WORLD METEOROLOGICAL ORGANIZATION

PUBLIC WEATHER SERVICES EXPERT TEAM ON

MEDIA ISSUES

MOSCOW, RUSSIAN FEDERATION

20 – 24 October 2003

FINAL REPORT

EXECUTIVE SUMMARY

A meeting of the Public Weather Services (PWS) Expert Team on Media Issues (ET/MI) was held in Moscow, Russian Federation from 20 to 24 October 2003 and was chaired by Mr Gerald Fleming (Ireland). Under its terms of reference the Expert Team had to develop guidelines on: (I) importance of communication skills in the effective delivery of PWS by NMSs; and the importance of the impact of high quality, well-delivered public weather services on the image of NMSs; and (II) delivery of weather information by radio. In addition, the Expert Team had to produce reports on the demand by the media for information on meteorologically–related disasters; trends and technology in the media; and communicating effectively the concepts of uncertainty and confidence in PWS products.

The key conclusions from the main areas of the terms of reference of the Expert Team are summarised below.

TOR (a)

- The Expert Team considered a number of ideas relating to the promotion in the media of the sources of official city forecast and warning information as represented by the SWIC and WWIS Web sites. It was decided to conduct a survey of media awareness through email, concentrating firstly on the members of the International Association of Broadcast Meteorologists (IABM) but also using some other email networks of weather broadcasters.

- Following much discussion, a distinction was drawn by the Expert Team between promoting the use of the city forecast information and promoting the direct use of the WWIS Web site itself. It was agreed that the database of city forecasts should be available for download by NMSs and media organizations in machine readable format, as this would enhance the ability of the media to use this information effectively. Ten detailed suggestions to promote awareness of the WWIS and SWIC Web sites, both to the media specifically and to the populace in general, are included in the body of the report.

TOR (b)

- The Expert Team prepared a short report summarising best practice for NMSs in preparing for, responding to, and following up on, the demand by media for information on meteorologically-related disasters. This is a continuation of work which the Expert Team has engaged in since its inception; however, due to the particular importance of the subject, it was timely to review best practices in this area and report accordingly.

- The report of the Expert Team, which is contained in the body of the document, restates some of the basic principles of dealing with media demand relating to periods of severe weather. The report is illustrated with case studies from recent severe weather events in Cuba, Sri Lanka, Australia, Kenya and Oman. These case studies serve to underline and emphasise the guiding material contained in the report.

TOR (c)

- The Expert Team reviewed a number of new and emerging technologies and considered the opportunities which they offered for the effective and improved delivery of PWS products. The importance of having a good understanding of the needs of users was emphasized as these needs are likely to change relatively slowly, while the delivery technologies may change a lot more quickly. A full understanding

of the users' needs will ensure that new technologies can be employed to best effect as they become viable.

- The Expert Team considered the possibilities offered by mobile communication technology in some detail, as it recognized that this technology may become very significant in the transmission of weather information in the near future. Developments in the use of the World Wide Web in the delivery of forecasts through video and audio streaming were also considered.

- Technological developments affecting older media were also discussed, as were the use of technology in parts of the developing world where the current infrastructure lends itself to the application of technologies such as RANET. The need for NMSs to be flexible in quickly responding to new opportunities was highlighted.

TOR (d)

- Recognizing the importance of communication skills in transferring weather information to the public, the Team noted that, historically, this area was not always given due attention by NMSs. Good communication and presentation skills by NMS staff ensures that the public and media receive the level and quality of information they require; that the desired message gets across; and that through good quality communication the NMS can maintain a high public profile and a strong brand image.

- In view of the critical importance of good communication the Expert Team suggested that the PWS Implementation Coordination Team (ICT) might recommend to CBS to consider the establishment of a certification process for weather broadcasters. Such a certification process would help in maintaining the highest levels of competency in presentation and communication skills.

- The Team agreed that the preparation of a set of guidelines in this area was appropriate.

TOR (e)

- The Expert Team recognized that good public weather services equals high quality content plus high quality presentation, and that both elements need to be present. A measure of the success of NMSs in providing good public weather services would be the degree to which citizens recognize the existence of their NMS and the appreciation which they have of its work.

- The Team agreed that NMSs needed to be aware of their "brand image" and make every effort to sustain and promote it. In some countries the role of the NMS in the direct provision of services to the public has been reduced, leading to reduced visibility of the NMSs. In view of this trend the Expert Team strongly emphasised that it was even more important now that NMSs provided the highest possible quality services in order to ensure that their public recognition and support might be sustained.

- The Team agreed that there was value in preparing a set of guidelines on this issue.

TOR (f)

- The Expert Team was aware that the existing guidance materials on media issues were already available on the PWS Web site. In view of the continuing importance of radio as an accessible medium for reaching a great majority of the public, and the

fact that at present no specific guidance material existed on radio, the Team decided that a set of guidelines should be developed on the delivery of weather information on radio.

- The outline of the guidelines was agreed at the meeting, and is appended to this report as Annex VI.

TOR (g)

- The Expert Team recognized that the use of confidence and uncertainty in the communication of PWS products was in its infancy. Nevertheless, it agreed that, in view of the important advances in the area of probabilistic forecasting techniques, it was important for NMSs to keep abreast of these developments, particularly as regards the effective communication of information contained in these forecasts to the public.

- The Expert Team appointed a rapporteur to keep abreast of developments in the relevant CBS OPAG teams and liaise with them as regards the requirements of PWS on this topic. In view of the potential importance of this subject, the work of the rapporteur will assist the Team in following and reacting to these developments as appropriate.

1. Introduction

1.1 A meeting of the Public Weather Services (PWS) Expert Team on Media Issues (ET/MI) was held in Moscow, Russian Federation from 20 to 24 October 2003.The agenda of the meeting is attached as Annex III. The participants were welcomed by Mr A. Gusev, Acting President of CBS, who opened the meeting as representative of Mr A. Bedritsky, Director of the Hydrometeorological Services of the Russian Federation and the President of WMO. The meeting was chaired by Mr G. Fleming (Ireland). The list of participants is given in Annex I. Ms Haleh Kootval (WMO Secretariat) welcomed the participants on behalf of the Secretary-General and provided background information on the structure of the PWS Programme within the CBS Open Programme Area Group (OPAG) framework, and especially on the objectives and expected outcome of the meeting of the ET/MI. These are deliverables under the Terms of Reference (TOR) of the team defined by the CBS as follows:

(a) **Promote awareness and use in the media of the sources (SWIC and WWIS Web sites) of authorized and official meteorological information provided by NMSs;**

(b) **Continue to advise and report on the demand by national and local media for information on meteorologically-related disasters;**

(c) **Continue to monitor trends and technology in the media and the consequent implications for provision of public weather products and services;**

(d) **Promote awareness and provide advice on the importance of communication skills in the effective delivery of PWS by NMSs;**

(e) **Promote awareness of the importance of the impact of high quality, well delivered public weather services on the image and visibility of the NMS;**

(f) **Make available on the Internet the guidance material on media issues, and expand and update it as required, with particular attention to the development of appropriate guidelines on the delivery of weather information by radio;**

(g) **Monitor the growing use of probabilistic forecast techniques, such as ensemble prediction systems and report on the development of communicating effectively the concepts of uncertainty and confidence in PWS products and services.**

1.2 Each TOR was led by an expert in a small group that discussed and prepared a report on the details of its work. The composition of each group is as shown below:

TOR (a)	Under this TOR, all members of the Expert Team contributed to the discussions in a brainstorming session as to the best way to distribute information and create awareness of the SWIC and WWIS Web sites. The results of the discussions are included in the report. The report on TOR (a) was assembled by Sam Muchemi, Ahmed Al-Harthy and Elena Cordoneanu.
TOR (b)	Jose Rubiera, and Jon Gill
TOR (c)	Gerald Fleming
TORs (d, e)	Ivan Cacic, and Paul Temple
TOR (f)	Elena Cordoneanu, Sam Muchemi, Gerald Fleming, and Ahmed Al-Harthy
TOR (g)	Jon Gill and Jose Rubiera

2. Background

2.1 The meeting was informed by Ms Kootval that the Extraordinary Session of the Commission for Basic Systems (CBS) (Cairns, Australia, December 2002) had approved the Terms of Reference of the Open Programme Area Group (OPAG) on PWS, which had been proposed by the Implementation Coordination Team on PWS. The work of the PWS Programme continues to be coordinated through three expert teams and an implementation and coordination team. These are the Expert Team on Product Development and Service Assessment (ET/PDSA); the Expert Team on Media Issues (ET/MI); the Expert Team on Warnings and Forecasts Exchange, Understanding and Use (ET/WAFU); and the Implementation/Coordination (IC) Team on PWS. The terms of reference of all the teams had been modified to reflect the areas of work still outstanding or those which needed emphasis in each team and covered all the broad issues of concern to the PWS Programme. The subsequent changes in the membership of each team were based on the areas of expertise required accordingly.

