



Chapter 1

INTRODUCTION

Since humankind evolved on earth the activities of men and women have been affected by the vagaries of the weather. The fundamental tasks of providing food, clothes and shelter were carried out within the dictates of the local climate, and with the hope that the following day would bring “good” weather – “good” could mean rain to germinate seeds, sun to ripen crops, wind to fill the sails, or a variety of other weather conditions. The weather needs changed from one season to another but, living closely with nature, mankind knew what weather was needed, and knew to take advantage when that weather occurred. What they did not, and could not know, was how that weather would change over the coming days.

The science of meteorology has developed to such an extent that we can now anticipate, with a reasonable degree of confidence, how the weather will change and develop over the coming week. As we have developed our needs have grown more complex and disparate. To try to define “good” weather is to invite more questions than answers. Many of us now live in an urbanised world cocooned from nature; as a result we are increasingly unable to read its signs and portents. As science has developed a greater understanding of weather and climate, it is important to enable society to take full advantage of the knowledge we now possess.

Extreme environmental events can have a catastrophic impact on society, and they are of particular concern. Events such as tropical cyclones, floods, droughts, cold spells, heatwaves – these all have the potential to cause enormous destruction and loss of life. Their economic effects can also be long-lasting; one such event can set back the economic development of a small nation by many years, perhaps up to a decade. The provision of early warnings of such natural hazards by NMHSs enables actions by individuals, governmental bodies and relief agencies that reduce the impact of these events on society. NMHSs can also provide advice about longer-term actions that protect against and mitigate the effects of such occurrences.

Specialised users of weather information – traditionally people involved in agriculture, fisheries, maritime and air transport – have now grown to encompass those concerned with the management of energy and water resources, banking and insurance, construction, and urban design. All of these users can derive significant benefit from weather services, whether these are provided through the NMHSs or through the private sector. Weather information contributes to the safety and welfare of the public, and is potentially of immense social and economic benefit to society.

Looking at longer time scales, climate change, ozone depletion, dwindling freshwater resources and increased pollution have an impact on the global environment. NMHSs and the wider research community can assist policy makers in understanding the causes of these changes and in developing strategies for society to deal with them.

It is no longer sufficient for National Meteorological and Hydrological Services (NMHSs) to employ good

science and provide accurate forecasts; they also need to educate and inform the public, and more specialised users, in how to make best use of the fruits of the scientific endeavour. It is clear that there is a need for public education and outreach.

Public education and outreach programmes aim to strengthen links between the providers and users of public weather services so that individuals, communities and organizations can make effective use of the available products and services. While the initiative to develop such public education and outreach programmes should normally come from the NMHS, it is preferable that these activities be undertaken together with partners such as educational authorities, emergency management agencies and the media.

As well as providing a direct benefit to the users of public weather services, such as the general populace, policy and decision makers and the economic sector, public education and outreach campaigns also contribute to enhancing the credibility of NMHSs. An informed and educated public will have a better appreciation of the information provided, and will be better equipped to make intelligent use of high-quality services commensurate with the advances in science and technology.

There is a broad spectrum of people that use public weather services and careful thought should be given to the needs of various groups within that spectrum. However, the target audiences for public education and outreach programmes fall into two broad categories:

- **Schools and academic institutions.** The aim is to assist schools and academic institutions with developing an awareness of the environment amongst both students and educators, with particular emphasis on understanding the physical processes associated with weather, climate and water. Having a public education programme is the main means of achieving this aim.
- **Users of public weather services.** The aim is to foster a better understanding and awareness of public weather services in terms of their availability, the terminology used, the way they can be used to the greatest effect and their socio-economic benefits. The target audiences include:
 - General public with their diverse needs and interests.
 - People involved in economic activities (e.g. farming, fishing, energy supply, transport, and building and construction) and recreational activities.
 - Reporters and editorial staff involved in the mass media.
 - Hazards community including people involved in managing, mitigating and handling hazards (e.g. media, governmental bodies, emergency managers, and non-governmental and volunteer organizations).
 - Governmental authorities (e.g. high-level policy and decision makers).

The main way of fostering this understanding is through an outreach programme, with the material used and approach taken being dependant upon which group of users is being targeted. Also it is important that staff who provide public weather services are knowledgeable about the needs of users, and this may require in-house training and development.

It is worth drawing a distinction between public education and outreach programmes and campaigns. A programme is considered to be a fixed plan or a course of action while a campaign is a connected set of actions intended to obtain a particular result. For example, a NMHS may embark on a public education and outreach campaign when it has a specific goal to achieve such as the introduction of a new service to the public, or raising the awareness of the public about a certain issue to a desired level. A campaign also spans a specific period of time. On the other hand, a NMHS may also have an ongoing long-term programme or a fixed plan of action with respect to public education and outreach. However, when implementing either a campaign or programme associated with public education and outreach the same principles apply. In the remainder of this document, reference will be made to programmes rather than campaigns.

Chapter 2

OVERVIEW OF PUBLIC EDUCATION AND OUTREACH

Before going into detail about how to develop a public education and outreach programme, consideration will be given to some general issues associated with such programmes. These include:

- How can the effectiveness of public weather service programmes be enhanced?
- What is public education and outreach?
- Why have a public education and outreach programme?
- What are the key strategies for public education and outreach?
- What are the critical success factors?
- What are the benefits of building partnerships?
- Do staff have the appropriate skills?
- How can appropriate skills for the staff be developed?

2.1 HOW CAN THE EFFECTIVENESS OF PUBLIC WEATHER SERVICES BE ENHANCED?

For a warning or a forecast to be successful, in addition to its accuracy it has to be disseminated and presented in a way that allows the intended users to actually receive, understand, believe and act upon the information. An effective public weather services programme will always aim to enhance:

- **User awareness** – to receive the information the users must be aware of the services available and the means by which they can be accessed.
- **User understanding** – to understand the information the product must be presented in plain, concise language and the users must know the meaning of the meteorological terms used.
- **User faith** – for users to act upon the information received, it is essential that they believe in it; this requires the NMHS to have a public image of credibility and a reputation for providing reliable, accurate and timely services.

These aims need to be supported by a well-organised and coordinated public education and outreach programme.

2.2 WHAT IS PUBLIC EDUCATION AND OUTREACH?

In the context of public weather services, public education and outreach can be thought of as follows.

- **Public Education.** This refers to products or services associated with learning about weather, climate and water, primarily within the formal education system, including provision of educational material, curriculum development and support for educators other than that specifically aimed at developing the professional

expertise required by NMHSs and others within the meteorological and hydrological communities.

- **Outreach.** This refers to products or services about weather, climate and water that involve short-term contact with members of the public and other users of public weather services with the intention of providing information, raising awareness and exciting interest.

Though public education and outreach are different, there are intimate links between them and some overlap. Together they can contribute to supporting a NMHS in achieving its long-term aims of providing the best possible service to the community.

2.3 WHY HAVE A PUBLIC EDUCATION AND OUTREACH PROGRAMME?

There are several reasons why an NMHS might consider embarking on a public education and outreach programme in support of public weather services. These include the following.

- A citizenry capable of making informed decisions about issues associated with weather, climate and water is essential for the welfare of the population and stewardship of the Earth.
- An NMHS has an obligation to maximise the benefits from the public weather services which are funded from the public purse.

In the context of the activities of NMHSs the overall aim of public education and outreach is to inform and educating the public, primary and secondary school students, policy and decision makers, and other users of public weather services about the scientific understanding and socioeconomic benefits to be derived from weather, climate and water, and related environmental services and thereby:

- Increase appreciation of the natural world and understanding of issues associated with weather, climate and water.
- Raise awareness of the importance of public weather services, the way such services can be used, and the benefits they bring, especially in relation to meteorological and hydrological hazards.
- Support top-level policy and decision making about resource management, preparedness for and mitigation of natural hazards, and environmental stewardship.
- Provide activities by which citizens can participate in community events focused on bringing science into the classroom.
- Help communities enrich their lives by gaining a greater understanding of the meteorological events affecting them.
- Develop, deliver, and promote educational resources for students, professionals and the general public.

- Promote the importance of professions associated with weather, climate and water and attract capable people into these fields.
- Contribute to international initiatives under the auspices of WMO to better serve the world-wide meteorological community and the public.

Possible topics for a public education and outreach programme

Possible topics for a public education and outreach programme might include the following.

- ◆ The role of the NMHS.
- ◆ The range of public weather services provided and how to use them.
- ◆ Hazardous weather and the different types of warnings issued by the NMHS.
- ◆ The economic benefits of weather services.
- ◆ Weather phenomena (in general or peculiar to a region).
- ◆ Meteorological terminology (especially those used in forecasts and warnings).
- ◆ Climate, hydrological and agro-meteorological services.
- ◆ Meteorology and hydrology as related to sustainable development and natural disasters.
- ◆ Environment topics (e.g. ozone hole, global warming and climate change).
- ◆ Opportunities for teachers and students to learn about weather and climate.
- ◆ Geoscience education in schools.

2.4 WHAT ARE THE KEY STRATEGIES FOR PUBLIC EDUCATION AND OUTREACH?

The following are some strategies that could be used for public education and outreach associated with weather, climate and water.

- **Provide information about the use of public weather services.** Reach out to the public at large through the most common channels (e.g. radio, television, newspapers and internet) to provide information and advice about how to make use of public weather services, with particular emphasis on weather warnings, appropriate response action, and ways of reducing the impact of hazardous weather. Develop materials such as pamphlets, brochures and leaflets aimed at particular audiences to complement the other channels of communication.
- **Use the latest communication technology.** Make use of the latest communication technology such as the Internet to distribute material, supply meteorological information and provide links to other information sources to meet the individual needs of users. Tools such as the toll free IVRS (Interactive Voice Reference System – an automated telephony system that interacts with callers, gathers information and routes calls to the appropriate recipient) can provide convenient access to current weather and forecasts for specific sites.
- **Conduct seminars, workshops and training courses.** Meet directly with the users through conducting seminars, workshops and training courses for different

user groups to advance the use and understanding of weather information and services. In addition, take advantage of any other events that can be used as an opportunity to bring providers and users of services together to support public education and outreach.

