undertake field evaluation of the outcomes of the trial.
- 4.7 Monitor all media (press, radio, TV) for any publicity of the trial.
- 4.8 Arrange debriefing meetings and workshops at the end of the monsoon season to consider lessons etc.

#### **5. Required Outputs**

The consultant should produce a full report on the work undertaken including:

- Executive summary
- Description of work programme and methodology
- Details of NGO's used and reasons for selection
- Description of the areas covered in the trial and the flood experiences of those areas during the trial.
- A description of the current arrangements for disseminating flood warning information in the trial areas and the extent to which the use of the NGO(s) fitted in with this.
- Findings reported under the headings in 3 above.
- Recommendations reported under the headings in 3 above.
- Appendices

#### **6. Coordination Arrangements**



To assist in coordination of the inputs required from the different agencies and the ultimate implementation of the outcomes of the trial, consideration should be given to the nomination of a contact point in both the BWDB/FFWC and DMB as well as FAP10

### **7. Timing**

The trial should commence as closely as possible to the start of the flood season (approx 1 May) and that at least some preliminary analysis of the results should be available by the end of September to coincide with the second mission of the Disaster Management Specialist.

JFE  
25/3/97



# FLOOD FORECASTING AND WARNING CENTRE ACTION PLAN

## DRAFT OUTLINE

**Prepared March/April 1997**

NB

*This draft has been prepared from the initial outline prepared by Dr Walsh in March 1996 but has been modified to include the comments of FFWC staff following discussion during March/April 1997 and some fairly minor additions of mine. The FFWC have also provided a copy of their 'Checklist' which includes much of the factual information regarding contact details, addresses etc that is to be included in the plan. This information can be entered at the appropriate places in the document as indicated.*

*Further work is required to finalise the plan and will depend heavily on further input from FFWC. The proposal is that this be followed up during the second part of my Mission in September/October.*

*The headings and structure of this draft have remained consistent with Dr Walsh's original to assist reference to his original.*

JFE  
April 1997

## 1. INTRODUCTION

The purpose of this Action Plan is to document standard operating procedures and essential reference information for the Flood Forecasting & Warning Centre (FF&WC) to fulfill its responsibilities as defined in the Standing Orders (reference) and taking account of development outputs planned for FAP10. As such it meets the requirements of the Standing Orders that each Ministry/Division/Department /Agency prepare such a plan. This plan integrates as far as possible with those of other Ministries concerned with mitigating the disastrous effects of floods, in particular the Ministry of Relief (DMB) and .....(see later Appendix).

As required, the plan addresses the training needs of employees at the village and union levels to meet their responsibilities during the various phases of disaster.

This plan is restricted to FF&WC's core role and therefore covers only those activities that directly interface with the forecasting and warning procedures. It does not cover other flood warning and flood related activities within BWDB which should be either addressed in separate plans or integrated into this plan at a later date.

## 2. SCOPE

### 2.1 Objectives for Action Plan

*A setting out*  
To document operational procedures for the river forecasting and flood information and warning dissemination service provided by the BWDB FF&WC, operating within the overall FF&WC for Bangladesh as described in the Flood Warning Manual for Bangladesh. The document sets out the requirements for this service operating within this overall system and this Action Plan will enable FF&WC to meet these requirements in an orderly and efficient manner.

### 2.2 Role and Aims of FF&WC

The Flood Forecasting and Warning Centre is a component of Bangladesh Water Development Board (BWDB). Its primary task is to meet the needs of the community through the provision of comprehensive flood information services with particular emphasis on Flood Watches and Flood Warnings for public safety and welfare.

Through education and public information programmes [developed with DMB] it fosters public understanding of the capabilities of FF&WC and how best to use its services and flood information.

BWDB maintains a network of river level and rainfall stations which report daily in near real-time to the FF&WC by two-way radio. It receives weather data and forecasts from Meteorological Department, satellite images from SPARSSO and, for specified conditions, some data from India. FF&WC operates the MIKE11-FF model to produce forecasts of river level at [30 sites with lead times of up to 72 hours and coarse area inundation forecasts for part of the Northern Region (under development).]