2.2 The results of work under the various TORs of the Expert Team are summarized below.

3. Expert Team Work Programme

3.1 Promote awareness of the Web sites Severe Weather Information Centre (SWIC) and World Weather Information Service (WWIS) as authorized and official NMS information (TOR a)

3.1.1 All team members had prepared input concerning this TOR and during the brainstorming session agreed to a number of strategies designed to promote awareness and use in the media of these Web sites as the official NMS sources of information.

3.1.2 The Team drew a distinction between the promotion of the official information gathered together in the SWIC and WWIS Web sites, and promotion of the Web sites themselves. While promotion of the Web sites was worthy in itself, the Team recalled that the primary objective of these projects was to collect the relevant information and make it readily available to the media.

3.1.3 A series of specific suggestions resulted as follows:

- WMO Members are requested to put a link to the WWIS and where relevant, the SWIC Web sites and some promotional material about the sites on their own homepage.

- WMO requests international media associations such the International Association of Broadcast Meteorologists (IABM) to promote WWIS and SWIC sites as the official provider of weather forecasts and warnings among their members. Similarly, NMSs are urged to formally inform national and regional media associations of the Web sites. This would ensure that knowledge of existence of the sites would be resident with associations that not only work for the benefit of media houses but who also seek to encourage good media practices at peer level and uphold high standards of reporting.

- All media utilizing WWIS information are encouraged to give attribution to its source using the standard wording: “Official city forecasts are provided by Members of WMO”.

- WMO may consider encouraging IATA to ask airlines to provide a link to the WWIS service on their Web sites in conjunction with their booking services. A similar request might also be made to the body regulating shipping services.

- NMSs might consider establishing a service whereby users could access the information in the WWIS database through mobile phones or similar technology. This would imply downloading the database to their own servers and developing an appropriate interface. The service could be promoted by NMSs themselves or with a private sector partner.

- NMSs are encouraged to use forecast verification information to promote, to the media, the quality and accuracy of the forecasts that are available on the WWIS and SWIC Web sites.

- NMSs might consider the possibility of including a standard statement at the bottom of appropriate products and press releases referring to the SWIC/WWIS sites as sources for further official warnings and forecast information.

- WMO and the Hong Kong Observatory should continue to implement methods to increase the likelihood that the most popular web search sites will return links to the SWIC and WWIS sites near the top of the listing. The two sites should also be inter-linked.

- NMSs are encouraged to take the opportunity of the World Meteorological Day, press conferences and other occasions to raise awareness of the media of the information available through the Web sites.

- NMSs are encouraged to promote the sites through media publications e.g., newsletters, magazines, etc.

3.2 Advise and report on media demand for information on meteorologically-related disasters (TOR b)

3.2.1 The Expert Team agreed that a high level of interest existed in the media for immediate access to news related to disasters of meteorological and hydrological origins. The Expert Team reviewed a number of case studies corresponding to such situations and agreed that NMSs needed to plan in advance in order to respond in an effective and timely manner to this type of interest.

3.2.2 The Team identified five distinct stages which needed to be considered and planned for in developing a strategy to deal with the media demand at times of severe weather. These were periods of no severe weather, when preparatory work could be undertaken; the developing situation, when warnings and related advice needed to be adequately communicated; the “height of the storm”, when frequent authoritative updates to the media are required; and the period directly following the event, when the consequences of severe weather are still a significant news story. Finally, the the NMS may provide educational material and the post event review, when the lessons to be learned from the experience could be considered.

3.2.3 The Team noted that an NMS may have to deal with explanations of “what went wrong” if an event was not adequately forecast, and that a strategy needed to be in place to successfully manage this situation. The Team noted the need to have a clearly identified, and authoritative spokesperson who would act as the principle media contact in such an event.

3.2.4 The Team prepared a report detailing its suggestions and recommendations for the various stages outlined above. The report is illustrated with case studies drawn from a number of countries that serve to highlight the most important conclusions. This report is contained in Annex IV.

3.3 Monitor trends and technology in the media and the consequent implications for the provision of public weather products and services (TOR c)

3.3.1 The Expert Team recognized that, with the continuous advances in communication and presentation technology, NMSs faced considerable challenges in ensuring that their products and services were meeting the expectations of an increasingly sophisticated public and other users as regards access to reliable weather information via the most up to date technologies.

3.3.2 The Team noted that the established channels of television and radio would most likely remain the most important media for communicating weather information to the public for some time to come.

3.3.3 The Team agreed that, while changes and developments in communications technologies were proceeding at a tremendous rate, and were likely to continue to do so for the foreseeable future, the needs of users for information were not changing at such pace. Consequently, it noted that it was preferable for an NMS to focus on the needs of the end user, rather than on the exploitation of every new communications technology that came along.

3.3.4 Notwithstanding the points above, it was recognized that the use of mobile communications media to deliver weather information was likely to increase in importance as the technology matured and improvements in bandwidth allowed the more convenient use of graphics and animation. The Team reviewed the experience of a number of countries with this technology, and noted the difficulties in producing high quality location-specific forecasts appropriate to such services.

3.3.5 In reviewing the use of the Internet for the transmission of weather information, the Team looked beyond the basic provision of weather information via text and graphics, and concentrated its attention on the possibilities offered by streaming of audio and video files. It was agreed that, while bandwidth limitations currently existed, such services would probably grow in importance in the near future.

3.3.6 Furthermore, in reviewing the use of the Internet to transmit forecasts and warnings via email or similar, the Team expressed some concerns regarding the robustness of the Internet system itself, and recommended that NMSs put in place a protocol for verifying the safe receipt of warnings by their intended recipients.

3.3.7 A more complete account of the Team's deliberations on TOR (c) is appended to this report as Annex V.

3.4 Importance of communication skills in PWS delivery (TOR d)

3.4.1 Under this TOR, the Expert Team stressed that the quality of the presentation of the information was of equal importance to the quality of the information itself in ensuring the credibility of the NMS and its image.

3.4.2 Communication skill as applied to the effective delivery of PWS may be considered as the successful transfer of weather information through the use of technical means (e.g. hardware, software, telecommunications) and presentation skills (e.g. verbal and non verbal

communication). The importance of good communication skills rises from the nature (public) and mission of PWS (weather service).

3.4.3 The Team agreed that the benefit of developing good communication skills within the NMS, or through partnerships with the media, builds credibility and enhances the public reputation of the NMS. This ensures that the basic aim of the NMS, i.e. the effective delivery of the PWS, is achieved. Good communication and presentation skills by NMS staff, either directly to the public or through the media, ensure that:

- The public and the media receive the level and quality of information they require, which, in turn means that they are more likely to turn to the NMS in the future. If the media get poorly-communicated information, they are likely to go elsewhere for their information the next time they need it.

- The desired message gets across. Forecasters who are unable to communicate through the media deny themselves access to one of the main avenues for getting their message to the community.

- An NMS that actively communicates to the community through the media can maintain a high public profile and a strong brand image. This is helpful in ensuring the ongoing security of the organization in the face of government funding pressures.

- Communication is a two-way process and encourages feedback from the public and media. The media have good links with the community, and can act as an effective communications channel from the community back to the NMS. This feedback is critical for ensuring that the NMS meets user needs.

3.4.4 The Team identified the following as issues requiring particular attention:

- Encouraging the WMO regional associations to appoint national focal points on PWS following the example of the Regional Association VI (Europe). This will help to improve their national PWS activities through collaboration with existing regional and international broadcast and media organizations.

- Encouraging NMSs to make use of existing PWS support materials in general and on communication in particular to develop standards for their own communication to the public. Areas to be addressed could include:

  Establishing communication standards such as,

  - o verbal (language, speech)
  - o non verbal (body language, styling)
  - o usage of technical means (scenery, graphics HI Tech audio and video tools),

- Identifying the conditions necessary for skillful communications (available personnel, legislation, technical conditions).

3.4.5 The Team was informed of the current discussions between WMO and the IABM for the establishment of a “certification process” for weather broadcasters that would set a standard of excellence in weather broadcasting and provide a WMO-backed, internationally recognisable, qualification for those who achieve such standards. The Expert Team strongly

urged the continuation of these discussions and suggested that WMO examine undertaking a leadership role in this process at the international level.

3.4.6 In addition to the above, the Expert Team proposed WMO examine the following as a means of assisting NMSs in achieving excellence in their media presentation skills:

- Make available on the PWS Web site all existing WMO guides, brochures and other publications relating to communications skills
- Compile and organize e-learning tools – with a library of audio, video and graphics examples of skilful weather presentations
- Organize regular training of NMS trainers in the field of communication skills
- Organize workshops on communication skills for NMS staff involved with Media
- Encourage NMSs to develop short, medium and long term plans for improving the human and technical resources needed for communicating PWS products, particularly in the area of TV broadcasting
- Encourage NMSs to organize workshops on communication skills using their local and national media resources,
- Encourage NMSs to work with local and national educational institutions to incorporate media skill courses as part of a degree in meteorology

3.4.7 The Expert Team suggested that in order to assist NMSs in improving their communications skill, a set of guiding principles be made available on this topic

3.5 Promote awareness of the importance of the impact of high quality, well delivered public weather services on the image and visibility of the NMS (TOR e)

3.5.1 In considering TOR(e), the Expert Team stressed that high quality and well-delivered PWS directly influenced the image and visibility of the NMS. NMSs should therefore place proper emphasis and resources in continually improving the presentation of their PWS so that they can fulfill their role and mandate as national weather services. High quality PWS is defined as a consistently reliable and available service, whereby the official weather information is prepared and issued by employing the best possible expertise and technology available to the NMS.

