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Meteorological services for transportation

Weather affects the operation of the transportation systems that we all rely on ... Climate, on the other hand, affects transportation infrastructure.

M. McGuirk et al.

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In this issue

Activities involving transportation are inherently more sensitive to weather events than activities that are located in a single place. Consider an individual contemplating a ten minute walk to his favourite coffee shop: indoors, he is not particularly weather-sensitive but once outdoors, the situation changes substantially. Is it so hot that he should wear a hat and sunscreen? Is it likely to rain and so should he take an umbrella and wear a coat? Is it so cold that he needs a wooly bonnet to keep his ears warm?

Undoubtedly important questions to be answered, but the underlying principles are even more significant. In choosing to be mobile, our man must gather some weather-related information and make decisions which are aimed at reducing his sensitivity to adverse weather. There is a cost to him in terms of loss of personal freedom and amenity in taking extra gear which he must trade off against the greater loss if the weather is so adverse that he will experience significant discomfort. How those involved in transportation deal with sensitivity to weather is the substance of all the articles appearing in this issue of the Bulletin.

Decision-makers face a number of issues in ensuring that their transportation-related activities reduce their weather sensitivity in a cost-effective way. For the aviation industry, for example, that involves having de-icing equipment on aircraft, weather radar to avoid thunderstorms and instrument landing systems to land in fog and other low visibility situations. These are all up-front investments to reduce weather sensitivity, each one is taken after a careful weighing of costs and benefits, often informed by years or decades of operational experience. The next step in the process is to consider systems that will enable real-time decision-making to avoid threatening weather situations. To do this, the aviation industry uses real-time weather data collected expressly to meet its needs by National Meteorological and Hydrological Services (NMHSs) coordinated by WMO. These real-time meteorological data underpin operational decisions on such matters as which routes aircraft should take to minimize fuel costs, which runways should be open and how many landing and take-off slots should be available in a given period.

While the aviation industry has billions of dollars at stake and uses weather information to minimize the risk of disaster and increase operational efficiency, the individual traveller is also a heavy user of weather data. Our fictional coffee drinker is one example of a traveller using weather information but, of course, individuals involved in many forms of transportation, including rail, road, boat and air, and travellers using these modes of transportation, all make good use of the wide variety of real-time weather information available via the Internet, television, radio and newspapers. While it is not always clear, this wealth of meteorological information is only available because of the incredible success of WMO in promoting, coordinating and sustaining the free and open exchange of meteorological and related data over the past 50 years or so and because of the vital work of NMHSs around the globe in participating in this data and information exchange.

Of course, meteorology has two components—weather and climate—and, while the foregoing discussion considers the weather-sensitivity of transportation, it is also sensitive to climate and, in particular, climate change. Supporting all forms of transportation is a significant investment in infrastructure. The investment in roads, railway lines, port facilities and airports is enormous, with many of the major installations designed with lifetimes of 50 and more years. An example is the Kansas City downtown airport and port which are located on a loop in the Mississippi River. Nearby are railroad facilities and an interstate highway. With a 50+ design life required consideration would be given to the one-in-100 year flood and also the one-in-1 000 year flood heights, as well as the extreme temperatures, both hot and cold, extremes in short-term rainfall and

snow fall, likelihood of extreme winds at the port and airport, and extreme wind shear at the airport among other things. In the past, design engineers would have used the 30-year means (most recently 1961 to 1990) as guidance for the long-term means as well as statistical studies based on long-term records. More recently, thought would have been given to climate change and how, under the various warming world scenarios, the climatology of the various relevant extreme event climatologies might change and, as a consequence, how the infrastructure should be built to best handle future climate and the weather events that go to making it.

The article by Marjorie McGuirk and her co-authors, drawing on an extensive study conducted by the US Government, reports on the impacts climate change is likely to have on the transportation sector in the USA. It considers the impact of change in extreme weather climatologies on individual travel decisions, as well as on the built infrastructure that supports transport.

Chi Ming Shun and his co-authors give a comprehensive view of how and why the aviation industry is weather-sensitive and what, through the clever use of new meteorological science and technology, is being done to make the experience of the traveller a safe one.