FF&WC currently aims to produce Flood Watches and Flood Warnings of floods with [72 hour lead time for monsoon floods (planned increase from 48 hour current lead time).]

### 2.3 Guiding Principles

[based on p10 of WMO guide to PWS. These are included to illustrate that FF&WC services (existing and planned) are in line with WMO recommendations and to enhance its public image and standing by emphasising the set of values which benefit society]

- i. The population has a right to a basic service providing Flood Warnings for their safety, security, convenience and economic benefit.
- ii. All publicly disseminated Flood Watches and Flood Warnings will originate from FF&WC as the single official source. All media organisations will identify FF&WC as the originating authority.
- iii. River Forecasts, Flood Watches and Flood Warnings will be issued, whenever possible, to provide sufficient advance warning of significant events.
- iv. River Forecasts, Flood Watches and Flood Warnings will be expressed in clear, concise and unambiguous terms and in languages readily understandable to the public. Reports, Bulletins and Digests will be expressed in clear and concise terms and use graphical presentations for rapid assimilation by users.
- v. Appropriate dissemination methods will be chosen to ensure the widest possible distribution of all products consistent with agency responsibilities under the SOD's and within the overall framework of the Bangladesh FFWRS. Priority and particular attention will be given to Flood Watches and Flood Warnings.
- vi. Arrangements will be developed with the media and other organisations to ensure that Flood Watches and Flood Warnings are delivered in the most effective and efficient manner
- vii. FF&WC products and their relevance to flood preparedness should be continually promoted but in particular at the commencement of the monsoon flood season
- viii. Regular consultation will be held with users and other agencies to explore ways in which FF&W services can best meet their needs
- ix. The accuracy, timeliness and distribution methods of River Forecasts, Flood Watches and Flood Warnings plus the penetration of their dissemination will be continuously monitored and verified. Information obtained will be used in to revise and improve the service.

### 3. HAZARDS AND RISK

#### 3.1 The Flood Hazard

The types of flooding for which FF&WC provides a service are:

(a) Main river (monsoon)

Major rivers and their side channels overflow causing extensive areas of inundation. The rivers rise slowly and may stay at high flows for extended periods of many weeks. Simultaneous peaks on the three main rivers can cause particularly extensive flooding

(b) Flash Floods

Mainly in eastern and northern rivers where short duration heavy rainfalls in the mountain catchments (within India), lead to rapidly rising hydrographs, rapid runoff response and very fast flood waves with consequential damage.

(c) Rainfall floods

High local rainfall intensities and long duration monsoon rainfall cause flooding due to inadequate local drainage.

#### 3.2 The Flood Risk

*The purpose of this section is to summarise as far as possible what is known about the size of the flood risk. This could be in terms of area inundated at different levels, percentage of population at risk at different levels, etc. The information may not be readily available at the moment but the intention is to gradually build up a better picture of the risk to enable planning of the expansion of the service to proceed more systematically.*

*The impact of the flood in different areas will vary with the depth of flooding but also the timing can be important. In the case of flash flooding, the expectation is that the flooding will commence in May/June, however if it occurs earlier than that the losses will be higher since harvesting of the crops will be interrupted. Similarly if the flash floods occur later than September the impact will be greater since planting of the crops will be underway toward the end of September.*

## 4. RESPONSIBILITIES OF FF&WC

### 4.1 Normal Time

Normal Time is defined by the Standing Orders for Disasters (SOD) as: "A period when there is no immediate threat but long-term actions are taken in anticipation of the impact, at some unknown time in the future, of known hazards."

For the FF&WC Normal Time can be considered in two parts: Normal Time during Winter and Normal Time during the flood season.

#### *(i) Normal Time (Winter)*

The primary role of FF&WC during winter time normal operations shall be to establish and maintain all its facilities in full working order. This includes:

- ▶ radio and telemetry networks,
- ▶ computer hardware,
- ▶ software and databases,
- ▶ telephone & fax
- ▶ other communications facilities
- ▶ operating procedures.