3.5.2 Providing high quality and well delivered PWS is in a large part determined by employing strong communications skills in the delivery of the PWS, either directly by the NMS or through partnerships with the media. However NMSs must ensure that they also receive the proper recognition for the high quality and well delivered PWS they provide. Emphasis must therefore be placed on proper attribution and branding.

3.5.3 The concept of brands is all about quality. Creating and maintaining a brand image is about convincing the public that the product or service in question is of a superior quality to others that are available. The identification of a brand by a user will usually be through the name, the logo, a short and well-recognized song, or through some other visual or audio device, such as the use of a corporate colour scheme that is employed across a variety of platforms. Brands and brand confidence may also be invested in persons, which allow both image and voice to represent the value and authority of the brand.

3.5.4 It should be automatic in peoples´ minds that the NMS offers a quality service through its weather forecasts. The content of the NMS forecasts should be superior to any other forecasts provided for the national territory of the particular NMS. A quality brand must be built on quality content. Any attempt to build a quality brand without first ensuring quality content poses a risk of weakening the image of the organization.

3.5.5 Credibility and accessibility are two necessary, but not always sufficient, conditions for the image and visibility of NMSs. Under certain conditions, the visibility of some NMSs - in spite of the obvious existence of high quality service and usage of high communication standards have been gradually decreased.

3.5.6 The Expert Team agreed that in building the image and visibility of NMSs, it is essential to first stop the process of erosion of the role of NMSs as the providers of public weather services. Failure to strengthen the NMSs' visibility may lead to continued weakening of its PWS. Accordingly, NMSs should focus their attention on several key groups among their collaborators and counterparts, specifically: the private meteorological sector, the media, and government and the public at large.

3.5.7 As part of strategies to achieve the above, the Expert Team encouraged NMSs:

When dealing with the private meteorological sector:

- Ensure that they understand and acknowledge the role of NMS as the single official source of warnings and that proper attribution is given to public weather information when used by private sector meteorology.

- Endeavour to define complementary roles, always ensuring that proper attribution is given when NMS data and/or forecasts are used or distributed by the private sector.

When dealing with the Media:

- Ensure that the parties understand the difference in the philosophy on the media activity between NMSs (as the official source of weather warnings and public forecasts), the private meteorology sector and the Media (as a distributor of weather information).

- Promote NMSs as the authority with the responsibility for issuing official warnings and public weather forecasts and information to the media. Make sure the media understands the need and indeed the requirement to give proper attribution to its information source.

- In return, seek cooperative activities designed to meet the day-to-day information needs of the media. Ideally media liaison personnel should be identified within the NMS to assist media on a regular basis. Opportunities to gain exposure might include writing articles for newspapers and magazines profiling the NMS's expertise in certain areas, or on topics of local interest (e.g. climatology).

- Be accessible and supportive of media information requirements during periods of severe weather. Examples include providing background information, in layman's terms, on meteorological issues in the news, issuing press releasers and-or organizing press conferences as required, dialog and interviewing NMS experts (possible photos usage), live interviews.

- Seek to establish cooperative relationships with local and the international media organizations and associations in addition to direct contact with media companies.

When dealing with the government or public at large:

- Ensure the government (particularly - relevant ministries), local authorities and persons of national influence are aware of the role of NMSs as the sources of standards and official voices for public weather information. Place special emphasis on the importance and scope of activities that extend well beyond simply issuing severe weather warnings.

- Seek opportunities to provide educational material to schools, universities etc that can profile the expertise of the NMS.

- Provide opportunities for teachers, senior government officials and other opinion leaders to tour the NMSs facilities and view the available technology.

- NMSs often have the best linkages with official disaster management agencies and can use this association to build brand strength. Joint activities between the NMS, disaster agencies and the media can be very beneficial in demonstrating to the community who the 'key players' are when dealing with severe weather.

- Consider undertaking a public opinion survey (WMO has samples of surveys conducted by NMSs) to understand the degree to which the services of the NMS are understood and appreciated. Use the survey results to focus on important activities and strengthen weak areas.

3.5.8 In addition, the Expert Team suggested that WMO could use certain opportunities to support NMSs in achieving some of the goals suggested above. One such opportunity may be during the sessions of the CBS whereby an invited speaker (perhaps with a public relations background) might make a presentation on this topic.

3.5.9 The Expert Team agreed that guidance material should be prepared on this topic.

3.6 Make available on the Internet the guidance material on media issues, and expand and update it as required, with particular attention to the development of appropriate guidelines on the delivery of weather information by radio (TOR f)

3.6.1 The Team noted that all available guidance material relevant to media was currently available on the PWS pages on the WMO Web site.

3.6.2 The Team recognized that radio represented a powerful and important medium for broadcasting weather information, and noted that it had the capability of reaching communities, particularly in the developing world, where television and other communications infrastructure were not available.

3.6.3 Noting that radio had not received due attention at previous sessions of the Expert Team, it was decided that a set of guidelines should be prepared relating to the broadcasting of weather information via this medium. A copy of the headings of these guidelines is appended as Annex VI.

3.7 Effective communication of the concepts of uncertainty and confidence in PWS products and services (TOR g)

3.7.1 The use of probabilistic forecast techniques, such as ensemble prediction systems is gaining popularity among NMSs. The effective and correct communication to the public of information contained in such forecasts is of utmost importance in order to realize the real value of these new forecasting techniques.

3.7.2 Uncertainty is an inherent ingredient in the forecast process. Forecasters are very familiar with the question of uncertainty and predictability and must deal with it every time a forecast is formulated. Sometimes the available models or other guidance are consistent in their predictions and the forecaster is confident of the outcome. At other times, the models may differ greatly or the weather parameter may be intrinsically difficult to forecast; nevertheless, a forecast must be made, even when the confidence is low.

3.7.3 An extra challenge faced by forecasters is that although there might be quite a high level of uncertainty in a forecast, when presenting it they need to appear sure. It has taken a period of continuous improvement in both the science of meteorology and the presentation of forecasts to arrive at a stage where forecasts are a trusted source of information. It is therefore important not to overemphasise uncertainty in such a way that users lose trust in the value of the forecast, but rather to educate users that the forecast they receive is the best possible prediction from a variety of possibilities.

3.7.4 Strategies for addressing the issue of communicating forecast uncertainty have been, or are being, developed by many NMSs. This has been recognized by the WMO Public Weather Services Expert Team on Product Development and Service Assessment who have recently reported[1] on the increasing availability of ensemble prediction systems products which have opened up new possibilities in probabilistic forecasting.

3.7.5 A report has been prepared by the PWS Expert Team on Media Issues that summarizes some of the main issues associated with the use and communication of forecast uncertainty and confidence information in PWS services and products. The report discusses the need for effective user education if uncertainty information is to be understood and used appropriately, especially by the media and the general public. The use of probabilistic forecasts by specialized users such as emergency managers is also discussed in the report. Some of the ways in which this kind of information is conveyed are summarized. The report is included in Annex VII.

3.7.6 The Expert Team agreed that this was an area that is continuing to grow in importance and needs to be monitored. The Team therefore appointed Mr Jon Gill to act as a rapporteur on the use and communication of uncertainty and confidence in PWS products and services and requested that he liaise with the appropriate CBS OPAG Teams to exchange information on the activities of the researchers/developers and communications/ service providers on this issue.

4. Conclusions and Further Actions

4.1 The key conclusions arising from the meeting of the ET/MI are given in the Executive Summary of this report. The team accomplished its task of preparing outlines of drafts of guidelines according to its terms of reference. The Team, in addition, prepared reports and advisory material for distribution to NMSs as part of its other Terms of Reference.

4.2 The Expert Team agreed that guidelines on TORs (d) and (e) will be prepared by Messrs Ivan Cacic and Paul Temple. They will submit the Table of Contents by 30 October and aim at producing the draft guidelines by 31 March 2004. The final document should be ready by 30 April 2004. As for TOR (f), the guidelines draft will be prepared by 15 December 2003 under the leadership of Ms Elena Cordoneanu, Messrs Ahmed Al-Harthy and

[1] Report on meeting of WMO Public Weather Services Expert Team on Product Development and Service Assessment, Kuala Lumpur, Malaysia, 22 – 26 September 2003

Sam Muchemi. The guidelines draft will be circulated to team members by 15 January 2004 for comments. The final version should be completed by the end of February 2004.

4.3 The Chairman of ET/MI will provide the OPAG/PWS Chair with the final report of the expert team meeting.

4.4 The Expert Team reviewed its terms of reference and in the light of the work accomplished by the meeting made proposals for amending them. These proposals will be submitted to the next meeting of the IC Team.

