



World Meteorological Organization

GUIDELINES ON WEATHER BROADCASTING AND THE USE OF RADIO FOR THE DELIVERY OF WEATHER INFORMATION

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Part I

GUIDELINES ON WEATHER BROADCASTING

Chapter 1

INTRODUCTION

One of the principal roles of the National Meteorological and Hydrological Services (hereinafter NMHS) is to provide to the general public, and also to more specialised users, reliable and accurate weather products and services. These products and services help to ensure the safety and protection of people and of goods at times of occurrence of extreme weather phenomena, but also assist in the efficient and economic pursuit of business and of the domestic activity of citizens engaged in their own particular areas of pursuit and responsibility.

Weather products and services are, of necessity, subject to certain variability, and they also follow the evolution of weather parameters with time. They are highly perishable goods. Consequently, they must be communicated and distributed in a timely manner to the users and to the public. To ensure that this information is received in the optimum manner it is necessary that the public not only be able to take in and understand the message, but that they be attracted the

product and have sufficient interest and motivation to consult it, read it, listen to or look at it.

Thus,

- the manner of communicating,
- the choice of the information supports used,
- the duration of the bulletin, and
- the balance between ordinary language and technical terms used represent significant factors in determining the success or otherwise of the process of communication between the weather presenter and his or her public.

The main text of Part I of these guidelines deals with the "human" elements of communication in Chapters 2 to 9. Chapter 10 examines some of the communications "hardware" and how this is developing.

In addition to the main text, a template for WMO training courses in weather presentation is provided in Appendix 1.

Chapter 2

BROADCAST METEOROLOGISTS

In the 21st century, an NMHS may find itself in the (challenging, but perhaps unenviable) position of having to:

- (a) name one of its "own" as the future "face" of local, regional or even national media weather presentation, or
- (b) possibly review or revisit the existing policy, which has been employed to choose a spokesperson.

Up until recently this particular staffing position has tended to be seen in some quarters as a vaguely undesirable job, not entirely consonant with the scientific ethos that underlies the work of Meteorology. It may even have been met with quiet resentment or distaste from some within the ranks of the NMHS. However, in the rapidly and constantly evolving world of weather broadcasting, as many NMHSs have discovered, there is much to be gained from having a scientifically competent public servant embedded within the media. This position is a natural "public-image-building" role that has, frequently, been largely undervalued, and hence grossly underutilized, by NMHSs.

The primary mandate of most NMHSs world wide is to provide weather information to the public and to supply information and warnings that will help to protect life and to mitigate property damage during times of inclement weather. Utilizing a competent spokesperson assists an NMHS to meet the challenges of their mandates with a higher degree of visibility and a greater public trust.

In choosing a person for this position, the NMHS must be clear in its own scientific and political direction and must have complete trust in the capabilities of the chosen individual. Placing a staff member on the outside, in the sometimes-hostile environment of the media, entails some risk. The person must be unquestionably loyal to the NMHS, must have a deep and extensive working knowledge of both the science and the Service itself, and must be willing and able to become known and recognized as the "face" of the NMHS; indeed the face and voice of weather itself. Basic yet solid communication skills are an essential pre-requisite of the individual. Further training will hone those skills, but an inherent ability and willingness to talk to an audience is absolutely imperative. The person should not be easily intimidated by audiences (scientific or otherwise), and should be prepared to work seemingly at the whim of the media. The upper managerial staff of the NMHS must also be comfortable and not threatened by the developing role of the spokesperson. On the contrary the spokesperson

must be fully supported and openly encouraged in their work. Trust for this person and their abilities must come from within the NMHS as well as – later - from the public.

The NMHS should be aware that the role of the officially designated spokesperson comes with many pitfalls. A public service environment is not usually one that encourages a single person to stand out from the field of personnel, to put their head above the parapet. As such it can be a difficult transition for the individual chosen. The media, which is an intensely aggressive, fast paced, personality driven culture may feel quite alien at first. However, the NMHS should not underestimate the importance of increasing the visibility of the Service by putting a "real face" to the organisation.

If there is no one person within the NMHS who is capable, or willing, to take on a role as the public face of the NMHS then the next best option is to establish an Information Officer / PR Officer who will serve as an interface between the meteorological expertise of the NMHS and the media expertise of journalists and/or presenters. Such a person could develop relationships with journalists, and brief them as appropriate on weather stories. They could also, perhaps, manage a team of talented presenters who have been equipped with a suitable level of meteorological knowledge. This approach might be useful in a scenario where, for whatever reason, the forecast staff of the NMHS cannot or will not present directly in the media.

Finally, in a perfect world, the chosen spokesperson should be encouraged to hold the position for a fairly extensive period of time (usually a minimum of 3-5 years). It is widely acknowledged by those already using official spokespersons that the longer the term of employment, the greater the degree of (internal and external) trust that is developed. This trust is twofold: (a) a perceived trust by the public in the ability of the person with whom they have become familiar, and (b) a longer, potentially more lucrative trust by the media themselves, who will undoubtedly develop a strong personal relationship with someone who has proven skills in aiding them in the efficient production of quality broadcasting.

This person is a multi-faceted asset to the NMHS – he/she increases the visibility of the NMHS, facilitate information flow between media and the scientists, or even between internal policy makers, managers and the media. With the right person in this position, the NMHS can often minimise the impact of any weather related controversy.

Chapter 3

STRUCTURAL, CONTRACTUAL AND EDITORIAL CONSIDERATIONS

In the last decade NMHSs have found themselves becoming increasingly involved with all of the commercial aspects of forecast weather delivery. Informal relationships have been forged between media outlets acting as the vehicles for weather dissemination, and the various NMHSs. This portion of the document is intended to act as a guideline for any NMHS willing to enter into a more formal business contract with a local, regional or even national media outlet. It is intended to review and outline various points that will invariably arise during both early and on-going contract and editorial policy negotiations. It should be noted that the media's view and hence agenda in reference to weather dissemination is usually quite different to that of the NMHS, and that building a strong and reliable relationship is highly desirable for both parties. Credibility and trust for an NMHS and the associated media outlet can be enhanced substantially when a strong relationship is built between the two.

These guidelines are also intended to be relevant regardless of the level of involvement of the NMHS with the media. Professional levels of involvement vary from country to country, and may even vary widely within a single country. Regardless of the individual level of involvement, all NMHSs must maintain full and absolute control of the wording, content and initial issuance of weather warnings. Unlike the media, individual NMHSs bear a responsibility or mandate to uphold public safety during times of inclement weather. Hence weather warnings - their content and their wording - must remain solely the responsibility of the NMHS. This is intended to protect both the NMHS as well as the media during times of potentially life-threatening weather.

There are certain policy points whose review by the NMHS is recommended prior to entering into a formal business contract negotiation. The NMHS, when discussing forecast product dissemination, should work out, as thoroughly as possible in advance, all ramifications and expectations of the contract. The NMHS should be aware, from the outset of any "non-negotiables" (ideas or products that the NMHS is not willing to relinquish control over; for example the wording and content of weather warnings) or essential requirements when considering the final forecast product. It should be recognized that, from the start, the expectations of the two sides entering the negotiations might be far apart. As negotiations develop, both sides will invariably converge on a mutually acceptable formula for dissemination. During early discussions, limitations to the contract (self imposed or otherwise) will become obvious. The NMHS must state initially any known limitations that may restrict the delivery of the final forecast product.

In the beginning contract negotiations can appear extremely laborious – this is to be expected. As broad areas are broached and agreed upon, finer details tend to be easier to achieve.

These guidelines are not meant to be all encompassing, and can only outline various aspects of what may become a potentially much deeper relationship. It is recommended that they be used as a basic framework when a NMHS intends to enter, renew or simply review a formal commercial or business contract with a media outlet.

3.1 NMHS ESSENTIAL REQUIREMENTS:

The NMHS must decide "essential" requirements of product delivery (such as non-editorialising and citing the source of weather warnings) prior to the start of contract negotiations. These requirements are intended to help define the role of the NMHS within the bounds of a commercial contract and to ensure that the essence of the forecast information is not corrupted (inadvertently or otherwise) by the media.

1. (a) **WARNING DISSEMINATION:** Warnings must be delivered in a fashion that is conducive to quick dissemination. Therefore warnings should initially be written in a media-friendly format. It must be stated that potentially life saving weather information should be delivered as expeditiously as possible – both by the NMHS to the media outlet, and then further by the media on to the user (viewer/listener). It should be stated in the formal contract that weather warnings should never be delayed by the media disseminator as a tool for maintaining an audience longer or later into a broadcast. An NMHS should try to discuss in advance how a warning is to be delivered – for example, certain colours or looks, tonal alerts etc. may be requested or agreed upon in order to allow the information to stand out more clearly from the regular day-to-day weather broadcast. It is recognised that these points will ultimately build credibility for both the NMHS and the media.
1. (b) An NMHS must also recognise that it has responsibilities to provide weather warnings to media organisations with whom they do not have an arrangement for the supply of forecast information; indeed, who may be receiving forecast information from a competitor. The NMHS must insist on their pre-eminent role, in accordance with the "Single-Voice" policy of WMO, in providing warnings of severe weather to all citizens within their region of responsibility. Therefore, these "competitor" media outlets are entitled to receive a full and efficient service of weather warnings, and the NMHS is entitled to expect that these will be broadcast without alteration and without undue delay, with proper attribution of the NMHS as source of the warning information.
2. **RESPONSIBILITY OR OWNERSHIP OF A FORECAST:** An NMHS must be aware of at least partial responsibility of ownership of the final disseminated forecast product. For example a media outlet may start to

be blamed for a suspected "missed" forecast event; the NMHS cannot waive complete responsibility for this event. The NMHS and media must be aware of the delicate relationship between the delivery of the forecast, and the actual generation of the forecast. The NMHS may want to include a formal statement as being the "forecast provider" in the original contract. The NMHS may also want to include periodic advertising as being the sole "forecast provider".

3. **LEVEL AND CONTENT OF SERVICE:** The media should be made fully aware of the inherent scientific limitations applicable to the level of service and content offered by the NMHS during the terms of the contract. The media must not be left with the impression that individual forecast products might, for example, be expanded upon at a later date. The NMHS should offer explicit products e.g. a 5-day forecast should not "grow" into a 7-day forecast if the NMHS in question does not have the capabilities to legitimately provide this information. Specialized (specifically seasonal) forecast products can be added to the original contract after further negotiations.
4. **SCHEDULING OF DELIVERY OF THE FORECAST PRODUCT.** The NMHS's internal operational schedule cannot be expected to fully revolve around commercial clients. Forecast products should be issued at mutually acceptable negotiated times that allow both the NMHS and the media to work to the best of their individual capabilities. Both parties should respect these operational requirements as they allow for the best final product to be delivered to the end user – the public.
5. **FORMAT AND TECHNICAL SPECIFICATIONS:** The NMHS and individual media outlets should agree upon the technical details regarding the format of the forecast product. This agreement should be included in the working contract between the two parties. Requests for changes to the product from either party should be acted upon whenever possible, but only with the agreement of all involved.

3.2 UNDERSTANDING MEDIA EXPECTATIONS:

From the start of contract negotiations an NMHS must understand that the media (print, radio, TV and others) have well defined, preset expectations in regards to the final forecast product. Individual types of media outlets will have differing requirements of an NMHS. The final forecast product would need to be tailored to suit the media delivering the product. A forecast written for, say, radio will differ substantially to that written for publication in print. Ideally, the NMHS should be able to deliver the product in such a way that dissemination through the media does not entail further editing. This is to be expected despite the fact that these conditions will often act as a constraint on the final weather and forecast product.

3.3 TAILORING:

Forecast products will invariably need to be tailored in-house by the various media outlets if not delivered in a format that coincides with the requirements of the media. Therefore an NMHS will retain a far greater degree of control of the final result if the product is originally delivered in a form that is acceptable to, and desirable by, the media. Once a certain "look" and delivery mechanism has been negotiated, products issued by the NMHS should remain consistent in look and content. This does not negate the addition of extraneous information when appropriate – however the NMHS should try to add this information in a way that is compatible with the original product.

3.4 EDITORIAL CONTROL OF THE FINAL DELIVERED PRODUCT:

The NMHS should understand that the media delivering a forecast would normally retain final editorial control of that product. The content of the forecast will usually remain untouched. However, the media is the vehicle or mechanism by which the forecast is delivered to the user, and as such, the media will often expand or (more usually) contract the original work. This is to be expected. The NMHS must understand that once the forecast product has been "handed over" to the various media they no longer have full and complete control of that product. There is therefore the need for a clear and explicit "post delivery" editorial policy to be worked out between the two parties.

3.5 FRONTING THE BROADCAST:

Choices need to be made about who will "front" the presentation - whether this should be a forecaster or a presenter, and whether they are employed by the television company or by the NMHS. These choices will have resource and management implications for both parties. In the case of a non-meteorological presenter, there will be issue of how much freedom the presenter is given in preparing the script. It is desirable that a non-meteorological presenter should have some introductory training in meteorology; how that training is to be provided will need to be considered. Presenters, be they forecasters or otherwise, will also need to be trained in how the computer graphics system works, and the range of capabilities available in the system. Other matters to be considered include whether the presentation is to be live or recorded, and what the on-air context should be, e.g. will it be a stand-alone presentation, or will the information be presented through a conversation with a news anchor?

3.6 OVERALL AND FINAL APPEARANCE OF FORECAST PRODUCTS:

The NMHS will often want to preserve the graphical "look" of the forecast products – but this is not generally possible. Typically, the product will undergo some trimming or

embossing process by the media delivering that product on to the customer. The NMHS must concede that once delivered, they relinquish control of the "look" of the end result. If the NMHS wishes to retain a certain (say) graphical feel, a request stating this clearly should be included in the initial contract negotiations.

3.7 TIMING AND LENGTH OF FORECAST PRODUCT:

The NMHS will not have control over the issuance of the product to the public from the media. This can often become problematic when dealing with a rapidly evolving and changing weather situation. The NMHS should understand from the outset that some forecast products would need to be made available with a certain degree of inaccuracy already built in, solely because of the length of time, which it takes for that product to be disseminated to the public. Equally, the length of time (or space) allocated by the delivering media to the product is completely controlled by the individual media outlet delivering the product. This is true regardless of the weather situation. It is advisable to attempt to negotiate an absolute minimum length, of time or space, which is allocated to the forecast product. If at all possible however, it is far more desirable to actually negotiate a fixed, mutually acceptable length of time or space for the product. During times of inclement weather, the time (and space) allocated for the delivery of the forecast will often not change. This inherent constraint by the media should also be recognized as a constraining factor for the NMHS. Forecast products should therefore be tailored (as much as possible) to the individual requirements of each explicit user. Very often the forecast product will be required by the media outlet at a mutually agreed and explicit pre-ordained time (update times must also be defined and preset). These times must be strictly adhered to, especially during times of inclement weather.

3.8 SPONSORSHIP:

Sponsorship arrangements for weather bulletins need careful consideration, and pose many difficult questions. Will the sponsor require other publicity services to be delivered by the presenters, and might these conflict with the delivery of the

weather forecast? What messages are carried by the sponsorship information; do these reinforce the message of the weather presentation or obscure it? Does the sponsor understand the limits of their sponsorship? What happens if sponsorship of the weather forecast conflicts with sponsorship of adjacent programmes?

An NMHS must understand that the media environment is a commercial environment and that the media has the right to sell or place advertising around the forecast products at will, and without consultation. Some of this advertising may even appear to be in direct competition with the NMHS. It is up to individual NMHSs to decide what is acceptable and what is not. Equally, media outlets may want to strategically place advertising during or on top of forecast products that have been issued by the NMHS. Again – the individual NMHS must discuss commercial product placement in the context of what is acceptable and what is clearly unacceptable (particularly if this is blatantly misleading). The NMHS may also find that the individual delivering the weather, be they an NMHS employee or otherwise, are required to be used in a commercial sense by the media outlet. Acceptable and/or unacceptable commercialisation of the forecast, the forecast product and even the forecaster/presenter should be explicitly stated in the formal business contract. An NMHS needs to clearly define its own thinking on each of these issues, and come to a decision as to what is best in its own context.

3.9 NEGOTIABLE CHANGES:

Finally, it should be understood that an editorial policy or contract is not cast in stone. It should be continuously updated by both the NMHS and the media in order to meet the end requirements of the user (customer) as well as the changing needs of the media, or of the NMHS itself. Open and frequent discussions between the NMHS and the media organisation are encouraged before and during the term of the contract. Equally open and frank discussions may also be necessary if a third party is the actual disseminator of the forecast product. There should also be allowance for the introduction and development of new technologies within the life of the contract. Contracts between NMHSs and the various media outlets are subject to change in light of the rapidly evolving technological world in which we all live.

Chapter 4

PRESENTING THE WEATHER – THE CHALLENGE

Weather information is presented through a wide variety of media, but the two, which place most demands on the quality of the presenter, are radio and television. Later in this publication there is a more detailed examination of the presentation of weather on radio. The following pages are devoted primarily to the particular issues, which are relevant to the presentation of weather on television.

When creating a weather story a weather presenter is faced with the task of looking at the meteorological information at their disposal in a rather unique and non-scientific way. The presenter must recreate the facts, build onwards into an unembellished yet almost fictional narrative, and finish with a distinctive, yet not foregone conclusion that is the forecast. The language used must be descriptive enough to inspire attention and yet absolutely accurate in building on a solid scientific base.

The data, however, being inherently dry, does not necessarily lend itself to this kind of exposition. For the weather presenter, creating a weather "story" can be a fairly daunting prospect. The following points are therefore intended merely as aids or tools when attempting to paint the overall weather and forecast picture.

1. Learn to filter the information. Not everything that appears in the observations, the maps and the charts needs to end up on air. Less is most definitely more when faced with a mountain of meteorological information. As a very loose rule of thumb, individual TV maps or graphics should be cut down to carry only 5 pieces of information (and remember that the actual map background is already one piece and the data specific title is another).
2. There should only be about 1-2 pertinent pieces of information per minute of air time (the attention span of your audience is limited - you do not want to overload them). To discover for yourself what is relevant to that day's weathercast, ask yourself a series of questions. When you look at all the day's data in front of you, what leaps out immediately? That piece of information is imperative to the story (it is, in essence, the "lead character") – and invariably should start the broadcast. Why that particular piece of information is so impressive or important, is the second identifying piece of information for the broadcast. The last piece of information is the forecast. All this barely leaves you 2 other separate pieces of information that you can cram into a 2-3 minute (average) broadcast. The tendency to overload the forecast is a common mistake of many weather presenters (old and new). Learning to whittle scientific information down to an interesting, useful and hence valuable core is a skill in itself.
3. A good weather forecaster will immediately recognize important or relevant weather data. This information can be thought of as story or chapter headlines. The story is advanced through the chapters as the weather presenter draws towards the final forecast.
4. Simply deciding what pieces of information should and should not go into a broadcast is not enough to develop a good weather story. That information now has to be woven together. It is all interrelated via a meteorological feature that acts as a story line drawing the viewer through a complete beginning, middle and end. This "thread" links the main points and brings cohesion to the entire weathercast. It should be noted at this point that weathercasts do not have to be presented in a chronological order – but that there must be a sequence of interrelated maps and graphics that clearly lead into and from one to another. Remember that the weather is changing and moving in a dynamic fashion, but it will frequently be possible to show only one or two charts to represent every day. Take care to describe what happens in between! The story must carry the viewer from one scene (or day) to the next in an easy, comprehensible manner.
5. In contrast to the usual telling of a story the one aspect of a weathercast that is not typical is that of constant reiteration. TV is an inherently busy and cluttered medium. Specific details in a weather forecast can often be lost in, for example, the sheer motion of the satellite imagery looping behind the presenter. To combat this the weather presenter must feel completely at ease constantly reiterating pertinent points of the forecast. Reiteration, in this case, is not merely the act of repeating the same information ad nauseum. Reiteration for a TV weather presenter is all about reinforcing a point so that the viewer retains the information for a longer period of time. Reiteration involves using different maps and graphics to emphasize and underline the most relevant points of the forecast.
6. Finally – every good weathercast should end with a punch; a flourish. This ending is the forecast! The broadcaster should make every attempt not to bury the weather information by winding down too quickly and allowing insufficient time to fully summarise the forecast. This last piece of information is often the most highly anticipated part of the broadcast. A presenter may even alienate the viewer if they feel short changed by an all too brief and barely conclusive ending. Try not to leave the ending in mid-air. It should also be noted that the ending does not necessarily have to be definitive – this is the weather after all! The audience should, however, feel that they have a good idea of what to expect from the weather during the coming days.