Simon Christopher provides a lighter view of how travellers using the air transport system can take best advantage of the broad range of weather and climate information available on the Internet. While it is not always possible to avoid weather-related delays, they no longer surprise the weather-wise traveller, nor should the weather conditions they encounter at their destination.

Peter Dexter and Phillip Parker take us back to the beginnings of meteorology and transportation and, inter alia, remind us that it was the Safety of Life at Sea Convention that we have to thank for the global free exchange of meteorological data and information, and the cooperation between NMHSs intent on preventing disasters at sea.

The article by Yan Mingling and his two co-authors is, for many of us, a look into the future with respect to systems that can optimize the use of our roads and railways in the face of adverse weather. Automatic observation networks coupled to modern decision-support systems and powerful graphic displays provide the managers of China's surface transportation system with capabilities most large cities can, as yet, only dream of.

World Climate Conference-3

Geneva, Switzerland
31 August – 4 September 2009

Geneva International Conference Centre

Adaptation to climate change: making climate services work for society

Societies the world over are experiencing unusual climate conditions: floods, droughts, tropical and extra-tropical storms, snow falls, heatwaves, bushfires and unusual diseases. These conditions are the result of the impacts of global warming on the climate system (Earth, oceans, atmosphere and the cryosphere (ice sheets)). The changing climate system may lead to higher frequency, intensity and magnitude of severe weather and extreme climate events. Societies need to be prepared to live with these new conditions, since the climate system will take a long time to adjust to mitigation measures.

It is possible to adapt to the changing climate conditions. Our ancestors were able to develop lifestyles consonant with the prevailing conditions, using the knowledge they gleaned from nature. Today, the science of climate has advanced; historical records provide many instances of extreme events, as well as their frequency and intensity, while the tools to gather, analyse and exchange data to generate climate services have improved significantly. Similarly, improvements have been made in the tools for rapid dissemination of early warnings and alerts.

Despite progress in our understanding and prediction of the climate system, societies, institutions and governments remain unprepared in the face of natural hazards which often become disasters. Frequent natural disasters slow down the socio-economic development of a country, since most available resources are used for saving lives and rehabilitating affected communities. Climate-related disasters constitute more than 80 per cent of natural disasters worldwide, thus the ability to manage their impacts is an important step in stimulating socio-economic development and efforts to reduce poverty.

Importantly, enhanced climate services, that include climate advisories, predictions, warnings and alerts, could also help societies take advantage of the opportunities associated with climate events.

Efficient management of the risks and opportunities of climate hazards

requires a multisectoral approach, which brings information about how climate extremes interact with the various elements of society, environment and economy. Strong partnerships and high-quality data are needed from all sectors involved.

Climate science has made great strides in the organization, standardization and data-quality enhancement through the initiatives of WMO and its Members. The level of availability and adequacy of climate data varies from country to country, however, with most developing and least developed countries having inadequate networks and systems for collecting, managing and exchanging data.

Relevant data in some sectors are either not available or insufficient to promote research and the development of climate services. The first challenge therefore is to improve the availability, adequacy and quality of climate data. The second challenge is to promote interdisciplinary research to improve our knowledge of the interactions of climate with various elements of society, economy and the environment. The third challenge is to use the results of these studies to provide efficient, relevant and skilful climate services to meet diverse societal needs. The final challenge is the development of capabilities to access and apply these climate services.

Efforts to improve our ability to manage climate-related risks and opportunities cannot be addressed by a single institution. World Climate Conference-3 offers a unique opportunity for the world community to develop a Global Framework for Climate Services which will accelerate action to address climate-related risks that threaten the well-being of society. It will also capitalize on associated opportunities in the context of achieving sustainable socio-economic growth, especially in developing and least developed countries.

It will aim to do this by improving the gathering and sharing of climate observations and products; encouraging interdisciplinary, targeted research to develop climate predictions, international services and tools to support their applications; encouraging the development of policies that support the application of climate services; and building national, regional and institutional capacities to generate and apply climate services.

The successful implementation of GFCS will be a vital step in enabling nations to adapt to changing climate and will contribute to the agenda of the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change, especially on issues regarding adaptation.