5. Visit to the WMC Moscow

The Expert Team visited the WMC Moscow and was briefed by the Director of the WMC on its functions and responsibilities. In addition, the team visited the "Moscow Bureau", a forecast office that has been specifically set up in partnership with the local authority of Moscow and the relevant emergency management agencies to provide detailed forecasts and warning services to the Megapolis of Moscow (population ~ 10 million). The Team also viewed both the computer facility and the forecast coordination centre of the Hydromet Centre of Russia.

6. Closing

The meeting closed at 12.30 on Friday 24 October 2003.

Annex I

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Annex II

EXPERT TEAM ON MEDIA ISSUES

Terms of Reference

(a) Promote awareness and use in the media of the sources (SWIC and WWIS Web sites) of authorized and official meteorological information provided by NMSs;

(b) Continue to advise and report on the demand by national and local media for information on meteorologically-related disasters;

(c) Continue to monitor trends and technology in the media and the consequent implications for provision of public weather products and services;

(d) Promote awareness and provide advice on the importance of communication skills in the effective delivery of PWS by NMSs;

(e) Promote awareness of the importance of the impact of high quality, well delivered public weather services on the image and visibility of the NMS;

(f) Make available on the Internet the guidance material on media issues, and expand and update it as required, with particular attention to the development of appropriate guidelines on the delivery of weather information by radio;

(g) Monitor the growing use of probabilistic forecast techniques, such as ensemble prediction systems and report on the development of communicating effectively the concepts of uncertainty and confidence in PWS products and services.

Annex III

PUBLIC WEATHER SERVICES EXPERT TEAM ON MEDIA ISSUES

(Moscow, Russian Federation, 20-24 October 2003)

PROVISIONAL PROGRAMME

	Monday, 20 October	Tuesday, 21 October	Wednesday, 22 October	Thursday, 23 October	Friday, 24 October
AM 0900	**1. Opening** 2. Background Information and Objectives (Secretariat) **3. ET/MI work programme** TOR (a): Discussions of key issues led by **Sam Muchemi and Ahmed Al Harthy**	TORs (d and e): Discussions of key issues led by **Ivan Cacic and Paul Temple** TOR (f): Discussions of key issues led by **Elena Cordoneanu and Sam Muchemi**	Start individual group work under each TOR TORs (a, b, c): Work plan: prepare input for reports on each subject and for the report of the meeting TORs (d, e): Work plan: development of guidelines and input for the report of the meeting	Presentation of work plans by sub-groups to the ET/MI General discussion Arrangements for follow-up actions under TORs Prepare inputs for the Executive Summary of the meeting	Preparation of report of the Expert Team (continue)
1200	*Lunch*	*Lunch*	*Lunch*	*Lunch*	*Lunch*
PM 1330	TOR (b): Discussions of key issues led by **Jose Rubiera and Jon Gill** TOR (c): Discussions of key issues led by **Gerald Fleming and Roman Vilfand**	TOR (g): Discussions of key issues led by **Gerald Fleming and Jon Gill** General discussion on ET/MI work TORs a, b, c, d, e, f, and g	TOR (f): Work plan: input for a document for NMSs and for the report of the meeting (guidelines for radio) TOR (g): Work plan: prepare input for a document for NMSs and for the report of the meeting.	*** Review TORS** **4. Preparation of report of the Expert Team** **5. Visit to the WMC Moscow**	Review and adoption of the report **6. Closure**
1700					

REPORT ON THE DEMAND BY NATIONAL AND LOCAL MEDIA FOR INFORMATION ON METEOROLOGICALLY-RELATED DISASTERS

The media demand for information on severe weather-related events can change according to the situation. As the event develops, the requirement for information increases, both in terms of the amount of detail and the frequency of updates. There is an increasing demand for direct interviews with the NMS representatives at this time as well. During the event itself, as parts of the community are impacted by the event, the media look for information that is as up-to-date as possible with frequent updates on what is happening and what areas are being affected. After the event is over, there is often a need for summary information on the event as well as explanatory material on what caused the disaster; this provides a good opportunity for public education because there is a high level of interest in the community at this time.

The following discussion looks at the different requirements that the media have for information at different stages of a severe weather event and describes some examples of 'good practice' on the part of the NMS in providing this information in effective and proactive ways.

The Calm Before The Storm

For the majority of the time, there may be no severe or hazardous weather threats and the media may not appear to have much requirement for information from the NMS. Nevertheless, this is often the best time for public education activities and the media can have an important role to play. The media are always looking for interesting stories and there is a lot of useful information that the NMS can provide that can form the basis of interesting articles in newspapers or presentations in the electronic media and which can serve to keep the NMS in the public eye. Press releases are a useful mechanism for generating media interest in this way.

In addition, the media and the NMS will be working closely during an event, so it is a good idea to use the 'quiet time' away from the severe weather season to make sure operational arrangements are in place. The media will need to know the appropriate names and contact details of NMS personnel that they may need to contact when the event is occurring.

Case Study 1

The Sri Lankan Department of Meteorology conducts an active awareness program for Government officials, higher education institutions, voluntary groups and the instructors of school teachers on various weather related disasters and climate change issues. An important component of this program is the education of the general public through the publication of weather-related articles in newspapers and conducting awareness programs and holding discussions with electronic media before and during bad weather situations.

Meteorological personnel in collaboration with officers of the Disaster Preparedness Centre conduct awareness programs to educate regional and village level officers and grass root volunteers on prevention and mitigation strategies relevant to their localities. The media are important partners in this process.

Sometimes the media are interested in events that occur in other countries. Under such circumstances, they may request the NMS to provide some relevant information. Alternatively, the NMS may recognize that the media would be interested to learn of events elsewhere and might desire to give them some information. It is important that this information is accurate and consistent with the information that exists in the country where the event is occurring. To ensure consistency, there should be good coordination between the NMS's involved. It may also be worthwhile giving the media a contact within the country where the event is occurring so that they can get authoritative information from the source. In order to know who the most appropriate contacts are, appropriate details could be included on the WMO web site that lists NMSs contact information.

Another way to share information on the event could be for NMSs to post it onto the WMO site and refer journalists to it. WMO may also publish this information as a press release.

The Developing Situation

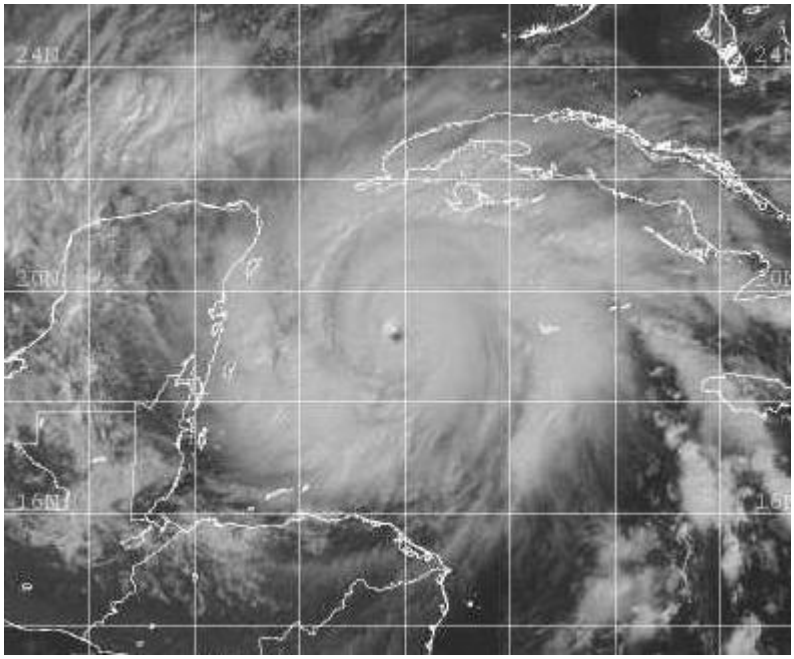
As a severe weather event develops, the NMS initiates the provision of advice to the media and the community at large that a threat may be developing. At first, the level of threat may be quite low and the media requirements for information may be relatively 'low key'. However, once the threat becomes more direct, the need for information may increase rapidly and it is important that the NMS is ready to provide the necessary information at short notice. At the very beginning, the NMS should identify its spokesperson(s) and have the key messages identified. A useful exercise is to develop a series of questions that the media may ask and have answers pre-prepared.

Once these preparations have been made, the NMS should be proactive in initiating contact with the media and begin the process of communicating the situation to the public. Direct interviews with NMS staff is an effective way to achieve this task. Supporting material (such as maps, satellite pictures, radar imagery, etc) that has been prepared beforehand can be provided as necessary. The situation can change rapidly, and the NMS needs to be 'ahead of the game' so as to remain in control of the circumstances.

It is important during this stage, to pay attention to the success (or otherwise) of getting the message across. For example, if it appears that there is a level of complacency in the community, despite the dissemination of warning information through the media, steps can be taken to raise awareness.