Chapter 5

VISUALISING THE WEATHER STORY

An image is worth one thousand words, according to an old English saying. Visual images that create a strong impression in the mind of the viewer are remembered easily, and the information relayed through the images is therefore retained more effectively.

Television is primarily a visual medium; the images are the principal means through which the message is conveyed. In a radio broadcast the voice is the fundamental means of communication. In television, the voice, while still of great importance, is secondary; it comments on or amplifies the message, which is expressed primarily through the images – all of the images – including the image of the presenter!

A weather forecaster creating a weather story must imagine how best to communicate that story through visual imagery. To a large extent the implementation of this vision will depend on the facilities provided by the weather graphics system, which is available to them. The weather graphics system can be seen as a kind of toolbox; different tools are available to illustrate different elements of the weather story. For example, a satellite image (or an animation loop of satellite images) is an excellent tool to show the movement of a large-scale weather system; the viewer can see the size of the system; its direction and speed of movement, and can make some assessment as to whether (or when) it will affect their region.

For rainfall, on the other hand, a radar image is ideal to illustrate the location and movement of precipitation and to give some indication of how heavy it is falling. Indeed one of the benefits of using a radar image on screen is that, often for the first time, the viewer will appreciate properly, for example, the distinction and difference between frontal rain and showers, or the size of a large thunderstorm. Other normal visualisations of the weather include the use of synoptic charts, maps with weather symbols, maps with colour shading for temperature, different displays of wind speed (isotachs, winds arrows), charts of wave height; perhaps even 3-dimensional fly-through presentations that take their information from the weather models.

Aside from these "meteorological" visualisations we can have simple photographs of weather events (snow, lightning, dust, floods etc), video footage of weather (current or historical) or even cartoon images such as those of people with umbrellas or sunhats. Each and all of these images can convey a message.

As the weather will be different from day to day, therefore the presentation of weather on television should be capable of change, so as to better emphasise each day the most important weather elements in the forecast. The forecaster should develop the practice of thinking through the forecast in a visual manner; should think about how best to communicate the story of the day using the visual graphic tools at their disposal. Nonetheless there are some essential elements that should be in every forecast: precipitation or other significant

weather, cloud, temperatures, wind information, etc. That which is essential will vary from one climatic region to another, and should be clearly defined at a local level. The viewers also have a right to expect that the temporal coverage of each forecast presentation (whether it be for one, two, three or even more days ahead) should be consistent in a given presentation from day to day.

It should also be remembered that the visual charts carry far more information than the presenter can speak about in the (usually) short length of time allocated to the forecast presentation. Different parts of a country or region will have differing weather symbols, temperatures, wind speeds, etc. and the presenter will not always refer to each and all of these explicitly. The charts therefore allow a range of different weather "stories" to be told simultaneously to people living in different regions, or even people living in the same region who have a different focus of interest. One person may be seeking sunshine, while another may wish for wind. The images and charts displayed in a weather bulletin of two minutes duration can convey a huge amount of information, both in space and in time.

There are some "ground rules" which should guide the visual structure of the forecast.

1. The first image is the most important. It is the scene-setter and the image, which the viewer will remember best. The main story of the forecast should be told in the first image, if this is possible.
2. A weather chart is on screen for only a short length of time. If there are too many elements in a chart, the viewer will not be able to take them all in. Remove unnecessary clutter!! One rule is to have no more than five elements on a chart at any one time – this normally includes the chart title (tonight, tomorrow, etc.) and the map background.
3. Each graphic should be on-screen long enough to speak to the viewer; it is very frustrating for the viewer not to be able to take in all the relevant information during the time the graphic is on-screen.
4. There needs to be good synchronisation between graphics and commentary; transitions between graphics should always be at an appropriate place in the narrative.
5. Every graphic should have a clear title, which accurately gives the day and time to which the chart refers, and which is data-specific.
6. Animations are a good tool in some weather situations, but the viewer may be easily confused by moving clouds, rain, etc. Sometimes, in a satellite animation, the weather system, which is the main focus of the forecast, is not clearly seen. In this situation, it is best not to have any satellite animation rather than show a confusing or irrelevant picture. The animation must support the central message of the forecast; it should not be used for its own sake only.

7. Transitions between charts should normally be simple. A very complex or "busy" transition can take the viewers attention away from the message of the forecast. On the other hand a special transition can be used to bring special emphasis to some part of the forecast; for example, a zoom transition can focus attention on one particular region, while a different transition might be used to introduce a warning message, for extra effect.
8. Weather broadcasters are not normally trained in graphic design but they should have some appreciation of the need for good visual composition of the weather charts. It may be wise to get some advice on this from the graphic artists working for the TV station. They might provide a style book with illustrations of good and bad composition using the graphics and charts specific to the station; a learning tool such as this can guide forecasters away from basic errors in this area.
9. Every weather graphics system or software package will have inherent strengths and weaknesses. The weather broadcaster needs to understand how best to use the strengths, and how to avoid the weaknesses, in the graphics system, which they employ.
10. If a broadcaster is preparing a forecast for many days ahead they should, where possible, not use the same style of presentation as is employed in illustrating the forecast for "tomorrow"; the message is less certain, and the visualisation of the forecast should reflect this.
11. If a forecast uses a 3-dimensional fly-through then there are special rules that should be observed; the direction north should always be towards the top of the screen; there should be a still-frame to start so that the viewer can become oriented before the movement begins; movement should be gentle with no abrupt changes in direction or speed.

Weather broadcasters should get into the habit of critically reviewing themselves as well as watching other weather presentations, especially those that utilise a similar graphics system to that which they employ. Another broadcaster may use the system in a different or original way; there is no copyright in styles of weather broadcasting and new ideas can be assimilated as a forecast presentation evolves.

A good test of whether or not the weather story has been adequately told through the use of graphics is to watch a weather presentation with the sound turned down. The visual representation of the weather forecast should alone be strong enough to tell the story, unsupported by the words of the presenter.

Chapter 6

EFFECTIVE USE OF LANGUAGE IN WEATHER BROADCASTING

The language of meteorology is the language of science. It uses tightly defined terminology, whose meaning is well understood by those within the profession. The language of science is the language of the written paper; exact, sometimes dense; often requiring reflection and study to extract the full meaning. When scientists talk to each other they do so in a manner that assumes a common base of understanding between speaker and listener. It is an efficient method of communication for the initiated.

Television and radio are media that facilitate communication from one person to many; and that many will encompass an entire range of interest and understanding. There will be those listening who will be keenly attentive to the message, while there will be others for whom the forecast presentation will be no more than a background to some other, more immediate, interest. The language of the forecast must speak to all, from the attentive to the apathetic.

What makes a successful weather forecast? The weather forecast is no more than the story of the upcoming weather, ideally told by someone whom the listener likes, and in whom they believe. The manner in which the weather facts should be moulded into a story has been dealt with in Chapter 4 "Presenting the Weather". The visual construction of the story is outlined in the succeeding chapter. The final element is the language in which the story should be told.

Weather is experienced by the ordinary person through the medium of the senses. The heat of the sun, the cold of the night, the wetness of rain; the strength of the wind; these are all sensory experiences. They are also, by and large, ordinary experiences, which people feel day-to-day during the course of their normal life. Weather should therefore be described using normal conversational words and phrases. It should be spoken of using descriptive adjectives and nouns. The language might even become lyrical at times, creating, for example, an image of "deep blue skies" or of "angry churning seas". However language does also communicate values; and the wider interests or viewpoint of the viewer will not always correlate with the interests and viewpoint of the forecaster. Be careful to tell the story using value-free terminology where possible.

For most weather broadcasters, and most especially those coming from a meteorological background, these sorts of word and phrases will not feel comfortable at first; there will be a tendency to fall back on the safe and familiar technical terminology. This technical terminology certainly has a place in the weather broadcast, but it must be used appropriately and it must be explained. The explanation will, of necessity, be brief, and may be no more than identifying a cold front with a band of clouds, or linking the isobars with wind speed and direction. No matter how many times you have explained these before, in the course of a broadcast, you need to explain them again and again. There will always be

some viewers for whom it is new; for others, you will be reinforcing their knowledge and understanding.

Clarity of language begins with clarity of understanding. If the presenter has a firm and complete knowledge of the weather situation, and of the direction, which the forecast is to take, then the flow of the weather story will naturally evolve. Add in an enthusiasm to get the message across and the language will usually be clear and direct. For the presenter, getting into the right frame of mind is, after a thorough study of the weather, the most important preparation for the broadcast. The presenter, after all, has a great story, full of useful information, to tell the viewers and listeners. Enthusiasm and energy carry the forecast, and lead naturally to good language and expression.

There are some pointers, which can be stated to help define the most effective use of language in weather broadcasting.

1. Keep it as simple as possible. Never use a long word where a short one will do. Don't try to use language to impress.
2. Explain technical terms as you go along. Reiterate explanations as necessary.
3. Don't use long sentences; speak in sentences that have a clear beginning, middle and end.
4. Use proper grammar where possible, but err on the side of conversation rather than formality.
5. When speaking, make sure that the emphasis of your voice is put on the most important words. Many presenters put emphasis on words such as "and", "but" or "however" which do not convey any meaning in the context of the forecast, but are only link words to get from one part of a sentence to another. This habit of intonation makes it difficult for the listener to get the full meaning.
6. Pause after important points, to allow the information to be absorbed, especially if the information is also evident on the chart (as it should be).
7. Don't be afraid to be creative; to use unusual words or phrases. Most people speaking without a script, as the majority of weather broadcasters do, will tend to draw from the same small pool of words. Get a thesaurus; look up synonyms, and work them into the forecast to give variety of expression.
8. The use of onomatopoeia, words that convey sense through their sound as well as their meaning, works well in weather broadcasting – but use sparingly!
9. Personalisation is a good device to help the viewers identify better with features on the weather chart. This is the ascribing of human characteristics to inanimate objects. Examples include a *nasty depression*; a *rogue shower*; a *harsh wind*, a *gentle breeze*, a *vigorous frontal system*.
10. Don't use language to hide meaning, especially when some aspect of the forecast is unsure. Be honest about the

uncertainty; words that are deliberately vague or imprecise will be quickly recognised by viewers for what they are.

11. Be aware of verbal tics; the insertion and repetition of unnecessary words or phrases that add no meaning, or the "ums" and "ahs" which, while acceptable in normal conversation, may convey indecision in a weather broadcast. It is a good practice to critically listen to recordings of one's own broadcast in order to recognise, and then eliminate, these irritating habits.

While all of these ground rules are important and valid, a weather presenter should not be afraid to develop their own personal style. It would be a very boring world if all weather broadcasters spoke in the same way. The way in which a weather presenter uses language is an important reflection of their personality; it should not be an "add-on" that only appears at broadcast time. Make an attempt to mould your everyday speech according to the guidelines above; you will then more easily use the right words, and more natural intonation, in front of camera.

Chapter 7

DEVELOPING PERSONAL SKILLS IN TELEVISION

WEATHER PRESENTING

People who are asked or selected to perform the task of weather presentation are normally provided with some initial training in the job. This training can be provided by the broadcaster, by the NMHS, by a private firm who specialise in communication training, or by WMO. The provision of ongoing or refresher training is usually intermittent, ad hoc and much more patchy in nature. It is therefore fundamentally the responsibility of the broadcaster to develop, maintain and renew the skills, which are necessary for successful weather broadcasting. It is, after all, the broadcaster who stands to gain the plaudits, or suffer the criticism, of the audience. Skill development should be seen as part of the Continuing Professional Development (CPD) of the broadcaster; it is invariably an on-going and personal responsibility.

The following is a list of some of the fundamental skills and proficiencies that are desirable, and in many cases necessary, in weather broadcasting, together with some suggestions as to how those skills can be developed and maintained.

1. Become self-critical, but not negatively so. Learn to draw a distinction between yourself and your broadcast image. If there is a problem with your image this is not a reflection on you as a person; merely a problem to be solved. Many of the succeeding points will deal with what are normally intensely personal issues (how you look, speak, behave); they have to be viewed objectively in order to be improved. A weather presenter is not an actor, in that they are not projecting a personality different from their own; nevertheless they do need to develop something of an actors approach to their image.



Meteorologist broadcaster preparing a broadcast

2. Behavioural traits – does the presenter have "tics" or distracting mannerisms? These can be visual (too much movement, hopping about) or verbal (over use of certain words or phrases, inappropriate sing-song intonation). The best way to recognise these is to record several sequential broadcasts and watch them back-to-back;

preferably with a trusted colleague, professional trainer, or television director.



Presentation on air (example 1)

3. Communication between human beings is not just conveyed through succinct use of language, but also through movement and gestures of the body, and more particularly through facial expression. Body language is important. Does the presenter have a good posture? A friendly appearance and demeanour? Are they comfortable in front of camera? It is difficult to define what makes a person look "comfortable", but it is almost immediately evident on screen. Some people are naturally comfortable from an early stage, but for most this skill can be learned with time and experience. Generally speaking an easy stance works well, slack (but not rounded) shoulders; and arms not continually moving. (Crossing and uncrossing arms tends to be an anxious movement, while arms permanently crossed in front of the body is a defensive, stiff, posture).
4. Voice – is the forecast delivered with clarity, good projection and appropriate intonation? Some voices are very flat, and need an injection of expression. Women's voices generally have a higher pitch that can be clearly heard above background noise, but can also seem harsh to the ear – an effect that is often amplified through television. Male voices often have a softer, lower pitch which needs sometimes to be raised or "energised" a little to work best. When a person is nervous there is a natural constriction of the throat and chest; this can lead to a raising of the pitch, and to problems with breathing (gulping or gasping). Every presenter should take a couple of deep breaths before going on-air, consciously adopt a relaxed body posture, and make a point of calming down the voice.
5. "Punching" your speech. A weather presenter should be aware of emphasizing or "punching" the correct words within a sentence. Words like "and" and "but" do not need to be punched; descriptors (a cold wind, some heavy rain) should be. Allowing a voice to rise and fall through a sentence also adds clarity. A monotonous

voice is dull and the viewer will lose interest; a disinterested viewer will ultimately be more likely to go



Presentation on air (example 2)

elsewhere for their forecast.

6. Tricks and devices can engage your audience and help maintain their attention. Occasionally try asking a rhetorical question. Obviously the viewer cannot answer, but they will often feel a greater sense of interaction with you at that point.
7. Visual appearance – there is often an assumption that television executives are interested in putting only very good-looking or "beautiful" people on air. This is not necessarily the case; for the work of weather presentation, classical or culturally accepted beauty can be more of a distraction than anything else. Strong and distinctive physical features – from whatever end of the spectrum – are generally problematic. Above all, the person must be natural – they should not take the attention away from the weather charts unduly.
8. Hair should be clean, combed or brushed neatly, and should not fall over the face. Flyaway hair needs to be tamed down; lighting tends to highlight random bits of hair, and chroma-key systems (frequently used in weather studios) can add a shimmer, which magnifies the distraction experienced by the viewer.
9. Clothes should be neat and well tailored, but not excessively bright or patterned. Is the story lost behind the wardrobe? The lines of the clothes should be clean, smooth and even vaguely bland. Material should be easy-care, to avoid visible wrinkling caused by normal use in the office or on-camera. Clothes should reflect and fit in with the culturally accepted norms of the viewers. Most weather presenters will end up wearing microphones; these can tug or crease soft material and pull it out of shape, leading to unsightly wrinkles which are themselves magnified by the strong studio lighting. For this reason, it is often advisable to wear tailored jackets on-air.
10. Do not touch your hair, face, nose etc on-camera.
11. Eyes are of the utmost importance. The expressive potential of the face is primarily carried by and in the eyes. The wearing of glasses should be avoided where possible; if they must be worn a very light frame (or frameless pair) works best. The viewer needs to be able to see your eyes; eye contact is a fundamental element in person-to-person communication. Have you ever tried to talk to someone with his or her eyes covered?
12. Whilst on-air the camera eye line is important. If it's not natural and "right" – such that the presenter does not appear to be looking at the maps behind them – it can be very distracting for the viewer, apart from the fact that it destroys the illusion of the "chart-wall" created by the use of chroma-key. TV monitors need to be placed to the sides of the chroma-key screen, and at the right height, so that the illusion of "seeing" the maps is maintained. Ideally three monitors should be placed in the studio with the presenter – one on either side of the chroma-key screen, and one directly in front of and slightly below the camera (or preferably in an auto-cue head on the camera itself).
13. The weather presenter must be aware of inadvertently making distracting movements. At the beginning of the broadcast, vague hand waving at a chart is not a decisive introduction. Hand motions should be slow, deliberate and exact. A presenter must allow the viewer time to recognize the information being indicated.
14. Don't bring the problems of your life onto the screen. The viewer should not know if you're having a bad day. Take a few seconds before the broadcast to collect (and even clear) your thoughts. Avoid negative sentences ("it really wasn't that bad out there today") – try to make the weather positive in some shape or form – except (obviously) during severe weather.
15. Smile! But do try not to laugh or giggle.



Presentation on air (example 3)

16. Is the presenter "camera aware"? Actively understanding that it is a two dimensional medium, that standing half off frame is like talking to someone without fully looking them in the eye. The presenter must not sway, or bob, or bounce around – some actions are magnified by the camera and, equally, some actions are masked. Hand movements need to be slower and more deliberate than in a personal conversation. Make sure that arm movements are not vague – "hand waving" during a broadcast can give the impression that the presenter is trying to be

vague with the details, that they may not know the forecast thoroughly.

17. A presenter must chat with the camera. Not preach or teach, but have a conversation with it. Are they comfortable doing this? Is it a forced, fake conversation? Remember that in essence you are entering the viewer's home – try to be a welcome guest at all times; to project a friendly, polite, interested and engaging demeanour.



Presentation on air (example 4)

18. The camera is the "other" person in a two-way conversation. Does the presenter engage the camera – so that you (as the viewer) feel drawn into the conversation? Does the presenter skilfully then draw your attention to and from the graphics as necessary? Remember that a viewer will not lose eye contact with a presenter until the presenter looks away (i.e. to the graphic); the act of turning to the background and (apparently) looking at the charts draws the attention of the viewer to the graphic. Is this done naturally and effectively?
19. Is an emotional connection (with time) built up between the viewer and the weather broadcaster? This is highly advantageous when attempting to build an audience. People stay with presenters (personalities) that appeal. The weather broadcaster should present "likeable" demeanour – inoffensive, easy to listen to and watch.
20. A presenter must have a good command of the language, but they must also learn to punctuate their thoughts appropriately. Pausing in conversation is a natural way of allowing the other person to absorb the information.

This is also true for television. Sentences should be clearly broken up with pauses. Avoid long, complicated run-on sentences. Finish one thought before going on to the next. What may feel like an interminable time on-air can actually translate into a brief period that allows the information to soak in.

21. Scripting - historically speaking, the weather presentation is an unscripted portion of live television, delivered by a forecaster. A presenter who is not a forecaster will usually work from a script prepared by, or agreed with, a forecaster. This presents a different type of challenge; people invariably read with a different voice to the normal speaking voice – and a viewer does not want to have the forecast "read" to them, they want to hear a description and interpretation of the forecast. A relatively new and inexperienced weather presenter will try to script the forecast so as not to miss any pertinent information, but should also aim to make the delivery seem natural, with a flowing, conversational tone. With time the weather presenter should learn to identify key points (perhaps prompted through the autocue) that need to be stated, but the overall presentation should be unscripted. It is easier to maintain the flowing, conversational tone to the weathercast if there is no preset script.



Presentation on air (example 5)

A brief synopsis – "Ten Guidelines of Good Weather Broadcasting" – is given in Appendix 2.

Chapter 8

ANATOMY OF A WEATHER BROADCAST

In this chapter we will review separately all of the elements that may make up a television weather broadcast, giving some suggestions as to best practice and some ideas, which may help inform the construction of the weather bulletin. Not all of these ideas will find favour with, or even be relevant to, many users of this guide. There are substantial differences of approach to broadcast weather; indeed one could make a sociological study of nations and / or cultures through the medium of weather bulletins. This is because these bulletins often cover the essence, or the specificity, of the country in question, and by examining weather bulletins from different places we can see something of the differences between peoples and cultures.