In this way it will ensure the efficient functioning of the Flood Forecasting and Warning Service at all times.

It will also undertake reviews of performance during the previous monsoon season leading to the development and refinement of its flood information and warning products, systems and procedures.

It will promote publicity campaigns and ensure that publicity is regularly undertaken by other appropriate bodies, especially at local community level to educate and inform on the meaning of Flood Warnings and flood warning messages.

#### *(ii) Normal Operational Time*

Operational time is defined in the SOD as the period April to October. This includes the normal monsoon flood period (May to September) as well as the start of the flash flood season (April) and the possible extension to mid-October to cover the eventuality of an extension to the flood season in case of an emergency. Normal operational time refers to that period during April to October when there is no Alert or Flood Warning current.

The primary role during the normal operating period shall be to collect data, monitor the state of rivers and issue Rainfall and River Digests and River Forecasts. These activities are to ensure that it is able to advise and warn all relevant authorities of flooding with adequate lead times and accuracy. When appropriate the level of action shall be increased to the Alert and



Warning Phase activities.

#### **4.2 Alert and Warning Phase**

This phase is defined in the SOD as: "The period from the issuing of an alert (in the form of a Flood Watch) or public warning of an imminent disaster threat to its actual impact, or the passage of the threat and the lifting of the warning."

For FF&WC this period includes the preparation and issuing of the Flood Watches and Flood Warnings and covers the period of increased activity that occurs when river conditions are approaching critical thresholds specified for action by this plan.

Currently the critical thresholds used are the Danger Level and the Warning Stage (defined as being 1 metre below Danger Level). These thresholds should be kept under constant review.

#### **4.3 Disaster Phase**

This phase is defined in the SOD as: "The period during which direct impact of a natural calamity is felt. The Disaster Phase is long in case of slow onset disasters (a normal monsoon flood) and short in case of flash flood and cyclone."

In the case of FF&WC most activities carried out in the Alert and Warning Phase will continue as there will be a continuing requirement to update Flood Watches and Flood Warnings. However, these may be supplemented by additional activities including a need to issue additional warnings as well as to provide updated information bulletins to Ministers and other users.

#### **4.4 Recovery Phase**

This phase is defined in the SOD as: "The period, following the emergency Disaster Phase, during which actions are taken to enable victims to resume normal lives...."

Activities during this phase revert to those described in 4.1 (ii) above, but with the important additional activity concerned with review and improvement of the system which will involve the FFWC in assessing the success of its warning operations and identifying any need to revise its procedures to take account of experiences gained during each flood season.

## 5. ORGANISATION OF FF&WC

### 5.1 Staffing and Responsibilities

(Taken from 'Checklist, Annex-A')

DESIGNATION	ASSIGNMENTS
Deputy Director	Overall supervision of FF&WC in respect of Administrative and Technical Matters
Deputy Director	Analysis of satellite picture. Weekly and Monthly Flood Report. Liaison with BMD, SPARRSO & Prime Ministers Secretariat. Maintenance of computers, wireless, satellite receiver, air conditioners, miscellaneous.
Deputy Director	Program modification. Maintenance of tools and plant. Flood report in the light of paper cutting
Assistant Director	Preparation of forecast by MIKE11 FF & NCRM Model. Maintenance of transport. Indian data. Monitoring of weather situation as received through TP & radar picture. Taping of radio news regarding Indian and local weather.
Assistant Director	Preparation of Forecast by MIKE 11 FF & NCRM Model. Damage report. Forecast for Eastern Flash rivers. Administrative works. Assist DD for maintenance of computers, wireless, satellite receiver, air cooler and electrical equipment.
SDE	Preparation of forecast by MIKE 11 FF & NCRM Model. Preparation of flood reports and all technical reports. Analysis of all meteorological data.
SDE	Preparation of forecast by MIKE 11 FF & NCRM Model. Long term forecast. Estimates, tenders, etc. All reports including foreign journals and periodicals.