Case Study 2

In November 2001, Hurricane 'Michelle' struck Cuba as a Category 4 hurricane (on the Saffir-Simpson scale). It was recognized by the Cuban National Forecasting Center at the Institute of Meteorology that there was not a good awareness of how dangerous a Category 4 hurricane could be because the last such hurricane had occurred over 50 years before. There was therefore no historical memory amongst current generation. The initiative was therefore taken to show on television a series of damage photographs from the historical archives from the last 2 Category 4 hurricanes (in 1926 and 1944). In this way, the community, through the media, quickly learnt of the potential danger of 'Michelle' and the subsequent information provided by the Cuban National Forecasting Center was responded to appropriately and necessary community preparations and actions were taken. A measure of the success of this was that there were only 5 casualties even though this extremely powerful hurricane directly struck Cuba and affected almost 50% of its territory.



Visible satellite image of Hurricane 'Michelle' at the time of maximum intensity. 'Michelle' was travelling northeast towards Cuba at this time. (Image courtesy of Cuban Institute of Meteorology)

Sometimes the weather-related disaster develops more slowly or is predicted further ahead in time. In such instances, a well-written media release may be the most effective way of getting the message out. The purpose of a media release is to generate media interest in a story which leads interviews and further opportunities to promulgate the desired message. It is important that such a media release includes the name of an NMS spokesperson who is available for comment. This person should have pre-prepared questions and answers so that he/she is able to answer the media enquiries and not be 'caught out'. It is essential that the information in the release is interesting and topical and attracts the attention of the media who will recognise that their audience will find the information worth hearing about.

Case Study 3

In Kenya, great importance is placed on the seasonal forecasts issued by the Kenya Meteorological Department (KMD) one month prior to the start of the major seasons, especially the wet and dry seasons. In April 2003, significant flooding affected the low-lying plains of Budalang'i flanking Lake Victoria to the west. This region has become increasingly flood-prone in recent years due to an increase in forest clearing by Budalang'i residents. Following the April 2003 floods, and an increasing awareness of the vulnerability of this region, there was great interest in the seasonal forecast issued by the KMD in June for the approaching season; this forecast indicated an increased likelihood of above average rainfall. The KMD called a press conference for electronic and print media in order to draw particular attention to the expected seasonal conditions and these were given wide reportage by the media because the memory of the April floods were still fresh. As a result, when very severe flooding did indeed occur in the Budalang'i area in August 2003, a high level of community awareness had already been achieved. This in turn helped ensure an effective community response and as a result no lives were lost. The government and non-government organisations were also adequately sensitised and they were able to quickly provide much needed help to the flood victims in terms of food, clothing and temporary shelter.

A broken dyke on the River Nzoia caused by the August 2003 floods in the Budalang'i area. The photograph was taken after flooding had subsided. (Photo courtesy of KMD)

As the event approaches, the media often require more frequent information updates. There is no such thing as an 'information vacuum' – if the media require information they will seek it out. It is important that the information they need is supplied by an authoritative source such as the NMS rather than from a less reliable source.

During the event

In many ways, the same sort of information is required by the media during the event as leading up to it. Frequent updates on the situation are necessary, and direct interviews and briefings by the NMS staff are important. Once again, having a clearly identified spokesperson is valuable. Advice on when the next update is to occur should be provided. Remember that the media prefer to look to authoritative sources for warning information and the NMS is in a good position to provide this.

Case Study 4

In May 2002, a tropical cyclone struck the Sultanate of Oman. Severe flooding and high winds caused significant social and economic disruption and the loss of 9 lives. Frequent interviews with forecasters on national television before, during and after the cyclone ensured that necessary warning information was conveyed to the public.

Live television broadcast from Cuban National Forecast Center of the Institute of Meteorology during 'Hurricane Michelle' in November 2001. (Photo courtesy of CubavisionTV)

Particular information that the media desire during an event is details about what locations are being affected and how severe the impacts are. The media like to focus on the 'human interest' aspect of the event (rather than the pure meteorology) so it is important for the NMSs to brief the media in terms of the communities (i.e. the people) that are being impacted. Comparisons with past events that people may remember is a common technique the media use to make the story relevant and interesting.

Other ways to make the information interesting for the media, especially television, is the use of graphics, such as tropical cyclone tracks, or satellite and radar image loops. Not only do these provide important information but are in a format that is consistent with the need for television material to be attractive and colourful.

In many instances, meteorological information is provided to the media by organizations other than the NMS. For example, emergency managers may have responsibility for briefing the media and the general community about the situation, and include in their advice some information about the hazardous weather. It is very important that in these circumstances, the NMS works very closely with the emergency managers so that an accurate and consistent message is conveyed that is not in conflict with the NMS's own information. For example, in the Sultanate of Oman, the Public Relation Office of the Royal Oman Police issues warnings to the public through different media channels. As a result, it is necessary to have very good coordination and cooperation between this entity and the Meteorological Department to ensure a consistent and appropriate message gets out.

Case Study 5

Between January and March 2003, southeast Australia was affected by some of the worst bushfires on record, with over 1,000,000 hectares of mountain terrain burnt by fire, and a deadly firestorm in the nation's capital, Canberra, which destroyed over 500 homes and killed 4 people. Throughout the episode (which lasted over 2 months in total) there was ongoing media demand for information on weather-related fire danger, in particular when days of high wind and temperature were expected. Much of the weather information was related to the media by the fire-fighters themselves, who were probably seen as the front-line 'combat soldiers' and therefore more interesting from a media perspective than the 'behind the scenes' weather forecasters. Close relationships between the Australian Bureau of Meteorology and the fire agencies ensured that weather information conveyed by the fire-fighters to the media were generally accurate and reflected the official forecasts. This experience demonstrated the importance of fostering close relationships with key organisations who may be interacting with the media and commenting on the weather and climate.

Coordination between NMSs

Where an event is affecting more than one country, it is essential that the message being conveyed to the media is consistent. Close interaction amongst the affected NMSs is vital, and the use of things such as video or telephone conferencing can be extremely valuable in coordinating the message.

After the event

Following the event, there is great public and media interest in what happened. There is an important opportunity at this stage for the NMS to provide information to the media on the nature of the weather event, how severe it was and what communities were affected. Working closely with emergency managers to gather this information is always a good idea.

Interviews with the electronic media give an excellent opportunity to reinforce messages or lessons that may have been learnt and are still fresh in people's minds. For example, if there was a good community response to warnings, and few casualties, then this would be a good time to reinforce how important it is to listen to warning information broadcast in the media and to 'congratulate' the community for their appropriate behaviours during the event.

The media often like to prepare stories about what happened and the NHMS has a valuable opportunity to provide information that can be educational. Maps of the weather event can be useful. For example, a track of a tropical cyclone showing the extent of the damaging winds can reinforce the important message that a tropical cyclone is not a point but extends over a large area. Comparisons with historical events is a very useful way of giving people a 'reference point' so that they can appreciate the severity of the event compared to past episodes.

Sometimes the weather event is not successfully forecast, perhaps because it developed too quickly or changed its path unexpectedly. The media may be looking for stories on 'what went wrong'. When this occurs, it is essential that the NMS is ready to provide accurate information on what happened. In this way, the NMS can 'stay on top' of the unfolding media story and avoid being seen as out of touch or slow to react. The event can even be turned into a positive outcome about how difficult it can sometimes be to forecast weather events and to manage the unrealistic expectations of the media and the community that all weather events will be forecast perfectly.

Case Study 6

On 18 May 2003, a tornado struck the Australian town of Bendigo, causing widespread damage. The tornado formed very quickly and no warning was issued by the Australian Bureau of Meteorology before it hit. Although there was potential for media criticism due to the lack of warning, none was made. Instead, there was close interaction with the media immediately after the event and all efforts were made to accommodate their requests for information. For example, a severe weather meteorologist visited the town the next day to undertake a damage inspection and the radio and television media were provided with his mobile phone number so that a number of 'on-the-site' interviews could be conducted. Written and graphical information was provided to the print media to accompany their stories on the event. The result of this was that negative criticism was minimised and the event was instead used to educate the community about such rare events (many people did not realise that tornados can occur in Australia). By being responsive to the media's needs, the Bureau of Meteorology was seen as a partner in the news stories rather than as a victim of them.

Post-event review

This is one of the most important stages of the whole episode because it is here that lessons can be learnt and improvements made so that the next time there is an event, the interactions with the media are as effective as they can be.

The review should look at what worked well and what needs improving. The media themselves will have important contributions to make to this process and they need to be closely involved in the review. The lessons of the event should be clearly documented and actions agreed to and implemented. Otherwise, the same mistakes will keep occurring and the media and the community will become frustrated with the NMS.

Conclusions

In summary, the demands that the media have for meteorologically-related disaster information is wide-ranging and exists at all times, not just during the event but before and after as well, and even when there is no hazardous or severe weather at all. It is important that the NMS continually anticipates these needs and is able to be proactive and ‘ahead of the game’ in getting this information to the media outlets, in ways that the media require and which also serve the needs of the NMS in getting its message across.