The manner of presenting weather is naturally guided by characteristics, which are readily understood by the audience. One can be influenced by, for example, the weather culture of the people; the level of their meteorological education; the religious values of the community; the impact of the weather on the activities of these people, etc. The contents will normally need to be based around the traditional structure of a weather bulletin, but may leave this path at times to emphasise elements or matter more specific to the interests of the public.

8.1 THE INTRODUCTION

The introduction to the broadcast is highly significant in the dissemination of weather information, as it is in all other forms of communication. The introduction sets the tone; it announces the flavour of the forecast, which can in itself summarise the type of weather to be expected. For example, the simple phrase "clear, cold and beautiful" conveys a strong message. It can allow those who don't have the time (or the inclination) to view the entirety of the weather bulletin to get the essence of the forecast. While avoiding any attempt at sensationalising the forecast the presenter should try to give a headline of the weather; either the weather, which has happened, or the weather, which is expected. An example: "Good evening and welcome to our heat wave weather".

In the case where the weather – past or expected - is the cause of, or related to, serious difficulties for some of the viewers, or has resulted in some unhappy event, the presenter will need to communicate some sympathy with those viewers and listeners. This empathy with those who have to suffer this poor weather is normally achieved by adopting a serious tone; thus demonstrating some feeling and identification with the difficulty or the misfortune which has occurred.

If a very significant improvement in the weather situation – and its consequences - is expected, the presenter should emphasise this improvement by speaking in a very positive way. In case of a happy event (the rain which arrives after a long drought for example), the presenter should present in a

good mood with a positive, upbeat tone. In the contrary case - the sorry situation where the weather is likely to get worse - the presenter needs to consider a warning and if possible may give advice on protecting from the severe weather, or at least on the avoidance of the worst of the conditions.

The introduction will be particularly difficult in a scenario where the forecast delivered on recent days has turned out to be very wrong. It is not necessarily appropriate for the weather presenter to apologise for the forecast, but they should acknowledge that the information given was misleading, and show some empathy with those among the viewers who have suffered loss or serious inconvenience. To present to the public directly after an incorrect forecast (especially where severe weather has occurred without being correctly predicted) is perhaps the most difficult challenge of all; it is an occasion which can either make or break the reputation of even an experienced and trusted weather presenter. Establishing the correct tone is of the utmost importance.

8.2 THE PRESENT WEATHER

The importance of this part of the presentation will depend upon the details of the synoptic situation, but also on the forecast.

- If the weather is good, and is settled, one may deal with the present weather briefly, without too much consideration;
- If the weather is good, but is expected to soon change, one can use this part of the bulletin to show the evolution of the weather and how it will change rapidly;
- If the weather has been bad, and is expected to stay very poor, then one will not spend too much time dealing with what has already happened;
- If the weather is bad, and is expected to become even worse, then the presenter must place a lot of emphasis on the expected development.

For this introductory part of the forecast the presenter explains and communicates the situation with visual support from charts, satellite and radar images etc as appropriate.

8.3 THE FORECAST WEATHER

Having established the current weather conditions the presenter will then go on to explain the evolution of weather over the coming hours or days.

8.3.1 Significant weather:

If the weather is expected to be severe, the presentation must always begin with an alert or warning. Whatever advice is

necessary should be provided for the safety and security of the population, with the intensity of the phenomenon clearly explained, together with the expected location and time of impact. If it is not possible to be exact in the forecast as regards timing and intensity, then the presenter should communicate this with appropriate emphasis and intonation, as otherwise there is a risk of damage to credibility. A time of severe weather is a time when a weather broadcaster can either enhance their reputation, or do it great damage, with a consequent impact on the reputation of the NMHS.

If, on the other hand, one has a very high level of confidence in the forecast then this is the time to be especially authoritative in presenting the broadcast, thus making clear that this forecast is quite certain.

If the weather phenomenon is one to be welcomed, then it should be presented in an upbeat or positive way, so that the presenter shares the sentiments of the viewers. If, on the other hand, the expected weather is adverse then the forecast should be presented in a sympathetic manner, which shows that the presenter relates to the difficulties, which the conditions will cause for the viewers. The forecast should provide all necessary advice to help mitigate the worst effects of the weather, through helping people to be adequately prepared.

When presenting the significant weather the presenter should be fully aware of the need to refer to different regions or cities; this helps greatly in the appreciation of the information in the forecast, and builds a stronger relationship between the presenter and the audience.

8.3.2 Temperatures:

The forecast of temperatures will be one of the main elements of the weather bulletin; the viewers will always be most interested in the expected temperatures, and whether they are rising or falling in comparison to recent days. It can often be the principal focus of interest of the forecast. The minimum and maximum temperature ranges will normally be given, but the presenter also needs to be aware of the effects of humidity and wind in communicating whether the coming days will feel uncomfortably warm or exceptionally cold. Extremes of heat and cold can have a significant effect on human health (or can promote accidents, as with frost on roads) so it is important to be aware of temperature-related hazards. The European experience of exceptionally high temperatures during the summer of 2003 provides an instructive example of how what might normally be regarded, in context, as "good" weather (warm sunshine in the summer) can become very "bad" when taken to extreme.

8.3.3 Winds:

There is a bewildering array of possible units with which to express wind speeds, from Beaufort Forces to miles-per-hour, kilometres-per-hour, metres-per-second, etc. Alternatively the speed of the wind can be illustrated graphically, without specific numbers, by sizing the wind arrow or some such other device. There is also a question as to

whether or not gust speeds should be mentioned as well as mean speeds.

The weather presentation should employ units of wind speed that can be readily understood by the viewers and listeners. This may result in different units being used for winds over land (mph, kph) than over the sea (Beaufort Forces are more normal for mariners). If the strength of the wind is likely to be high enough to pose dangers then gust speeds should be highlighted, as it is normally the gusts that induce structural damage to buildings, or disrupt land transport. The direction of the wind will often be of secondary importance to the general populace, but it may be a vital piece of information for coastal communities, or for those living in regions of significant local wind funnelling.

8.3.4 Marine Weather:

The sea is a challenging environment. The weather dictates not just the lives but also the livelihood of coastal communities; their economies are normally heavily dependent upon fishing and other marine activities. While strong winds over land can be inconvenient, they are usually not dangerous (unless they reach storm strength). At sea, on the other hand, a strong breeze may pose a significant hazard to small craft.

A weather presenter in a maritime country should understand the needs of the fishing and coastal communities, and should also be attentive to the needs of leisure sailors, especially at weekends and other times of heightened marine activity. The weather presenter should ensure that the forecast contains all of the necessary information that a fisherman or sailor might need before making a decision as to whether or not to put to sea. Where possible the broadcast might publicise a contact number (or a web address, for internet-based information) where more extensive detail on sea conditions could be made easily available.

A forecaster also needs to be aware of the conjunction of fine weather and holiday times, when many people make excursions to the beach. Often the occasional beach visitor will not understand the dangers of the sea as well as those who live close to the coast. There should be special emphasis on marine hazards (wind, waves, fog) on such occasion. The opportunity might also be taken to publicise more general water-safety advice relating to care needed when swimming, windsurfing, dinghy sailing, etc.

8.3.5 Weather around the world:

There is always a tremendous interest in weather conditions in other countries, and even other continents. With the growth of inexpensive air travel many people plan annual vacations or weekends away at very short notice. An interest may also arise where family members are working or living abroad, or perhaps even from some sporting or cultural event that is happening in another country.

A weather presenter should therefore take some time to properly research actual and expected weather conditions in

other countries, and present them to the viewers in an appropriate manner. The WMO web sites www.worldweather.org and severe.worldweather.org are tremendous resources in this regard. Naturally, weather information for distant countries will not be given the same emphasis, nor be presented in the same detail, as the weather conditions for the "home" country; however an overview of international weather is normally appreciated.

8.4 POSSIBLE ADDITIONAL ELEMENTS IN THE FORECAST PRESENTATION

8.4.1 Biometeorology:

In addition to presenting the "basic" elements of weather, temperature and wind a weather broadcaster can add valuable extra information through the use of various weather-related or weather-dependent indices. The use of wind-chill temperatures is widespread (though not always properly understood) as a device to estimate the effect of wind and low temperatures together on the human body. At the other end of the temperature scale, heat indices combine temperature and humidity to give some measure of the discomfort, which arises when both are very high.

The solar UV index is particularly important in forecast presentations where a predominance of the viewers are fair-skinned, and thus at an enhanced risk of skin damage from prolonged exposure to the sun. It is appropriate for inclusion in all forecasts of fine weather during the summer months, and in all forecasts for holiday destinations. Note that recent WHO guidelines now recommend the use of a simple UV index – the Global Solar UV Index – rather than the use of "burn times" (see the web site www.who.int/mediacentre/factsheets/who271/en/ for more details). The weather broadcaster is in a position to have a positive impact on the health of the viewers through appropriate promotion of sun-sensible behaviour.



A simple weather graphics system

Other indices or measures that might be considered as appropriate for the forecast presentation include those relat-

ing to air quality; to pollen concentrations (for hay-fever sufferers); to tropospheric ozone and to the risk of forest fires. A full discussion of these and other biometeorological indices is available in the "Guidelines on Biometeorology and air quality forecasts" (PWS-10, TD No. 1184, 2004) available from WMO.



A simple weather studio

8.4.2 Astronomical information:

The weather broadcast is often the best place to provide information about astronomical data; this data does not strictly belong to the business of meteorology, but in the mind of many viewers all these things are connected.

Information, therefore, such as the time of sunrise and sunset; the phase of the moon (and perhaps also the rising and setting time of the moon) can be included in the weather broadcast – often at the end, after the discussion of the weather itself. This information can be very sensitive, and much appreciated, in cultures and communities where religious practices (time of prayer, fasting etc) are governed by the appearance of the moon, or by the times of sunrise and sunset.

Tidal information is also of great importance, and the time of high and low tide in particular locations can be very useful information to present. The weather itself may, of course, have the effect of making the tide especially high when the normal astronomical tide is enhanced by a combination of strong onshore winds, high swell, and very low atmospheric pressure. The presenter should be aware of the times of high tides (especially the unusually high "spring" tides) and should be alive to the dangers of coastal flooding when the weather conditions are likely to add to the "normal" tide height.

8.4.3 Communication plus – extra elements to be considered:

As the creed is "to communicate information on the weather", the weather broadcaster could attempt to gradually inject ingredients or aspects of weather information, which will assist the audience in identifying with the presenter more effectively. The examples are numerous.

1. It may be useful to employ music (normally a "music bed"; that is, music played at a low level behind the voice of the presenter, or played while the presenter is neither in vision nor providing a voice-over). The music might be selected according to the type of weather, or some style of music, which relates to the day of the week or the time of the year.
2. It is possible to create a page or image related to the weather, or a frame in which are expressed subjects which are of interest to the public and which can be related to current happenings (weather or non-weather). The public perception of weather is of a phenomenon well beyond the bounds of scientific meteorology; an image of a weather-related sport or activity can sometimes make a point more effectively than the presentation of the bare facts.
3. It may also be possible to use this opportunity to include some educational material, which will improve the understanding of the viewers of some aspects of the weather.
3. If the time is short, but the weather story is significant, the presenter might reduce the complexity of the broadcast - for example by using simpler transitions between charts, or by dropping satellite animations. In this case the focus needs to be directly on the forecast. Tell the story in fewer words; cut out all that is unnecessary.
4. A long weather bulletin also poses challenges; it allows the weather presenter to put in a lot of information, but at the risk of losing the viewer through boredom or lack of interest. It is more difficult in preparing and presenting a long weather bulletin to identify and maintain the "thread" which ties the weather story together.

8.4.4 Duration of weather bulletins:

The duration of the weather bulletin is normally of the order of two or three minutes, but it may vary according to the situation, and to the ability of the broadcast company to schedule or allow variable times, on occasion.

1. When the weather is settled, and is not forecast to change, it may be useful to present a concise bulletin, which just gives the principal weather features of significant weather, temperature, and also the extra elements such as sunrise, sunset, etc.
2. Another approach in such a scenario is to use the extra time to engage in some educational activity or explanation.

8.4.5 Some Concluding Points:

The aim of this chapter is to develop ideas, structures and directions that will help the weather service, and more particularly the weather broadcaster, to develop and build a strong connection with the viewer. The fact that there is a weather presentation every day (or many times a day) on television or on radio improves the opportunity for the presenter to create that strong connection or link. Over-familiarity, however, can lead to disinterest among the viewers. If the public become bored with, or lose confidence in the presenter then the reputation of the weather forecast – and the associated NMHS - will inevitably suffer.

Good weather broadcasting is built on good science, but must employ some of the techniques of education, psychology, even marketing and public relations to be entirely successful. It requires constant effort to keep the forecast presentation fresh, interesting and relevant.

Chapter 9

COMMUNICATING UNCERTAINTY IN THE PRESENTATION OF WEATHER INFORMATION

Uncertainty is an ingredient inherent 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 consequently 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, and presented to the public, 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 weather broadcasters 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 derived from a variety of possibilities.

Strategies for addressing the issue of communicating forecast uncertainty have been, or are being, developed by many NMHSs. This has been recognised by the WMO Public Weather Services Expert Team on Product Development and Service Assessment who have recently reported¹ 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

A forecast might thus 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).

This is a very technical manner of presentation that requires thought and effort on the part of the forecast user. It may be useful in a written forecast, supplied through a newspaper or on a web site, but it is unlikely to be of practical use in the context of a forecast on radio or television.

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 most users simply want a single forecast on which to base their decisions, other 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 that they can plan their resources with all contingencies covered and do not have 'all their eggs in one basket'.

Expressing forecasts in a probabilistic fashion is a common way of communicating 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 may come to be regarded as simply a case of the forecaster 'playing it safe'.

This is an emerging area for broadcasters, and one, which will undoubtedly see much development in the coming years. The focus of this chapter of the publication, therefore, is on the rising use of probabilistic and other methods for communicating uncertainty to the public through the media, and on highlighting some of the key issues that will need to be recognised and addressed in the near future.

9.1 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. The forecast itself will carry a

¹ Report on meeting of WMO Public Weather Services Expert Team on Product Development and Service Assessment, Kuala Lumpur, Malaysia, 22-26 September 2003, available on the PWS web page.

different meaning in a convective synoptic situation to that implied when the forecast rain is geographically widespread.

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!

Normally, users of weather forecasts seek 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 a 20% chance of rainfall may discourage someone to hold an outdoors event, whereas a forecast of an 80% chance of fine weather may encourage them to do the opposite; yet the meaning contained within both forecasts is the same. This is a good example of a situation when the manner of presentation of the information carries more weight than the substance of the information itself.

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 have a sense of what the normal likelihood is, so that they can get the full meaning from the forecast. An alternative approach is to couch the forecast in terms of comparison with recent weather; an example would be the statement "while the showers lasted for an hour or two this afternoon, and were rather sporadic, showers will probably be more widespread and frequent tomorrow, although again they are most likely to develop during the afternoon".

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 actually mean.

And of course, forecasters and weather broadcasters themselves must have a clear understanding. How can they be expected to explain probabilities to the public if they do not properly understand the concepts themselves?

9.2 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 envelope of possibility;
- **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 atmospheric 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 NMHSs.

As mentioned above 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 that it will not happen 4 times in 10. The implication again is that the use of probability forecasts requires very careful user education.

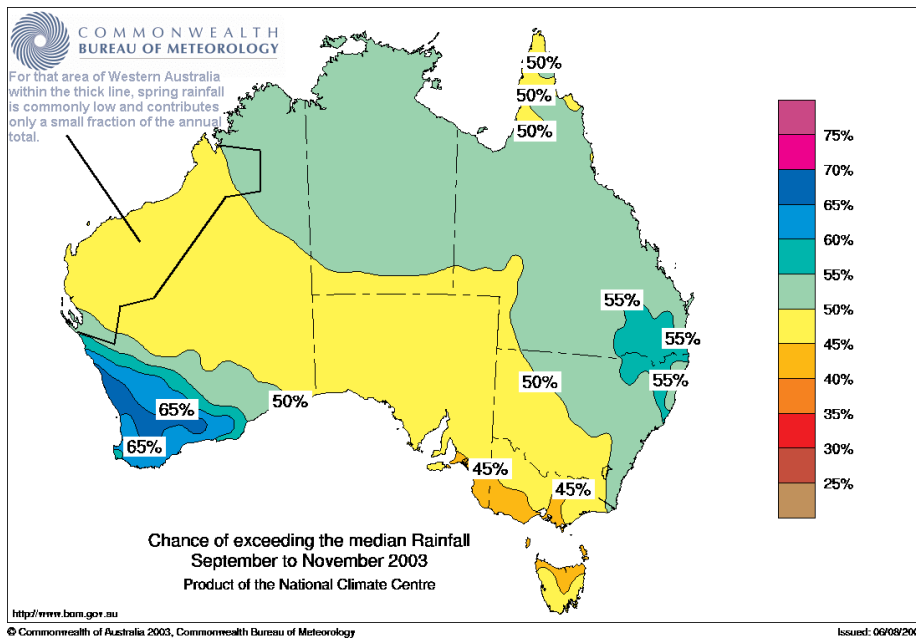
Or the alternatives can be overlain numerically. For example, the Kenya Meteorological Department include probability values for above average, average and below average on top of their seasonal forecast maps.

9.3 CONCLUDING POINTS:

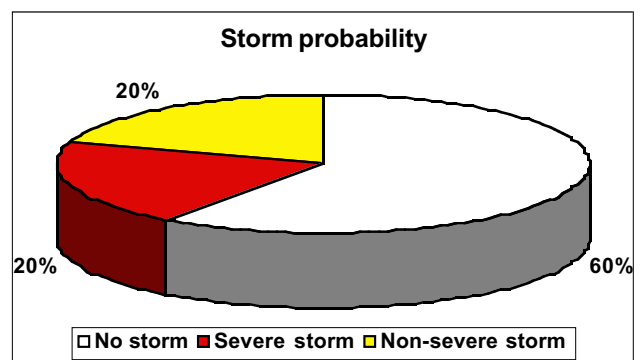
As the use of uncertainty and confidence information in Public Weather Services and products continues to grow it will be important to monitor developments and identify the strengths and weaknesses of the various approaches that are used to communicate this information. Visuals, graphics and animations have an important part to play in imparting uncertainty in weather broadcasts on television.



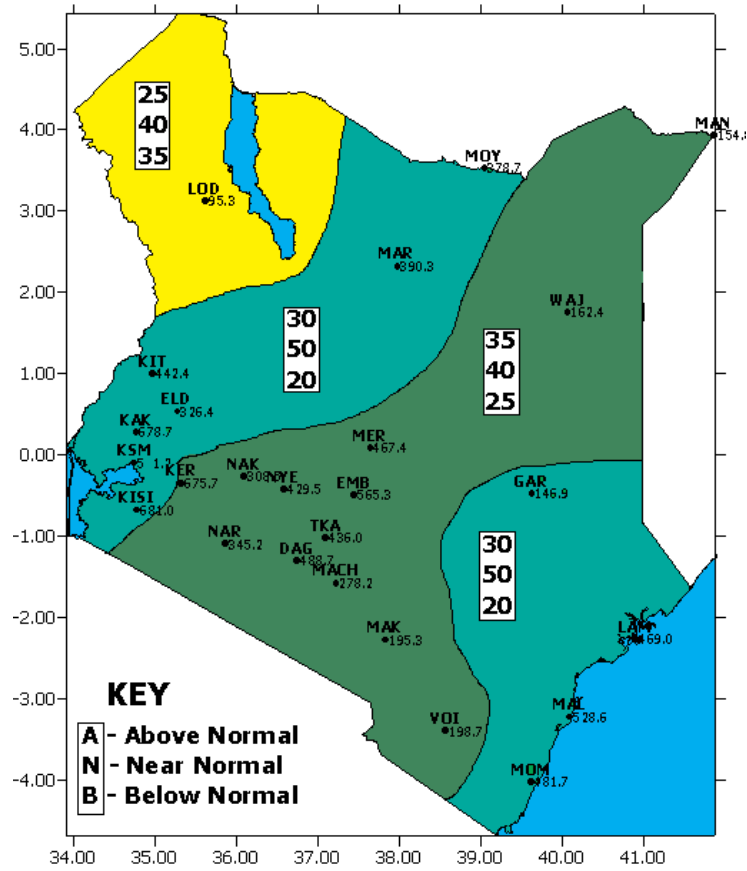
Probability cone showing potential danger areas up to 72 hours ahead corresponding to 60% track probability – Hurricane ‘Georges’, September 1998 (source: Cuban National Forecasting Center, Institute of Meteorology)



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



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.