- **Set up stands at shows and exhibitions.** Establish a stand at trade shows and exhibitions as an effective way of conducting two-way communication with groups of people with a particular interest. This also provides an opportunity to distribute printed material and inform the public of the modern technology used by the NMHS.
- **Organise publicity events.** Launch publicity events such as open days, weather icon design contests, tropical cyclone naming contests, essay competitions and book mark competitions to help enhance the interest and gain the attention of the public about weather services. Events for children are particularly good ways of engaging the interest of the whole community.
- **Take advantage of special events.** Mark special events such as the World Meteorological Day, the start of the cyclone season, the anniversary of a disaster or the inauguration of a new NMHS facility to raise awareness about the activities and benefits of NMHSs.

Talks, seminars, workshops and visits

The following are some guidelines on the use of talks, seminars, workshops and visits to support public education and outreach.

- ◆ Focus on specific topics (e.g. tropical cyclones or drought).
 - ◆ Focus on key target audiences (e.g. emergency managers or teachers).
 - ◆ Distribute awareness and education materials to the audience.
 - ◆ Get feedback from the participants in the audience and assimilate such feedback into the public education and outreach programme.
 - ◆ Conduct seminars on particular forecasts problems and inform users on how to interpret and make use of the forecasts.
 - ◆ Invite the hazards community to visit the NMHS to:
 - become familiar with the NMHS operations, technology, products and services.
 - learn how to access and use the products and services, and their limitations.
 - ◆ Conduct seminars and workshops with professional societies, international partners, universities, and public education programmes to ensure cross-fertilisation of ideas.
 - ◆ Organise joint training activities conducted by the NMHS and those government agencies charged with emergency response actions and school education.
- **Publicise success stories.** Use the mass media and public education and outreach material to publicise success stories or anecdotes (especially those with strong human interest) to help people understand the benefits from changing their behaviour.
 - **Educate the media.** Create good relationships with reporters and editorial staff and develop media

packages so that the media can contribute to publicising meteorological knowledge both during hazardous weather and in quiet times.

- **Provide educational tools and resources.** Work through education authorities to identify, develop and disseminate a range of educational tools and resources that will supplement the curriculum by increasing the breadth, scope and quality of education at all levels about weather, climate and water.
- **Support activities for students.** Promote interest in meteorology in schools by helping teachers and their students set up weather equipment and stations as well as organising activities for students such as weather diary competitions and quizzes.
- **Involve students and parents.** Arrange for events where students can help their parents and other members of the public learn about weather, climate and water through poster presentations, fairs, booths, and other community events. In addition, provide opportunities for the parents to become involved in the activities occurring in the schools.
- **Create partnerships.** Set up partnerships with other organizations with similar educational objectives or environmental interests (e.g. user groups and hazards community) to enhance the effectiveness of any initiatives.
- **Involve enthusiastic individuals.** Use members of societies and others who are interested in weather, climate and water (e.g. volunteer observers or citizen scientists) to help develop materials and contribute to implementing initiatives. If provided with appropriate information and support, these enthusiastic individuals can be effective advocates of the value of NMHSs and “help spread the word”.
- **Engage the public in meteorological activities.** Give members of the public an opportunity to make observations, collect other data or contribute to research activities so that they feel they are contributing to the activities of their NMHS.
- **Use dissemination facilities of other organizations.** Make use of dissemination facilities of other organizations to reach out to as wide an audience as possible.
- **Publicise importance of public weather services.** Publicise the importance of the provision of public weather services in support of national priorities, economic activities and the well-being of individuals. The NMHS Annual Reports and reports about exceptional weather events or natural disasters and their impacts can form important elements of public education and outreach.

For maximum effectiveness, these strategies should be linked to the overall strategy of an NMHS for developing a long-term public education and outreach programme. The strategies also apply when an NMHS decides to embark on a public education and outreach campaign with specific objectives, for example, to introduce a new service or to raise the awareness of the public to a desired level.

2.5 WHAT ARE THE CRITICAL SUCCESS FACTORS?

The establishment of a variety of public education and outreach programmes not related to weather, climate and water suggest that the following are critical success factors.

- **Understanding the needs of the target audience.** Align public education and outreach activities with the needs of the target audience by having a clear understanding of their behaviours and attitudes.
- **Establishing an implementation plan.** Establish a comprehensive implementation plan (including development and dissemination) based on clearly defined needs, goals, objectives and target audience.
- **Involving the target audience.** Involve members of the target audience in the planning, implementation and governance of the programme.
- **Using the right people.** Use people who are fully committed to the programme and have the appropriate range of knowledge and skills.
- **Achieving quick wins.** Plan some actions that will have an immediate, though probably limited, impact as well as those actions aimed at providing long-term and sustained benefits so as to maintain momentum and enthusiasm in the early stages of the programme.
- **Making material widely available.** Make material widely available and accessible using a variety of distribution mechanisms. Usually this will include hardcopy but where appropriate distribution based on modern technology may be used.
- **Ensuring high-level support.** Ensure that there is full managerial support and commitment for the programme and that communication with key decision makers and opinion shapers is maintained.
- **Ensuring adequate funding.** Ensure that adequate funding is available and that realistic consideration is given to sustainability and continuity of activities.
- **Coordinating initiatives.** Establish or support a coordinated effort which builds upon and/or creates synergies with existing initiatives carried out by independent institutions.
- **Learning from successful initiatives.** Learn from examples of public education and outreach programmes that have been successful.
- **Ensuring evaluation and feedback.** Establish an ongoing evaluation process which includes timely feedback to all partners.
- **Recognising achievements.** Publicly recognise particularly successful contributions to the programme so that both the people delivering the programme and those benefiting from it are more likely to become involved in the next initiative.

2.6 WHAT ARE THE BENEFITS OF BUILDING PARTNERSHIPS?

Building strong partnerships between the NMHSs and the other interested parties can be of value in the development and implementation of public education and outreach programmes. Some of the potential benefits of partnerships are:

- Access to additional resources in terms of staff and finance.
- Increased influence by lending credibility to the programme and providing publicity.
- Enhanced creativity, innovation and expertise.
- Removal of conflict between parties that have similar aims but slightly different interests.

Creating and maintaining such partnerships require:

- A clear understanding of any differences between the partners and the desired outcome they are trying to achieve.
- A willingness to build upon individual strengths by recognising the expertise of each partner and the contributions each can make.
- Coordination of the activities of all partners involved.
- An agreed communication plan that allows for review of all publicity and communication efforts by partners to ensure mutually beneficial and consistent messages are highlighted.
- Provision of adequate resources to support, evaluate and sustain each partner's activities.
- Involvement of all parties in joint fund-raising efforts.

The form of the partnership can cover a wide spectrum from a formal agreement between the parties (e.g. contract or Memorandum of Understanding) to the informal based on collaboration between people with a similar interest.

In seeking partners, efforts should be made to include the respected public organizations for any given community. These may not be organizations that would typically be involved in meteorological initiatives. It is worth casting the net wide when seeking partners and avoiding just considering organizations with which there is already a working relationship.

2.7 DO STAFF HAVE THE APPROPRIATE SKILLS?

Public education and outreach will only be effective if the services provided by the NMHS match the quality expected by the users. If the presentation of the services is perceived to be inadequate, then public education and outreach may have a negative effect by highlighting the weaknesses of what is provided.

The NMHS staff (especially forecasters, warning specialists and coordinators, and any staff members who have contact with the general public) need to be trained in the provision of public weather services. In addition to having the necessary meteorological knowledge, it is important that those people involved in creating, promoting, packaging, selling and delivering public weather services develop skills in presenting information and interacting with the public. When establishing a training programme to develop these skills, consideration could be given to including the following aspects of providing services.

- Composing forecasts and warnings so that they will be easily understood by the recipients.
- Grooming in media presentation skills and media relations (at least for some staff and with media input).
- Preparing and giving a talk to members of the public or groups of users.

- Preparing newspaper graphics and writing media releases.
- Designing web pages.
- Dealing with telephone and face-to-face enquiries, especially difficult ones.
- Cooperating with emergency management personnel during hazardous weather.
- Appreciating the special needs of particular national industries such as agriculture or forestry.
- Conducting surveys to ascertain users' requirements or to monitor the value of the existing service (these skills might reside outside the NMHS but it is important that staff appreciate what is involved).
- Evaluating the benefits of services, including social and economic impacts.

It may be that this training of NMHS staff needs to be facilitated in part by media specialists from outside the NMHS.

It is equally important that NMHS managers are capable of organising and supporting the delivery aspects of their public weather services. The training of managers could include the following.

- Developing a user focus with emphasis on identifying users and assessing their requirements.
- Creating a vision and a plan for the NMHS.
- Providing the equipment, staffing and training programmes needed to cater for the required level of service provision.
- Monitoring and evaluating the quality and benefits of the services provided by the NMHS (with outside help if necessary).
- Adapting to changes in interrelated national industries, community expectations and meteorological capability.

2.8 HOW CAN APPROPRIATE SKILLS FOR THE STAFF BE DEVELOPED?

WMO-No. 258 provides guidance for the education and training of personnel in meteorology and operational hydrology. Following these guidelines should help ensure that people involved in the provision of public weather services have the required knowledge and understanding of meteorology and the associated skills. These attributes are sometimes referred to as "hard skills" – the technical abilities and knowledge required to do a job. Such "hard skills" tend to be acquired through training which is a systematic process of developing knowledge, skills and attitudes for current or future jobs. There are a variety of ways of delivering the training, including:

- **Instructor-led courses** – An integrated series of learning events which have a common aim involving instructors and groups of learners. The learning events could include lectures, exercises, case studies, experiments and projects using conventional learning techniques as well as elearning (e.g. using internet, intranet, audio and video tapes, CD-ROMs or DVDs).
- **Simulation** – An activity aimed at replicating a real situation or task which might be faced in the workplace.
- **Self-study** – Learning initiated and directed by the learner which might involve use of textbooks, self-

study workbooks, e-learning and access to other learning resources.