REPORT ON MONITORING TRENDS AND TECHNOLOGY IN THE MEDIA AND THE CONSEQUENT IMPLICATIONS FOR THE PROVISION OF PUBLIC WEATHER PRODUCTS AND SERVICES

The means by which weather information can be delivered to the end user are increasing and multiplying at a tremendous rate as the communications revolution offers many new technologies for the transmission of text, graphics, voice and video. The sheer range of these possibilities presents a significant challenge to NMSs. The work of servicing the different communication media is continuously increasing, while the potential reach, or user-base, of each medium is probably decreasing, due precisely to this proliferation of media.

The medium of television continues to be the dominant means by which people access weather information, with studies indicating that 60% to 70% typically nominate television as their primary source. However, considering just this single technology of television, the old model of providing public weather services through public service broadcasters, and thus reaching a significant portion of the population, is rapidly becoming less important, through much of the western world at least. This is due to the explosion in number of satellite and cable television channels, and the consequent fragmentation of viewer ratings across many outlets.

In approaching the topic of disseminating weather information through new and emerging media technologies, it is worth distinguishing clearly between what technology can actually do and what people typically want. An NMS that wishes to bring its messages of weather forecasts and warnings to the public should first of all do some research to establish clearly just what their public want. What kinds of user groups are out there? What are their needs? Trying to grapple with the different communication technologies without answering this more fundamental question is like putting the cart before the horse.

In reviewing the different “new” technologies in the following sections, it is not implied that these will take over in any way from television and radio, which continue to be the pre-eminent sources of weather information for the majority of people. However different technologies make different demands on weather service providers, and it is important to be aware of the respective strengths and weaknesses of each technology in order to provide services through that technology in an optimum way.

Weather services on mobile phones and similar technologies

The widespread availability of mobile phones enables weather forecasts and warnings to be delivered directly to the users wherever they are. The fact that the mobile phone network “knows” the location of each phone means that very localised forecasts can be transmitted; alternatively phones can be used to interrogate a database to retrieve a forecast for a location remote from the phone itself.

An immediate difficulty is that location-specific weather information from limited-area or meso-scale models is rarely good enough to output directly as satisfactory forecasts, while the work involved in manually adjusting forecasts for many locations is beyond the reach of most NMSs due to staffing limitations. Some sort of filtering or post-processing will usually be required to automatically provide a satisfactory service to a variety of specific areas, as might be required for a mobile-phone or PDA-based service.

The experiences of a number of NMSs in this area have been reviewed. For example, Cuba has taken the route of preparing a limited number of forecasts and warnings for major towns and cities; this allows all forecasts to be prepared by a forecaster to ensure quality and timeliness. An easy-to-use software interface has been developed that cuts down

on the preparation time for these forecasts. The Romanian Meteorological Service applies statistical adaptations to the model output, and then present this adapted information to the forecaster for further amendment before transmitting this via mobile telephones. The Service has specifically rejected the approach of providing very detailed, location-specific forecasts directly from the model because it is not happy with the final quality. Romania provides a suite of forecast products through this method, ranging from 3-hour, very short-range forecasts through 24-hour forecasts to 7-day long range guidance.

One possible development of mobile phone-based services and warnings is to allow the user to define the trigger for a specific warning; perhaps a wind speed exceeding 30m/s or a rainfall of 50mm expected within the next 24 hours. This is similar to the decision support systems implemented in many forecast offices that prompt forecasters to consider warnings when certain weather conditions are predicted by the model. The advantage of this approach is that the user is not overloaded with irrelevant information, and is therefore more likely to react appropriately to the warning when it is received.

The easier option here is to offer a series of tailored services based on the expectation that certain weather criteria will be met or exceeded. A more sophisticated use would be to allow users to set their own criteria according to their particular needs. There would then need to be an automated query of the forecast database at regular intervals which would identify the particular warnings services that needed to be activated. This would be a specialised service, most likely of interest to a small sub-set of users, but critically important for this small group.

The expansion of mobile messaging to embrace graphic imagery is at an early stage, and most NMSs who have experimented with this technology to transmit weather charts, satellite and radar images, and other graphics, have quickly run into resolution problems; the quality/detail of images tends to be poor. The dissemination of weather graphics to mobile platforms, however, has the potential to be a very useful and popular technology, and NMSs should be considering services for these platforms. The technology and bandwidth will improve; the important thing is to be preparing for services now, even if these services are not commercially viable at first, in the expectation that this market will grow significantly in the near future.

One other use of mobile phone technology is to provide a recorded forecast in an audio file that can be accessed directly by the phone user. This is similar to the recorded forecast services commonly provided on landlines, but might automatically select the appropriate forecast for the given location from a pre-recorded range.

The Internet and the World Wide Web

Turning to the use of the World Wide Web, almost every NMS will have a publically-accessible Web site that carries a basic range of PWS products. In addition to forecasts and warnings, these sites have the potential to carry educational material, and also some background on the work and possibly the personnel of the NMS. Meteorology normally excites the interest of a substantial number of people, and the NMS should encourage and stimulate this enthusiasm with a range of appropriate information.

Looking beyond the normal provision of PWS products on web pages via text and graphics, there are a number of other means by which the Web can be used to deliver forecasts and warnings. Sound files can be provided, either of pre-recorded forecasts or recordings of live radio interviews; these allow the users to access forecasts at a time of their own choosing. Similarly video streaming can be used to allow dissemination of television bulletins, but experience to date has been that the available bandwidth usually limits the usefulness of this approach; in particular the detail of weather symbols on the charts can be

lost, and this reduces the value of the service considerably. Many public and private-sector weather providers do not provide a video-streaming service as it is too expensive in terms of the bandwidth used.

These technical limitations pose a significant challenge; nevertheless streaming technologies are likely to be very important in the future. The nature of a weather forecast is that it is an ephemeral product; its value is linked directly to the credibility invested in the forecast by the user. Most people will invest credibility in another human more easily than in a Web site or some other delivery mechanism that has a “cold” feel to it. This is partly why television weather broadcasts have such a following; the viewer develops feelings of trust and belief in the personality of the broadcaster. So, while it will be important to move to a variety of automated forecast delivery systems, one should not lose sight of the value of the human presenter.

Streaming audio and/or video to Web sites and mobile devices represents the best way of providing a human-mediated forecast to the user as and when they wish. This implies a need to update the forecast very regularly – perhaps even hourly at times of peak demand, and provide it on a server for play-out on demand. Technological, bandwidth and cost barriers will undoubtedly be overcome within a very few years. NMSs that are directly involved in radio and television broadcasting should be positioning themselves now to provide such a service.

Webpages are, in general, made freely available but many NMSs provide password-protected access to some pages; this enables them to offer higher-value services to specific users and to generate some revenue. So far it is not known if any NMSs include commercial advertising on their primary Web sites but some NMSs are considering this approach, as the popularity of weather Web sites makes them attractive to advertisers.

Another service offered on Web sites is a “pop-up” box that provides weather information for a specific location, which can be activated with updated information wherever the user logs on to the Internet.

The use of the Internet to transmit forecasts and warnings brings forward the matter of the reliability and robustness of the Internet system itself. If the system goes down, the messages will not get through and the NMS will typically have no control over this, and perhaps even no knowledge of the failure if it affects only a portion of the network. For crucial warnings services there should be some mechanism that enables the NMS to verify timely receipt. In the Russian Federation the practice is that warnings are sent out through two separate channels (typically email and fax) to ensure an adequate and reliable service for clients.

Developments in radio

One of the technological developments in radio that has substantial implications for weather services is the increasing tendency for automated output during the non-peak hours; perhaps through the evening and night. This development obviously limits the potential of the radio stations to carry warnings or forecast updates. NMSs might need to consider technological solutions which would allow a forecast or warning – perhaps prepared via an automated voice generator - to be inserted into automatic programming where this is needed.

RANET

As the world moves to broadband web access, which allows large files of information to be easily transmitted, some regions have insufficiently developed infrastructure where main-grid electricity is not supplied. This is not to say that technological solutions do not

have a place here also in the communicating of weather information. In parts of Africa the RANET project is such a technological solution.

Weather information is formatted into webpages, then uploaded to a server on a satellite. This information can then be re-transmitted, to be picked up by battery-operated WorldSpace radios which are in turn connected to computers. A range of webpages can be thus downloaded onto the hard disk of the computer, to be viewed by the user. This technology is used to transmit information concerning health; information of value to the agricultural community and other content in addition to weather forecasts and warnings. Weather observing stations may also act as receiving stations for these messages, and act as focal points in the community for local distribution. Other potential receptors include government bodies and agricultural research organizations. In this way access to a web-like service can be made available even to communities with no mains electricity and telecommunications infrastructure. In this system there is no “return path” to the world wide web; the range of pages available to the user is confined to those placed on the satellite-server.

Recorded telephone services

Recorded forecasts offered via telephone can be automated in that a text prepared by a forecaster can generate automatic speech, assembled from pre-recorded segments. Australia reports a positive experience with this approach; a retired newsreader was employed to pre-record the speech segments and words, and the quality is comparable with that provided by direct recording by the contracted service provider.