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)

The use of colour, shading, fuzzy edges, shifting storm tracks and consequential changes in impact areas, error bars etc all offer possibilities for the presentation of weather information in a manner that emphasises and, perhaps, defines some of the inherent uncertainties.

The over-riding consideration, however, is that care and thought are needed to present and explain forecast uncertainty in ways that do not confuse users, particularly the general public and the media who serve them.

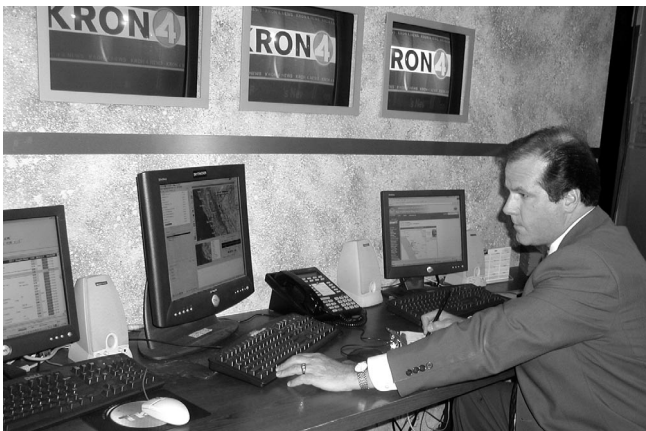
Chapter 10

GUIDELINES ON DISSEMINATION TECHNOLOGY

The preceding chapters of these guidelines dealt with the "soft" elements of weather broadcasting and presentation; those elements dealing with the negotiation of relationships between NMHS and broadcaster, with the design considerations that must be borne in mind when attempting to communicate complex information visually, and with the personal skills needed to mediate this information to the viewer. This chapter will focus on the "hardware" issues; examining the different levels of weather graphics technology and how these interface with NMHS systems, looking at evolving communications technologies and the possibilities they offer; stressing the new challenges for NMHSs in meeting the increasingly voracious appetite for Public Weather Services products and services; examining the future WMO Information System (WIS) and how it might be structured to help NMHSs to meet these new challenges, and considering how best an NMHS might marry its meteorological expertise with the Information and Communication Technology (ICT) skills required to create all-round quality in service delivery to the end-user. Appendix 3 considers some of the relevant emerging communications technologies in greater detail.

10.1 WEATHER GRAPHICS TECHNOLOGY AND INTERFACE

Weather products for the general public need to be capable of being easily assimilated, appropriate to the intended user group, and appropriate to the medium of communication. In this discussion the major emphasis will be on television, where the message is conveyed through a combination of pictures and graphics, movement, personality and speech – the use of text is very limited. For radio, the message is transmitted through speech alone. A more comprehensive consideration of the use of radio in weather broadcasting is provided later in this publication. For newspapers, text, graphics and pictures can be used. In web publishing, text, graphics and pictures are also used, but movement in the

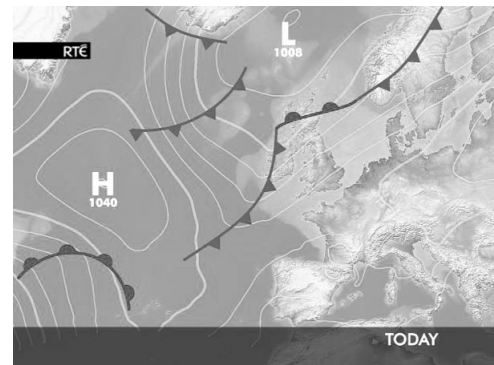


Preparation Desk

graphics can be employed; audio and video clips are possible but may not be practical or appropriate because of the slow response times. These differences need to be borne in mind; this document aims to provide help with the common features of all media work. It will concentrate on television, and will not cover the unique aspects of the other media.

10.1.1 Technology as a tool – a balance between the message and visuals

Technology continues to develop apace, especially graphics technology, driven primarily by the computer games market. However, the exploitation of graphics technology may not of itself be beneficial; the attractiveness offered by visual effects should be employed to enhance the message, and not to obscure or distort it in any way. What appears attractive to professionals working in graphics, in television or in meteorology may be simply confusing to the general public. One should use peer review and market research techniques to judge whether the message is being conveyed clearly and effectively. There is also a need to innovate to prevent the appearance of a presentation from becoming stale; something which can also militate against adequate understanding.



Traditional Analysis

10.1.2 Use of general purpose software packages and the range of capability

The essential features of any media weather forecast are that it is:

- delivered on time, every time, to the media company,
- that it has the agreed properties (see Chapter 3 under editorial policy) such as:
 - duration (for television and radio),
 - size (for print),
 - number and types of images,
 - appropriate introduction and finish.

Software and hardware maintenance, and backup procedures, should be carefully considered in the light of available resources as these tasks may pose a considerable challenge for an NMHS.

The use of general-purpose software packages is an option for keeping costs down while providing good reliability. For example, MS PowerPoint is commonly available and well known, and can be used to generate a presentation. Television companies will normally be able to employ this (although it is not something they would necessarily expect to use, except in an emergency). Linking a PowerPoint table to a spreadsheet gives a simple way of automatically updating a graphic of, for example, city temperatures. Other software packages will give smoother presentations than PowerPoint, e.g. Scala Iplay Studio. Some of these packages are available at minimal cost as shareware.

Preparation of images and sequences for television can be done effectively using other commonly available software packages. Encarta World Atlas is a good source of maps. Photographic editing packages (Photoshop, Corel Draw) can be used to manipulate these maps to highlight areas, and can be used to generate animated gif files for symbols such as clouds. Both photographic editing packages and presentation packages (PowerPoint, Scala Iplay Studio) can be used to prepare complete images, either by modifying and adding to images drawn from other sources (e.g. satellite photos), or by adding to a base map. If this preparatory work is done in a photographic editing package, then the images will need to be assembled in a presentation package to facilitate visualization on television.

The difference between what can be achieved by such generic and widely-available software, such as that outlined above, and presentations generated by dedicated meteorological media workstations, as described below in 10.1.4, relates primarily to the manual effort required in preparing the presentation, and to the achievable quality in the creation of some of the more sophisticated graphics features.



Simple weather graphics system-rear view

Using the sort of basic system described here, images may be "grabbed" from other systems, in particular from forecaster workstations. Satellite images are a visually attractive and easily understood element in many presentations. These may be copied from other systems, such as the Meteosat Second Generation workstations provided under the Meteosat Transition in Africa Project, from the Internet, or even from the RANET (Radio and Internet) broadcast

over WorldSpace radio. With regards to usage of these latter materials, more details and information can be found on www.ranet2000.org – the web site of the RANET project.

10.1.3 A simple ready-to-broadcast/print package for developing NMHSs

Having prepared a weather presentation, the next problem is to deliver it to the media in a useable form. For print media, the presentation will usually be saved in one of the standard electronic formats, and may be sent by any number of ways of transferring files - such as disks delivered by hand, ftp or email (though email may be subject to unpredictable delays). Fax is not generally suitable because of the poor quality of image reproduction.

For radio and television, one of the key questions is whether the broadcast company provides the studio, or whether the studio is physically located in the NMHS. If the presentation is to be delivered live, then it is likely that the television or radio company will provide the studio and, for television, will provide also the facilities to visualize the presentation graphics. The reliability problem is therefore reduced to ensuring that the information required for the preparation of weather graphics is delivered in good time, and that the weather broadcaster attends punctually at the studio.

In many places, especially in developing countries, the availability of studio, camera and visualization facilities at the premises of the broadcaster may be difficult, and it can be better for the NMHS to have, in-house, the ability to record a broadcast, so that it can be delivered directly to the broadcaster on videotape.

At a very basic level, using software as described above, a standard personal computer SVGA output can be fed into a scan converter to change it to broadcast video, which can in turn be fed into a DVCam recorder. A voice track may be added via a microphone (a good-quality microphone should always be used). In an emergency, the DVCam recorder could even be replaced by a Super VHS recorder. Some PCs (especially recent laptops) have an S-Video output, which does away with the need for a separate scan converter.

For television, an on-screen presenter implies the need to have a studio equipped with camera, lights, and means to display the graphics. A widely used device is the chroma-key system. This combines the image from the camera with that from the graphics computer, substituting elements of the image from the graphics computer everywhere the chroma-key mixer detects the background colour, (normally either blue or green). Experience indicates that a "full quality" broadcast camera is not always necessary, since the presenter remains at fixed focus. However for good chroma-key resolution a three-chip camera should be employed, rather than the single-chip of most domestic digital video cameras. The chroma-key mixing may be provided by either a suitable video mixer or a specific chroma-key unit. However, it should be noted that if a video mixer is employed the vast majority of the other facilities it offers, such as wipes and fades, will never be used - these will all be done on the graphics computer by the software of the presentation. The added complexity may be a risk.

Exact placement of the lights is very important in ensuring a good chroma-key effect, and it is worth putting considerable effort into ensuring an optimum set-up. A studio will need air conditioning to cope with the heat from the lights (cold cathode lights are available, but very expensive). There is a recent device, which uses a ring of high intensity blue LEDs mounted round the camera lens coupled with a reflective screen behind the presenter for generating the chroma-key signal. This arrangement reduces the number of lights required, is easier to set up, and potentially more reliable.

One monitor showing the mixed image is usually set up where the presenter can see it, typically above or below the camera. Additional monitors can be placed to the side, but presenters should then be aware of the need to regularly look forward towards the camera (and thus retain eye contact with the viewers).

More sophisticated systems might use an autocue for the script, and back-projection of a faint image on the blue or green screen to help the presenter in locating details of interest on the graphics. In a simple system a few map pins are sufficient and, carefully selected, should not be visible to the viewer. Highly sophisticated systems will arrange the camera and lights to the precise positions and settings that are best for each individual presenter.



Turning weather charts into graphics

10.1.4 More sophisticated weather graphics packages for media use

Weather graphics packages for broadcast media are available from a number of suppliers, either as specific packages or as add-ons to forecaster workstations. These generate images from the meteorological data (e.g. GRIB files) but display the data in ways, which are more accessible to a general audience, e.g. wind arrows to indicate the strength by varying the width and/or length of the arrow, rather than by the meteorologically standard feathers. Attributes such as colours and type of image may be set up beforehand by a file of characteristics, which set the default appearance of the presentation; the forecaster then modifies these to suit the particular weather situation. In this way, the "look and feel" (see editorial policy) of a presentation may be set up as a style, and multiple styles can be applied to the basic weather presentation for use by a number of different channels.



Chroma key screens can be either green or blue

These packages will include a section for playing out the presentation to air, or onto videotape. Packages may also include the ability to drive an autocue system.

In some systems, it is possible to package the file detailing the style of the presentation together with the data for the images, and the script, and send these electronically to a slave system at the television company, ready for a non-meteorological presenter to "front". Some systems can be set up to generate the presentation automatically at scheduled times; typically these are suitable for news or weather channels with frequent repeat broadcasts, such as 24-hour services. Automatically generated presentations may also be used to generate simple broadcasts for use overnight, with more comprehensive broadcasts prepared by a forecaster for daytime and evening use.

Some systems incorporate the ability to manipulate images for broadcast within the system software; in others this is done more effectively by transferring the image to a standard photo or publishing editing package (such as Photoshop), modifying it there, and transferring back into the presentation software; new images can also be added this way.

10.1.5 Internet resources that may be valuable in the preparation and enhancement of weather broadcasts.

Internet resources for media weather presentations can be considered under two distinct headings. The first is the use of the Internet to obtain basic meteorological information which is not available through other sources. This can be important for backup. One could use, for example, the Météo-France Synergie web version, or the SADIS back-up service to generate images on a server and then capture them from the browser. Satellite images are available from a number of sources.

The second use is as a resource for preparing images that are not directly "meteorological". Much potentially useful software is available (e.g. Lunar Phase Pro for moon phase images) as well as other valuable information. One might refer to significant local events during a presentation, for which on-line newspapers or the web site <http://www.interfaithcalendar.org/> are worthwhile sources. Care should be

taken over copyright and licensing issues, particularly in the use of photographs and software.

The RANET (Radio and Internet) broadcast over the WorldSpace satellite carries some satellite images, basic meteorological charts and cities lists. Because this does not depend on any other communications infrastructure, or on the availability of landlines, it can be used in remote areas where nothing else is available – or as a back up when other links have failed.

10.1.6 Interfacing with television networks under different working arrangements

There is a range of options in working with television networks, most of which will have implications for the NMHS in providing and setting up hardware, and in establishing staffing arrangements. One is the "fully independent" option where the television company employs their own forecasters and their own graphics preparation and presentation systems, using data from the NMHS (in addition, perhaps, to data from other sources). This is a simple option for the NMHS to support, but gives them little say in the content. At the other end of the spectrum the NMHS could prepare the presentation as a broadcast-ready tape using their own facilities – this gives the NMHS a high degree of control, but also requires significant investment; investment which might be under-utilised or which could even be wasted if the NMHS loses the contract with the broadcaster, or the television company declines to use the service for some other reason.

10.2 EVOLVING AND EMERGING COMMUNICATION TECHNOLOGIES

10.2.1 More mobile / time-specific / location-specific products

The rapid development in the IT world is an inescapable fact; this development will inevitably continue with ever-increasing pace. Demands from society for new and improved weather products and enhanced information will also continue, putting new requirements on NMHSs to meet that demand. People/customers already expect that they can access their weather product:

- wherever they want;
- whenever they want;



Weather satellite graphics



Weather graphics operation

- very locally if necessary; and
- pushed out to them when new information is available and/or when weather parameters reach or are expected to reach critical levels.

NMHSs need to keep abreast of developments in Information and Communication Technology (ICT) even if the effort required might be stressful, costly and resource-hungry. These developments offer an NMHS new opportunities to disseminate weather information and reach out to their target groups in a much more flexible way. It is of vital importance that NMHSs re-organize or re-structure their organisation as necessary so that they can meet the continuous need for re-adjustment and re-design of weather products. This can mean investments, both of time and of knowledge, that are far too much for a small or medium-sized NMHS to handle. NMHSs could consider developing co-operative agreements or partnership with companies and organisations that have the requisite technical know-how, for example the IT sector and/or universities.

Saving life and mitigating damage to property is the principal goal of an NMHS. Achievement of this goal implies that weather information should reach the affected population as soon as possible and with as much accuracy as possible. If an NMHS is able to combine new ICT with their expertise in weather analysis and forecasting, there are tremendous opportunities to enhance the value of weather products and information in the saving of life and the prevention of unnecessary damage to property.

10.2.2 More multi-media / multi-language channels and personalised / tailor-made delivery

New technology, and new expectations from the users of new technology, creates a demand on the supplier of weather information (the NMHS) that they be more flexible in their ability to transmit data and weather information. Specifically, the NMHSs should be able to send the data/information:

- in differing formats;
- in resolution appropriate to the medium;
- through different distribution channels; and
- to different technical systems/solutions utilised by end users.

Society, principally through the operation of markets, requires that it be able to access the same information through many different means of communication, such as television, web, mobile phone or other fixed or mobile devices. People themselves are more mobile now in the conduct of their daily lives, desire the freedom of choice between a variety of languages, and have a greater need to get location and application specific information. On the other hand, as the end products become more diversified in applications and usage, it is also essential for organisations, which supply weather information (be they public-sector NMHSs or private sector companies) to adopt a branding style or "look and feel" to project a consistent and recognisable image. Weather products provided by broadcast organisations, for example, will normally carry the same "look" independent of whether the information is provided on-line, on a next generation mobile phone, or on the television screen.

It would be advisable for an NMHS to avoid going into a dead-end by focusing on weather products, which are dependent upon a specific technical system or solution. In a rapidly changing world, those products will hardly survive for long and cannot normally be "re-used". **"Re-use" is important** to keep costs down and to build sufficient productive capacity at the NMHS. It is advisable for NMHSs to try to move their thinking from developing isolated production lines for specific end products, and to focus instead on creating the best possible data and information base. That database could then be used to feed the different technologies (systems/solutions) that produce end products (graphic, text, voice etc.) for the different target groups. Those systems could be inside the NMHS ownership and knowledge, or they may be outsourced.

10.2.3 Implications for the design, packaging and delivery of weather information

Text messages such as SMS are a very efficient means of transmitting short and timely messages to users with mobile phones, either on demand or as an emergency alert. Next generation mobile communication systems will be capable of transmitting and receiving graphics, voice and text in a similar way to television; some existing systems already have this capability.

The trend towards the mass use of different kind of mobile devices to receive weather products/information will increase the need for:

- more compressed, compact weather data/information
- more time-specific and location-specific information.

To facilitate the delivery of weather information to next generation mobile devices, new standards for data and protocols will be required, as well as more efficient means of data packaging. One example of a possible solution is the use of XML, an open standard for data exchange between different computer systems over the Internet. XML is a meta-language, which allows the language to describe itself through the use of an XML Schema. A web service is a kind of distributed computing technology over the Internet, similar to XML in many respects and used for the exchange of data between computer systems. It is based on the client-server applica-

tion model. More details of the emerging technologies can be found in Appendix 3.

Meteorological content remains essential in exploring such new opportunities. The new communication systems support the vision of giving target groups the information they need in the easiest and most informative way. The system is a tool to deliver the message in ways that are easily understood and used, but the limitations on that information should also be made known (see, for example, the discussion of probability forecast earlier). NMHSs should ensure they understand the possibilities that the communication systems offer. For this they should have a database of meteorological information, of the highest possible quality, in the most flexible form (standard format, convertible, compressible). They should also develop knowledge and skills in the application of their information to user needs.

Changes and developments in technology offer new possibilities to the NMHSs of developing countries. They can avoid investing in, and implementing, technologies that are in decline (e.g. fax) and may have new opportunities to work with development projects, especially ICT for poverty reduction and sustainable development (ref: World Summit on the Information Society).

10.3 POOLING AND MOBILIZATION OF RESOURCES

10.3.1 The Ingredients of a good Weather Programme

In early days the daily weather programme on television was simply some observations and forecast numbers or icons on a hand-drawn weather chart. It is fair to say that an audience nowadays expects more in terms of a well-presented weather story in support of a reliable forecast.

The basic meteorological ingredients that need to be assembled in the preparation of a properly informative weather programme would probably include the following items:

- (a) severe weather warnings (where relevant)
- (b) coverage of surface weather data, dense enough to produce high-resolution regional weather maps (e.g. temperature or rainfall distribution) through a combination of SYNOPS or regional mesoscale observational networks;
- (c) high-quality satellite or radar images, still or animated, overlaid with a good base map clearly marked with coastline, national or regional boundaries;
- (d) availability of NWP data for the plotting of forecast weather charts or, failing that, some visual representation of prognostic charts from available NWP models;
- (e) the availability of official forecasts for cities.

10.3.2 Challenges for NMHSs

In the case of NMHSs that operate their own radars and have their own satellite reception systems the obstacles to overcome are basically the post-processing works that include the overlay of base maps, clear annotation of

geographical locations and weather systems, and the visual improvement of images to make them more camera-friendly for television presentation. Notwithstanding all the sophisticated glamour normally associated with impressive images, or the eye-catching animation technology involved, it needs to be recognized that an adequate representation of what is happening locally in terms of weather, as mentioned in item (b) of Section 3.1 above, is probably even more news-worthy and captivating. It is this local weather information, which relates to the immediate experience of the audience within their local environment, and through it establishes a rapport with them as we look together to the continuing evolution of weather patterns. If the viewers consider the weather presenter knowledgeable enough in regard to the current situation, then they are more likely to put their trust in him or her on the trickier matter of the not-always-foreseeable future.