The training could be delivered at an institution specialising in education and training, as on-the-job training, or a combination of both approaches.

As well as developing “hard skills” it is also important that there are opportunities to develop “soft skills” which enhance effectiveness. Such skills include team working, analytical thinking, flexibility, problem solving, communicating ideas and information, planning and organising, and leadership. These skills tend to be associated with enhancing human relations and they are transferable between jobs. The development of these skills can use the same training approaches as described above for the hard skills. In addition there are some other powerful techniques available.

- **Coaching** – Involves a one-to-one process in which the coach supports the learner by giving guidance and feedback about the performance of tasks.
- **Reflection** – A learner thinks about how well a task has been carried out, identifies how it could have been done better, and then takes action to develop the skills which will lead to the improvement in performance.
- **Observation** – A learner observes how a colleague carries out a task, asks questions, and thinks about what lessons can be learnt from the experience.

Though it may be convenient to think in terms of “hard skills” and “soft skills”, in reality the performance of any specific tasks involves a combination of both types of skill. Indeed there is really a spectrum of skills with the hard and soft skills being at either end of the spectrum. Another way in which hard and soft skills are intimately linked is that the effective acquisition of hard skills often requires the application of the soft skills.

By acquiring an appropriate array of skills a provider of public weather services can be effective in turning high-quality meteorological information into services that meet the needs of the public and other users.

Chapter 3

DEVELOPING A PUBLIC EDUCATION AND OUTREACH PROGRAMME

When establishing a public education and outreach programme the following steps need to be taken:

- Initiate the programme.
- Identify the target audience.
- Create the message.
- Choose the strategies.
- Package and distribute the message.
- Implement the programme.
- Evaluate the programme.

It should be noted, however, that these steps are closely linked and a degree of iteration may be necessary to develop a coherent public education and outreach programme and to respond to experience and changing circumstances.

These individual steps will now be covered in more detail.

The content of this chapter is inspired by and makes full use of the guide entitled “*Getting in step. A guide for conducting watershed outreach campaigns*” published by the United States Environmental Protection Agency. Go to: www.epa.gov/owow/watershed/outreach/documents/

3.1 INITIATE THE PROGRAMME

When initiating a public education and outreach programme it is necessary to have a clear idea about the current situation and what a new programme is trying to achieve. Also consideration needs to be given to who will lead the team involved in the programme, the role stakeholders and partners might play, and potential barriers to the success of the programme.

Driving forces. Identifying the forces driving a programme will help determine the scope of the programme and provide a clear focus for it. The driving force is often associated with a specific issue. For example, the need to reduce the adverse economic consequences and loss of life associated with hazardous weather.

Goals. The goals (which may also be referred to as the aims or the mission) are a general statement about the broad focus of the effort. The goals should reflect the driving forces, be few in number and respond to a genuine need. Indeed the goals and driving forces may overlap, but usually the goals go beyond simply restating the driving forces. Normally the goals will be associated with changing behaviours, knowledge or attitudes. An example of a goal is to increase preparedness for and mitigation of the impacts of hazardous weather.

It is worth recognising that identifying the genuine need may not be straightforward without a full understanding of the existing position, the gaps in provision and the potential for improvement. Also the social, political and economic environment needs to be appreciated.

An effective way of setting the scene for establishing a public education and outreach programme or reviewing the state of an existing programme is to do a SWOT analysis beforehand to identify strengths, weaknesses, opportunities and threats.

SWOT Analysis

A SWOT analysis can be used to assess the strengths, weaknesses, opportunities and threats of the current public education and outreach activities when considering any new initiatives. The strengths and weaknesses tend to be internal factors whereas opportunities and threats are mainly associated with external environment.

- ◆ **Strengths.** Identify current strengths of the existing approach to the activities.
- ◆ **Weaknesses.** Identify current weaknesses of the existing approach to the activities.
- ◆ **Opportunities.** Identify opportunities for future growth and improvement of the activities.
- ◆ **Threats** Identify existing or potential threats to the health of the activities.

A rigorous SWOT analysis can help identify a realistic and strategic approach to further developing public education and outreach activities.

Later consideration will be given to identifying the target audience. In practice, however, the goals and associated objectives of a programme would need to be based on a clear understanding of the needs of the target audience.

Objectives. The objectives deal with how the goals are to be attained. They should be specific, measurable, action-oriented, relevant and time-focused (SMART) and consistent with the goals. Often there may be several objectives associated with each goal, but it is best to avoid proliferation of objectives. It is advisable to:

- Prioritise the objectives.
- Consider the process by which progress with fulfilling the objectives will be assessed.
- Ensure that the objectives are clearly stated and acceptable to the people who have to carry out the associated tasks.
- Ensure the resources are available to accomplish the objectives.

Programme team. The success of a programme will be highly dependent upon the person who leads the team that develops and implements the programme. The person chosen needs to have the appropriate expertise along with an enthusiasm for and commitment to what is trying to be achieved. Ideally the programme leader should be involved in the programme initiation so that person can contribute to and understand the key decisions from the start. The other members of the team need to have the appropriate range of

skills and knowledge of the needs of the target audience. If possible, one or more representatives of the target audience should be members of the team.

Key influencers within the target community. An effective way of reaching a target group is to have the message delivered by a respected representative of their own group. Therefore, at an early stage it is worthwhile identifying the influential members of the interest group/community. This opens up the possibility of having these people involved in the development of the programme. Later the same people can be provided with the tools to help deliver the message.

Stakeholders and partners. It would be worth considering whether any stakeholders, interest groups or partners should be involved in developing and delivering the public education and outreach programme. If others do become involved, it may be necessary to review the goals and objectives in the light of the new perspective they may bring. Also it would be wise to agree with any partners the roles and responsibilities and the decision-making process.

Barriers to success. At this early stage it would be wise to consider if there are any potential barriers to the success of a programme. Then the programme can be developed in such a way that the impact of these barriers is minimised. Indeed, throughout the development process thought needs to be given to what problems might be faced and how they can be overcome.

3.2 IDENTIFY THE TARGET AUDIENCE

The target audience is the group of people whose behaviours or attitudes the public education and outreach programme is attempting to change. Usually there is more than one audience for a programme. In this case, the target audience needs to be segmented in such a way that the people in each segment have essentially the same characteristics. If the audience is too broad it is unlikely that the messages associated with the programme will fully engage those people being targeted.

When considering the target audience, there are four common groupings that are often used. These are based on:

- Geographical location (e.g. region).
- Demographic characteristics (e.g. age, recreational activities, ownership of property).
- Occupation (e.g. farmers, fishermen, students, educators).
- Behaviour patterns (e.g. people that take no notice of weather warnings).

The target audience may be a combination of several of these groups.

The following are various audiences that might be targeted by a public education and outreach programme.

- **School and academic institutions.** Students and educators will mainly be interested in the understanding of processes associated with weather, climate and water in the context of the science and geography curricula. In addition, educators will benefit from knowing how consideration of these topics can enhance other curriculum areas.
- **General public.** This group of people is very diverse with interests covering a wide range of topics (e.g.

current weather, weather forecasts and warnings, climatology and environmental issues). It also needs to be recognised that amongst the public some groups are more vulnerable to weather events than others (e.g. children, elderly and homeless). Therefore the best way of increasing awareness of public weather services and appreciation of the natural world is through use of the mass media.

- **People involved in recreational or economic activities.** The information provided needs to focus on the particular weather of interest to each sector (e.g. agriculture, fishing, forestry, energy suppliers, transportation, building and construction, tourism, and recreational and sporting activities) and how to make best use of the information available.
- **Media.** The media is the main vehicle for transmitting weather information to the public. It is important, therefore, that people within the media are made aware of the forecasts and warnings that are available, how this information can be presented in an effective way and the benefits of the NMHS and the media working together. In addition, the media can play a vital role in supporting public education and outreach programmes.
- **Hazards community.** All the components of the hazards community (including the general public, media, emergency managers, governmental agencies, and non-governmental and voluntary organizations) play a vital role when hazardous events occur as they are the translators of warnings into mitigating action. They need to be aware of the contribution the NMHS can make in preparing for dealing with these events and reducing their impact when they occur.
- **Governmental authorities.** Efforts are required to ensure that high-level policy and decision makers are aware of:
 - The activities of the NMHS and the associated socio-economic benefits.
 - The knowledge and expertise the NMHS can contribute in making policy and decisions about environmental issues.
 - The need for warnings to be translated from scientific knowledge to field-level activity in a way that is understandable to the general public.

The high-level policy and decision-maker must not be forgotten since they can have a direct influence on the resources available to the NMHS and priority that may be given to supporting its various activities.

Having identified the target audience it is worth obtaining basic information that will help to provide a picture of the target audience and the community in which they reside. Consider questions such as:

- Why do people in the target audience behave as they do and what might make them change?
- What are the cultural and ethnic characteristics of the audience?
- What is important to the target audience?
- Does the audience believe there is a problem that needs addressing?
- What is the knowledge base of the audience?
- How does the audience receive and share information?
- Who are the opinion leaders and information disseminators in the audience?

- How does the audience perceive the NMHS?
Information about the target audience can be gained in a variety of ways including the use of trade associations, public agencies, surveys (mail, phone, email/web), focus groups and community discussions, interviews and observations.

Though a public education and outreach programme needs to be aimed at a specific audience, it is worth noting that the impact of the programme may go beyond the members of the target audience.

3.3 CREATE THE MESSAGE

The messages are intended to raise awareness, educate or motivate action amongst the target audience. Analysis of the goals, objectives and target audience should help identify the messages that will be effective. Messages need to be relevant to the target audience and persuasive.

If the message is trying to change behaviour of the target audience then in order to be most effective, the following approach is beneficial.