### 5.2 Contact Arrangements

(Can be taken from the current 'Checklist')

### 5.3 Equipment and Facilities

*Describe equipment available for river forecasting and flood warning. Use appendices for full details and listings or any operating instructions.*

*This could include*

- (a) *Field equipment including data collection stations, listings, location maps, reporting schedules, etc.*
- (b) *Office equipment including details of real time data collection (Wireless Room, Japanese Telemetry, etc), computer hardware and software.*

### 5.4 Working Arrangements

Period	Working Times	Comment
Winter Period	8AM - 2.30PM	
Operating Period (Normal Time)	8AM - 2.30 PM	
Alert and Warning Phase	8AM - 9PM	Varies with severity of flooding. Maybe up to 10PM by direction from Director/SWH-2
Disaster Phase	24 hour operations	During serious flood situation only. By direction from Chief Engineer, Hydrology in consultation with Board

## 6. COOPERATING EXTERNAL ORGANISATIONS

*List Ministries, agencies and other organisations with whom FF&WC has essential links*

*List key contact points by name and telephone number in other agencies. (In appendix?)*

## 7. OPERATION OF NATIONAL FF&WC

### A. Normal Time

#### 1 Winter Normal Time

- a. Continue collection of daily time interval data (every Thursday) and input to data base (involves only a subset of total network; viz 15 water level, 18 rainfall, 4 discharge stations)



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- b. Maintain software data files
  - c. Test, service and maintain computer hardware
  - d. Test and service radios and telemetry equipment
  - e. Test (monthly), service and maintain communications links with PMO, BMD, DMB etc
  - f. Test (monthly) standby power facilities (if any?)
  - g. Ensure that duplicate and fast communications facilities are available at FF&WC for critical links eg to DMB, Police (actually Deputy Commissioner - District Administrator), media etc
  - h. Establish or reconfirm (at Ministry level) contingency plan for Bangladesh Police to attend FF&WC (on request) with radio to provide emergency communications facilities should no others be available.
  - i. Prepare and hold in April exercises to test (FFWC Action) plan and dissemination arrangements, involving full chain of communications. Coordinate (whenever possible) any test exercise externally with Police, District Commissioners etc who are required by SODs to carry out similar exercises.
  - j. Revise dissemination procedures to overcome any deficiencies
  - k. Review and amend threshold levels for Flood Watches and Flood Warnings in light of previous season's experience.
  - l. Prepare and issue Flood Reports
  - m. Expand coverage of flood warning scheme following programme in long-term plan.
  - n. Undertake training (Annex A)
  - o. Evaluation of the flood forecasting system
  - p. Review and update flood modelling system
  - q. [Prepare and issue low flow forecasts ( to be developed at some future date).]

## 2. Normal Operational Time (April - October; *refer earlier comments on dates*)

- a. Test communication and standby power equipment weekly
- b. Check arrangements for receipt of data, weather and river forecasts from India.
- c. Monitor weather and river conditions daily
- d. Hold daily briefing consultation with BMD [& SPARSSO?] on weather outlook for next few days.
- e. Request special bulletins from BMD when rising river conditions are approaching Flood Watch levels and/or weather forecast anticipates exceptional rain. (*This is not done now but may be considered in future*)
- f. Prepare:
  - (1) Rainfall and River Digests
  - (2) River Forecasts
- g. Issue Digests to recipients in Appendix 1
- h. Issue River Forecasts to recipients in Appendix 2