NMHSs therefore need to extend every effort in setting up and maintaining a functional and reliable local observation network. It is also useful, and mutually beneficial, to exchange the collected data with neighbouring NMHSs through regional collaboration arrangements, or disseminate such data worldwide for use elsewhere. The advantages are manifold and far-reaching:

- (a) a broader perspective allows the viewers to develop a better appreciation and understanding of the possible weather scenarios that may be coming their way;
- (b) a broader perspective also allows the viewers to appreciate what could have happened if a failed forecast or warning had been correct, especially if the anticipated weather event failed to materialize locally but did occur just across the border by a marginal distance;
- (c) a good coverage of local or regional weather information will help to:
 - (i) attract support from the public,
 - (ii) create demands from areas not yet covered,
 - (iii) provide information and statistics on record-breaking, these are much sought after by the media,
 - (iv) establish a positive image for the NMHS, and
 - (v) hence improve the likelihood of receiving support from central government for the funding of maintenance and development works.

The trend of globalization and of a much more mobile population means that the scope of weather information that needs to be covered is likely to extend further a field, to cater for the needs of an increasingly transient society. Weather and forecasts for cities worldwide, as well as severe weather warnings for specific regions, are now part and parcel of the majority of weather programmes. In the spirit of the one-voice principle, official forecasts and warnings from participating NMHSs are now provided through the official WMO web sites WWIS (World Weather Information Service) and SWIC (Severe Weather Information Centre). These web site resources are managed primarily by the Hong Kong Observatory, and further technical information relating to the web sites can be obtained by contacting the Observatory staff at webmaster@worldweather.org or swic_wm@worldweather.org.

10.3.3 Challenges facing the WMO Community

For NMHSs that do not have the capacity to run their own Numerical Weather Prediction (NWP) models, operate their own radars or receive satellite images, as well as for NMHSs that require extra material on an irregular basis for the purpose of "putting up a good show", there is a need to consider means whereby, in the future, they can readily access external sources to retrieve useful information and content.

In reviewing the items listed at the end of 10.3.1 above, high-resolution NWP data that enable the plotting of forecast weather charts, and satellite images to visualize the weather systems at play, constitute products that would add substantially to the quality of weather broadcasts. In the context of capacity building for developing countries, major modelling centres and satellite operating agencies should be encouraged to release and make freely available, either on a global or a regional basis, selected products in formats that can be readily translated into camera-ready images. As an example, users can request products from the general purpose Synergie server, operated by Météo-France, which can be prepared in some prescribed manner, with the products then displayed for reference using a browser over the Internet. A pilot project is also planned for RAII in which numerical guidance for selected locations and cities, from major NWP centres, will be provided to the respective NMHSs for their reference and for the formulation of forecasts.

Building on this approach, if ready-to-broadcast products can be pre-generated at a far-end dedicated server, then it is just a matter of grabbing the images from the screen as input material for television presentation. Such an approach can, in the years to come, assist NMHSs in developing countries enhance their weather broadcast products and services, within the overall context of capacity building.

In the developing WIS (WMO Information System), implementation of request/reply systems through web-services or web portals, and the routine exchange of high volume datasets, would probably be augmented by additional communication capabilities such as those provided by the Internet or the use of private dedicated network services. In places where dedicated communication lines are prohibitively expensive to set up and maintain, transmission of basic data and pre-generated products can be accomplished by relatively low cost satellite links.

In the context of supporting public weather service activities of NMHSs the following approaches may also be considered in the course of WIS development:

- (a) An Internet meteorological portal site could be built to serve as a one-stop shop of "WIS via Internet" to offer NMHS users access via a single web site address. Starting here, the user might be led to a variety of different services offered, including different kinds of forecasts and severe weather warnings, and to download-areas (ftp site) comprising larger datasets such as satellite and radar imagery, model output, meteorological database (e.g. climate information), links to NMHSs' web sites, and other useful and related topics.
- (b) The general public might be encouraged to use this WIS Internet portal to access data which is available to all without restriction. This would enhance the visibility of

- NMHSs, especially those of developing countries, so as to strengthen the public recognition of the weather services they provide.
- (c) To facilitate the active participation of the less developed NMHSs, the WIS Internet portal might also supplement the GTS to provide data exchange services (mainly on request-reply applications), and might encompass a diverse range of data exchange methods such as email, ftp and web form to adapt to the actual requirements of different WMO Members.
 - (d) The work of an NMHS spans a diverse range of responsibilities and capabilities. WIS should provide a flexible and extensible structure that would allow NMHSs to enhance their capabilities as their national and international responsibilities grow. In particular, for less developed Members with less demanding requirements, the WIS services should be accessible through a simple PC working over a dial-up Internet connection.
 - (e) As an aid to enhancing the capability of the less developed NMHSs to deliver medium-range forecast services, the WIS Internet portal might be used as an access point to modelling centres, through which they might provide their products in a user-defined manner (e.g. prognostic charts in image format or grid data format with regions and elements defined by end-users).
 - (f) Apart from supporting the data collection and exchange requirements of various WMO programmes such as WWW, WCP, AMP and HWRP, the WIS could also provide support to education and training programmes through the development of a knowledge database. Various training programmes on different topics related to public weather services have been organized by WMO. The WIS portal could serve as a point of access to a library of related literature, to other PWS training materials, and to web-based learning modules that would reach out to a greater audience.
- (a) material or technology that can improve the "look-and-feel" and enhance the contents of the weather programmes;
 - (b) better means of retrieving information for use in the weather programmes; and
 - (c) more opportunities to reach out to a wider spectrum of the community via multi-channel delivery in multi-media format.

The dilemma facing the NMHS is often whether to retain ICT capability in-house, or to engage outside specialists to look after the ICT aspects. Ultimately, pragmatic considerations would probably determine the path to take; but whichever way each NMHS decides to go, there are road signs that require attention and evaluation.

For an NMHS that can afford to develop and retain ICT skills in-house the immediate reward is to furnish better control and coordination of service development strategies. In comparison to meteorological research, which is essential, but may take a long time to show tangible benefits, ICT-led improvement can often be readily felt in the guise of better products and services, and as such can be much more visible and immediate. A broadening of the skill base within the NMHS can also inject a more dynamic outlook and greater technological awareness. In some cases, ICT-led improvement may actually provide opportunities for NMHSs to grow and expand. NMHS management need to strike a good balance between the development of the science and the pursuit of service delivery.

For an NMHS that engages outside ICT specialists, the immediate reward is to allow a more focused meteorological perspective within the NMHS. The main challenge here is to establish a sustainable working partnership with the outside specialists or agencies, and to ensure that an efficient mechanism is in place for project management and for implementation coordination. This applies even to specialists with good meteorological background and knowledge, as their corporate objectives and goals may not be totally in line with those of the NMHS. In going down this path an NMHS may need to relinquish control to a certain extent to allow room for the specialists' expertise to flourish, to be more flexible in their management approach in accordance with the prevailing practices in the private sector, and yet to be extra diligent and vigilant in monitoring progress to ensure that the targets are met and products delivered to acceptable standards.

10.3.4 Alternative Resources

In a fast-changing landscape of Information and Communications Technology (ICT) NMHSs may find it difficult to keep up with changes owing to resource or infrastructure limitations. Continuing technological developments outside the meteorological community inevitably bring about new possibilities:

Part II

GUIDELINES ON THE USE OF RADIO FOR THE DELIVERY OF WEATHER INFORMATION

Chapter 1

INTRODUCTION

Radio is one of the oldest and most reliable means of mass communication. The work of Marconi in the last decade of the Nineteenth century led to wireless telegraphy, where messages in Morse Code were broadcast without wires; in the very early years of the Twentieth Century the characteristic dots and dashes of Morse were quickly replaced with the sound of the human voice, and a new, direct, means of person-to-person communication as born.

By the 1920's most countries in the developed world had established radio stations for the transmission of news and entertainment to the populace. The style of these early broadcasts was very formal; news stories were read in a ponderous manner, while radio programmes on particular subjects were in the manner of "essays"; formal written compositions that were read to air by actors, announcers or sometimes the author themselves. This approach to radio broadcasting is epitomised by the fact that the senior announcer on duty at the BBC was required, for many years, to turn up for work in formal dress.

While there are still some echoes of these earlier styles on radio today the history of broadcasting in the Twentieth Century has been characterised by a move towards greater informality and increased pace. DJs on music-driven stations speak at a tremendous rate – the old norm of three words per second has long been breached. We have seen the rise of the "shock-jock" whose role is to taunt, irritate and sometimes enrage his or her audience, playing always on their fears and sensitivities. Even in current-affairs and discussion programmes the debates are often played out at an emotional rather than an intellectual level; emotion "works" well on radio.

Radio, then, can sometimes seem like a rather hostile medium for a factual-driven service such as the provision of weather information. However other factual services, such as traffic reports, agricultural commodity prices or stock-market summaries, can also be found on radio beside the more conventional news and sports bulletins. All listeners, whatever their age, occupation or demographic category have potentially an interest in the basic weather forecast, while more specialised users such as farmers and fisherman have a much more focussed interest.

Radio is a medium to be used and exploited by NMHSs at many different levels; for the basic forecast, for more

specialised forecast services, for warnings of severe weather, and for educating the listening public in the more scientific aspects of meteorology and climatology. Through all these services an NMHS should strive to establish and maintain an image of professionalism and competence, an image that will build credibility in the weather services and in the organisation itself.

These guidelines are intended to stimulate a fresh look at radio broadcasting among NMHSs, but also to act as a resource in helping to establish and maintain high-quality services. The Chapter 2 provides an overview of the status of weather on radio, and emphasises some of the unique aspects of radio, as a medium, examining how well these match the strengths and weaknesses of NMHSs.

Chapter 3 distils some of the essence of radio as a medium. It deals with how people receive and retain information aurally, and the overarching importance of voice quality in unlocking the attention of the listener. There is a discussion on the importance of identifying and knowing your audience, and a summary of advice on how to structure radio scripts, both for delivery by professional forecasters and others such as newsreaders.

Chapter 4 considers the broadcasting of weather information during "normal" weather conditions; the daily and sometimes humdrum forecast services that represent the greater part of weather information on radio. These services generate the background level of quality, which the public come to expect.

Chapter 5 examines how weather information should be handled on radio during periods of severe weather. These occasions put great strain on forecast offices and on forecasters themselves, yet the reputation of an NMHS can be either severely damaged or greatly enhanced at such times. As in all walks of life planning and preparedness can help to ensure that the challenges of broadcasting during times of severe weather are met and surpassed.

Finally, Chapter 6 looks beyond the forecast at weather discussions in the form of interviews. This chapter deals with how an NMHS can be proactive in generating radio coverage for the science of meteorology and for broader issues within meteorology and climatology. Techniques for dealing successfully with interviewers – either face to face or over the telephone – are outlined.

Chapter 2

STATUS OF RADIO

WEATHER REPORTING

The aim of this chapter is to describe and define the importance and status of weather reporting on Radio and the need for, and importance of, excellent cooperation between NMHSs and radio stations. This cooperation should be a natural one, based on the reality that NMHSs need radio stations to convey weather related information to the public, while radio stations need to put weather information on-air as a service to its listeners; indeed weather information, properly presented, can be a significant audience attraction for a radio programme.

2.1 RADIO BROADCASTING

Radio is one of the most important and powerful broadcasting media. It is used widely by people from all walks of life for company and for entertainment, and for the reception of information on a diverse range of issues depending on one's interest. Radio can reach audience at home, in the office, on the road, on the mountain, in the desert, at the beach, at the sea, etc. The technology of radio is relatively simple and inexpensive. The preparation of radio programmes requires little more than a tape recorder or equivalent and some editing facilities; since the advent of digital technology sound-editing software can be run on ordinary PC's. Radio is therefore a very useful tool; one, which NMHSs must exploit, and use effectively. The fundamental use of radio in the context of meteorology is for communication to the public, round the clock on a daily basis, information related to:

- weather forecasts,
- weather advisories,
- weather warnings and
- any other weather issues of concern to the public

2.2 WORKING RELATIONSHIP

It is of fundamental importance that NMHSs establish a very good working relationship with the management and operators of radio stations. This good working relationship should exist, ideally, on many levels. A formal, high-level standing committee comprising members from NMHSs and the radio station is desirable so that regular reviews of the services provided to listeners can be carried out. This standing committee may consider organizing reciprocal visits to familiarise members with each others working environment. No less important are the informal contacts between the radio announcers and DJs who introduce the weather forecast, and the forecasters themselves who prepare the forecast content and frequently present it on-air. Each group has its own legitimate concerns and these needs to be well understood.

The standing committee might address at its regular meetings, among other issues, the type of information that

needs to be broadcast in the daily weather bulletins; the optimum manner in which the radio station should receive the agreed information; the editorial policy applied to weather broadcasts by the radio station; the timing and duration of weather programs that will be aired; the desirability of additional information at times of heightened interest in the weather, and how this additional information should best be worked into the radio schedules.

Of great importance is the establishment of a protocol for handling warnings of severe weather, so that these are transmitted to the radio audience with timeliness and clarity.

In planning the schedule of radio broadcasts the needs and interests of the audience should be of paramount consideration, with special attention given to matters such as:

- The timing of morning and evening rush hours
- Activities around weekends and public holidays
- Special events that take place around the year

The standing committee may need to assess and review the weather programs being aired from time to time and bring forward proposals on how these might be developed and improved. This process should be continuous in order that the public not become bored by the necessary routine of weather broadcasts, but that their interest is maintained by the introduction of variations and improvements now and again. That being said weather bulletins need to be fixed into certain times and points of the radio schedule, so that those who need to know what the weather will do have an opportunity to find out that information by tuning in at pre-determined times. Change for change's sake is rarely a good idea.

2.3 TRAINING CONSIDERATIONS

To state the obvious, and in contrast to the medium of television, the appearance of a presenter is not a factor while reporting on radio, and this increases the pool of potential radio broadcasters enormously. (However, the matter of voice quality is very important – this is dealt with in more detail in Chapter 3). An NMHS should encourage and train as many of its staff as possible in the practices, skills and techniques required when reporting on radio. The training should encompass basics such as the operation of simple equipment, the preparation of radio scripts, microphone technique, and the optimum use of radio time. The training might be arranged with the cooperation and assistance of the radio station, or it might be arranged with a commercial firm who have a good reputation in this area. Some more detailed information on the required skills and appropriate training are given in Chapter 3. By the same token, an NMHS is encouraged to arrange short training opportunities for radio presenters working on the station with whom they have a relationship, so that they too may become familiar with the fundamentals of meteorology, the typical weather patterns in

their region, the terminology of meteorology etc. More importantly, radio presenters should be familiar with the hazards presented by severe weather and the over-riding need to ensure that the latest weather warnings are passed to the radio audience without delay and without amendment.

2.4 INTERVIEWS AND LIVE DISCUSSION

It is important that from time to time the schedule of regular weather reports on radio is augmented by more broad-ranging interviews which serve to increase public awareness of past and expected weather events, as well as of other weather-related topics of interest. Most radio stations have "flagship" current-affairs or discussion programme and an NMHS should endeavour to have its experts interviewed on such programmes in order to reach as large an audience as possible. In a similar manner, arrangement might be agreed with a radio station to conduct a live discussion on a "phone-in" programme, which would facilitate the wider participation of the public. In this context the topics selected could be related to the prevailing weather condition at the time, or indeed any weather topic of interest to the public that might make them willing to participate in the program in greater numbers. This type of program will help greatly in raising the visibility of the NMHS.

Chapter 5 gives more detail on how radio interviews should be set-up and conducted, and provides some ideas and guidance on training and preparation that will help NMHS staff to make the most of the opportunities offered by participation in interviews and discussion on radio.

2.5 PARTICIPATION OF STAFF IN OBSERVATORIES AND OUT-STATIONS

NMHSs should encourage their staff located in the observing stations established in cities and towns around the country to provide useful information whenever they are contacted by a radio station. In many countries there is a network of local radio stations that deal almost exclusively with local issues; such local radio stations will often prefer to speak with an NMHS observer working in the locality than deal with a staff member from HQ or the capital city. Staff in these out-station observatories may not have the overview of the weather available at the forecast centre, so some communication and information support scheme should be established to provide them with the necessary information to enable them to contribute effectively to the local radio station. The staff involved should also be provided with the appropriate training that will enable them to make best use of broadcast opportunities.

A mechanism can be arranged with national radio stations, which enables them to communicate regularly with outstation observatories in order to get details of the local weather prevailing at different cities and towns. Emphasis should be placed on meteorological changes that will have the greatest interest to, and impact on, the listeners. An example might be the reporting of extreme parameters that will have

direct impact on the day-to-day activities of the audience. Emphasis should particularly be placed on those parameters that break historical records. This process of reporting directly from the area of interest rather than being filtered through the Central Forecasting Office will undoubtedly draw the interest of the public who will want to follow up with subsequent updates in weather reporting.

2.6 BROADCASTING AND RECORDING ENVIRONMENT

NMHSs are encouraged to seek the advice of engineering experts in the radio station with which they work in establishing a proper studio environment for the purpose of live broadcasting and recording. In the forecast offices there is almost always background noise and commotion of various sorts, which can degrade the quality of live broadcasts, and also of recorded weather reports destined for radio. It is therefore essential that both NMHS and Radio Station work together to provide a dedicated broadcasting and recording facility in order to achieve a better and more professional weather service to the public.

2.7 AUTOMATION OF RADIO STATIONS

There is a growing trend towards the automation of Radio Stations – or at least the partial automation of stations through the night hours. This provides a challenge to NMHSs who will want to have the facility of providing up-to-date forecasts and warnings through all 24 hours of the day. Where a radio station is going down the road of automation it is of vital importance that NMHSs meet the challenge by establishing ways and means of automating the provision of their weather reports and warnings in a manner that will be compatible with the radio station in question. Unless they do so they will lose their presence on radio for at least some hours of the day and thus lose their status and visibility as the primary providers of timely and accurate weather related information to their public.

2.8 COMMERCIALIZATION OF NMHSs

Many NMHSs commercialize their services so they need to develop a certain competence in handling the issues of marketing, product branding and contract. Doing commercial business with the media can be a major activity and this can impact the oftentimes-fragile relationship with the media. If properly handled however, this economically driven aspect to the relationship may increase the variety of products available to the public as well as the quality of their presentation. Experience frequently shows that broadcasters who make profit on weather information have a strong incentive to maintain and develop the quality of their offerings, and therefore tend to deliver better services to the public. This is a win-win situation for both broadcaster and NMHS.

Chapter 3

THE PROPER USE OF RADIO FOR THE COMMUNICATION OF WEATHER INFORMATION

3.1 COMMUNICATION WITHOUT THE VISUAL

Radio is a medium of deceptive simplicity. What could be more simple and natural than one person talking to another? And yet, when we meet face to face so much of our communication with each other is conveyed visually; through our facial expressions, the use of our hands in emphasis – the gestures of the entire body are put at the disposal of the thought that the mind wishes to convey. To state the obvious, radio is a completely aural medium - everything depends on, and is expressed by, the voice. It is as if we are trying to communicate in an environment where a significant proportion of our "faculties of communication" have been disabled.

Psychologist Albert Mehrabian has found that, in non-technical communication, the impact a person has on their listener can be divided up as follows:

- 7% depends on WHAT you say;
- 38% depends on HOW you say it, and
- 55% depends on how you LOOK when you are saying it.

While a weather forecast can perhaps be described as "technical" communication it normally fits within a radio schedule that is anything but technical. The weather broadcaster should therefore take note of this guidance, and tailor their style of presentation accordingly.

What the above figures tell us is that, in the context of a radio broadcast, with the 55% of communication normally conveyed through visual means unavailable to us, there needs to be significant concentration on HOW we deliver the message. Note that the impact of the HOW outscores the WHAT of the message by a factor of more than 5 to 1. The WHAT are the facts we wish to convey; the HOW encompasses the creation of a script to convey those facts, and the delivery or presentation of that script to the audience.

3.2 THE VALUE OF THE VOICE

The concentration of the message through the voice alone does, however, offer some significant advantages. Radio is an intimate medium - the communication is directly from person to person; it is one to one. Our eyes can take in, and our brains process, a vast amount of visual information but this does mean that a medium such as television is constantly competing for attention with other distractions; a person coming into the room, or moving within our field of view; a shaft of sunlight streaming in the window. Our visual world is full of constantly moving imagery, and our brains must constantly decide what is important and what is not.