- Affect emotions so as to provide the motivation for a change of behaviour in addition to supplying relevant factual information.
- Highlight individual benefits associated with taking the desired actions and the adverse impact of not taking those actions.
- Build upon existing behaviours.
- Propose actions which are relatively low cost in terms of time, energy, money and materials and avoid actions requiring a lot of steps or training.

The following are examples of messages that might be appropriate.

- ***Appreciate the natural environment.*** Being knowledgeable about weather, climate and water can add to an appreciation of the natural environment.
- ***Make learning more enjoyable and relevant.*** Supplementing the school curriculum with topics associated with weather, climate and water can be stimulating and make traditional curriculum areas appear more interesting and relevant.
- Save money and reduce loss of life. Having knowledge of how to use public weather services can bring economic benefits as well as reducing the impact of natural hazards.
- Maximise use of the expertise available. Making use of the wide-range of knowledge and expertise within the NMHS can provide valuable support for top-level policy and decision making.

In developing the messages it should be remembered that:

- The choice of language or vocabulary, the order in which material is presented, whether one side or both sides of an issue are presented, how much repetition is needed to get the message across, and whether the message uses fear, humour or logic to make its point will depend upon the target audience.
- A message is most effective if it builds awareness as well as suggesting specific actions (e.g. do X because of Y).

- The message needs to be vivid, lively, personal and memorable to capture the attention of the target audience.
- It is worth emphasising the common ground between the NHMS and the recipients of the message.
- The required actions need to be simple and clear with a positive message (“do this”) tending to be more effective than a negative one (“don’t do this”).
- It is most effective to keep the message simple and to avoid diluting it by providing too much information.
- The message needs to be believable and consistent with the values and motivations of the target audience.
- A balance needs to be struck between engaging the audience and putting them off by hyperbole or exaggeration.

Persuasion theories

Persuasion is a process which uses messages to influence others. The emphasis is on influencing the receiver rather than just providing information. The aim is to change minds or to generate action. There are a number of theories of persuasion which involve some key concepts.

- ◆ ***Belief.*** What people think is true or false.
- ◆ ***Value.*** What people think is good or bad, right or wrong.
- ◆ ***Motive.*** What people think are their own interests.
- ◆ ***Attitude.*** What people like or dislike, favour or oppose.
- ◆ ***Behaviour.*** What people do.

A rational model of persuasion is based on the idea that beliefs plus values/motivation produce attitudes which influence behaviour. This means that people are more likely to be persuaded if the approach taken is based on an understanding of the beliefs, values and motivation of the target audience.

Another way of thinking about how to persuade is to consider:

- ◆ ***Image.*** How does the new behaviour fit in with the image the target audience has of itself?
- ◆ ***Consistency.*** Is the new behaviour consistent with the existing beliefs and behaviours of the target audience?
- ◆ ***Effectiveness.*** How does the new behaviour affect the short- or long-term goals of the target audience?

There are a variety of strategies that can be used to persuade the audience, including appealing to authority (e.g. “Research shows that...”), appealing to the majority (“Most people nowadays...”), taking a moral approach (e.g. “You owe it to your family...”), appealing to self-interest (e.g. “You will benefit by doing...”), and requesting a moderate change (e.g. “Why not do X as well as your usual Y”). Which ever approach is taken, it is necessary to be clear about the purpose of the message.

- ***Create uncertainty.*** When the target audience is opposed to the persuader’s view the aim is to make the audience less certain.
- ***Reduce resistance.*** When the target audience is moderately opposed to the persuader’s view the aim is to reduce opposition.

- **Change attitude.** When the target audience is not committed the aim is to change the attitude.
- **Amplify attitude.** When the target audience is moderately favourable to the persuader's view the aim is to reinforce current attitudes.
- **Gain behaviour.** When the target audience is strongly in favour of the persuader's view the aim is to get action.

Different formats used for presentation		
Format	Advantages	Disadvantages
TV news coverage	<ul style="list-style-type: none"> • Creates awareness, publicity and recognition. • Popular source of environmental information. • Free • Can reach a large audience. • Most people would rather watch than read. 	<ul style="list-style-type: none"> • Working with reporters takes time and patience. • Reporters might change focus of desired coverage and message received. • Training on giving interviews might be needed.
Radio	<ul style="list-style-type: none"> • Can be free to air. • Can reach large audience. • Can focus on target audience. 	<ul style="list-style-type: none"> • Stiff competition for air time. • Very passive.
Videos	<ul style="list-style-type: none"> • Can discuss an issue in depth. • Have control over content. • Can be visually appealing. 	<ul style="list-style-type: none"> • High cost. • Requires expertise in video production to do well. • Need a good distribution mechanism.
Printed formats (e.g. fact sheets, newsletters, brochures, booklets)	<ul style="list-style-type: none"> • Can be used in any setting without sophisticated equipment. • Can reach a large audience. • Can tailor message for specific audiences. • Can go beyond building awareness by providing technical information. • Reader can scan material to focus on items of interest and can reread the material. • Often low cost and relatively easy to duplicate. • Easily edited and revised. 	<ul style="list-style-type: none"> • Static presentation. • Passive rather than participatory. • Dependent upon a good mailing list. • Mailing may be costly. • Audience must have the interest to read them. • Dependent upon reading skills
Events (e.g. trade shows, trade fairs, festivals)	<ul style="list-style-type: none"> • Good for persuasion. • More personal. • Offer two-way communication. 	<ul style="list-style-type: none"> • Difficult to reach entire audience. • Require staff time. • Could be expensive and inefficient. • Potential for low attendance. • Requires significant planning time. • Requires publicity.
Presentations (e.g. workshops, conferences, group meetings)	<ul style="list-style-type: none"> • Can be participatory. • Good for persuasion. • More personal. • Offers immediate feedback. 	<ul style="list-style-type: none"> • Reach small audiences. • Require staff time. • Can be too technical. • Hard to get commitment to attend. • Effectiveness depends upon presenters.
Web sites	<ul style="list-style-type: none"> • Can reach large audiences. • Inexpensive. • Easily maintained. • Offer up-to-date information. • Individuals may choose the content they need, and learn at their own pace at a time which suits them. 	<ul style="list-style-type: none"> • A challenge to market. • Long-term commitment to maintain. • Must have access to computers and be computer literate
Displays (e.g. libraries and other public locations)	<ul style="list-style-type: none"> • Can reach large audiences. • Visually pleasing. • Reusable. • Can be specific to an event. 	<ul style="list-style-type: none"> • Require staff time. • Must be durable. • Material can become dated.
Billboards	<ul style="list-style-type: none"> • Can reach large audiences. • Visually pleasing. 	<ul style="list-style-type: none"> • Very short message. • Generally high cost.

3.4 CHOOSE THE STRATEGIES

As indicated earlier, there is a wide variety of strategies that can be used to implement a public education and outreach programme. It is imperative that:

- The strategies chosen are appropriate for the target audience.
- The NMHS has the resources in terms of staff time, expertise and finance to carry out the chosen strategies.
- There is a clear understanding about what each strategy will achieve.
- Thought is given to how the various strategies interlink and complement one another, and the timing of the introduction of each strategy.

In deciding what strategies to use, it is probably better to initially implement a few strategies well rather than to try to do too much right from the start.

3.5 PACKAGE AND DISTRIBUTE THE MESSAGE

It is important that the messages are packaged in such a way that the format is appropriate for the target audience. Some of the factors that might affect the format of the messages in terms of the content, language and presentation are:

- Size, geographical distribution, age and educational attainment of the audience.
- Existing level of awareness of the audience.
- The way the target audience normally receives information and their preferred formats and learning styles.
- The way in which the target audience will access the information and frequency of access.
- Availability of existing formats/materials that can be used directly or adapted.

It is particularly important to recognise that material for children requires a very different approach from what is appropriate for users of public weather services within the adult population.

Before developing any new material it is important to review what is already available. Doing this can avoid duplication of material, identify material that can be adapted either in terms of content or presentation, and provide ideas about new ways of presenting the material. It is sensible to build upon what is already available rather than immediately produce new material. Note, however, that when adapting existing material it must be done in such a way that it is still relevant to the new target audience and does not contain irrelevant information left over from the original version.

There is a wide variety of formats available for packaging the messages. Often it is worthwhile using several formats which when combined have the effect of reinforcing the messages. In making a decision about which formats to use it is important to ensure that the format is appropriate for both the message and the audience, and that its use will be effective in getting the message across.

It is worth noting that material that is serious in intent does not necessarily have to be serious in presentation. Use of attention-grabbing headlines, comic strips or cartoons can be an effective way of engaging the audience.

As well as providing information and advice, it is also worth including suggestions about where more information can be found or what follow-up self-teaching can take place. It is important to recognise that though a public education and outreach programme may be a one-time event there is a continuing need for a dynamic approach to reinforce the messages and deal with changing circumstances.

Developing public education and outreach material

Design stage

- ◆ Determine the need for material by assessing the evidence for there being a gap between what exists already and what needs to be supplemented or augmented.
- ◆ Analyse the target audience to understand their cultural background, educational level, prior knowledge, motivation, interests and familiarity with various delivery systems.
- ◆ Establish objectives (i.e. what the recipient will know, understand or be able to do after using the material) so that there is a clear understanding of the purpose of the material.
- ◆ Select an instructional strategy based on an understanding of the learning process.
- ◆ Develop an evaluation strategy.

Development stage

- ◆ Create an outline of the content based on the outcome of the design stage.
- ◆ Review existing material to assess what can be adapted and get ideas about an appropriate style, format and content.
- ◆ Organise and develop content, and discuss proposals with some members of the target audience.
- ◆ Select/develop materials and delivery methods whilst taking account of learner needs, content requirements, instructional strategy and technical constraints.
- ◆ Review the material for clarity, presentation and content.
- ◆ Test materials on some members of the target audience.
- ◆ Develop an evaluation strategy.