## B. Alert and Warning Phase

- a. In addition to normal operational activities above:
- b. Review need for and if necessary implement extended hours operations
- c. Monitor weather and river conditions
- d. Request data from India by xx.xx hours
- e. Prepare additional products:
  - (1) Flood Watches
  - (2) Flood Warnings
  - (3) Flood Bulletins
- f. Issue Flood Watches and Flood Warnings, with clear instructions for their onward dissemination, to recipients in Appendices 3&4, including
  - (1) PMO and Ministries
  - (2) DMB and Police
  - (3) Media
  - (4) BWDB radio operators
  - (5) etc
- g. Monitor extent of flooding and update and revise Flood Watches and Flood Warnings and reissue as appropriate
- h. Maintain a log of actions specifying time of issue, to whom, for which location and mode of transmission for all Flood Watches and Flood Warnings.
- i. Issue Stand Down messages when rivers are forecast to stay below Flood Watch and Flood Warning thresholds
- j. Issue Flood Bulletins to recipients in Appendices 5&6

## C. Disaster phase

- a. Continue with all actions from Alert and Warning phase
- b. Implement extended hours' operations
- c. Establish arrangements for additional support staff should need arise.
- d. Adjust frequency of data collection as required to meet needs for any additional model forecast runs or special bulletins
- e. Prepare and issue additional special bulletins (to list in Annex ?) and/or issue more frequent (from one/day to nn/day) Flood Watches and Flood Warnings as required

## D. Recovery Phase

*This phase includes that time during which the rivers remain above Danger (or Warning) levels when Flood Watches and Warnings still need to be issued, and the time when the rivers are below these levels. Operational requirements have priority and the extent to which the non-operational activities can be undertaken will depend upon the operational demands.*

### 1. Operations

- a. Revert to Alert and Warning Phase activities until all risk of further

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flooding has passed and rivers have receded to below Danger (or Warning) levels.

- b. Undertake flood and flood damage assessment tasks as directed by BWDB Management
- c. Prepare Monthly and any Special Flood Reports
- d. Ensure that local staff are collecting flood inundation data on extent and depth of flooding (needs additional budget?)

## 2. Review

- a. Undertake investigations to assess effectiveness of Flood Watch and Flood Warning distribution
- b. Obtain reports from all appropriate sources at local level on extent of flooding to review fit of forecast information with extent of actual flooding
- c. Visit field sites affected to gain first hand evidence and experience of local procedures.
- d. Hold review meeting(s) with PMO, DMB, Police and media to assess effectiveness of dissemination arrangements and make recommendations for their update as required.
- e. Revise dissemination arrangements as required.
- f. Compare impacts (eg extent of inundation) forecast with those experienced
- g. Prepare Flood Reports
- h. Revise and update this Action Plan to take account of all lessons learnt during previous season and review. (Annex C)

## 8. PREPARATION AND ISSUE OF FLOOD INFORMATION PRODUCTS

*(Note: This section is base on the ideas for new products as foreshadowed in the Flood Warning Manual and will need to be revised after further discussion with FFWC staff)*

This section will describe all products and services supplied by FF&WC. Appendices should contain examples, pro-forma or in case of larger reports their contents list.

The range of products should provide an escalating level of information with increasing detail and content as the flood hazard intensifies. The suite of products should provide

A coherent suite of defined products  
Unique roles for each product  
A progression of information

The following range of products [subject to review following development workshops] is recommended for implementation:

### A. RAINFALL AND RIVER DIGESTS



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These will be for rapid dissemination to key Government Agencies and Officials (Appendix 1). They should focus on key statistics and changes; if recipients require further details they should be issued with River Forecasts or Flood Bulletins

## B. RIVER FORECASTS

These will be for regular issue to other agencies (Appendix 2), but not for general release to media. In addition to forecast of future river levels even when flooding is not likely, they will provide a full statistical summary of recent river and rainfall conditions. They are intended primarily for use by technical departments who can interpret basic facts for use in their own area of responsibility and activity.

## C. FLOOD WATCHES AND FLOOD WARNINGS

All types of messages should be specified, along with details of computer files containing templates

1. Flood Watches
2. Flood Warnings
3. Stand Down

These will be issued to those agencies listed at Appendix 3

## D. FLOOD BULLETINS

NB DMB requires information for issue to UN Agencies and Embassies and some donor and commercial organisations have indicated a willingness to pay for receipt of this information.