The number of stimuli that arrive through the sense of hearing (aural stimuli), on the other hand, are far fewer. To be sure our busy world provides a great deal of background noise; from traffic, from all manner of electrical motors in domestic appliances and computers; from air conditioning

units - even from birdsong. The brain, however, is efficient at suppressing these background noises, to such an extent that we often become aware of them only when they suddenly cease. We are capable, therefore, of keenly focussing our attention on a voice, even when we are simultaneously performing other tasks, such as driving, working around the house or in the garden, exercising, etc. The brain is capable of focusing on the voice, while going on "autopilot" in dealing with the other, simultaneous, tasks. A good radio voice can "open the door" between the ear and the brain; once the door is opened, the attention is captured, and the thoughts can flow through.

In order to understand what makes a good radio voice, we need to consider more closely the intimate nature of radio. Listening to the radio should be like listening to the conversation of an old friend, with whom you feel completely at ease. It is one-to-one communication – a very different dynamic than when one is, for example, standing in front of an audience to deliver a talk. The latter is very clearly a one-to-many form of communication; listeners to radio, on the other hand, are very often alone. This aloneness encourages the listener to imagine that the speaker is talking to them and to them only - the delivery, therefore, should be softer, more conversational, than a formal presentation would demand.

We react to the sound of someone else's voice in an emotional, instinctual way. A voice that seems harsh will make us grit our teeth; can almost physically cause us hurt – and will convey very little meaning, other than a dislike of that person and a desire to quickly move on to other company. A soft, mellow voice, on the other hand, will flow over us and cause us to relax, sometimes to such an extent that we hear the sounds, but not the meaning. A good radio voice lies between the two, but leaning more towards the latter.

3.3 USING THE VOICE EFFECTIVELY

A voice expresses thoughts through the use of language. Language is made up of words, which have an accepted meaning. Clarity of voice is therefore a fundamental of radio broadcasting; the words need to be enunciated clearly, with good diction. It is very difficult for a person to achieve good diction in a radio broadcast if they do not practice good diction in their normal, everyday speech. The effort required to "put on" proper diction that does not come naturally to the speaker will make the broadcast seem stilted and contrived. A broadcaster needs to practice good diction with every word they speak during the waking day.

Next to clarity of voice comes pacing. A listener needs time to take in the meaning of words, to assimilate the thoughts being conveyed. Delivery that is too fast, in which the words are crowded together, will quickly result in a loss of attention on the part of the listener. For most people, pacing means slowing down; the pace of delivery on radio normally

needs to be somewhat slower than the pace of everyday, conversational speech (remember again all those visual communication cues that the listener must do without). The pacing also needs to vary through a broadcast, as does the pitch – and to some extent the volume – of the voice.

The pitch of a voice relates to the frequencies created in the process of speech. Women normally have rather higher-pitched voices, with men often speaking with a very low pitch. The pitch of our voice rises when we get excited, or emotional, or angry. It rises when we are nervous, as the muscles in our neck and throat become tense and restrict our vocal chords. Lower pitches tend to work better on radio; higher pitches can become over-amplified and the voice will then seem "squeaky". Those with higher-pitched voices need to work at controlling this for radio, which usually means putting conscious effort into relaxing the body – and more especially the shoulders, neck and throat – before a broadcast. Those with lower pitched voices need sometimes to almost do the opposite – to generate energy and variability by raising the pitch at times. A broadcast delivered in a flat, low monotone can be very boring.

The reason for varying pacing and pitch is to create emphasis at certain parts of the broadcast. Not every word that is to be delivered is of equal significance. The more significant words and phrases need to be "highlighted" and this is achieved by giving them space (pacing), stress (pitch) and importance (volume). All of this seems very complex, yet we do this naturally every day of our lives in normal conversation with our families and friends. Good radio broadcasting is about using natural delivery in an unnatural environment. It is difficult to achieve this without some feedback, so the trusted opinions of a skilled colleague or a radio director will help each individual to achieve their full broadcast potential.

3.4 ACCENTS AND PRONUNCIATION

One of the difficulties for anyone assessing the quality of a radio broadcast revolves around the question of accent and pronunciation. In all countries, and through all languages, there will be variations in the way in which words are pronounced. Some of these variations fall within acceptable limits of the way words should be spoken; others are clearly in the realm of bad diction, where the sounds that go to make up a word are rendered indistinctly or improperly. Variations in accent are usually regionally based, but are also often based on background and class. For this reason they can lead a listener into making a subjective judgement on the worthiness or credibility of the speaker.

Most countries have some sort of standardised pronunciation which is defined, either formally or informally, by the style of speech used by politicians and other major public figures, or by the public service broadcast service. While it should not be necessary for weather broadcasters to speak with a particular accent, the emphasis should be on clarity, good diction, and understandability. If these conditions are satisfied then accent should be irrelevant. However it is appropriate to say that strong accents, be they based on regional background or otherwise, will normally lead to some

difficulties in understanding for people from other regions or backgrounds.

One particular instance of pronunciation that requires especial care is the pronunciation of place names. Mispronunciation of a place name will immediately alienate people from that place or region. Broadcasters should consult a person familiar with the region (or indeed the dialect or language if this is relevant) to ensure that they have the correct pronunciation of place names.

3.5 REACHING OUT TO THE AUDIENCE

Normally, communication is a two-way process, in which the communicator picks up feedback from their audience. Effective communication often depends on the ability of the speaker to "listen" to this feedback and tailor their delivery accordingly (ask anyone who has tried their hand at stand-up comedy!).

How can this concept be applied to radio broadcasting, where there is no "return channel" of feedback to the speaker? One of the keys to this is for the broadcaster to be fully aware of his or her target audience. The broadcaster should take a few moments to think about the listeners; who they are, what their concerns might be, how the weather information, which is about to be imparted, will be of help to them. If the listenership is predominantly rural then the broadcaster should be aware of the farming concerns of the moment – are the farmers waiting for rain after a dry spell, or are they looking for some settled weather in order to take in the harvest? If the listenership is predominantly urban then the focus of interest might be on whether or not it will be wet at rush hour, adding stress at commuting time. A broadcast delivered in the early morning will have a different emphasis to one delivered late in the evening. Similarly, a weekend broadcast will need to be pitched somewhat differently to that on a week-day.

By thinking through these matters the broadcaster can form a mental picture of the audience – he or she can almost create the audience in their own mind, and then "sense" the feedback that is such an essential element in good communication.

While meteorology is a science, communication is an activity rooted in the culture; the culture of a country or region; the culture of a particular language or dialect; even the broadcast culture of a particular radio station. Good communication draws on the reference points of a particular culture, and uses them to reinforce the scientific and information message. A broadcast delivered in France will not – and should not – be similar to a broadcast delivered in Germany. A broadcaster born and raised in a particular culture should instinctively know what will and will not work when delivering a message via radio; a broadcaster who has moved from elsewhere will take some time to learn how best to shape the message appropriately.

The fundamental point is this: a broadcaster needs to be fully aware of the audience; their needs and concerns, their wishes and fears, their work and their leisure activities, in order to be able to communicate the weather message to them with maximum effect.

3.6 SCRIPTING RADIO BROADCASTS

Chapter 4 below provides advice in considerable detail regarding the optimum construction of scripts for weather broadcasts. This Section will consider scripting in the context of the peculiarities of radio as a medium of communication.

When people who meet on the street talk about the weather they do not do so in meteorological terminology; they use the ordinary words of everyday speech. Scientists – including Meteorologists – use words that are defined to have a very specific meaning; these meanings are known and understood throughout the scientific community. The average listener, however, has no such knowledge of the defined meaning of certain words and phrases. A weather broadcast script, therefore, has to use the language of ordinary speech; to use the common words of the street, but to do so in a way, which is consistent and coherent.

It is not easy to do this without slipping into the language, or jargon, of meteorology; it requires careful preparation. As a medium of mass communication, radio demands simple, ordinary language. Using technical terms in a broadcast demands that the brain of the listener must take in, translate and understand that technical term before arriving at the meaning to be conveyed; even if the listener achieves this they will most likely have missed the following part of the broadcast as their brain will have been too busy translating the technical term to concentrate on the words which follow. Weather broadcasters need to deliver using simple words.

Sentences within weather broadcasts should be as short and compact as possible. If a long sentence is used, with many sub-clauses, the listener will simply have forgotten what was

at the beginning of the sentence by the time the end is reached, and the meaning will be lost. If the forecast is presented as a dialogue with a news reader or other presenter, the responses to questions should be concise and to the point.

For "monologue" style weather broadcasts, where the meteorologist is speaking directly to the listener, the structure of the broadcast should follow the normal lines for any presentation; there should be an Introduction, then the Body of the message, followed by the Conclusion. The Introduction could be a summary, but it could also take the form of a "teaser" by asking a rhetorical question or making a startling statement. The purpose of the Introduction is to gain the attention and interest of the listener. The Body of the message is for the details of the forecast, keeping them as simple as possible. The Conclusion should be a summary with emphasis on the main points of the forecast (getting warmer / wetter / windier / more settled etc). Many listeners may have mentally "tuned out" during the Body of the forecast; the Conclusion should offer them useful information nonetheless.

Finally a few words on preparing scripts that will be delivered by a third party – usually a newsreader (sometimes called "rip-and-read" scripts). If these come at the end of a news bulletin the reader will almost certainly be short of time (news journalists will invariably give news stories priority over weather stories, and squeeze the time allocated for the forecast). The key point when preparing these forecasts is that the main forecast message must be contained in the first line. Frequently this will be the only line that gets read out on-air. Put the main points of the forecast first, and the subsidiary points later.

Chapter 4

GUIDELINES ON THE REPORTING OF WEATHER INFORMATION DURING PERIODS OF "NORMAL" WEATHER

For most of the time the nature of the weather in any given country or region is not such as to represent a threat to life or property, yet there are still enormous benefits to be gained from the efficient dissemination of weather information to the populace. These gains may be difficult to quantify, as they arise from the aggregate of very many individual decisions made by people in organising their lives and work. These benefits will be economic in nature, yet there are also benefits in the "quality of life" that arise from enabling individuals to plan their activities around the expected weather so as to minimise disruption and inconvenience.

Because of the increasingly mobile nature of people's lives, radio is the optimum medium for reaching a large segment of the population as they go about their daily routine. Radio can reach people travelling in cars, buses and trains; many people wake to the sound of radio alarms and start their day by listening while preparing to go out to work or school. The optimum use of radio for transmitting weather information should be founded on an understanding and appreciation of the different contexts in which people listen to radio; these contexts will change from morning to evening and from weekday to weekend.

An NMHS should encourage and cultivate working relationships with radio stations during periods of "normal" weather. Apart from the direct benefit in the provision of daily weather forecasts, such a productive working relationship will be of tremendous value during times of severe or emergency weather, when the NMHS can use the radio more effectively to inform the public and in a correct and timely manner. This relationship can be achieved in a variety of ways as, for example, the setting up standing committees, the organisation of media workshops and more informally by inviting radio representatives to social gatherings and events organized by the respective NMHS.

In this Chapter we will consider how to construct a schedule of radio broadcasts that best reaches the listening population. We will review the different sources of weather information that are used in preparing radio bulletins, and make some suggestions as to how to deal with the use of "unofficial" sources. Before going on to deal with these aspects in more detail, it is worth noting that weather bulletins are rarely seen as key components of radio station output, and this leads on to two general points:

- The editorial and management staff of radio stations are rarely concerned with the accuracy of weather bulletins. Arguments based on measures of quality and accuracy will not usually be useful. On the other hand, references to specific inaccurate forecasts and warnings may carry some weight.
- There is not usually any significant income to be derived directly from the provision of weather services on radio. Apart from the fulfilment of its public service role, the best that most NMHSs can hope for is good attribution

of the official source of weather information, and often some degree of cross-promotion of other services, such as telephone or web-based weather forecasts (which may in themselves produce some income).

4.1 DEVisING A SCHEDULE OF WEATHER BULLETINS FOR RADIO

Despite the rise of "Breakfast Television" it is probably true to say that, in most countries, radio is still the broadcast medium with the greatest audience during the first part of the working day. An NMHS needs to concentrate first on providing a comprehensive forecast on radio during the early waking hours. Where the start of the working day is staggered across several hours, or is not aligned with the start of the school day, or where significant numbers of the working population are commuting long distances to work (and thus rising earlier) there will usually be a need to provide two, and perhaps three, forecast bulletins each morning so that every member of the public can listen to a radio weather bulletin at a convenient time.

This comprehensive weather bulletin should carry enough information to allow people to plan their day, with perhaps some additional information for coming days so that arrangements for outdoor activities can be confidently made. The usual elements of expected weather, temperature and wind should be noted along with any specific locally relevant information (sea conditions, times of tides etc).

Through the morning and early afternoon many people will be listening to radio while they are travelling, or working, or at home about the house. The forecasts should now have a more short-term focus, concentrating on the rest of the day and making reference to satellite and radar information where this is available.

From mid-afternoon through the evening the forecast should look ahead to the coming night and the next day. The nighttime weather may be especially relevant if frost or fog is likely to occur, and these elements should be given pre-eminence when appropriate.

Radio listening at nighttime can be a minority activity, as television tends to dominate the attention once darkness falls. This can be a time when a variety of special interest programmes are to be found in the radio schedules – such as those aimed at the farming or the fishing community – and these may provide opportunities for more specialised forecasts directed at these interest groups.

4.2 WHERE THE STAFF OF THE NMHS DISSEMINATE THE FORECAST DIRECTLY THROUGH RADIO

It is advantageous, where possible, to arrange for the direct dissemination of the forecast to the public by the staff of the

NMHSs. This arrangement adds greatly to the visibility of NMHSs and helps to increase the awareness with the public of NMHSs products and services. This increased awareness usually leads to stronger public and political support for the NMHS and helps to ensure the provision of adequate funding for the development of the service. This direct broadcasting arrangement affords the NMHS the opportunity to fulfil its primary role of providing quality public weather services to the people.

NMHSs who are in the fortunate position of having direct access to the public via radio should make the most of this opportunity, and should help to ensure the continued availability of the direct service, by pursuing the following strategies:

- Assign the weather presentation duties to the most appropriate person. It is worth putting some effort into trying to understand what type of voice works best on radio in the particular country or region served by the NMHS (see Chapter 3 above for more detailed guidance on this topic). When the optimum type of voice has been identified, the NMHS should then choose from among its forecasters those who best meet this particular criterion.
- Ensure that the meteorologist broadcasters have all the necessary presentation skills; this will be best achieved by the careful selection of appropriate personnel (as above) and by professional training. Training is best carried out by those with experience in radio; these may come from outside the meteorological community.
- Be aware of the durations set down for each radio bulletin, and always stick to these durations with broadcasts that are neither too long nor too short. All broadcasting works to a strict time schedule and all broadcasters need to recognise and respect this.
- Good radio broadcasts begin with good scripting. Writing for the spoken voice requires a different, less formal style than writing a text that will be read in a newspaper or magazine. Try to develop a natural, easy style. Avoid long sentences with many subsidiary clauses; short, direct sentences work best. There can be a lot of detailed information in a radio weather broadcast and, if the listening public are to take in and retain the information, some structure is usually needed. The broadcast could begin with a short overview of the main weather developments, then give the forecast details for "today", followed by "tonight" and then "tomorrow" as appropriate. It is usually good to finish with a brief summary, and then a reminder of when the next broadcast will follow.
- When the weather broadcast is introduced by a programme presenter, or when it follows a "dialogue" format between radio presenter and meteorologist, one should always be prepared for possible questions that the presenter might pose. These may not be at all related to the forecast itself but to some news item that is relevant to weather (climate change, El Niño, meteorological records broken etc) or to some other natural phenomenon, which the public associates in some way with meteorology (astronomical occurrences, geological events, maritime happenings etc.). A broadcaster needs

to be up-to-date with current newsworthy events as it is these that will most likely generate questions.

- It is important that the broadcast be provided from a properly equipped radio studio to ensure clear transmission of the forecast. A forecast that is broadcast on a poor-quality line will be difficult for the public to hear clearly. A separate room, properly furnished, equipped and soundproofed, is recommended; firstly for assuring good conditions for transmission and secondly to prevent disturbance of the rest of activity of the forecast office.
- Ensure attribution to the NMHS is included in the bulletin

4.3 WHERE A RADIO STATION DISSEMINATES DAILY WEATHER INFORMATION FROM THE NMHS.

The provision of scripts of weather forecasts and warnings to radio stations is a common practice, with these scripts then being read on air by newscasters, continuity announcers or disc jockeys. However, the delivery of weather scripts to the public by personnel with no training in meteorology brings its own difficulties. The message may not be delivered in its entirety, or it may be delivered in such a manner as to mask the original intention of the forecaster. In extreme cases it may even be delivered with a tone that signifies disbelief – which will render the forecast effectively useless with respect to the listening public.

On the other hand, a broadcasting company will frequently insist on editorial control, keeping to themselves to right to edit and adjust any script, which is to be read out to air. This is a normal requirement of broadcasters, and stems in part from the legal obligations of any publishing organization, by which it is the broadcaster who is held responsible for any legal offence (libel etc) committed through its channels. This concept of editorial control can be difficult to reconcile with the desire of an NMHS that its forecast and warnings scripts be delivered to air verbatim.

For this reason it is recommended that a formal contract or Memorandum of Understanding be drawn up between an NMHS and a broadcaster that will define codes of practice that will cover this potentially contentious area. At the very least, an NMHS should be able to ensure that all warning messages are broadcast without alteration, and in a timely manner. While forecast scripts may be subject to editing, the need for this can be minimized if the broadcaster and the NMHS agree on the length of forecast script to be supplied, and the NMHS ensures that the forecasters adhere to this recommended length.

The next step is to establish a reliable and rapid communications channel by which forecasts and warnings can be transmitted from the forecast office to the broadcaster. There will normally be established a schedule of times for the provision of regular forecast updates; there also needs to be provision for forecast amendments and corrections outside the agreed schedule times, and of course for the issue and safe receipt of warnings whenever these are meteorologically justified. It is good practice to have the reception of these

"out-of-schedule" forecasts and warnings confirmed by a telephone call to the broadcaster, and appropriate contact points need to be identified to facilitate this process.

The method of communication of forecast and warning messages will depend on the technology available to both broadcaster and NMHS; on the telecommunications infrastructure in place, and sometimes on the physical distance between the broadcaster and NMHS sites. Many newsrooms will have in place a software system that allows news stories to be ingested (from the news agencies, for example) or prepared; then edited, and distributed to the staff who must read them to air. It is worthwhile providing forecasts and warnings in a manner that allows them to be integrated into such a system. This will usually involve defining a means by which a forecast can be automatically input (sending by telex or email, or placing on an FTP server, for example) and also the format required for the system to pick up the forecast and make it available to editors and newsreaders in a convenient manner. The emphasis should be on speed of transmission and ease of access by the broadcast client.

Another method, which can be useful when there are a number of radio broadcasters accessing the same forecast information, is to place the forecast on a Web site, which the staff of the broadcaster can access freely. This may be an open, publicly available website, or it may be password-protected so that only nominated organizations can recover the information. However, it should be noted that this method depends on the diligence of broadcast staff in checking for the most up-to-date forecast or warning. A busy broadcaster will sometimes read the first forecast that comes to hand – this can sometimes be a script left lying around since the day before!! A system which provides new forecasts to the broadcaster while automatically overwriting the older forecasts would be much preferred.

Forecast scripts provided to radio stations should respect the following guidance:

- Time of issue and time of validity of the forecast / warning to be clearly stated.
- Length of forecast script to be as agreed with the broadcaster.
- Avoid meteorological terms and jargon wherever possible.
- Identify, and concentrate on, the main weather "story".
- Describe the weather in the context of recent days / weeks
- Mention all necessary weather parameters (weather, temperature, perhaps wind)
- Describe the parameters clearly, along with their physical significance.
- Refer to seasonal norms (e.g. for temperature) where relevant.

In addition to the above, warning scripts should always:

- Clearly state the expected time of arrival, and likely duration, of severe weather;

- Describe the severity of the anticipated weather by some clearly defined scale
- Include advice to the populace on the actions that should be taken to minimize danger to individuals and damage to property

There should be some agreed mechanism for cancelling warnings when they are no longer valid, and for making listeners aware of the cancellation.