Evaluation stage

- ◆ Collect and analyse evaluation data.
- ◆ Assess whether the objectives have been met and whether the material has had the planned impact.
- ◆ Identify achievements as well as ways in which effectiveness or scope of the material can be improved.

Revision stage

- ◆ Use evaluation results and feedback from colleagues to revise material.
- ◆ Test significant changes to the material.

As well as considering which are the most appropriate formats to choose, it is also necessary to consider the resources, work and timescales for preparing and distributing the material. It is important to be realistic – unrealistic plans lead to frustration and loss of credibility. The following are some of the issues that need considering:

- Are the resources available in-house (including skilled staff and finances) to prepare and distribute the material?
- Can partners provide resources and/or expertise to support the development of materials?
- Can use be made of members of societies and others who are interested in weather, climate and water to help develop, test and distribute material?
- Is there enough time available to produce and distribute the material?
- Can enough material be produced for the whole target audience?

Careful consideration needs to be given to the distribution of the material. Indeed getting material to the right people at the right time is perhaps the most difficult aspect of a public education and outreach programme. To clarify the situation, ask questions such as:

- How will the material be distributed?
- Should the material be distributed in hard copy format, electronically or in both forms in order to reach the desired population?
- Are there other modes of distribution that might be more efficient (e.g. radio, television and internet)?
- Are there partners or existing distribution networks that can be used to help distribute the material?
- Can the message be distributed by attaching it to someone else's message?
- When is the best time to distribute the material?
- Will the material get through to remote areas and/or those that will benefit most from it?

Distribution of material should include planning for any required or beneficial follow up on the materials that may be needed. This plan should include actions aimed at building on previous materials so as to ensure that the follow up distribution will provide the next step or continue the learning process in the area of interest or concern.

3.6 IMPLEMENT THE PROGRAMME

To implement the programme you need to develop an action plan supplemented by a consideration of the risks and any mitigating action.

The plan needs to identify what needs to be done, when it should be done, and who should do it. Also it may be appropriate to include priorities, evaluation indicators and resource requirements.

It is usual for the plan to identify a set of activities associated with each objective aimed at a particular goal. By recording the status of each task and reviewing its progress it is possible to monitor implementation of the action plan.

As mentioned earlier, to launch a successful programme staff, technical and financial support will be required. In all these areas partnerships may provide additional resources and, just as important, increase the impact of the programme.

Achieving the goals of the programme may take a considerable amount of time and this can lead to those involved becoming disheartened. A way to avoid this is to look for "quick wins" so that there is a feeling of achievement even in the early stages.

Advice about preparing printed material

The priority is to have printed material (e.g. pamphlets, brochures and leaflets) which is interesting and relevant. However, it also needs to be presented in such a way that it is visually appealing. This means that a lot of thought needs to be given to presentational aspects.

It is advisable to collect and review samples to get ideas before preparing a newsletter or brochure. One should also explore various sizes and folds. Then, when preparing the material, take into account the following guidance.

- ◆ **Typeface.** Use a variety of typefaces but exercise restraint (two or three typefaces are usually sufficient). Sans serif fonts (e.g. Arial and Helvetica) are good for headings, with serif fonts (e.g. Times Roman) being best for block text. Avoid using upper case lettering.
- ◆ **Font size.** The font size used depends upon the column width – the narrower the column the smaller the font size.
- ◆ **Layout.** Leave plenty of white space. This can be achieved by having wide margins, gaps between paragraphs and not right-justifying the text. Use headings to break up text and grab attention – headings in the form of questions are always engaging. Introduce bullets for quick and easy reading. Include variety in design, but avoid a "busy" appearance.
- ◆ **Graphics.** Photos and artwork break up the text, add visual appeal and can impart a powerful message. However, use of poorly produced graphics, especially those that are unnecessarily complicated, can detract from the appearance of the material.
- ◆ **Text.** Use short sentences and avoid long complex sentences. Avoid acronyms, jargon and uncommon words.
- ◆ **Colour.** Varied use of colour for the text or background can make material appear much more attractive provided it is used in a consistent and discriminating manner. Too much colour can be overpowering.
- ◆ **Information.** If possible include a variety of types of information such as facts, examples, explanations and advice.

Inevitably any programme will face problems during its implementation, though these can be reduced by identifying the risks to the programme and considering what action can be taken to mitigate these risks. One can use a risk register as part of this process.

Some of the risks that might be faced are as follows.

- **Poor coordination and planning.** There needs to be a clear strategy with considerable effort being put into the following from the start:
 - Establishing driving forces, goals, objectives, target audience and messages.
 - Using appropriate formats and distribution mechanisms for the messages, and the evaluation process.
 - Involving the key players and stakeholders.
- **Lack of communication.** All members of the implementation team need to know about the actions

that are being taken, achievements that have occurred, and issues that need to be addressed.

- **Fear of the unknown.** The fear of failing in a daunting task can cause delays. Also there is the need to avoid not taking important decisions because all the data on which the decision is based is incomplete, uncertain or contradictory.

Using the media

Use of the mass media (i.e. newspapers, radio and TV) is a highly effective way of getting a message across. A NMHS is often in an advantageous position if it is responsible for weather presentations on the TV and radio. These can provide a unique opportunity to raise awareness about weather, climate and water issues. However, for NMHSs in general, there are opportunities to use the news media which are effective, available and free.

Which ever media is used, the message needs to be clear and presented in such a way that it will resonate with the audience. For example, a news story might have one or more of the following attributes.

- ◆ Relate to significant or unusual issues or events.
- ◆ Involve controversial issue or strong emotions.
- ◆ Be relevant to many people within the community.
- ◆ Deal with current events.

In all cases the material should be designed to educate, inform, engage or motivate the audience.

When choosing the type of media to use take into account the following factors.

- ◆ Television is picture-oriented and devotes little time to any particular story.
- ◆ Radio may be prepared to devote more time to news items than TV and be rather more analytical.
- ◆ Print media (e.g. newspapers and magazines) tends to contain longer and more analytical articles than those using audio/visual media.

The key to using the media successfully is to be proactive in establishing good relationships with reporters and editorial staff. This will require personal contact built up over time, with both parties understanding each others needs and the constraints under which they work. Good relationships will result in increased reporting, fewer factual errors, a willingness by the media to research stories about weather, climate and water, and the provision of more balanced views in the media of those affected by hazardous weather and those providing the services.

- **Getting bogged down.** Once the implementation plan has been established, avoid spending too much time on the process (e.g. meetings and reports) but focus on carrying out the tasks needed to achieve the objectives. Avoid loss of momentum.
- **No follow-up.** Not including a follow-up component often results in a campaign that simply fizzles out and is forgotten.
- **Funding problems.** If the funding is short term then the programme may be isolated from the mainstream activities, be treated as low priority, raise expectations that cannot be met as the long-term results may not be

immediately apparent, and damage the credibility of those involved in the programme. Therefore funding for the whole programme and follow-up action needs to be secured.

- **Not disseminating the results.** Not providing sufficient and timely information about the results of the programme can result in loss of partners and support from the community.

It is important to adapt the programme to changing circumstances as it progresses. No matter how carefully a programme is planned, the unexpected will inevitably happen!

Instructional strategies

The following are the "nine events of instruction" as put forward by R. Gagné (1987).

- ◆ **Gain attention.** Gain attention by creating interest from the start (e.g. something eye-catching or through provoking).
- ◆ **Inform learners of objectives.** Establish the purpose of the instruction as this facilitates learning.
- ◆ **Stimulate recall of prior knowledge.** Try to make a link to prior knowledge as this helps make the instruction meaningful and relevant.
- ◆ **Present content.** Where possible use a variety of media (e.g. text, graphics, video).
- ◆ **Provide learner guidance.** Provide advice about what other learning resources are available.
- ◆ **Elicit learning/practice.** Provide opportunities for what has been learnt to be put into practice.
- ◆ **Provide feedback.** Provide useful, immediate and constructive feedback.
- ◆ **Assess learning.** Assess comprehension at the end and/or during the learning process.
- ◆ **Enhance retention and transfer.** Review and summarise to reinforce new material and help retention.

3.7 EVALUATE THE PROGRAMME

It is good practice to build the evaluation process into the design of the programme. The aim is to monitor the impact of interventions and improve their effectiveness. Regular follow-ups and feedback help assess the success of the programme. The weak points in the programme can be clearly identified and deficiencies rectified through periodical updating of the programme.

The two main types of evaluation are as follows.

- **Process evaluation.** This focuses on implementation activities and allows modification to the implementation plan in the light of experience. For example, assessments might be undertaken of expenditure, staff resources and whether tasks have been completed on schedule.
- **Impact evaluation.** This focuses on the extent to which the original objectives have been met. For example, assessments might be undertaken of whether there has been increased awareness or knowledge, and whether behaviour has changed.

Some key questions that need to be addressed with any evaluation process are:

- Who will have overall responsibility for the evaluation process?
- What will be evaluated, when will it be done and who will do it?
- Are the resources available to analyse the results?
- What will be done with the results of the evaluation and how will they be disseminated?

Some common ways to assess effectiveness include conducting surveys among participants of public education and outreach activities, and analysing web site hit rate statistics. However, it has to be recognised that the impact of the activities may be difficult to assess because:

- They are often conducted with groups that are hard to reach.
- It is difficult to discover what action has been taken in response to programme activities.
- Outcomes can be difficult to quantify.

The programme needs to be evaluated in terms of the specific objectives of the programme whilst recognising the benefits may be different for the target audience, the wider community and those carrying out the programme.

Performance indicators can be used to measure the overall effectiveness or degree of success achieved by a programme. Some suggested indicators are:

- Change in casualty statistics (e.g. injuries and loss of life) and property damage due to adverse weather.
- Economic benefits/losses reported in weather-sensitive sectors of the economy resulting from use of NMHS products in planning and operations.
- Rate of use of NMHS products (was there an increased demand?).
- Change in the number/type of clients and queries.
- Feedback in the form of compliments or complaints received directly or in the media (e.g. the number of press clippings, letters, phone-calls and e-mails).

