**Conclusion**

Weather forecasting is a complex and challenging science that depends on the efficient interplay of weather observation, data analysis by meteorologists and computers, and rapid communication systems.Meteorologists have achieved a very respectable level of skill for short-range weather forecasting. Further improvement is expected with denser surface and upper air observational networks, more precise numerical models of the atmosphere, larger and faster computers and more are to be realized.However, continued international co-operation is essential, for the atmosphere is a continuous fluid that knows no political boundaries. So far, the accuracy of long range forecasting has been minimal, but the short range forecasting has been of immense help and advantage to the world at large today.

The goal of weather prediction is to provide information people and organizations can use to reduce weather-related losses and enhance societal benefits, including protection of life and property, public health and safety, and support of economic prosperity and quality of life. In economic terms, the benefit of the investment in public weather forecasts and warnings is substantial

Better forecasts and warnings are reducing these numbers, but much more can be done. The past 15 years have seen marked progress in observing, understanding, and predicting weather. At the same time, the United States has failed to match or surpass progress in operational numerical weather prediction achieved by other nations and failed to realize its prediction potential as a result, the nation is not mitigating weather impacts to the extent possible.

and products into operations. Further, the report does not seek to address important issues uniquely related to climate research nor does it touch on intra- and interagency organizational procedures and practices. Instead, the report puts forth the committee’s judgment on the most pressing high-level, weather-focused research challenges and research-to-operations (R2O) needs, and makes corresponding recommendations. This report addresses issues including observations, global nonhydrostatic coupled modeling, data assimilation, probabilistic forecasting, and quantitative precipitation and hydrologic forecasting.

The report also identifies three important, emerging issues—predictions of very high impact weather, urban meteorology, and renewable energy development—not recognized or emphasized in previous studies. Cutting across all of these challenges is a set of socioeconomic issues, whose importance and emphasis, although increasing, has been undervalued and underemphasized in the past and warrants greater recognition and priority today.

In the past decade, the field of extreme event attribution has made great strides in understanding and explaining extreme events in the context of climate change. This is still an emerging science, however; thus, continued research is required to increase the reliability of event attribution results, particularly for event types that are presently poorly understood. The need for improved understanding is coming at a time when there is increasing inquiry by the public, policy makers, and practitioners about the relationship between specific weather events and climate change . Advances in the field will depend not only on addressing scientific problems specific to attribution but also on advances in the basic underlying science, including observations, weather and climate modeling, statistical methodology, and theoretical understanding of extreme events and their relation to climate.

This chapter builds on the information presented in the preceding chapters to provide guidance for framing questions about event attribution and approaches to ensuring the robustness and reliability of event attribution studies and information. The committee also recommends future research that would improve extreme event attribution capabilities and discusses the future of event attribution in an operational context.