In drawing up an agreement with the broadcaster an NMHS should ensure that it is given proper attribution as the source of the forecast and warnings service. This might be in the form of an arrangement whereby the name of the NMHS is broadcast with the forecast on each occasion, or at least a specified minimum number of "mentions" each day or week. Ideally the person reading out the forecast would introduce it with a form of words such as "The weather forecast from XXXXX is for"

4.4 WHERE A RADIO STATION DISSEMINATES DAILY WEATHER INFORMATION FROM ANOTHER SOURCES

Radio stations will rarely be in a position to pay significant costs for content, including weather information content. For this reason, among others, many will seek to obtain their weather information from other sources. These sources may be private meteorological companies but are just as likely to be forecasts "lifted" from the Internet, perhaps prepared and disseminated from another country. Such forecasts are very often derived from the direct output of global forecast models.

These forecasts will rarely match the quality of forecasts, which an NMHS can offer, but the measurement of forecast quality is notoriously difficult; measurements of quality couched in specialist statistical terminology are not readily understood by the ordinary person. Selling a service on the basis of forecast quality is, therefore, not a straightforward proposition. It is unfortunate that an NMHS cannot readily derive full benefit in this situation from what is likely to be its strongest point. The strongest scientific point is not usually a strong selling point in the media market.

The NMHS must therefore compete on the basis of service delivery; that is, it must offer a product in such a manner as to make it easy and affordable for a broadcaster to take and use the forecast from the NMHS. Most broadcasters will appreciate that there is value in using an official, authoritative, nationally known source for weather information and will use this source as long as it is accessible and economic. However, it must be sold to them. This can best be done by personal visits from NMHS staff. At the very least, the radio station should have an arrangement whereby it passes on warnings of severe weather to its listeners when these are issued.

Chapter 5

GUIDELINES ON THE REPORTING OF WEATHER INFORMATION DURING PERIODS OF "SEVERE" WEATHER

There is mention in Chapter 4 of the importance of ensuring that warnings of severe weather are fully and promptly relayed by radio broadcasters. However, severe or hazardous weather situations place a particular strain on forecast offices, challenging both the ability of the staff as forecasters; their ability to effectively communicate the warnings message, and their ability to satisfy the myriad demands of both media and the emergency community all at once. For this reason Chapter 5 will focus on how forecasters can best interact with the medium of radio in the context of such severe weather episodes.

The material in this Chapter is based on the "Guidelines on the Improvement on NMHS-Media Relations" (WMO Technical Document No 1088). The more general material in that document has been adapted here to provide guidance especially relevant to the medium of radio.

There are five stages to consider when dealing with how we handle severe weather:

1. Normal weather – planning and preparedness.
2. Severe weather on the way – putting the plans into action
3. Severe weather has arrived – keeping everyone up to date
4. Severe weather just over – dealing with the aftermath
5. Review the event – lessons learned; plans updated

5.1 STAGE 1 – NORMAL WEATHER

This is actually the most important stage, because it is the plans prepared at this time that will guide the actions and responses when the weather turns bad, and the forecasters are under stress.

We will assume that appropriate categories of warnings have been established, identifying the different levels of severe weather that might occur. The public should be familiar with these warnings, and what action is recommended when they are issued. There is an educational task to be accomplished here, which may well be best tackled through the medium of radio.

Preparing a radio programme on warnings criteria, and on the recommended actions to be taken by the public at times of severe weather, poses a challenge. In order to be effective a radio programme needs to generate a good audience, and a programme dealing purely with the issues above might be too technical to do this adequately. A better strategy would be to prepare a radio programme dealing with some historical severe-weather event, describing both the event itself and the consequent damage caused. This would allow coverage of the "human dimension", which is an important element in engaging the attention of the listeners. The programme could then go on to consider the improvements in forecasting and in preparedness. Thus, the educational aspects could be put in the context of avoiding some of the worst consequences of severe weather; of avoiding some of the damage and destruction caused by historical severe weather events.

Such a radio programme (or series of programmes) might not be prepared by NMHS staff themselves, but by journalists with an interest in science and the environment. The process of preparing such programmes should promote a positive co-operation between journalists and NMHS staff; itself a resource of some consequence at times of severe weather. There is also scope within this sort of programme for examining specific local risks that arise from topography or situation; this would have the effect of bringing the awareness of risk down to the local level; making it seem more tangible and less theoretical.

The next step is to identify the NMHS staff who will have primary responsibility for dealing with radio bulletins and interviews at times of severe weather. These should be chosen on the basis of their competence as forecasters, but also on the basis of their ability to communicate effectively via radio. This ability will be based on good scripting and presentation skills, and the possession of a good "radio voice". These matters are dealt with more completely in Chapter 3. The staff thus chosen should be afforded the opportunity of getting to know the relevant researchers and journalists working in radio news and current-affairs divisions. Personal relationships of friendship and trust, which are well established, make contact and communication much easier during times of difficulty and stress.

Other steps to be taken in advance are to define clearly the optimum communication links between the forecast office and the radio stations. These might be normal telephone lines; ISDN lines with appropriate equipment for better broadcast quality, or even fixed links between forecaster and broadcaster. These should be put in place and regularly tested to ensure their continued serviceability.

It might also be considered how radio journalists should be accommodated within an NMHS premises for press conferences and other such occasions. Severe weather situations will create a high demand for access – perhaps even competing demands from different media companies for access to forecasters at key news times. Strategies should be in place to allow these demands be met in a manner which satisfies the media while not compromising the forecast and warning process.

5.2 STAGE 2 – SEVERE WEATHER ON THE WAY

One of the advantages of the NMHS / forecast office is that it should, in most circumstances, have some awareness in advance of the approaching severe weather. Depending on the phenomenon in question this advanced awareness might be measured in hours or days; exceptionally perhaps even a week or more. Full use needs to be made of this advance notice; it offers an opportunity to set the media agenda.

Stage 1 should have seen key personnel identified as being the primary contact points with the media during

severe weather events. In Stage 2 rosters need to be rearranged so that these key personnel are working the appropriate shifts through the duration of the expected severe weather. This may, inevitably, result in some inconvenience to forecast office staff. However severe weather situations can result in the reputation of the NMHS being either greatly enhanced or, conversely, greatly damaged, so it is important to ensure that the best possible staffing arrangements are in place.

It may be appropriate for the forecast office staff to proactively contact journalists to make them aware of impending severe weather, even before it is time to issue formal warnings. This will help to ensure that the warnings, when issued, are given due prominence, and that any accompanying articles are written on the basis of good information.

It would be good practice at this stage for the NMHS to offer live interviews to radio news and current affairs programmes during which the forecasters could clearly outline the extent of the threat. The media will usually tend to “talk up” or “hype” the impending dangers, and it can be difficult for a forecaster in a live interview to hold the line, neither understating nor over-estimating the risk. A useful device is to make comparisons with similar severe weather events that have occurred in living memory, and to be able to quote statistics relating to the resulting damage. It is important – though often difficult – to remain calm, and not to sensationalise.

5.3 STAGE 3 – SEVERE WEATHER HAS ARRIVED

This third stage can last for some hours or, in extreme cases, perhaps a number of days. The primary need is to present accurate information, and to update this information with sufficient frequency that the populace are guided towards actions that will minimise risk and economic loss.

In a severe weather scenario many people may be away from home, either displaced by the direct effects of the weather or brought to a place of shelter to ensure safety. In these situations radio may be the most effective medium for conveying information that keeps people up-to-date; television may not be accessible, or may even be off the air because of the conditions. The simpler and more robust technology of radio is much more resistant to the effects of severe weather and other disasters.

At this stage facilities for journalists should be provided by the NMHS, adjacent to the forecast office, where briefings can be given and interviews arranged. The provision of some facilities such as telephones, internet-connected computers etc can help the journalists to properly research and disseminate the weather story. The provision of light refreshments for journalists and technical crews will also be greatly appreciated.

The nominated NMHS contact person should now be leading the show; providing regular briefings and making themselves available to journalists as required. Sometimes it is best to have regular scheduled updates; perhaps once every two hours, depending on the situation. However it is good practice to always check with the journalists before deciding on the exact update times as they will have their own dead-

lines, and it will be of little use having an update that misses the deadline for the news reporter.

Using the same spokesperson / forecaster throughout the emergency is recommended (although this may not be possible if the situation continues for more than a couple of days). Apart from reinforcing the continuity of image of the NMHS, it helps to avoid contradictions in the information given out to the media. In a severe event involving loss of life any inconsistency or contradiction in the information can itself become a story in the media, much to the embarrassment of the NMHS concerned.

While the demands of the media at this time will be considerable, it is important for the NMHS to maintain contact with the other professionals dealing with the effects of the disaster; Emergency Managers, Police, perhaps Army, probably Fire Services. The media will also be getting information from them, so it is vital that they are kept up-to-date with the developments in the weather. Once more, inconsistencies in information should be avoided at all costs.

The following Chapter provides extensive advice on how forecasters can best manage interviews; however in the context of severe weather it is worth emphasising one point. Radio news bulletins will not normally carry a long interview with a forecaster. It will be important for the information to be conveyed in short, direct sentences. Just how short will be determined by the nature of the radio station. A music-driven station will need a “sound-bite”; a succinct summary of the situation, and of what people should do. A news-driven station or a public service broadcaster will normally allocate more time to the news item and interview, and it is then possible to go into somewhat more detail. It can help to ask the radio journalist in advance what length of “package” s/he hopes to produce. If the forecaster speaks for five minutes, it will, in all probability, be edited down to one minute. It is much better for the forecaster to “self-edit” and present all the relevant information in one minute, if this is possible.

5.4 STAGE 4 – SEVERE WEATHER JUST OVER

The immediate aftermath of severe weather is the time of greatest challenge for the emergency management community. They will now need forecast advice that will assist them in the rescue and clean-up phases, and their needs must come first.

For the media in general, and radio in particular, this may well also be the busiest time. News reportage prefers the human dimension to the scientific overview, and there will be a multiplicity of human-interest stories to report on, detailing the loss-of-life, injury and damage to property caused by the severe weather. Radio will need good quality information about the weather event to accompany these stories; the strength of the wind or the intensity of the rainfall, for example. They will also need to know whether there is any possibility of the damaging conditions returning in the near future, or even if more normal bad weather is on the way, as this can impede the work of recovery and inflict further damage and misery on the affected population.

At this stage, however, the NMHS can begin to regain control of the news agenda. It is a time for analysis and more

in-depth discussion than was possible during the event itself. Often the most senior reporters and journalists will now be working on this story, and they will tend to work on the day shifts, so it makes sense to make arrangements that suit their schedules.

Mid-morning or early afternoon are the best times for news conferences. The key data relating to the weather event should be prepared and presented in a simple format. Do not use too much detail; neither the journalists nor the public will be able to take it all in. A timeline or chronological sequence should be prepared, giving the evolution of the weather event, when it first affected the region, when it peaked, and how it moved away or declined.

It can also be useful to provide some historical context at this stage; was this the worst event in ten years, in fifty years, how did it compare to the great storm / flood of xxxx etc. Always keep in mind the human dimension and the suffering that has resulted from the disaster, and show sympathy with those who have been affected. A Met Service should show itself to be a caring organisation with a good understanding of the needs of the population.

5.4.1 If the forecast has gone wrong

Sometimes (hopefully not too often) the forecast and warnings will not have given adequate notice of the weather disaster, and there will be a lot of criticism of the NMHS, and possibly also the emergency response community. Remember that those who have suffered will almost always look for someone to "blame", even when it is not fully justified. It is important not to react against this and be critical; wounded professional pride can recover quickly, but those who have suffered damage, or perhaps even lost loved ones, will carry that burden for far longer.

Do not try to hide the fact that warnings were late or inadequate. Provide full details of what warnings were issued, and when. The evidence will be there in any case, it is better to be honest and "up-front" about the facts. Do explain, as simply as possible, why the forecast was not as accurate as you might have wished. Try not to lose the listeners in technical terminology or jargon. It is important for the representatives of the NMHS to speak clearly and calmly.

Emphasise that the NMHS will learn from this event; and does realise that the forecasts and warnings were not as good as they should have been. Acknowledge again the human suffering. Try to make a distinction between what was preventable and what was not. There is no need to accept blame for the entire event – the NMHS did not create the disaster – but it is not wise to maintain that the response was as good as it should have been. This can be a difficult balance to achieve.

Where necessary the NMHS should apologise to the community, and then move on. This can be difficult to do in

a dignified manner – here the senior people in the Met Service have to be very supportive of the forecast staff and the frontline spokesman or woman.

5.5 STAGE 5 – REVIEW THE EVENT

When the severe weather has passed, the NMHS will need to prepare a definitive account of what happened. While this will be necessary for Climatological purposes, there may also be value in preparing a media article – or, in this case, a radio programme – that looks closely at all aspects of the disaster. Such a programme might be prepared to mark the anniversary of a particularly damaging event; perhaps one year later. The programme could look at the event itself, and then go on to consider the lessons learned and the improvements planned and/or effected following the experience of the severe weather.

As well as working on such programmes for the public there should be an opportunity, after the event, to liaise with the media contacts and journalists. The principal focus of this liaison would be to assess how happy they were with the cooperation and support they received from the NMHS in their job. This is the sort of question often best posed in a social context rather than at a formal meeting, unless there is an arrangement for some sort of standing committee that reviews arrangements between the official bodies and the media.

It is important to listen on these occasions; to ask the media what worked for them, and to try and find out what deficiencies they perceived in the arrangements. If there is to be an internal report to focus on how the NMHS responded to the situation, then that section of it that relates to the media might be circulated to some trusted media contacts in draft form, and their opinions and input sought. This will not be appropriate for every journalist, but feedback from carefully selected media people can be very valuable.

If the report recommends changes in procedures or protocol, then it should be acted upon by management without delay. There will be no way of knowing whether the next weather disaster will come along in one week, one month or one year. As well as looking at the procedures themselves there should be a focus on how staff dealt with the pressures, and whether training would help in providing a better response next time. If some people have proven to be unhappy with or unsuitable for the responsibilities which they have taken on, then management may need to look at changes in personnel. The important thing is not to put off the actions, which appear to be necessary. The NMHS has now gone through the complete cycle and is back in the "normal weather" time that was defined at the beginning. Armed with the lessons learned from the experience it is time to revise plans for the challenges that lie ahead.

Chapter 6

GUIDELINES ON RADIO INTERVIEWS PROVIDED ON WEATHER RELATED SUBJECTS

The Guidelines in this chapter seek to assist NMHS staff to prepare for and to go through radio interviews effectively. The chief aim is always to inform and educate the listener. Done effectively, radio interviews enhance the visibility of the NMHS and render it credible to the listeners. Radio interviews may take place in many different kinds of locations and situations. Here we seek to explain how you can best handle interviews in such situations for particular weather related subjects such as climate change, application of weather and climate to specialized sectors such as Health, Agriculture, Tourism and Disaster Management.

This chapter aims to provide advice on how to prepare for live versus taped radio interviews, and gives various tips such as the importance of 'visuals' on radio and many more.

6.1 PREPARATION FOR AN INTERVIEW

Here's the chorus; prepare & practice, keep it simple. Giving a good interview is simple – but not necessarily easy! Professional spokespeople with years of experience understand these principles. They understand that the person being interviewed must control the interview and deliver message points while still meeting the reporter's needs. The goal in an interview is to educate, deliver message points and control the interview while under pressure. This task is about 50% learned skills, and 50% natural ability.

It is an accepted rule that, prior to any interview concerning weather and climate, the meteorologist needs to familiarize him or herself with all aspects of the current forecast. This includes short-term, medium-term and even long-term forecasts because whether or not you are the forecaster on duty, you are expected to know what forecast your service has issued. It can be quite embarrassing if you fail to answer adequately question on the forecast weather during a live radio broadcast. Likewise, be well versed in topical issues such as the state of El Niño/ La Niña. The first rule therefore, is to be prepared.

- Additionally, know your audience and prepare answers from their point of view, anticipate likely questions and think through your answers in advance. Practice! Review worst-case scenarios and appropriate responses to them.
- Reporters are generalists. Do not assume they will know anything about meteorology. Provide them with good, concise background material prior to an interview if possible, or some summarised information, which they can take with them.
- Before the interview, find out how long you will be on the air. Are you being interviewed for a news story? For a talk show? This will tell you if you need to make your answers 10 seconds or 30 seconds.

6.2 INTERVIEWS AT THE STUDIO

6.2.1 Interview to address a specialized weather application subject

Some radio discussion programs provide adequate time for an in-depth treatment of subjects such as specialized weather applications. These subjects include application of weather and climate information to enhancement of the quality of life in Health, Agriculture, Food Security, Disaster Management and other similar fields. NMHSs might wish to observe the following points for ensuring the effective dissemination of such information to the public:

- It may often be advantageous to suggest a broad discussion panel in order to treat a complex subject adequately. For example, in order to discuss the influence of weather on mosquitoes that propagate Malaria, it would make sense to invite an entomologist and a medical doctor to join the meteorologist on the panel. Always be prepared for possible questions that the presenter may pose. Normally you will be asked to arrive at the radio studio early in order to discuss questions before recording, or going on air where the programme will be live. Take this seriously. It could save the day.
- To help increase listener satisfaction it can be good practice to organise and participate in a call-in session. Be honest with the listeners and use simple language devoid of meteorological jargon. As much as possible relate the answer to the locality of the listener. Do not mention figures (e.g. 109 mm of rain) without attaching the physical significance to the figure. Figures which are presented without being attached to then life experience of the listener remain just figures. In the example mentioned, it would be illuminating to point out that such a rainfall amount could well lead to flooding.
- If you are being interviewed at length in a radio studio, bring your notes along. Again, there is nothing wrong with using them for reference. Make sure you unclip your notes before the show starts and lay them out so you won't have to shuffle through them while on the air.

While it is not appropriate to ask for specific questions, it is okay to suggest that a reporter cover certain areas or suggest certain topics to be covered prior to an interview. He may not always do so. Make sure you have your agenda set on what you want to get across in an interview. Select a few key points and be certain to cover them regardless of what specific questions the reporter may ask. You have more control over a face-to-face interview with its direction and flow. Do not feel compelled to continue speaking if there is a pause.

6.2.2 Control the interview

It is all right to steer the interview in any fashion you choose. If you are good at it, you can use their question to springboard to the area you want covered. This is legitimate.

- Keep coming back to your core message.
- Answer questions to your advantage by rephrasing when possible. (I think what you're asking is...)
- Answer the question and stop talking.
- Do not allow your message to get lost in too much detail. State your conclusions and back them up with facts.
- Don't repeat an offensive comment or phrase. Answer with a positive statement.
- Avoid personal or judgmental opinions.
- Keep your cool. Do not argue.
- Avoid answering hypothetical questions. Don't speculate. Rather, validate concerns and feelings caused by hazardous weather, for example.
- Ignore studio distractions. At times, the host might cue up a commercial, or someone might walk into the studio. Concentrate only on the questions and your answers.
- Keep your cool during a call-in show. Many anonymous callers love to upset guests on these programs. If you get angry, that will be the element of the show that people best remember.

6.2.3 Interview to address a weather occurrence or forecast

When discussing weather that has been experienced, or a forecast that has been issued, it is not necessary to include other professionals in the discussion panel. It is however necessary to prepare sufficiently for the interview even if this means doing some research prior to the interview. For instance, if you are preparing for an interview on frost that has led to the destruction of a crop somewhere, be ready to explain in simple terms the processes by which frost can kill crops. This may require some reading to understand the behaviour of amino acids that make up the juices in the leaves of particular plants and how they can crystallize under a sudden temperature drop even if the temperature may not necessarily drop to zero degrees Celsius. Explaining in simple terms that the fluid in the leaf is not pure water, so that the temperature does not have to drop to freezing point of water for it to solidify and burst cell walls, could be very interesting and informative to the listener if done simply and clearly.

6.2.4 Telephone Interviews (When a journalist calls the NMHS)

Sometimes a journalist will call for information that you may not have at your fingertips. When one does not have the required information, to avoid giving inaccurate facts, there is no harm in asking the journalists to give you a little time to gather and arrange these facts. Make it a point to call back without undue delay as journalists normally operate on tight schedule.

- The interviewer's voice may seem distant due to technical reasons. Resist the impulse to speak loudly in response.