Chapter 4

PUBLIC EDUCATION PROGRAMMES

Consideration will now be given to some aspects of developing a programme which are specific to public education. Information will be given about the following.

- Environmental education
- Public education strategy within the formal education system
- Supporting the educators
- Finding partners for education programmes

In addition some examples will be given of some wide-ranging education programmes.

4.1 ENVIRONMENTAL EDUCATION

The Belgrade Charter and the Tbilisi Declaration concerning environmental education resulted from two United Nations conferences held in the 1970s. They defined environmental education as being a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones.

Objectives of environmental education

The objectives of environmental education as specified by the Belgrade Charter and Tbilisi Declaration are:

- ◆ **Awareness:** To help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.
- ◆ **Knowledge:** To help social groups and individuals gain a variety of experiences in and acquire a basic understanding of the environment and its associated problems.
- ◆ **Attitudes:** To help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection.
- ◆ **Skills:** To help social groups and individuals acquire the skills for identifying and solving environmental problems.
- ◆ **Participation:** To help provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

The associated goals of environmental education are:

- Clear awareness of and concern about economic, social, political, and ecological interdependence in urban and rural areas.
- Personal opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.
- New patterns of behaviour of individuals, groups, and society as a whole towards the environment.

Also there are particular objectives that have been specified for dealing with awareness, knowledge, attitudes, skills and participation.

These goals and objectives are just as applicable in the education associated with weather, climate and water.

4.2 PUBLIC EDUCATION STRATEGY WITHIN THE FORMAL EDUCATION SYSTEM

The overall goals of a public education strategy initiated by a NMHS could be:

- Awareness and understanding of the science associated with weather, climate and water amongst students in primary, secondary and higher-education programmes, and amongst their families and the wider community.
- Awareness of actions that can be taken to reduce the effects of hazardous weather.

The strategy of a NMHS to achieve these goals might be:

- To bring the best science and information on weather, climate and water to educators so that they can be integrated into the curriculum.
- To provide learning resources that will help students develop a scientific understanding of weather and its impacts.
- To encourage students to collect and analyze data in their local environment, and if possible to go beyond their own surroundings to gain an understanding of the impacts of weather on other parts of the world.
- To make available environmental data, and support the creation of local databases for environmental parameters that can be shared and analyzed.
- To encourage schools, other educational institutions and the local communities to work together to develop knowledge and share information about environmental issues.
- To stimulate action by students and education authorities to plan, implement and monitor actions to prepare for and mitigate the impacts of natural hazards.

The key message is that the learning experience of young people and an appreciation of the natural environment and its hazards can be enhanced by including in the curriculum topics dealing with weather, climate and water.

An additional benefit of enhancing interest in the natural environment amongst the young is that it may make meteorology and hydrology a more attractive choice of career.

4.3 Supporting the educators

In many countries the school curriculum is already set and may include little about weather, climate and water. In these circumstances the aim is to find ways of supplementing the existing curriculum so that full use is made of the

educational opportunities that come from including aspects of these environmental topics. At the same time it may be worth trying to persuade the educational authorities to include more explicitly environmental topics in the standard curriculum.

The support provided to educators is aimed at helping them find ways of enhancing the curriculum by including material about weather, climate and water in an appropriate and engaging way for learners of different ages,

backgrounds, levels of knowledge and developmental abilities. To do this it is necessary to build confidence in dealing with topics concerning weather, climate and water, show how these topics can be integrated into the existing curriculum and provide access to appropriate curriculum resources. There are various actions that can be taken by a NMHS to support educators, including:

Six characteristics of high quality education material

According to “*Nonformal Environmental Education Programs: Guidelines for Excellence*” there are six characteristics of high-quality environmental education material. The following are some of the key points associated with each of those characteristics

Fairness and accuracy

- ◆ **Factual accuracy.** Materials should reflect sound theories and well-documented facts about subjects and issues.
- ◆ **Balanced presentation of differing viewpoints and theories** Where there are differences of opinion or competing scientific explanations, the range of perspectives should be presented in a balanced way with learners encouraged to explore different perspectives and form their own opinions.

Depth

- ◆ **Awareness.** Materials should acknowledge that feelings, experiences and attitudes shape perceptions and issues.
- ◆ **Focus on concepts** Materials should use unifying themes and important concepts and set them in a context that includes social and economic as well as ecological aspects.
- ◆ **Attention to different scales** Issues should be explored using a variety of scales as appropriate, such as short to long time spans, localized to global effects, and local to international community levels.

Emphasis on skills building

- ◆ **Critical and creative thinking.** Learners should be challenged to use and improve their critical thinking and creative skills.
- ◆ **Applying skills to issues.** Students should learn to arrive at their own conclusions about what needs to be done based on thorough research and study.

Action oriented

- ◆ **Sense of personal stake and responsibility.** Materials should help learners to examine the possible consequences of their behaviours and evaluate choices they can make.
- ◆ **Self-efficacy.** Materials should aim to strengthen learners’ perception of their ability to influence the outcome of a situation.

Instructional soundness

- ◆ **Learner-centred instruction.** Materials should present information and ideas in a way that is relevant to learners and, when appropriate, learning should be based on learner interest and his/her preferred method of learning.
- ◆ **Different ways of learning.** Materials should offer opportunities for different modes of teaching and learning.
- ◆ **Goals and objectives.** Goals and objectives for the materials should be clearly spelled out.

Usability

- ◆ **Clarity and logic.** The overall structure (purpose, direction, and logic of presentation) should be clear to educators and learners.
- ◆ **Easy to use, long-lived and adaptable.** Materials should be inviting and easy to use, have a life span that extends beyond one use, be adaptable to a range of learning situations and accomplish what they claim to accomplish.
- ◆ **Accompanied by instruction and support.** Additional support and instruction should be provided to meet educators’ needs.
- ◆ **Fit with national, state, or local requirements** Materials should fit within national state, or local standards or curricula.

More information can be found at:
<http://naaee.org/pages/npeee/materials.html>

Digital Library for Earth System Education (DLESE)

DLESE is a geoscience community resource that supports teaching and learning about the Earth system. It is being built by a community of educators, students, and scientists to support Earth system education at all levels. DLESE provides:

- ◆ **Collections of educational resources.** Access to these collections provides resources to support a wide range of learners.
- ◆ **Earth data sets and imagery.** Access to digital learning resources, including the tools and interfaces that enable their effective use in educational settings, allows students to explore Earth data.
- ◆ **Support services.** The support services help educators and learners effectively create, use and share educational resources.
- ◆ **Communication networks.** The networks facilitate interactions and collaborations across all dimensions of Earth system education.

DLESE resources include electronic materials for both teachers and learners, such as lesson plans, maps, images, data sets, visualizations, assessment activities, curriculum, online courses, and much more.

The search facility allows resources to be identified according to:

- ◆ **Subject.** As well as atmospheric science, climatology and environmental science the categories include various aspects of geological and ocean sciences.
- ◆ **Grade.** Categories include primary, intermediate, middle, high, college graduate/professional and general public.
- ◆ **Resource type.** Categories include classroom activity, computer activity, lab activity, resource guide for instructors and lesson plan.

Use of DLESE is free – it is entirely funded by the National Science Foundation (NSF) in the USA. The vast majority of the resources that can be discovered in DLESE are free as well.

Information about how to access resources from DLESE and make contributions to it can be found at: www.dlese.org/library/index.jsp

- **Identifying existing educational resources.** Identify and evaluate existing educational resources and, where possible, providing links to good material (e.g. via the web).
- **Providing educational resources.** Provide lesson plans, learning materials and suggestions about learning activities associated with the environment (e.g. experiments, investigations, projects and field work), along with advice about how to use these resources.
- **Making links with existing curricula/standards.** Demonstrate how the incorporation of environmental knowledge and issues can enhance delivery of the existing curricula or standards for subjects such as science, mathematics, geography, language and arts.
- **Training educators.** Provide training courses for educators and/or trainers of educators to build

confidence and develop understanding about unfamiliar concepts associated with weather, climate and water.

- **Indicating links to weather information.** Indicate where up-to-date information about weather, climate and water, including observations, can be found on the web.
- **Showing the educational value of environmental observations.** Show how making and analysing environmental observations can be of value in many areas of the curriculum.

Education in disaster management in schools in India

In India the Central Board for Secondary Education (CBSE) has successfully introduced disaster management as a curriculum subject for children in Class VIII and Class IX. Also plans are in place to extend this to Class X. These classes cover children aged 13 to 15. A training programme has been implemented in order to support this priority. Also a series of text books has been produced under the title “*Together, towards a safer India*”. The comprehensive scope of these books is illustrated by the various chapter headings.

An Introduction to Disaster Management for Class VIII

- ◆ Being prepared – a vital part of disaster management
- ◆ Earthquakes
- ◆ Cyclones
- ◆ Floods
- ◆ Drought
- ◆ Man-made disasters – an overview

A Textbook on Disaster Management for Class IX

- ◆ Becoming a disaster manager – understanding key terms
- ◆ Components of disaster management
- ◆ Introduction to disaster management – understanding disaster mitigation
- ◆ Specific hazards and mitigation
- ◆ Preventing common man-made disasters
- ◆ Community based disaster management
- ◆ School planning for disasters

A Stride Ahead – A Textbook on Disaster Management for Class X

- ◆ Introduction
- ◆ Tsunami – the killer sea waves
- ◆ Survival skills
- ◆ Alternative communications systems during disasters
- ◆ Safe construction practices
- ◆ Sharing responsibility
- ◆ Planning ahead

Note that supplementary materials that are provided as part of the programme need to be “easy” to integrate into the existing curriculum. Therefore it is desirable if local educational experts:

- Explain how and when the materials can be integrated.
- Provide opportunities for educators to practice/learn the material in a hands-on manner.

- Plan research activities around the integration of the supplemental activities to assist in evaluation efforts. Also it is important that there is top-level acceptance and support for the programme within the educational community otherwise the educators will not be allowed to use the new materials and/or their implementation efforts will not be supported and their effectiveness will be reduced.