1. Daily Flood Bulletin

This interprets data from field into user friendly form using maps of rainfall, thanas currently at warning stage or experiencing flood (using colour to indicate severity). These will be distributed to those agencies listed in Appendix 5.

2. Weekly Flood Bulletin (replaces current weekly flood report). These will be distributed to those agencies listed in Appendix 6.

## E. FLOOD REPORTS

1. Monthly
2. Annual
3. Special

These provide a authoritative record of the flood event and should continue in line with current reports. These will be distributed to those agencies listed in Appendix 7.

## 9. ANNEX A - ARRANGEMENTS FOR TRAINING FF&WC STAFF

Details to follow development of basic training syllabus and training manual (Flood Warning Manual for Bangladesh) by local consultant's team

*To include field staff to meet SOD requirements??*

## 10. ANNEX B - ARRANGEMENTS FOR EXERCISING PLAN

[This section is very provisional and requires further development by Disasters Specialist]

Exercises, which complement training, also demonstrate commitment to improve the service and, most importantly offer an opportunity to test and validate effectiveness of the plan ahead of its use. A critical component of this Action Plan is the warning communication and dissemination arrangements. It is recommended that a communications exercise is run every April.

Exercises need thorough and detailed planning and would benefit from input from a disaster management specialist. Testing of links to other agencies requires the development of an exercise that embraces disaster management principles and should be led by DMB as the nationally responsible GOB agency for coordination.

Exercises can take a number of forms, from very simple desk exercises to those involving full mobilisation of response agencies.

The following broad principles will need to be incorporated in any exercise:

### A. Activities and procedures to be tested

#### 1. Communications

- a. Procedures
- b. Equipment

#### 2. Inter agency cooperation

- a. Builds and maintains regular liaison
- b. Exercise of mutual benefit
- c. Tests responsibilities within SODs

#### 3. Coordination

- a. Identify conflicting priorities of different agencies
- b. Test feedback from village and Thana to FF&WC
- c. Clarify roles and responsibilities

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B. Which other Agencies and organisations will need to be involved?

- a. Prime Minister's Office
- b. Disaster Management Bureau
- c. Bangladesh Meteorological Department
- d. Bangladesh Police
- e. Media
- f. ?? at local level

C. Execution of exercise

1. Agree with all participants on their role
2. Brief participants on what they are expected to do and not to do.  
Eg keep log of time messages received and passed on  
Not to warn public!
3. Ensure messages will not be treated as real warnings
4. Brief media about exercise (as well as include as participants)

11. **ANNEX C - ARRANGEMENTS FOR REVIEW AND UPDATING PLAN**

- A. Hold "postmortem" review at the end of each monsoon season to draw out lessons from experiences during the summer.
- B. Prepare a report on all lessons, include sections on (as minimum):
  1. Executive Summary (incl. recommendations)
  2. Brief description of the event. (Flood Reports will provide full details)
    - a. Type and magnitude of floods
    - b. Fatalities and Injuries
    - c. Scale of damage, disruption and economic impacts
  3. Data and weather forecast acquisition
  4. Coordination with other agencies
  5. Dissemination (\*)
  6. Users (Grass-roots) Response (\*)
  7. Summary of Findings
  8. Recommendations(\* ) these items need to be done in close coordination with DMB
- C. Modify this Action Plan where actions are wholly within responsibility of FF&WC.
- D. Coordinate with other agencies and provide feedback to assist in the update of their plans to ensure fully effective flood warning dissemination.



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## 12. APPENDICES

APPENDIX 1 - Dissemination list for Rainfall and River Digests

APPENDIX 2 - Dissemination list for River Forecasts

APPENDIX 3 - Dissemination list for Flood Watches

APPENDIX 4 - Dissemination list for Flood Warnings

APPENDIX 5 - Dissemination list for Daily Flood Bulletins

APPENDIX 6 - Dissemination list for Weekly Flood Bulletins

APPENDIX 7 - Dissemination list for Flood Reports

Monthly

Annual

Special

*This list to be established as required.*