- Make sure you can hear questions clearly. If you are uncomfortable with the volume, say so.
- Get your point across quickly.
- Use notes so that you have facts at your fingertips.
- Begin your answer only when you are sure the question has been fully asked.
- Don't provide new information when asked at the end of an interview: "Do you have any additional thoughts?" If necessary, repeat your message.
- Do not be afraid of silence or pauses when giving recorded interviews. Once you have made your point, stop. They will edit out silence. A pause gives you time to think and comes across as being thoughtful. Give brief answers to questions. The more tape they have the less likely they are to pick exactly what you want to say.

6.2.5 Stand ups (After an event e.g. Press Conference, etc)

Stand-ups are interviews that are done on a one-to-one basis after holding a press conference or brief. A journalist may stop you as you leave the venue, wanting a particular point clarified. The journalist could for example be looking for an exclusive story so as to outclass competing media. It could also be that s/he requires an interview delivered in another language that was not used in the press conference or brief. In this case, be prepared for questions outside the confines of the brief just completed. This begs proper preparation. In case of a requirement for the use of a different language, make sure that a forecaster who is fluent in and comfortable with the language in question is provided (and briefed) - even if he or she is not the person who has led the conference.

6.2.6 General tips on radio interview

Interviews are not conversations. The reporter is representing the public and will probably ask hard or sometimes deliberately leading questions to elicit an emotional response from you. You are speaking to the public, not the reporter. The reporter is a vehicle for your thoughts. If you don't want certain phrases in the interview do not use them. This is easier said than done, especially with reporters with whom you have worked in the past. It is easy to slip into a conversational mode. Be very clear on your choice of words.

- Reporters come in all personality types. Do not put them all in the "out to get you" category.
- For some reporters there is no such thing as "off the record." If you do not want something aired, do not say it.
- Tell the truth. If you do not, your credibility is ruined. If you cannot absolutely divulge information, say so, and state why. Be completely honest. Never lie or try to fool a reporter. If you are unsure of an answer to a question, that is okay. Offer to get the information.
- Warm up your voice by talking for a few minutes before.
- Do not speak too slowly, but do speak clearly.
- Repeat your message. Listeners may tune in late, and miss your message.

- Vary your voice, but avoid "ah" and "um."
- Try to sound as if you are speaking to a friend. Try to keep your voice animated and positive. It is all the listener has to get a sense of you. Smiling sometimes works to come across in a people-friendly way. If your voice becomes higher pitched because you are nervous, try to lower it with subtle deep breathing.
- In any taped interview, you can correct yourself if you make a mistake or stumble. They will use the "clean" version of your answer.
- As radio does not have the advantage of visual weather symbols or footage such as is possible with television, try to describe phenomena as graphically and lucidly as possible using examples familiar to the listener. Do this to achieve a 'visual' effect. This is very useful especially if you have a flair for it.
- When the interview is over, offer to gather additional information for the reporter so you can determine his/her interests. Call the reporter if the story, which is being broadcasted, contains inaccuracies, and politely provide appropriate corrections.

6.3 CONCLUDING POINTS

Despite all the advances in new communications technology radio is – and will remain for the foreseeable future – one of the primary media for the broadcasting and

dissemination of weather information. Indeed in many parts of the world – both developed and developing – it may be the only regular means by which listeners receive regular weather forecasts and warnings.

Radio has a particular value during times of severe weather because of the speed with which amendments to the forecast, and developments in the weather, can be broadcast, and because of the inherent robustness of radio transmitters and receivers. Radio has a tremendous reach and reliability.

For all its simplicity the proper use of radio requires skill, training and careful preparation. The forecaster needs to be very aware of the inherent strengths and weaknesses of the medium in order to exploit it to the fullest extent. This document has attempted to provide comprehensive guidance to all those involved in the broadcasting of weather information via radio. Weather information is valuable information, assembled at considerable cost and with appreciable skill. To unlock the potential benefits it can provide to the community, it deserves and needs to be packaged and presented to the public in the best manner possible.

The benefits to be gained go further than a better understanding of the weather forecast and a greater reach for weather warnings; they include a greater appreciation of the work and expertise of the meteorological community as a whole, and of the NMHSs in particular.

Appendix 1

A TEMPLATE FOR WMO TRAINING COURSES IN WEATHER PRESENTATION

WMO devotes considerable resources to the training of Meteorologists in the area of weather presentation. This is principally to aid capacity building of NMSs; particularly those of developing countries. The following is suggested as a template for training courses weather broadcasting.

DURATION

For practical purposes the training courses should be designed around modules of one week (five working days). Most courses will be of one week duration; in certain circumstances a course of two weeks might be appropriate, if resources permit.

NUMBERS OF TRAINEES

Courses should aim to have between 12 and 15 trainees in attendance.

STAFFING

Two principal trainers should be engaged; these trainers should, between them, have extensive experience in both media aspects and meteorological aspects of weather broadcasting. It may also be useful to provide for some assistant trainers to supervise the group work of the trainees under guidance. Ideally there might be two or three assistant trainers; typically these might be locally-based weather broadcasters of some experience.

The local organisers should also arrange for a comprehensive briefing of current and forecast weather to be delivered to the trainee group first thing each morning for the duration of the course.

FACILITIES

Courses in weather presentation should cover both radio and television work; consequently the following facilities should ideally be made available:

1. A room with adequate seating for 20-25 people.
2. Two or three smaller rooms (or corners of a larger room) where the trainees could work in small groups.
3. Facilities for overhead projection.
4. A mock-up radio studio containing a chair, desk, clock, and microphone together with equipment for the recording and playback of sound broadcasts.
5. A video camera with stand; some studio-type lighting; a video recorder; a large monitor for video playback (or a connection to allow playback through the overhead projector).
6. A simple weather graphics system (could be based on Powerpoint or similar).
7. A chroma-key studio (camera, screen, mixer and video recorder) which can accept input from the weather graphics system.
8. Adjacent facilities for lunch, coffee etc.

(N.B. The weather graphics system and chroma-key studio need not be available on-site, nor for the full duration of the course. In the context of a five-day course, two or three days availability of these facilities on the premises of a nearby broadcaster would suffice).

STRUCTURED TRAINING

There is a potential need for three levels of training courses, as follows:

- Basic – for introducing new or untrained people to the work of weather broadcasting.
- Advanced – for those who already have some broadcast experience. An advanced course might also be appropriate when "training the trainers", i.e. equipping experienced broadcasters with the skills to become trainers themselves in their own regions.
- Refresher – for updating meteorological knowledge and presentation skills. This should be thought of as an element of Continuing Professional Development, and might incorporate peer review and management feedback.

The training should be based around core competencies or skills; the details of how any particular course is put together will be decided by the level of the course, and by the existing and desired competencies of the trainee group.

COMPETENCIES

1. Presentation Skills
 - (a) The weather story. The trainee should be able to identify the key point or points of the weather story, and to develop these into a coherent narrative and presentation. The trainee should understand the importance of clear and unambiguous presentation of weather warnings. The trainee should have a good understanding of the meteorology and climatology of their own country or region.
 - (b) Weather Graphics. The trainee should be able to visualise the weather story as a series of graphics, and to prepare a suitable sequence of charts on a weather graphics system.
 - (c) Scripting / Language. The trainee should be able to articulate the weather story in clear and natural language, whether through a written script or for a non-scripted presentation. The language used must be descriptive enough to inspire attention and interest, and yet be absolutely accurate in building on the scientific base.
 - (d) Appearance. The trainee should appreciate the need for suitable grooming towards in an acceptable on-screen appearance. This should be in accordance with the relevant social and cultural norms. The trainee should understand the need for an appearance which enhances the brand values of the NMS and the broadcast

- organisation, and which does not conflict with, or detract from, the proper tone of the weather message.
- (e) Personality and Presentation Techniques. The trainee should develop the confidence to express their personality in a manner that allows them to deliver the weather message with authority. The trainee should develop the ability to connect with the viewer or listener, and to recognise and modify any personal behavioural attributes which might detract from the message.
2. Technological Awareness
 - (a) Weather Broadcast Hardware. The trainee should have a basic understanding of the functions and operation of hardware commonly used in weather broadcasting; specifically the PC or other computer system employed for weather graphics, the recording equipment, and the necessary adjustments of camera and mixers where this is relevant. The trainee should understand the manner in which the visual elements (presenter image, graphics) are brought together and transmitted to the broadcaster.
 - (b) Weather Broadcast Software. The trainee should develop a thorough knowledge of the graphics software on their system; its capabilities and limitations. The trainee should have an awareness of other software packages that might be used to enhance the capabilities of the service.
 - (c) Routine Production. Trainees should be able to use routine production techniques appropriate to their service, and understand the requirements of routine production, including documentation and instructions.
 3. Development of Weather Broadcasts
 - (a) Editorial Policy. The trainee should understand the concept of editorial policy as applied to weather broadcasts, and should be capable of developing and proposing revision to such a policy in response to changing circumstances; both meteorological and otherwise.
 - (b) New Graphic Elements. The trainee should be able to design and incorporate new elements into the graphics of a presentation, ensuring that they are in accordance with editorial policy.
 4. Relationship with Broadcast Organisations
 - (a) Working in a Production Environment. The trainee should understand the need for weather broadcasts to be delivered on time and reliably as required by broadcaster's schedules. The trainee should appreciate the importance of developing and maintaining good relationships with editorial and production staff.
 - (b) Negotiating Editorial Policy. The trainee should have a clear view of the editorial issues pertaining to weather broadcasts; in particular the needs and requirements of the NMS. This should include an understanding of the "Single Official Voice" policy for public safety warnings. The trainee should develop the negotiating skills necessary to engage with representatives of media organisations on editorial policy issues.
 - (c) Selling the Service. The trainee should understand the necessity of selling and promoting weather presentation services to media companies including an awareness of competition, an understanding of branding, and an ability to articulate the benefits of good broadcast meteorology both within NMSs and to media organisations.
 - (d) Sponsorship Issues. The trainee should appreciate, where appropriate, the role of commercial sponsorship of weather broadcasts, and in particular the need for sponsorship not to obscure or conflict with the weather message.
 5. Training and Mentoring Skills
 - (a) Evaluation of Presentations. The trainee should be able to evaluate and produce a critique of their own and other weather broadcasts, and to communicate this critique to others in a constructive and positive manner where appropriate.
 - (b) Mentoring of Colleagues. The trainee should understand the framework of competencies and skills, and how this applies to weather broadcasting. He or she should be able to use this framework to help develop the competencies of other staff.

POSSIBLE COURSE OUTLINES

One-Week Basic Course:	Day One	Introduction The Weather Story Scripting / Language
	Day Two	Personality and Presentation Techniques Scripting / Language Appearance
	Day Three	Working in a Production Environment Weather Broadcast Hardware Weather Graphics Personality and Presentation Techniques
	Day Four	Routine Production All of "Presentation Skills" Editorial Policy
	Day Five	All of "Presentation Skills" Personality and Presentation Techniques

Two-Week Basic Course:	Day One	Introduction The Weather Story Scripting / Language
	Day Two	Personality and Presentation Techniques Scripting / Language Appearance
	Day Three	Personality and Presentation Techniques Weather Graphics Scripting / Language Appearance
	Day Four	Working in a Production Environment Weather Broadcast Hardware Weather Broadcast Software Personality and Presentation Techniques
	Day Five	Editorial Policy Negotiating Editorial Policy
	Day Six	All of "Presentation Skills"
	Day Seven	Selling the Service Scripting / Language (radio only)
	Day Eight	Personality and Presentation Techniques Weather Graphics Scripting / Language Appearance
	Day Nine	Evaluation of Presentations All of "Presentation Skills"
	Day Ten	Evaluation of Presentations All of "Presentation Skills"

One-Week Refresher Course:	Day One	Introduction The Weather Story Scripting / Language Personality and Presentation Techniques
	Day Two	Appearance Personality and Presentation Techniques Weather Graphics New Graphic Elements
	Day Three	Routine Production Editorial Policy The Weather Story Scripting / Language
	Day Four	Evaluation of Presentations All of "Presentation Skills"
	Day Five	Evaluation of Presentations All of "Presentation Skills"

One week Advanced Course / Training the Trainers:	Day One	Introduction The Weather Story Scripting / Language Personality and Presentation Techniques
	Day Two	Weather Broadcast Hardware Weather Broadcast Software Weather Graphics New Graphic Elements
	Day Three	Editorial Policy Negotiating Editorial Policy Selling the Service Sponsorship Issues
	Day Four	Evaluation of Presentations Mentoring of Colleagues
	Day Five	Evaluation of Presentations All of "Presentation Skills"

This advanced course could be tailored to make it particularly suitable for experienced broadcast meteorologists who could then train and mentor less experienced staff, either in their own NMS or at regional training workshops. Such regional workshops should also provide a forum for the sharing of experience and constructive criticism between neighbouring NMSs on an ongoing basis.

Appendix 2

TEN GUIDELINES OF GOOD WEATHER BROADCASTING

1. Make sure you have a good knowledge of the weather situation. Good knowledge brings confidence to you and thus to the viewer.
2. You should look presentable; well groomed with smart, neat clothing. This will help you to act professionally.
3. Be organised; check the studio and all equipment in advance; give yourself time for rehearsal; be time conscious and focussed.
4. Take charge of the studio! Have a good working relationship with the technicians, and ensure that the studio is set up the way you want it.
5. Tell your story in a clear, concise manner; avoid jargon and use the language of normal speech as much as possible.
6. Don't try to impress on camera – be natural. You have a good story to tell. You should project a relaxed, lively and friendly personality.
7. Position yourself so that you can turn easily from the camera to the charts; keep good eye contact with the camera except when you are "looking" at the charts behind.
8. Don't speak too quickly; use pauses for emphasis. Use appropriate intonation so that your voice is not too "flat". Mind the pitch of the voice; many men need to pitch a little higher than normal, while ladies usually need to lower the pitch somewhat.
9. Any technical terms should be explained and, where possible, visualised and linked to the weather.
10. Use the Funnel Principle. The full range of information should be presented, then funnelled down into the essence of the forecast; a simple message that can be easily understood and remembered.

Appendix 3

EMERGING COMMUNICATION TECHNOLOGY FOR DISSEMINATION OF PWS PRODUCTS

1. MOBILE TELEVISION AND MASS TRANSPORTATION

During the last decade, the digitalization of content has had a tremendous impact on the broadcasting landscape around the world. The key advantages of digital video broadcast system are:

- (a) Video and audio signals are coded and compressed before transmission
- (b) The transmitted (digital) signal is less susceptible to ambient interference an comparison to an analogue signal.

Therefore, digital video broadcast is suitable for television program reception in moving vehicles such as buses, trains and cars. With the popularity of television mobile system in the near future, the latest television weather broadcasts could be transmitted and shown in the various modes of public transport.

Background Information:

There are currently three popular standards for digital television broadcast: the European Digital Video Broadcasting Terrestrial (DVB-T), American Advanced Television Systems Committee (ATSC) standard and the Japanese Integrated Services Digital Broadcasting Terrestrial (ISDB-T) standard. A major advantage of digital television is the ability to carry more channels over the same amount of bandwidth. Another can be high-definition programming. The first commercial DVB-T broadcasts were performed in UK in late 1998. In 2003, Berlin, Germany was the first to completely stop broadcasting analogue television signals. Singapore is now using DVB-T as the television mobile system for broadcasting on the public bus network.

2. DIGITAL BROADCAST FOR HANDHELD DEVICES

An emerging digital broadcast technology for handheld devices is the IP Datacast, which is based on a combination of the European Digital Video Broadcasting for Handheld Devices (DVB-H) and Internet Protocol technology (IP), and is optimised for mobile content distribution and reception. Basically, this is a technology for transmitting IP packets over digital broadcast radio channels rather than over the Internet, as is more usual. Therefore, in addition to television signals, IP Datacast also supports the transmission of data and files directly to handheld devices. IP Datacast is a multicast service and, as in radio and television, the broadcast signal is carried via the broadcast antenna, with any receiver in the area of coverage capable of receiving the signal.

The most suitable use of IP Datacast is to deliver data in which all have an interest, such as a television news programme or weather broadcast.

IP Datacast is a rather new broadcasting technology and is still in a trial stage. Several pilot tests have been conducted in Europe with a common aim to extend the reach of video and audio broadcast into mobile phones.

3. MOBILE INTERNET ACCESS

Mobile Internet access through the use of handheld devices, like Personal Data Assistants (PDAs) and mobile phones, or directly to a laptop, is becoming more available and more popular. Two technologies used for mobile Internet access are General Packet Radio Services (GPRS) and 3rd Generation Services (3G). With GPRS, a user may access email and the Internet from a mobile phone, or from a laptop or PDA via a mobile phone. The peak data transfer speeds range from 26kbps to 52kbps depending on the hardware used and the mobile network operator. To deliver weather information to users of handheld devices with Internet access via GPRS, an NMS would need to prepare a web site of specialised design. Bearing in mind that GPRS is much slower than a fixed communication link, and that the form factor of handheld devices is also much smaller than a normal PC display, the design considerations for web pages servicing handheld devices would include the following:

- (a) The width of web pages or images should fit within the screen of most handheld devices (width of 220 pixels is a reasonable size);
- (b) Minimize the size of pages or images. For images, select a suitable colour depth (example, for a 256 colour image, do not use 16bits colour depth)
- (c) Avoid using client-side technology in web pages (such as Javascript or Java Applet) and keep away from multimedia content, as handheld devices have a limited processing power
- (d) Web pages should be kept as simple as possible. Avoid using deep links. 3 levels of hyperlinks are quite sufficient.

3G is a new communication technology, enabling mobile Internet access with a high-speed data rate. 3G supports variable and high-speed data rates of 384kbps and faster. Such high speed opens up the possibility of delivering weather information in multimedia content (such as video) to mobile or handheld users. Another new possibility offered by 3G is location-based weather information based on GPS and cellular positioning systems (<http://www.3g.co.uk/PR/March2004/6797.htm>). Novel applications of location-based services for PWS include route forecast and location-based nowcasting products.

4. XML

Extensible Markup Language (XML) is an open standard for data exchange of information between computer systems over the Internet. XML is a meta-language which allows the language to describe itself through the use of XML Schema. XML Schema is itself a XML document that defines the data format to be exchanged. The WMO city forecasts currently available on the WWIS web site are already in XML format. This is to facilitate NMSs in the development of programs to ingest weather information into their application systems, for consumption within the NMSs or for distribution to the local public.

In the WMO Information System project a standard approach to describing data is central to the concepts behind the proposal. Metadata is information that describes data. For climatological data, the metadata would be station number, update frequency, latitude-longitude of the station, observation elements and location of data file. For NWP GRIB dataset, it would include element types, horizontal resolution, number of vertical levels, forecast hours, forecast area, etc. The CBS Expert Team on Integrated Data Management proposed and developed a "WMO Community Core Metadata" standard for the WWW DATA Management in 2001. The standard aims to provide a general definition for directory searches and exchange that should be applicable to a wide variety of WMO datasets. XML is recommended as providing for the implementation of the standard, and the WMO Core Metadata XML Schema is also developed.

5. WEB SERVICES

Web service is a kind of distributed computing technology over the Internet, similar to XML in many respects for data

exchange between computer systems. It is based on the client-server application model. An example of application in PWS product delivery is the provision of world city forecasts to the international media. The client application of a company contacts the web service (in the server) providing the forecast information, and sends a service request asking for the weather forecast of a specific city. The server would return the requested forecast through a service response in XML format. Once the client application receives the forecast, it can ingest the information into its application system in accordance with its own needs. For television stations, the city forecast fetched from the web service can be put into the weather broadcast automatically in order to streamline the whole production process.

Another application of web service in PWS is the provision of weather reports at all airports and observation stations (see, for example, <http://www.cape-science.com/webservices/globalweather/index.shtml>).

6. FORECAST DELIVERED BY SMS

SMS is well known for its efficiency in the transmission of text messages, such as severe weather warnings or forecast messages, to a group of mobile phone users. On-demand PWS product delivery can also be implemented using SMS. The UK Met Office recently deployed a "Forecast by SMS" service (see <http://www.metoffice.gov.uk/services/wxcall/mobile.html>). To use this service, mobile phone users simply send "weathercall" (an SMS message), appending the name of the town, city or location for which the forecast is requested, and the type of forecast (today's forecast, or a 5-day forecast) to a designated phone number. The system will then automatically return an SMS message containing the weather forecast to the user.