Concluding points

While technologies may change and develop, the needs of users will remain more constant. It is essential to try to understand **what** the user needs, even though it may not be immediately known **how** this information may be delivered in the near future. NMSs still need to be open to new technologies; the public take-up of the differing technologies can be variable and it can be difficult to anticipate specific uses. An NMS needs to be organized to be flexible; so as to be able to quickly bring on stream new PWS products and services as technology allows and as users demand. This, perhaps, is the greatest and most crucial challenge.

OUTLINE OF THE GUIDELINES ON THE DELIVERY OF WEATHER INFORMATION ON RADIO

CHAPTER 1. STATUS OF RADIO WEATHER REPORTING

Radio is one of the most important and powerful means of broadcasting information. It is used widely by many people for a diverse range of issues depending on one's interest.

It is therefore a very useful tool that NMSs can capitalize on and use effectively to communicate to its public weather forecasts, advisories, warnings and weather related issues of concern to the public.

It is important that from time to time an interview is conducted on the radio station to keep the public aware on past and expected weather events as well as on relevant weather-related topics of interest.

Since the appearance of the presenter is not a factor while reporting on the radio, the NMS should encourage and train as many of its staff as possible on the best practice, skills and techniques required when reporting on radio. The training can be arranged with the cooperation and assistance from the radio station.

In this connection it is important to have a very good relationship with the radio management and to agree together on the type and timings of programs to be aired taking into consideration special events that normally takes place across the country.

CHAPTER 2. GUIDELINES ON WEATHER INFORMATION REPORTING DURING NORMAL WEATHER

Where a radio station disseminates daily weather information from the NMS or from other source

Where radio sources from the Internet

Forecasts sourced from the Internet will rarely match the quality of what NMSs can produce. The public will probably assign any forecast errors to the NMS since radio may rarely quote their source.

What to do:

Discuss with the radio management and offer them higher quality products. Hopefully, they will stop getting forecasts from the Internet.

Where radio sources information from the NMS

Establish a system for rapid and safe information exchange between the NMS and the radio. Ensure that scripts are easily readable.

Observe good script writing methods in order to avoid editing distortion by the editor at the radio station. Some of the points to observe are as follows:

- Avoid technical meteorological terms or jargon

- As far as possible, explain weather parameters clearly, attaching their physical significance to the explanation

- Dwell on expected impacts and advice on the action that the listener should take (umbrella, warm clothing etc.)

- Make reference to the climatological values of weather parameters for the period in question underlining any important occurrences

Ensure that the NMS is given its due attribution.

Where the NMS does dissemination through the radio

It is advantageous when NMSs do the direct dissemination to the public: increasing NMSs visibility and awareness of the public with NMSs products.

What to do:

1. Ensure that the necessary dissemination skills are imparted to meteorologist broadcasters through training.

2. Assign the weather presentation duties to the appropriate person

3. Observe all rules for writing wholesome radio scripts

4. Space (room) for transmission

5. Ensure attribution to NMS is included in the bulletin

CHAPTER 3 GUIDELINE ON WEATHER INFORMATION BY RADIO DURING SEVERE WEATHER EVENT

NMSs should have a standard procedure to liaise with the radio station in the event that severe weather is expected to affect the country. This procedure should take into consideration the following:-

1. Discuss briefly the impending situation with the radio station and inform them that they will receive warnings and advisories which will be updated as deemed necessary. In addition, agree to have oral interviews as frequently as necessary to keep the public aware of the latest information.

2. Whenever a weather warning or advisory has been sent to the radio, the weather forecaster has to call the radio operator to confirm receipt.

3. Forecasters should be ready for an interview at short notice and they should provide clear and concise information to the public on the prevailing weather.

4. The content of the speech: the forecaster's interview should contain a short description of the past evolution of the severe meteorological phenomenon and its forecast, climatologic references, etc..

5. The NMS should organize a program on the radio to discuss the weather event.

CHAPTER 4 GUIDELINES ON RADIO INTERVIEW ON A PARTICULAR SUBJECT

Interviews at the radio studio:

Interview to address a specialized weather application subject

Interview to address a weather occurrence or forecast

Telephone Interviews (When a journalist calls the NMS)

Side Interviews (After an event e.g. Press Conference etc)

CHAPTER 5 THE PROPER USE OF RADIO FOR THE COMMUNICATION OF WEATHER INFORMATION

An aural medium – everything depends on, and is expressed by, the voice.

An intimate medium – the communication is directly from person to person; one to one.

Cultural considerations - culture of the country or region, and culture of the radio station.

Awareness of target audience.

Clarity of voice – good diction – pacing – emphasis.

Thoughts on different accents. Pronunciation (especially place names).

Visual and aural memory.

Scripting considerations. Meteorological words and common words.

Structure of a “monologue”-style broadcast.

Forecast scripts for third-party delivery (rip and read).

Diagrams – meanings conveyed by words, and meanings conveyed by tone etc.

REPORT ON THE COMMUNICATION OF UNCERTAINTY AND CONFIDENCE IN PWS PRODUCTS AND SERVICES

Introductory comments

Uncertainty is an inherent ingredient in the forecast process. Forecasters are very familiar with the question of uncertainty and predictability and must deal with it every time a forecast is formulated. Sometimes the available models or other guidance are consistent in their predictions and the forecaster is confident of the outcome. At other times, the models may differ greatly or the weather parameter may be intrinsically difficult to forecast; nevertheless, a forecast must be made, even when the confidence is low.

An extra challenge faced by forecasters is that although there might be quite a high level of uncertainty in a forecast, when presenting it they need to appear sure. It has taken a period of continuous improvement in both the science of meteorology and the presentation of forecasts to arrive at a stage where forecasts are a trusted source of information. It is therefore important not to overemphasise uncertainty in such a way that users lose trust in the value of the forecast, but rather to educate users that the forecast they receive is the best possible prediction from a variety of possibilities.

Strategies for addressing the issue of communicating forecast uncertainty have been, or are being, developed by many NMSs. This has been recognized by the WMO Public Weather Services Expert Team on Product Development and Service Assessment who have recently reported[2] on the increasing availability of ensemble prediction systems products which have opened up new possibilities in probabilistic forecasting.

As these products are developed, it is important to be aware of some of the possible pitfalls. For example, meteorologists - as scientists - are quite comfortable with uncertainty and the language of probabilities. This is not the case for the general public and so there is a significant risk of misunderstanding.

The conventional text-based forecast offers very little opportunity for expressing uncertainty. There is limited space in the forecast, it is not easy for recipients to absorb every word that is there, and it can take the forecaster a long time to get the words ‘just right’. One possible solution is to devise a simple numerical scale for confidence, and attach it to all forecasts. This idea is not new! In an article published in Monthly Weather Review in 1906, W. E. Cooke offered a 5-point scale for describing confidence:

5 We may rely upon this with almost absolute certainty

4 We may rely upon this with tolerable certainty, but may be wrong about once in ten times

3 Very doubtful. More likely right than wrong, but probably wrong about four times out of ten

2 Just possible, but not likely. If showers are indicated, for example, they will not be heavy even if they occur at all

1 The barest possibility. Not at all likely

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[2] Report on meeting of WMO Public Weather Services Expert Team on Product Development and Service Assessment, Kuala Lumpur, Malaysia, 22-26 September 2003

And a forecast might read: *Southwest district: Fine weather throughout (5) except in the extreme southwest where a few light coastal showers are possible (2). Warm inland (4), with a cool change expected on the west coast (3).*

Another way to express uncertainty is to include in the forecast the next most likely scenario as well as the expected one. This allows users to make 'back-up' plans. Although many users simply want a single forecast on which to base their decisions, some users with more specialised needs can get value from knowing what the alternatives might be. This is especially true for emergency managers who need to know alternative and worst-case scenarios so they can plan their resources with all contingencies covered and do not have 'all their eggs in one basket'.

Expressing forecasts as probabilities is a common way of expressing uncertainty and is a widespread practice. It is important that the probabilities are based on objective scientific techniques, so that they are reliable, trustworthy and well-calibrated to the true probability distribution of the phenomena in question. If the probabilities are too subjective, and influenced by forecasters' opinion and 'hunches', then they will not be accepted by users and will come to be regarded as simply a case of the forecaster 'playing it safe'.

The focus of this report is the emerging use of probabilistic and other methods for describing uncertainty to the public through the media, and highlighting some of the key issues that will need to be recognised and addressed.

User understanding

This is perhaps the most pressing issue for those wishing to provide forecasts in probabilistic terms. What do users understand by a forecast that there is, say, a 30% chance of rain? Does it mean that there is a 30% chance of rain at some time within the forecast period, or that it will rain for 30% of the time, or that it will rain continuously over 30% of the forecast area? Forecasters may intend it to mean the first of these three options, but they may be surprised at the range of interpretations amongst users.

There is also an important question about the perceived significance of particular values or thresholds of probability. This perception can be strongly influenced by the importance of decisions that are made based on that value, rather than on the objective value of the number itself. For example, a 10% chance of being struck by a tropical cyclone may seem to the public like a low probability and therefore not worth responding to. However, given the serious consequences of an impact, this level of complacency may not be appropriate. If passengers were advised that the plane they were aboard had a 10% chance of crashing, then the response would be far from complacent!