4.4 FINDING PARTNERS FOR PUBLIC EDUCATION PROGRAMMES

When developing material for use in schools it is advisable to go into partnership with the national education authorities or one or more educational establishments. Such partners may be able to:

- Provide educational expertise which helps identify ways in which the existing curriculum can be enhanced

and the kinds of material that would be of assistance to educators.

- Develop some of the material and test it on small groups of students and educators.
- Contribute to the distribution and assessment of any new material.
- Identify additional partners or sources of educational expertise and funding that can contribute to the programme.

In addition partners may add authority and credibility to the programme.

For educational programmes it is particularly important to establish partnerships as the professionals in NMHSs can often be unaware of current teaching practices and the level of material required for various age groups. Without the use of partners there is a significant danger that the material is at the wrong level for a particular age group and does not link in with other components of the curriculum.

The GLOBE Program

Global Learning and Observations to Benefit the Environment (GLOBE) is a worldwide hands-on, primary and secondary school-based science and education program designed for K-12 students (aged up to approximately 18 years old).

GLOBE measurements have been selected by the international science community to provide data needed for Earth science research, allowing student with opportunities to work with international scientists, while providing scientists access to data that would otherwise go uncollected. GLOBE data also complements satellite remote sensing missions.

GLOBE is an international initiative which brings together students, teachers and scientists to:

- ◆ Increase scientific understanding of the Earth.
- ◆ Support improved student involvement in science and mathematics.
- ◆ Enhance environmental awareness of individuals worldwide.

GLOBE supports students by providing hands-on experience in authentic science. Students begin with measurements of individual environmental parameters and build towards an understanding of how the Earth functions as a system. Measurements are made of the physical, chemical and biological properties of the atmosphere and climate, hydrology, soil, land cover/biology and phenology. More than 15 million pieces of environmental data have been collected by the international GLOBE community. The resulting data are made freely available via the internet.

GLOBE makes available a variety of educational materials for children to approximately 18 years of age. This ranges from hands-on inquiry-based activities for classroom use to online interactive learning experiences and investigations using student-collected data. The educational material includes:

- ◆ **GLOBE Teacher's Guide**. The Guide includes advice about 54 data collection protocols and describes 60 learning activities that build upon the data collection activities. The guides are translated in all United Nations' languages (Arabic, Chinese, English, French, Russian, and Spanish), and at least part, if not all, of the GLOBE Teacher's Guide is also available in Czech, Dutch, German, Greek, Hebrew, Japanese, Portuguese and Thai, with many other materials becoming available in other languages through GLOBE's 109 international partner countries.
- ◆ **Elementary GLOBE** This consists of a suite of primary storybooks and learning activities aimed at engaging children in the early stages of their school education. These resources build literacy skills while addressing the Earth system.
- ◆ **On-line Training Modules and assorted educational activities** Interactive on-line resources are available to promote understanding through a hands-on approach.
- ◆ **Data Use Activities** Materials have been developed to encourage the analysis and interpretation of environmental data using the GLOBE web site and its on-line graphing tools.

GLOBE is an international programme with over 34,000 trained teachers representing more than 18,000 schools in over 100 countries. For more information about GLOBE go to: <http://www.globe.gov>.

GLOBE is an interagency program funded by the National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF), supported by the U.S. Department of State, and implemented through a cooperative agreement between NASA, the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado and Colorado State University in Fort Collins, Colorado. It is also a cooperative effort of schools in partnership with colleges and universities, state and local school systems, and non-government organizations.

Chapter 5

OUTREACH PROGRAMMES

Outreach programmes tend to have a different focus from those aimed at public education. Therefore consideration will now be given to some issues that are particularly associated with outreach programmes. Also some advice will be given about developing outreach programmes for specific groups of people. The following topics will be covered.

- Real-time education and public awareness initiatives.
- Finding partners for outreach programmes.
- Using the media.
- Using intermediaries.
- Outreach programmes for farmers.
- Supporting policy and decision makers.
- Improving the response to warnings of hazardous weather.

5.1 REAL-TIME EDUCATION AND PUBLIC AWARENESS INITIATIVES

Outreach activities fall into two broad categories: real-time education and public awareness initiatives.

Real-time education. When warning messages are issued they may contain information about the preventive actions that can be taken to reduce the impact of the event. Repetition of this kind of advice helps to educate the public. This approach is particularly effective because the information is presented at a time when it is most needed. It is relevant to dealing with the current threat and provides a basis for responding to future events. The material may be made available in a variety of ways including:

- Text, TV crawlers, interactive television, faxed messages, internet, SMS messages, newspapers.
- Radio, recorded telephone messages, interviews on television, personal telephone conversation with forecasters, loud hailers.
- Disaster management control rooms and community announcements.

Usually a combination of these approaches is used, with TV and radio presentations involving staff from NMHS being particularly effective. Though the reporting by the media of news about hazardous events creates an opportunity for real-time education, in reality such events are often sensationalised with little effort being made to help the public understand what is happening and know what action needs to be taken.

Public awareness initiatives. These initiatives are not linked to the occurrence of any specific weather event. A programme to increase public awareness can be instigated at any time. However, when such programmes are associated with hazardous weather, the timing is very important. It would be appropriate to have a programme:

- Just before and during the season in which the hazard occurs to help minimise the risk for individuals and communities.
- Immediately after a hazardous event as this represents an opportunity to build upon personal experience.

These initiatives can be delivered in a variety of formats using a range of dissemination mechanisms. As with real-time education, the media, especially radio and television, can play a vital role in raising awareness.

Awareness leading to action

- ◆ Provision of information raises awareness – information must be accessible with the target audience correctly identified.
- ◆ Awareness will foster knowledge – two-way communication leads to assimilation of information.
- ◆ Knowledge will lead to understanding – knowledge acquisition is most effective if linked to personal experience.
- ◆ Understanding will prompt concern – usually requires a personal connection and the concern could be intellectual or emotional.
- ◆ Concern will mobilise action – lack of action could come from not knowing how to act, lack of opportunity, reduced priority or lack of time.

5.2 FINDING PARTNERS FOR OUTREACH PROGRAMMES

The development of an outreach programme will usually benefit from the involvement of partners who have specialised knowledge of the target audience or who are concerned in some way with providing similar services to that audience.

A good example of the use of partners is when trying to improve hazard awareness and the response to warnings for a hazard-prone community. There are a variety of governmental agencies and other bodies already involved in protecting life and property by dealing with disaster preparedness, disaster management and disaster response. These include:

- Federal, state and local government agencies involved in the warning process or the associated warning infrastructure.
- Emergency managers or coordinators.
- National emergency services.
- Private sector weather companies and neighbouring NMHSs which have to deal with similar hazards.
- Schools and educational institutions have an especially important role as making young people more aware of hazards and their impacts can help a particularly vulnerable group of people, spread knowledge amongst their families, and develop good practice which can be taken into adulthood.
- International agencies which provide humanitarian relief (e.g. Red Cross and Red Crescent).
- Non-governmental organizations (e.g. charities and faith groups) with a philanthropic mission.

- Meteorological societies have members that are a valuable resource, covering a wide range of expertise spread across the community.
- The media, especially radio and television, which play a vital role in communicating warnings and advice to the public about hazards.

Experience indicates that collaborative programmes dealing with hazard awareness are more effective than those carried out by a single institution. Such an approach provides additional credibility and ensures that those affected by hazards do not receive mixed or contradictory messages.

5.3 USING THE MEDIA

Media can be very useful in supporting outreach programmes and so they should be effectively utilized. For this, the people preparing and presenting material need to be adequately trained and informed about meteorological facts. They also need to be motivated by their organizations. In this regard, the NMHS and the policy makers in various sectors of Media could have joint ventures to enhance the quality of media coverage of meteorological events.

Various forms of media (print and electronic) have characteristic strengths and weaknesses. An NMHS should therefore make an attempt to strike a balance and exploit the maximum possible benefit out of the strengths of each form of media. A judicious combination of different forms of media would also help in this regard.

An approach which would bring long-term benefits is to encourage some institutes (e.g. those offering training in journalism and mass communication) to include topics on weather reporting and presentation which are lively and absorbing.

5.4 USING INTERMEDIARIES

In rural and developing areas an effective way of raising awareness of environmental issues and increasing understanding of how to use the available services is to develop and support intermediaries. This is especially effective if those intermediaries are already involved with the target audience. The intermediaries need to be trained so that they gain professional recognition and expertise, and have the confidence to advise and support the communities they serve.

The training of intermediaries is intended to build awareness and functional knowledge rather than create “experts”. This means that the aim is to develop intermediaries who:

- Know what information exists and where to find assistance.
- Supplement their sector-specific expertise with knowledge about the impact of weather, climate and water on the sector activities.
- Have the confidence to explain products and services, and to further develop their knowledge and expertise.

This kind of training should not be static. The intermediaries need to be kept aware of developments by being provided with additional information and advice. For example, newsletters and guidance notes can be used. There

is also great value in bringing groups of intermediaries together to share experiences, and to meet with the professionals who provided the initial training.

Using intermediaries can help overcome literacy problems. This can also be addressed through the use of audio broadcasts.

5.5 OUTREACH PROGRAMMES FOR FARMERS

The farming community is an important group that may benefit from an outreach programme. However, the principles outlined for developing an outreach programme for farmers may be generalized for other user groups. Before the start of such a programme, information needs to be gained about this community. For example:

- How do farmers get information and what do they consider to be the most reliable sources?
- What training methods have been successful with farmers and what are their preferred learning styles?
- Are there regional, cultural and sector-specific differences that need to be taken into account?
- How will the needs of farmers for additional information and advice be assessed for a diverse and scattered farming community?
- Are farmers receptive to suggestions about changes in practices?
- How can representative farmers contribute to developing an outreach programme?

In addition to having a clear understanding of the target audiences and the goals and objectives of an outreach programme, there is a need to have clarity about the messages that the programme intends to provide. The messages might be concerned with:

- The economic benefits resulting from the use of weather and hydrological services (e.g. by increasing yield).
- The benefits of reducing risks to crops and livestock due to adverse weather conditions.
- The benefits of taking an active approach to environmental stewardship based on using information about weather, climate and water.

To deliver the message, it is preferable to use existing means of communication, rather than starting a new newsletter or organization. Indeed there are particular difficulties involved in communicating with people in rural communities because they are often remote and scattered. The following are some of the vehicles that could be used for delivering the message.

- Magazines and newspapers aimed at farmers.
- Newspapers, television and radio.
- Internet.

Preparing pamphlets may also be worthwhile. However, issues surrounding dissemination must be taken into consideration, especially since the members of the farming community tend to be scattered across large geographical areas.

There are a variety of outreach strategies that could be used with farmers.

- **Focus on a geographical area and/or farming sector.**
Focussing on a particular geographical area and/or

farming sector will allow the outreach programme and the associated materials to concentrate on the needs of a relatively homogeneous group of farmers.

- **Use familiar presentation styles.** Designing the outreach material so that it has a presentation style familiar to farmers will increase the effectiveness of the materials.
- **Involve farmers.** Involving some farmers in developing the material and approach used in the outreach programme helps ensure that the outreach activities are appropriate.
- **Support consultants.** Supporting existing farming consultants and others who have regular contact with farmers will allow them to contribute to the outreach programme and enter into dialogue with farmers, on an individual or group basis, about the associated messages.
- **Focus on benefits.** Focussing on the potential benefits to the individual, family and community realized through a positive response to the messages in the outreach programme will increase the relevance of the messages.
- **Recognise barriers.** Recognising that farmers may not have the time, energy, resources or access to real-time information to do all that the outreach programme is suggesting will avoid the programme appearing to lack realism about what changes in behaviour can be achieved in both the short- and long-term action plans.
- **Linking with production decisions.** Link the outreach programme to the production decisions that farmers typically have to make.

The Hong Kong Experience

The Hong Kong Observatory has a comprehensive approach to supporting disaster risk reduction.

In support of the operation of warnings, the following materials are provided:

- ◆ Description of hazard, meaning of the warnings
- ◆ Issuance and cancellation criteria
- ◆ Advisories and precautionary measures
- ◆ Rationale behind criteria and recommended actions

In addition there is the raising of awareness of disaster risks by providing:

- ◆ Explanations of meteorological phenomena.
- ◆ Descriptions of cases of extreme events, both local and worldwide.
- ◆ Information about the effectiveness of precautionary actions.

There are many pamphlets available, in both English and Chinese, which provide advice about how to respond to a variety of warnings, including those about tropical cyclones, rainstorms, thunderstorms, landslips, cold and very hot weather, fire danger, UV radiation and danger from the sea. Other sources of information are announcements on television and radio and compact disks. Information about these warnings and disaster reduction is also available from the web site at:

<http://www.weather.gov.hk/textonly/explain/intro.htm>

The target audiences for all the materials developed by the Hong Kong Observatory include:

- ◆ The general public, with particular emphasis on those most at risk (e.g. elderly people and children), special interest groups (e.g. hikers and paragliders) and special user groups (e.g. fishermen).
- ◆ Decision-making authorities including government departments (e.g. emergency relief, search and rescue, social welfare, transport and education) and private companies whose business is sensitive to weather hazards.

Much thought has been given to the scheduling of activities throughout the year.

- ◆ **During** the quiet season. Visits to the observatory by students, open day, exhibitions in public venues and outreach visits by Observatory staff to homes for the elderly and schools. Also implementation of campaigns seeking to raise awareness, including various related contests, particularly those involving students.
- ◆ Pre-rain and tropical cyclone season. Meetings with decision-making authorities and conducting seminars for front-line staff of government departments with duties during an emergency, appeal by the Director of the Observatory for the public to be prepared for natural hazards, regular broadcasts of API on TV and radio, and meetings with stakeholders to refresh their memories and advise them about service enhancements.
- ◆ During the rain and tropical cyclone season. Step up API broadcasts, and meet with those users hardest hit to understand their problems to identify quick fixes and long-term solutions.
- ◆ After the rain and tropical cyclone season. Meetings with users to discuss enhancements to services, and organise training courses for the public and special user groups whenever staff resources allow.

In addition to the activities described above, there are also educational programmes aimed at:

- ◆ Developing a better understanding of meteorological phenomena.
- ◆ Explaining the strengths and limitations of weather forecasting.
- ◆ Promoting trust in the NMHS as the meteorological authority.

5.6 SUPPORTING POLICY AND DECISION MAKERS

NMHSs can have an important role in supporting policy and decision makers. The provision of meteorological and hydrological services can be of enormous benefit to both economic activity and the well-being of the population. However, some key policy and decision makers may not be aware of the benefits of the services provided and the important role that a NMHS can play in contributing to top level policy and decision making. For example, the NMHS can play a vital role in making decisions when hazardous weather occurs and in contributing to policy about how to prepare for hazardous weather and the impact of climate change.

The following points are worth bearing in mind when developing an outreach programme for decision makers in order to raise the profile of an NMHS and the services it provides.

- **“Contributions” rather than “features”.** Speaking the language of the policy makers, with emphasis on the socio-economic contributions of meteorological and hydrological services to society, will make them more receptive to the messages that are being delivered. Just providing information about the “features” of the NMHS is unlikely to be convincing or of interest to them.
- **Practical rather than hypothetical.** Presenting case studies about the value of meteorological and hydrological services will be worthwhile when trying to influence decision makers. The case studies could provide a firm foundation for claims about the benefits of these services by emphasising the practical rather than the hypothetical.
- **Supporting policy making.** Emphasising the role of NMHSs in support of policy-making in areas such as disaster mitigation and responding to climate change will help ensure that the expertise within the NMHS can be used at an early stage in making policy.

5.7 IMPROVING THE RESPONSE TO WARNINGS OF HAZARDOUS WEATHER

It is important that the public and emergency services know how to prepare for and react to weather hazards so as to reduce the impact of such events. An outreach programme may be necessary to ensure that warnings and forecasts are understood by the users. A programme of this kind could help develop a high level of awareness of hazards with the aim of people knowing such things as:

- What hazards might affect me and when might they occur?
- How will I be warned about the hazards?
- What would be the impact of the hazards?
- What would I do if a hazard is likely to occur?

The goals of an outreach programme could be:

- Awareness amongst the public, emergency managers, governmental agencies and other bodies involved in dealing with emergencies about how to prepare for hazardous weather and how to react to warnings of such events.

- Confidence in meteorological warnings and an appreciation of the uncertainties associated with weather forecasts and warnings.

When developing a programme it might be appropriate to try to deal with the attitude of some people towards warnings.

- **“Cry wolf”.** Some people may not trust warnings because in the past warnings have been given but the event has not occurred. Such a loss of credibility means that warnings may be ignored. Therefore it is necessary to educate the public about the inherent uncertainties in forecasts. This may involve:
 - Explaining why a certain event did not happen following the issue of a warning or why its timing was not as expected.
 - Helping people recognise that a degree of over warning may be a prudent way of managing potential disasters.
 - Making people aware that even if they are unsure about the validity of a warning they need to consider the risk of ignoring the warning.
- **“Fading memory syndrome”.** There is the danger that if there is a long period between hazardous events, the people tend to forget and or ignore the past calamity.

As well as aiming an outreach programme at adults, it is also worth considering children. Educators and children in schools can become model disaster managers within a community, especially if they have experienced hazardous weather in the recent past. Increasing children’s awareness of hazardous weather can lead to a spread of knowledge and understanding amongst the family. Consequently it is desirable to include in the school curriculum topics dealing with how to prepare for disasters and the actions to take when they occur.

Chapter 6

YOU CAN DO IT !

The ideas and information presented in this document are intended to help NMHSs embark on a public education and outreach programme or to improve the effectiveness of an existing programme. However, there is no perfect recipe for public education and outreach – each NMHS must assess the need for a public education and outreach programme and its own capability to effectively deliver such a programme. Once that has been done it is hoped that the guidance in this document will stimulate thought and provide practical ideas about how to develop a programme.

As with any initiative the establishment of a public education and outreach programme needs careful planning. Consideration needs to be given to questions such as:

- Where are we now and where do we want to go?
- How do we get there?
- How will we know that we have arrived?
- Do we have the resources to achieve what we want?

Ensuring clarity of purpose, a good implementation plan and appropriate resourcing are key elements in achieving success.

It is important that public education and outreach is not considered in isolation. For example, there is little point in putting a lot of effort into making the public more aware of the services provided by a NMHS and how they can be used if the services themselves do not meet the needs of the public and other users of those services. Consequently a NMHS needs to be sure that the quality and relevance of the services provided are appropriate before embarking on a public education and outreach programme. As well as considering the content and presentation of those services, it is also important to assess whether the staff involved in their preparation and delivery have appropriate skills.

The guidance in this document mainly concerns what action can be taken by NMHSs to make the public and other users of public weather services more aware of what is available and how it can be used. However, this is not a one-way process. Involvement in public education and outreach will involve a NMHS being more engaged with the users of its services. This could then bring new insights into their needs and encourage further development of public weather services in a way which is mutually beneficial.

Though the initiative for establishing a public education and outreach programme may come from the NMHS, a key component for success is to work in partnership with others. Agencies such as education ministries, universities, training institutions, professional bodies and trade associations can make a valuable contribution to ensuring a programme is properly focussed and relevant, and has the desired impact on the target audience.

There is no doubt that advances in knowledge of the earth-atmosphere system, observing capability, numerical modelling and technology have enabled NMHSs to improve the quality of public weather services. The priority now is to ensure that the users of those services can take full advantage of what is provided. In that way NMHSs can make an even bigger contribution to the safety and welfare of the public

and increase the social and economic benefits coming from the services provided.

Chapter 7

FURTHER READING

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