Oftentimes, users are seeking categorical predictions rather than probabilistic ones. Will it rain or won't it? When a forecast is given in probability terms, then the user may still interpret it categorically, deliberately or subconsciously. For example, a forecast of 20% chance of rainfall may discourage someone to hold an outdoors event, whereas a forecast of 80% chance of fine weather may encourage them to do the opposite; yet the forecasts are the same.

One possible way to explain the significance of certain probability values is to express them in the form of comparisons with average or climatological values, e.g. "There is a 60% chance of rainfall tomorrow. This is twice the normal likelihood for this time of year". A difficulty with this approach is that users need to know what the normal likelihood is so that they can get meaning from the forecast.

How then to attune the public to the meaning of probabilities? For any forecast or warning service that utilises probabilities, careful public education is required to ensure that the information is not misunderstood. For specialised users, with well-established decision procedures for certain probability thresholds, this education task may not be too difficult. But for the general public, with a wide variety of understandings and interpretations, the task is significantly more challenging. It may take many years of dedicated public education before a consistent and accurate understanding develops within the general community of what probabilities mean.

And of course, forecasters themselves must have a clear understanding. How can they be expected to explain probabilities to the public if they don't properly understand them themselves.

Different types of uncertainty information

Information about forecast uncertainty can be communicated in both quantitative and qualitative terms:

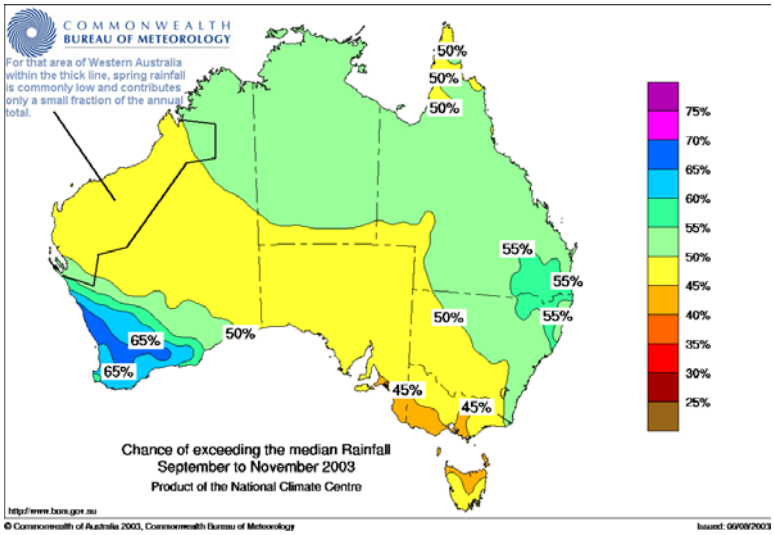
- quantitatively: as an explicit number (e.g. Probability of Precipitation) or a range of numbers. A worded scale (such as Low / Medium / High) may also be used which is defined according to specified probability ranges. Quantitative values of probability may also form the basis of more sophisticated forms of presentation such as tropical cyclone track prediction 'cones' that show forecast uncertainty as an envelop of possibility;

Probability cone showing potential danger areas up to 72 hours ahead corresponding to 60% track probability – Hurricane 'Georges', September 1998
(source: Cuban National Forecasting Center, Institute of Meteorology)

- qualitatively: sometimes the most effective way to communicate uncertainty is descriptively through the spoken word. This allows the forecaster to elaborate on the situation and explain in qualitative terms the degree of uncertainty and the sources of this uncertainty (such as the various models not being in agreement). Although this approach is less useful for specialised users who make decisions based on specified probability thresholds, it can be quite helpful for advising the general public how much confidence to place in the forecast that is being made. It is also a useful approach for describing possible scenarios (e.g. "If that low pressure moves over there by midweek – and there is some chance of that happening – then that will bring a strong Northerly airflow over the country and we will see bright sunshine mixed in with some sharp showers"). Non-verbal cues such as body language, emphasis and tone of voice can also contribute to the effective communication of this information, although the effectiveness of this may vary from country to country and culture to culture.

A range of different formats are utilised for the presentation of forecast uncertainty and confidence information, from simple numbers and tables of probability values, to graphical maps and charts.

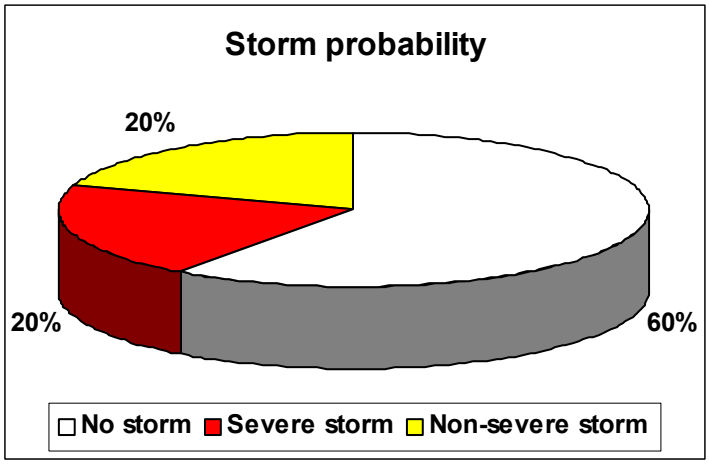
A common format for presenting quantitative predictions is contour maps of probability. Seasonal predictions are presented in this way by many NMS.



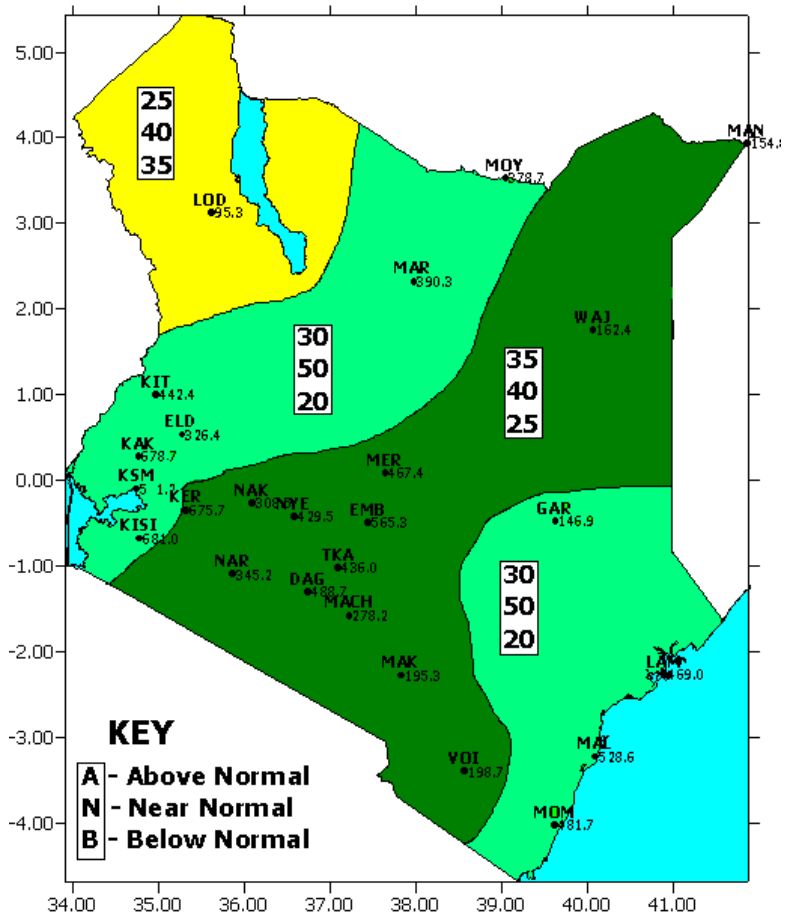
Seasonal Climate Outlook showing chance of exceeding median rainfall for the next three months (source: National Climate Centre, Australian Commonwealth Bureau of Meteorology)

As mentioned earlier, it is very easy for some users to misinterpret these as categorical forecasts. This is especially true for the media who are often looking for a short and simple message. For example, where an area is shown as having a 60% or greater chance of the phenomena occurring, this can be interpreted as a forecast that the phenomena is expected to happen; in fact it is expected to not to happen 4 times in 10. Therefore, the use of probability forecasts requires very careful user education.

One effective way of ensuring that users recognise that a probability forecast for an event implicitly includes a probability for the non-event is to present the forecast as a pie chart.



Or the alternatives can be overlain numerically next page. For example, the Kenya Meteorological Department include probability values for above average, near average and below average on top of their seasonal forecast maps.



Seasonal Forecast issued by Kenya Meteorological Department for March – May 2002 showing probability of above, near and below average seasonal rainfall (source: Kenya Meteorological Department)

Conclusion

As the use of uncertainty and confidence information in public weather services and products continues to grow, it will be important to monitor developments and identify the strengths and weaknesses of the various approaches that are used to communicate this information. Care is needed to present and explain forecast uncertainty in ways that do not confuse users, particularly the general public and the media who serve them.